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Making App Data Tangible

Transforming App Data into Data Physicalizations to Support Persuasive Strategies and Enhance User Experience

Masterarbeit

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Abstract

This thesis investigates the potential of data physicalization to enhance persuasive strategies and user experience in apps. While apps often use data to influence user behavior, engagement is frequently hindered by the need for users to actively open the app. This study explores how app-generated data can be transformed into physical representations to overcome these barriers and enhance user experience.

Using the household management app Flatastic as a case study, a dynamic data physicalization prototype was developed, translating the app's points-based task system into a physical scoreboard with motorized columns. A two-week field study with six households (N = 6) compared the App-only experience to the app paired with the physicalization. Results showed that the prototype significantly enhanced perceived persuasiveness and user experience, with notable improvements in enjoyment. The physicalization served as a passive reminder, reducing barriers to task awareness and fostering social interactions.

The findings demonstrate that data physicalization can amplify persuasive strategies by embedding app data into users' environments, lowering engagement barriers, and enhancing user experience. This approach offers promising opportunities for other apps seeking to enhance persuasive strategies and differentiate themselves in competitive markets.

Kurzfassung

In dieser Arbeit wird das Potenzial von Datenphysikalisierung zur Verbesserung der Überzeugungsstrategien und der Nutzererfahrung in Apps untersucht. Während Apps oft Daten verwenden, um das Nutzerverhalten zu beeinflussen, wird die Bindung häufig dadurch behindert, dass die Nutzer die App aktiv öffnen müssen. Diese Arbeit untersucht, wie app-generierte Daten in physische Form umgewandelt werden können, um diese Barrieren zu überwinden und das Nutzererlebnis weiter zu verbessern.

Am Beispiel der Haushaltsmanagement-App Flatastic wurde ein Prototyp zur dynamischen Datenphysikalisierung entwickelt, der das punktebasierte Aufgabensystem der App in ein physisches Scoreboard mit motorisierten Säulen übersetzt. In einer zweiwöchigen Feldstudie mit sechs Haushalten (N = 6) wurde die reine App-Erfahrung mit der App in Kombination mit dem Prototyp verglichen. Die Ergebnisse zeigten, dass der Prototyp die wahrgenommene Überzeugungskraft und das Nutzererlebnis verbesserte, insbesondere in Bezug auf den Spaßfaktor. Die Physikalisierung diente als passive Erinnerung, förderte das Aufgabenbewusstsein und unterstützte soziale Interaktionen.

Die Ergebnisse zeigen, dass die Datenphysikalisierung Motivationsstrategien verstärken kann, indem sie die App-Daten in die Umgebung der Nutzer einbettet. Dadurch werden die Barrieren für das Engagement verringert und die Nutzererfahrung verbessert. Dieser Ansatz birgt Potenzial für andere Apps, die ein einzigartiges Nutzererlebnis bieten möchten, um sich von der Konkurrenz abzuheben.

Table of Contents

1 Introduction

Modern applications collect and utilize personal data to engage users and influence behavior through persuasive strategies, such as fitness apps that incorporate features like self-monitoring, rewards, and competition to promote physical activity (Matthews et al., 2016, pp. 4–6). Despite their potential, the reliance on screen-based visualizations often limits how accessible and impactful this data can be (Sauvé et al., 2020a). This research investigates an alternative approach: data physicalizations, which transform digital data into tangible, physical forms. Using the household management app Flatastic (Flatastic GmbH, 2024) as a case study, the study explores how app-generated data can be physicalized to create more engaging user interactions while offering developers new opportunities to enhance their applications.

1.1 Problem Definition

Digital applications collect large amounts of personal data every day, ranging from activity tracking to household management. Smartphones, smartwatches, and other sensor-driven IoT devices enable constant monitoring of our environments, social interactions, and personal behaviors. This data is often used to implement persuasive strategies, such as comparing with other users or sending task reminders, to reinforce desirable behaviors. These strategies are typically visualized through digital interfaces like dashboards or progress trackers, designed to simplify data perception and increase user motivation and engagement. However, as Sauvé et al. (2020a) point out, these visualizations are confined to screens and require users to actively access their data, creating a significant barrier to engagement.

To address the mentioned challenges, data physicalizations offer a promising solution. Encoding data into physical objects makes information directly accessible while providing additional benefits such as easier data perception and enhanced social interaction, as Jansen et al. (2015) outlined. Prior research, such as the work of Stusak et al. (2014), Botros et al. (2016), and Altmeyer et al. (2021), has

demonstrated the positive impact of data physicalizations on user motivation and engagement, as well as their ability to make data more persuasive and meaningful compared to traditional visualizations.

Most studies in the field of data physicalization focus on systems dedicated to the general public. In contrast, physical representations of personal data account for only 10% of data physicalization projects between 2010 and 2020 (Djavaherpour et al., 2021).

Existing projects that explored the physical representation of personal data can be divided into two main categories. The first includes projects like Activity Sculptures from Stusak et al. (2014), which represent user-specific activity data using static objects that participants manually update after completing specific goals. While effective, these are limited to static elements and narrow use cases. The second category involves projects using actuation to create dynamic applications, such as "Go and Grow" from Botros et al. (2016), which encourages physical activity by watering plants according to activity, and "Physikit" from Houben et al. (2016) which make existing sensor data tangible through cubes that produce airflow or change lighting.

Nevertheless, existing studies have one thing in common: they rely on data collected specifically for physicalization or through devices like sensors and activity trackers. This leaves a gap in understanding how data from existing apps and their embedded persuasive strategies can be translated into physical forms to improve engagement and enable new interaction methods. Exploring this area presents a promising opportunity by taking advantage of app-generated data that users willingly provide, enabling the creation of new, impactful ways to make this data more visible and engaging.

1.2 Motivation

Addressing the physical representation of app data aligns with the evolving research area of data physicalization, which explores how human perception can be leveraged to convey information more effectively. Bridging this research gap complements prior studies and highlights benefits for both users and developers.

For users, physicalizing data offers a more engaging and reflective way to interact with personal information, enabling deeper connections through tangible interactions (Karyda et al., 2021). It removes the need to open an app by making the data constantly visible in the user’s environment, encouraging interaction and

facilitating a deeper understanding. Physicalizations also enhance the social aspect of data by making it easier to share and discuss with others, as the data becomes an integrated part of the home's physical space.

For app developers, data physicalizations provide unique opportunities to amplify persuasive strategies and make their applications stand out in a competitive market. By integrating physical elements alongside their apps, developers can present app-generated data in memorable and impactful ways. Additionally, physicalizations create valuable marketing opportunities, offering tangible features that enhance the app's appeal and improve user satisfaction.

1.3 Research Questions

This research aims to explore the intersection of data physicalization and app-generated data through the following core questions:

RQ1: How can data from apps that employ persuasive design strategies be transformed into data physicalizations?

RQ2: How does transforming app data into a data physicalization impact the persuasiveness and user experience of apps with persuasive design strategies?

These questions guide the study by addressing both the technical and behavioral dimensions of data physicalization. The first question focuses on the technical challenges of designing and implementing a data physicalization based on an existing app. It examines how the app data and persuasive design strategies can be effectively integrated into the physicalization process. The second question examines how a physicalization based on app data affects user engagement. It explores how persuasive strategies are influenced with regard to the perceived persuasiveness of the system and the user experience.

1.4 Methods

This research addresses the research questions with a mixed-methods approach, combining a systematic review of related literature with the development and evaluation of a dynamic data physicalization prototype. The literature review was conducted first, as it provided the necessary theoretical and practical grounding for the prototype's design and implementation, as well as for shaping the field study to evaluate its effectiveness.

1.4.1 Literature Review

The literature review followed two primary goals. Concerning **RQ1**, it aimed to deliver a scientific foundation for the design and implementation of the prototype. This included understanding the current state of the art, examining standardized techniques and frameworks, and exploring related projects in the field of data physicalization to establish a structured starting point.

The second goal was to explore persuasive strategies and behavior change theories. These were critical for understanding the app's existing strategies, mapping them effectively to the physicalization, and addressing **RQ2** by designing the field study to measure the prototype's impact on user engagement and perceived persuasiveness.

A structured approach was taken by adopting key elements of the methodology for systematic literature review by Kitchenham (2004). After defining the research questions in Section 1.3, a set of keywords and phrases was developed to identify relevant studies. These included "data physicalization," "physical visualizations," "persuasion," and "persuasive design." The literature search was primarily conducted using the IEEE Xplore and ACM Digital Library databases. These were selected for their strong focus on technical and engineering research. Google Scholar was used to complement these databases to address gaps in psychological foundations and behavior change theories. After developing a list of key publications, backward reference searches were applied to include other relevant and foundational papers. Additionally, recent books were used as supplementary sources, providing an overview of the current research landscape, including projects. The most relevant among these were Making Data (Gwilt, 2022) and Making With Data (Huron et al., 2023).

The corpus was selected based on predefined inclusion and exclusion criteria. These criteria included a focus on the correct timeframe, prioritizing studies published between 2014 and 2024. Exceptions were made only for studies that provided foundational concepts. Thematically, the review included only studies addressing theoretical frameworks, practical implementations, or evaluations of data physicalizations and those exploring persuasive design principles or behavior change theories. The screening process involved reviewing abstracts for thematic relevance and evaluating full-text papers to ensure they met the criteria.

1.4.2 Prototype Development

To answer **RQ1**, a data physicalization prototype was developed, guided by a preceding design concept. Flatastic (Flatastic GmbH, 2024), a household

management app, was selected for this study because of its collaborative nature and the persuasive strategies it employs, which could benefit from being augmented by a data physicalization. The feature translated into physical form was the points system, visualized in the form of a scoreboard, where users are awarded points after completing a task. A detailed description of the concept is provided in Chapter 4, and the prototype development process is described in Chapter 5.

1.4.3 Field Study

A two-week field study was conducted using a between-subjects design to evaluate the prototype in a real-life environment and address **RQ2**. The study compared the experiences of households using only the Flatastic app with those using the app alongside the developed prototype. To measure persuasiveness, the Perceived Persuasiveness Scale (Drozd et al., 2012) was administered, and task behavior was tracked. For insights into user experience, the User Experience Questionnaire (UEQ; Laugwitz et al., 2008) and the Intrinsic Motivation Inventory (IMI; Wilde et al., 2009) were employed. Additionally, focus group sessions were conducted with all households to gather further qualitative insights. Detailed field study design and results are discussed in Chapter 6.

1.5 Overview of Chapters

This thesis is organized into eight main chapters. **Chapter 1** introduces the research topic, including the problem statement, motivation, and research questions, as well as the methodologies employed. **Chapter 2** explores the concept of data physicalization, offering insights into its definitions, classifications, processes, and current trends. **Chapter 3** focuses on persuasion and behavior change, providing a theoretical foundation for integrating persuasive strategies into technology. **Chapter 4** describes the development of a data physicalization concept for the app Flatastic, using design principles and established frameworks to bridge theory and practice. **Chapter 5** details the prototype development, covering its hardware, software, and integration. **Chapter 6** presents the design, implementation, and findings of the field study evaluating the prototype. **Chapter 7** discusses the implications of the findings, addressing feasibility, impact, and limitations. Finally, **Chapter 8** concludes the thesis, summarizing the outcomes and offering recommendations for future research.

2 Data Physicalization

Data physicalization refers to the process of giving data a physical form (Bae et al., 2022). Today's definition of the term was first proposed by Jansen et al. (2015), defining it as "a physical artifact whose geometry or material properties encode data" (Jansen et al., 2015). By the simplest definition, a data physicalization is an object that represents data through its geometric or physical properties (Djavaherpour et al., 2021). Consequently, the artifact possesses two characteristics: it must be physical and encode data (Dragicevic et al., 2020, p. 1). By this definition, physical models can be distinguished between real-life objects, such as architectural models and data physicalizations. Models lack a specific step known as visual mapping, where data is encoded into the object through variables like size or color (Jansen et al., 2013). In this field of research, several other terms exist that are either synonymous with or closely related to the original term and should, therefore, be mentioned. In prior work, Jansen et al. refer to data physicalizations also as *physical visualization* (Jansen et al., 2013). Additionally, the term *data sculpture* is used primarily when focusing on creating an aesthetically pleasing artifact rather than physically representing readable data (Jansen et al., 2015).

Despite data physicalization existing long before the digital representation of data, the research field itself is relatively young and has only recently gained significant attention within the research community (Hornecker et al., 2023, p. 1; Huron et al., 2023, p. 17). After Jansen et al. (2015), this research area aims to explore how physical representations, supported by computational tools, can enhance cognition, communication, learning, problem-solving, and decision-making.

An analysis of the research area reveals its strong overlaps with other domains within and surrounding the field of *human-computer interaction (HCI),* with the closest connection to visualization, as they share many research questions (Dragicevic et al., 2020, p. 2). Both research fields focus on the external representation of data to amplify the ability of humans to deal with information. However, data physicalization does not focus only on the visual channel but considers all aspects of human perception. This does not limit the depictions to flat visual displays and allows users to engage with data using more senses, such as touch and spatial perception, leading to richer, more immersive data exploration experiences.

Data physicalization is also closely related to the field of *Tangible User Interfaces (TUI)*. Both involve the interaction between physical objects and digital data. Typically, in TUIs, the physical parts are used to control digital data projections on screens. In contrast, data physicalization prioritizes data exploration and analysis, using physical objects as the primary medium for conveying information. This creates a stronger focus on the physicality of data rather than just its interaction (Jansen et al., 2015).

Additionally, data physicalization is linked to various areas of HCI, such as shape-changing interfaces and ambient displays. Even more artistic fields like architecture and graphic design have their influence, especially when creating data sculptures. While they share similarities in goals and methods, data physicalization uniquely focuses on data-driven tasks (Dragicevic et al., 2020, p. 2).

2.1 Potential

Humans are naturally skilled at perceiving and interacting with the physical world through touch and movement. However, digital interactions often ignore these abilities. Data physicalization bridges this gap by transforming abstract data into tangible forms, allowing perceptual skills to enhance understanding, engagement, and creativity (Huron et al., 2023, p. 15). This aligns with Jansen et al. (2015), who emphasize the significant potential of data physicalizations in offering benefits across perceptual, cognitive, and social dimensions.

2.1.1 Perception

Unlike on-screen visualizations, which often rely on complex navigation tools like pan-and-zoom, physicalizations provide an intuitive and seamless way to explore data through active perception, such as handling, rotating, or walking around the object (Jansen et al., 2015). The advantages of perceiving data in physical form were evaluated by Jansen et al. (2013). Comparing 3D bar charts with their on-screen counterparts revealed that physical visualizations outperform digital ones in information retrieval tasks. Spatial perception and touch are key factors, with touch enabling users to mark points of interest directly and reduce cognitive load. This tactile interaction, combined with the natural depth cues of physical objects, allows faster perception of data (Jansen et al., 2013). In perceiving information from physical objects, perspective also plays an important role. By changing the viewpoint, the way people interpret physical visualizations, such as identifying

groups, standout points, or highest and lowest values, can vary significantly (Sauvé et al., 2020b).

Although data physicalizations greatly benefit from enhanced visual and haptic perception, other senses, such as taste or smell, can also encode data. Each provides unique characteristics that contribute to information gathering, expanding the range of conveyed meanings beyond what is possible with visual displays alone (Jansen et al., 2015).

2.1.2 Accessibility

The enhanced perception through diverse sensory engagement also brings benefits in terms of accessibility, especially for visually impaired users. Unlike traditional methods such as tactile graphics, which use raised surfaces on paper to represent maps or charts, physicalizations enable richer three-dimensional forms. Additionally, properties such as material, texture, or temperature can represent data nonvisually (Dragicevic et al., 2020, pp. 11–13). This can facilitate data analysis by allowing blind users to identify patterns and details through touch, using both hands to gain a complete overview (Jansen et al., 2015). Furthermore, interactive systems can be created. An example is the Tangible Graph Builder, where tangible interfaces are combined with auditory feedback to support dynamic and independent data exploration (Dragicevic et al., 2020, pp. 12–13).

2.1.3 Cognitive Benefits

Physicalizations offer cognitive advantages by supporting learning, memory, and comprehension. In education, physical objects have long been used to facilitate understanding, such as in chemistry, through manipulable representations. Particularly, those that are rearrangeable or interactive extend these advantages by enabling learners to actively engage with data through tangible exploration (Jansen et al., 2015).

Furthermore, physicalizations have been shown to improve memory. Stusak (2015) demonstrated that users who interacted with physical bar charts remembered more information over time compared to those using digital counterparts, especially when recalling extreme values. This improved memorability is attributed to the spatial and tactile interaction with physical forms, which create stronger mental impressions. Therefore, physicalizations make data more engaging and support better learning.

2.1.4 Shared Experience and Engagement

Data physicalizations not only enhance individual understanding but also foster connection and engagement by making data visible in a social context. Unlike traditional data visualizations that are displayed on personal screens, physicalizations embed data into shared spaces. This allows them to influence our social life, which is reinforced by the fact that physical representations are always "on" (Jansen et al., 2015). This creates opportunities for communal interaction and discussion. For instance, Taylor et al. (2015) demonstrated how localized physicalizations in a neighborhood sparked conversations about shared concerns, such as traffic or environmental data. This data-in-place approach integrates data into communal life, making it more relatable and impactful.

Similarly, Khot et al. (2015) found that interactive physicalizations like TastyBeats, which transforms physical activity data into personalized, drinkable representations, facilitated shared experiences, encouraging social engagement and discussions about health. The physical presence of data artifacts in public or semi-public settings stimulates curiosity, invites participation, and acts as conversation starters (Dragicevic et al., 2020). By situating data within physical and social contexts, data physicalizations can bridge personal insights and collective dialogue, fostering a deeper connection to the data and to one another (Taylor et al., 2015).

2.2 Classification of Data Physicalizations

Data physicalizations involve different communities, such as art, design, and research, each with varied intentions, stakeholders, and approaches. This diversity is not fully addressed by conventional information or scientific visualization classifications. Therefore, Djavaherpour et al. (2021) developed a scheme with different approaches to classifying data physicalization. It starts with the initial stages of the creation process, including early decisions about the purpose, such as identifying stakeholders and intended applications, as well as the approach of transforming data into a physicalization. The authors mention that a single physicalization can fall into multiple categories. Figure 1 shows the physical rendering pipeline, which provides an overview of the rendering process. The mentioned parts for the classification theme can be found in the section "Physicalization Purpose and Approach to Physicalization." The following approaches can be used to classify physicalizatoins after Djavaherpour et al. (2021).

First, using a conventional method, it can be distinguished between *Information* Visualization (InfoVis) and Scientific Visualization (SciVis), based on whether the spatial representation is chosen or given in the data.

Another classification approach is to examine the defined goals and determine whether they are pragmatic or artistic. Pragmatic physicalizations aim to present their data in a way users can thoroughly understand it, whereas artistic physicalizations seek to convey a message rather than show data.

Additionally, physicalizations are categorized based on their reliance on computational power. They can be further divided into active, passive, and augmented. Active and passive are distinct in whether computational power is used or not, whereas augmented installations are static objects enhanced with projections or augmented reality overlays.

Furthermore, an artifact can be classified based on its intended application. Examples, therefore, are simplifying information such as complex scientific data, raising self awareness by tracking activities in a personal context or improving accessibility.

Finally, physicalizations can be categorized by their visual encoding (idioms). Most of the projects created so far fit into four categories: physical charts, models that depict topographical data or terrains, informative spaces and installations designed with data, and unique data objects like sculptures.

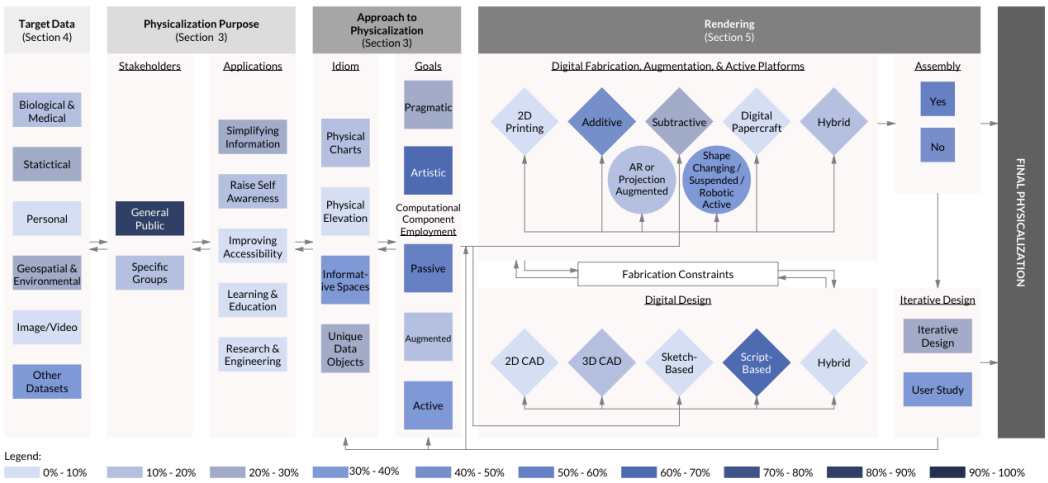

Figure 1. Physical rendering pipeline (Djavaherpour et al., 2021)

2.3 Rendering Process

"There is no right way to transform data into a physical object or experience" (Huron et al., 2023, p. 16). Multiple different approaches are used by researchers, artists, and designers in order to give data a physical shape. The data source widely diverges in scale and origin, and the physicalizations can range from artistic sculptures to concise depictions (Huron et al., 2023). This variety of approaches highlights the lack of guidance in designing and creating data physicalizations. Pittarello and Semenzato (2024) stated that the community would benefit from toolkits and design guides to encourage more people to participate as they do not have to start from scratch. Therefore, there have been some attempts to guide this process by sharing proven procedures or developing toolkits.

2.3.1 Adapted Infovis Pipeline

Jansen and Dragicevic (2013) first came up with an approach for a pipeline to transform data into physicalizations. They classify physical visualizations as part of *beyond-desktop visualizations*, as the term data physicalizations was first proposed in 2015. Beyond-desktop also includes a wide range of other emerging technologies, such as shape-changing displays and tangible input. The pipeline aims to process data into visualizations and further into the physical objects and should accommodate the increasing complexity of visual systems. Therefore, they adapted the infovis pipeline as described by Card et al. (1999) and Chi and Riedl (1998). While the classic Infovis pipeline focuses on transforming raw data into visual representations on screens, the adapted model introduces additional stages that consider physical interaction and user perception. Figure 2 shows that a *rendering process* is added to the visual presentation. This step makes the visualization perceivable through physical artifacts such as paper prints or 3D models.

Furthermore, the pipeline addresses how an observer perceives and interprets the physical presentation, recognizing that a depiction is only fully realized when it is actively perceived, processed, and given meaning by the user. Therefore, factors such as lighting conditions, viewing angles, and individual perceptual abilities are carefully considered, as they significantly influence how the physical presentation is perceived and interpreted. This should help designers to create more effective visual systems (Jansen & Dragicevic, 2013, pp. 2396–2398).

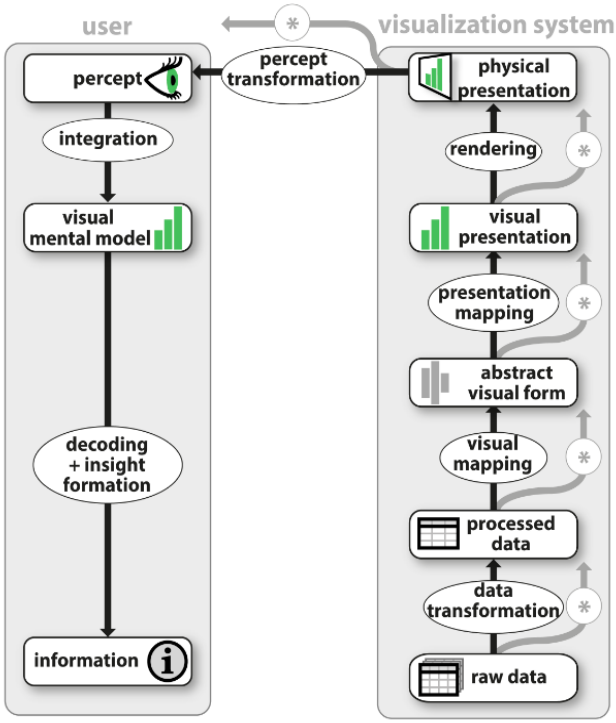

Figure 2. Extended infovis pipeline (Jansen & Dragicevic, 2013, p.2397)

2.3.2 From Data to Physicalization

A more modern guideline for creating data physicalizations was proposed by Sauvé and Houben (2022). They split the process into key elements critical for turning data into physical artifacts and aim to create meaningful physicalizations that integrate into everyday life (Sauvé & Houben, 2022, p. 41).

As the first step, they select the data the physical artifact should convey. They ask the question: "What is the actual information people need […]" (Sauvé & Houben, 2022, p. 42). Furthermore, the target audience's goals influence how the data should be depicted. For the authors, granularity (needed level of detail), actionability (use in daily life), and temporality (how often and over what duration) are important factors here. Also, the level of user participation, such as using fitness trackers, during the data collection process has an influence.

The next question the authors deal with is how data can be translated into design. As methods for 2D visualization are only partially suited for three-dimensional artifacts, a visualization vocabulary with three important aspects is proposed. Starting with the aesthetic *aspect*, the physicalization must balance being informative and visually appealing. People will not accept artifacts in their homes or in public spaces if they are not aesthetic or visually interesting. Next, abstraction

is mentioned, which defines an object that can blend in with the environment when not needed but still provides the opportunity for personal interpretation when engaged. The last point is comparison, which means to make raw data more understandable by placing it in context, such as comparing it over time or across categories (Sauvé & Houben, 2022, pp. 1–2).

For the design process, various creative methods can help develop different ideas. Examples are sketching, rapid prototyping, and pilot studies. For this realization, various skills, such as UX design for interfaces, mechanics and electronics for interactive behavior, or coding for web parts, can be necessary (Sauvé & Houben, 2022, p. 44).

When it comes to building data physicalizations, Sauvé and Houben (2022, p. 16) agree with Huron et al. (2023, p. 44) that there are no standardized tools or methods for the development process. The range of artifacts can vary from static, handcrafted elements made from simple materials like wood and clay (Huron et al., 2023, pp. 38–61) to digitally fabricated pieces produced through technologies such as 3D printing (Gwilt, 2022, p. 18), and even extend to more complex, dynamic installations that include electronic circuits (Huron et al., 2023, p. 292). In the beginning, searching for reference projects in related fields, such as information visualization or tangible user interfaces, can be helpful. To get qualitative feedback, it is also essential to include the relevant stakeholders and users as early as possible.

After the development of the physicalization, its usage should be investigated. Due to multiple field studies, three usage patterns could be recognized. In the first phase, users explore how they can interact with the object to get a first understanding of the data. The more exploratory elements are provided, the faster users will understand the scope of the data, which will lead to more meaningful engagement. After the understanding is developed, people aim to adapt the physicalization to fit specific contexts or situations. This can be enhanced by flexible designs that allow customization. The last step is social reference. Thereby, user compare their interpretations to reflect on their understanding. This indicates that interacting with physicalizations is not an individual task but more of a collaborative understanding process (Sauvé & Houben, 2022, pp. 44–45).

2.3.3 Guidelines and Toolkits

Other authors approached standardization from the design perspective by breaking physicalizations into smaller, reusable parts to aid in standardizing and comparing data physicalizations.

Hornecker et al. (2023) proposed a design vocabulary for data physicalizations. Their concept builds on the observation that many physicalizations have been created before the research field evolved. This allows for a bottom-up approach, where existing objects are analyzed, and the design elements used for data mapping are compared. This vocabulary supports the design process as it provides relevant information on existing approaches. Moreover, the authors aim to assist academics and educators by establishing a standardized methodology for analyzing existing physical artifacts. This approach helps to better understand the decisions made in prior work.

Khot et al. (2017) took a more abstract approach by creating a set of ten design themes representing key qualities for data physicalizations, such as purpose, data, or physical properties. Their goal is to encourage designers to consider all aspects of data physicalization and explore diverse ways of representing datasets. The design themes are flexible, meaning their order of use or whether all themes are applied is not critical**.** The authors recommend using these themes during the concept phase to develop new design possibilities or during iterative design processes to refine initial work. They argue that applying these principles leads to more playful and engaging results.

Pittarello and Semenzato (2024) introduced Dataphys, a flexible and modular toolkit for designing physical representations of spatio-temporal data. The system offers a ready-made system to help users create data physicalizations without starting from scratch. Their approach includes a set of cylindrical shapes called tokens, depicted in Figure 3. All are in the same color but available in different sizes. These tokens can be stacked to represent the main variable of a dataset. Smaller add-ons, available in various colors and shapes, can be attached to the tokens to represent secondary variables. To make the toolkit easily available, the components are 3D-printed, ensuring low cost and easy reproducibility. The hands-on setup process, which requires assembling components, encourages users to actively engage with the data.

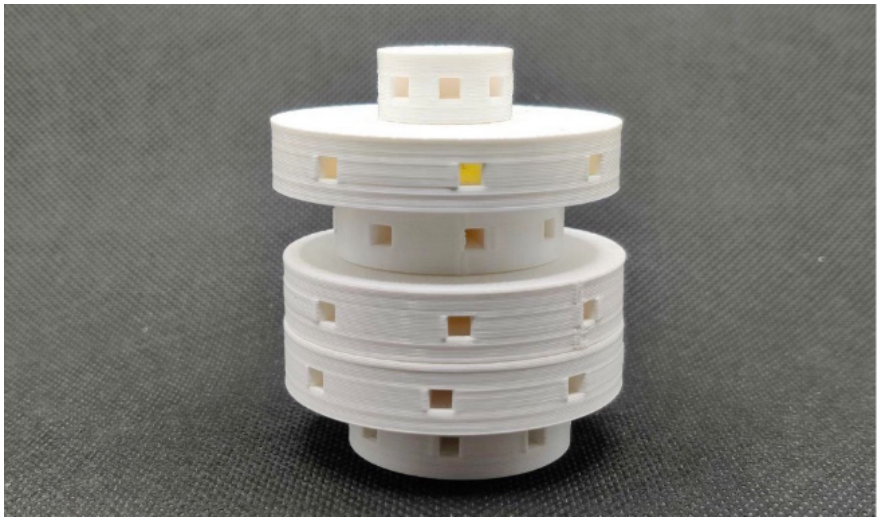

Figure 3. Design tokens (Pittarello & Semenzato, 2024)

To address the increasing popularity of dynamic data physicalizations, Hardy et al. (2015) introduced ShapeClip, a modular toolkit for building shape-changing displays. This toolkit transforms a regular 2D screen into a physical data representation. As illustrated in Figure 4, ShapeClip consists of individual columns equipped with actuators for height adjustment and LEDs for color changes. When placed on a screen, a light-dependent resistor adjusts the height and color of the columns based on the screen's brightness. This method applies changes using graphical elements, making shape-changing displays accessible to a broader audience by eliminating the need for advanced electronics or programming knowledge. This shift allows designers to focus on physicalization rather than complex constructions.

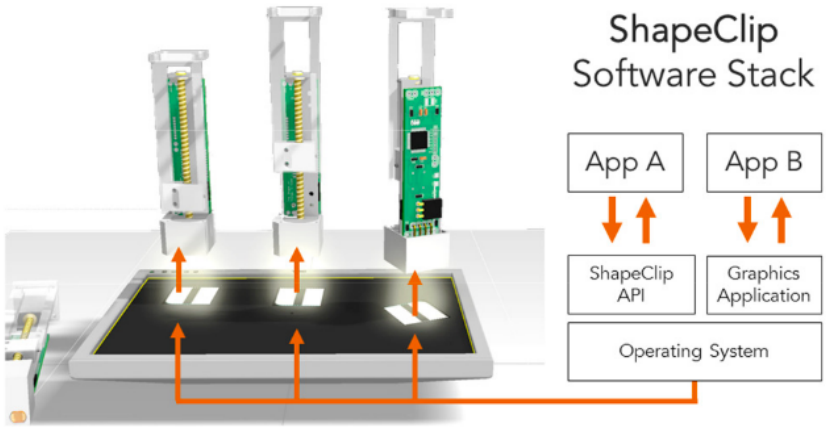

Figure 4. ShapeClip (Hardy et al., 2015)

MakerVis goes a step further by automating the whole render process. Swaminathan et al. (2014) developed a proof-of-concept prototype that lowers barriers to producing data physicalizations by supporting both design and fabrication. The toolkit provides predefined, pragmatic visualization types that can be adapted to various datasets. Users select the dataset and visualization type, after which the data points are mapped to visual variables, and the geometry of the visualization is defined. The final step involves selecting a fabrication machine, with options including laser cutting, 3D printing, and CNC milling. Figure 5 shows the MakerVis user interface, with settings and a project preview. The system also allows users to visualize the final physicalization before production, ensuring the outcome aligns with the intended design goals. By automating complex processes, MakerVis makes data physicalization accessible even to users without extensive technical expertise.

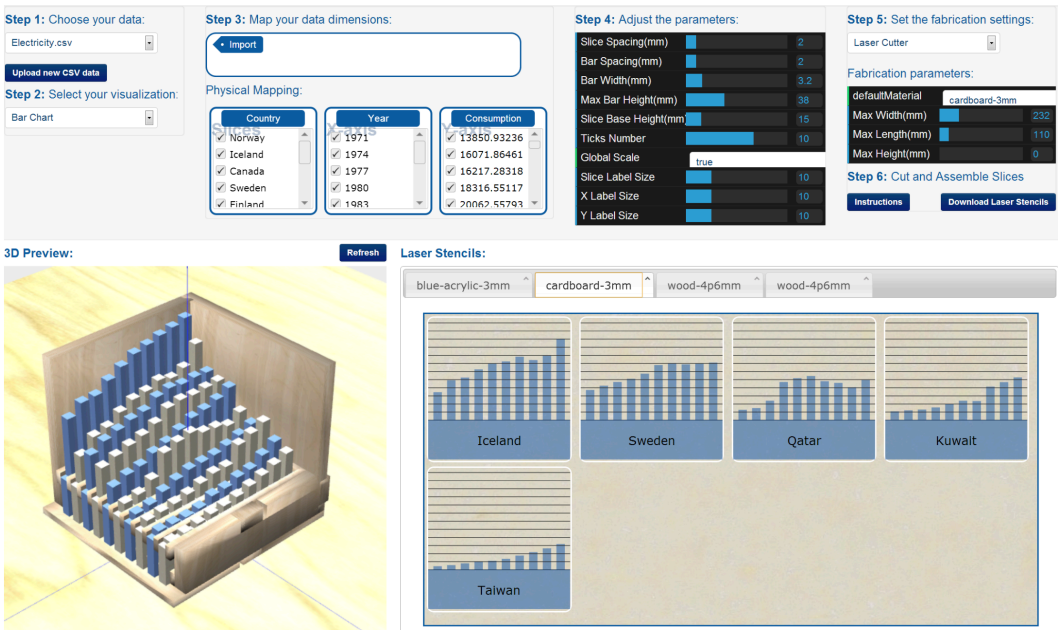

Figure 5. MakerVis toolkit: software and preview (Swaminathan et al., 2014, p.3850)

2.4 State of the Art

The evolving field of data physicalization spans various domains, such as displaying personal data or using data physicalizations in education. Gwilt et al. (2022) offers a comprehensive overview of the most recent use cases in this rapidly developing area. The following section provides an overview of the most common techniques and approaches used in creating data physicalizations in

recent years. Additionally, it introduces the most discussed trends and challenges in the research area of data physicalization.

2.4.1 Current Trends and Design Practices

Djavaherpour et al. (2021) provide a comprehensive overview of the current research landscape in data physicalization. The authors analyzed research outputs published between 2010 and 2020, selecting 141 representative works and incorporating examples from the broader art and design community. For the analysis, the researchers categorized the collected works using a coding schema based on a pipeline of the physical rendering process, detailed in Chapter 2.2.

In terms of selected datasets, there is a notable tendency towards statistical and geospatial data, each represented by 20 to 30 percent. Looking at the stakeholders, it is evident that implementation for the general public represents the predominant focus, with over 80 percent of papers falling into this category. Physicalizations are mostly created to present complex information, followed by raising self-awareness. Regarding the approach of physicalization, the most common forms are informative spaces (40 to 50 percent), followed by unique data objects and the creation of physical charts. Additionally, there is a tendency toward artistic goals with a 60 to 40 percent ratio compared to pragmatic physicalizations. When examining the use of computational power, passive physicalizations, which do not rely on computational power, and active physicalizations, which do, are nearly balanced, with a slight preference for passive approaches. Digital design and digital fabrication processes were analyzed during the rendering process. Regarding digital design, about half of the creators rely on a script-based process where custom code is written to automate design tasks and manage complex data transformations. This is followed by 3D CAD tools like Blender and Maya. For the digital fabrication process, a focus on additive techniques such as 3D printing can be seen (Djavaherpour et al., 2021).

Dumičić et al. (2022) took a slightly different approach in providing an overview of the state of the art by analyzing projects on their used design elements. Therefore, 163 papers and journal articles with keywords linked to data physicalization were selected. The authors categorized design elements into two main groups: conceptual elements, which include design objectives and aesthetic considerations, and practical elements, covering aspects like appearance and user experience. As their classification approach focuses more on design aspects, it can not be compared directly to the evaluation of Djavaherpour et al. (2021). However, it also includes data on the design purpose and goal of the physicalization.

Regarding the design purpose of physicalization, tools for tracking and communicating personal data, tied with elements that assist in research (both 39), make up about half of all analyzed works. Followed by artworks with 31 papers as the main purpose. Grouped by the impact of their artifacts, 37 papers help in understanding information through physical depiction, which marks the biggest group. Another relevant group is physicalizations that enhance user engagement or provoke emotional effects. Regarding the technology used, the results match those of Djavaherpour et al. (2021) and show a slight tendency to analog artifacts compared to technology-assisted projects. The more design-focused attributes analyzed in this paper are used design metaphor, form and shape of artifacts, and their scale. The results indicate that artifacts that do not directly represent the data themes in their form are the most common. While no definitive statement can be made regarding the predominant shape, as both geometric and organic forms are used equally, the scale of physicalizations leans towards smaller artifacts, with a size of approximately 50 cm or less (Dumičić et al., 2022).

2.4.2 Standardization

One prominent topic is the standardization of data physicalizations through the development of toolkits and guidelines. Building data physicalizations requires knowledge about visualizations, digital fabrication, and craftsmanship. This results in a relatively high entry barrier. Therefore, standardized practices can help to enable broader accessibility, allowing individuals not yet familiar with the field to engage without needing to comprehend technical details (Swaminathan et al., 2014). As discussed in Section 2.4.3, previous approaches range from design guidelines and reusable toolkits to automated pipelines for data physicalizations. However, according to Djavaherpour et al. (2021), significant gaps still need to be addressed, especially in automating the entire physicalization pipeline. Only one prototype exists that attempts to fully automate this physical rendering process, showing potential for further advancements.

2.4.3 Dynamic Physicalizations

"Dynamic data physicalizations represent the future of physical data representations" (Gwilt, 2022, p. 232). This statement outlines the relevance of dynamic elements in the field of data physicalization.

The goal is to create artifacts that can autonomously update themselves, eliminating the need for manual intervention. The endless possibilities do not stop at changing the arrangement of a physicalization, which is what most current

installations focus on. Properties like texture, temperature, and smell encode information as well and could also be altered in dynamic representations (Huron et al., 2023, p. 248). The vision is to design an interactive object that can dynamically morph into any shape or material to meet the user's specific requirements and context. The ultimate goal is a display where a computer can control the physical properties of matter.

Compared to static artifacts, dynamic physicalizations have some advantages, such as reusability and interactivity. Every change in data or context for static elements results in a new version. In contrast, dynamic physicalizations can adapt and are more sustainable. In terms of interactivity, users can manipulate the data directly to their needs, allowing more efficient exploration. Furthermore, dynamic physicalizations can animate data over time, using movement to convey additional insights, such as variance between data points. An unproven advantage is the ability to present the same data in multiple forms, such as transforming a bar chart into a pie chart (Gwilt, 2022, p. 224). Additionally, static artifacts limit the opportunity for self-reflection for the viewer, as they do not allow for ongoing synthesis of information (Karyda et al., 2021, p. 74).

One method for creating dynamic physicalizations is rearranging a set of computer-driven objects that assemble into a shape. For instance, shown in Figure 6, Zooids uses a swarm of circular robots that move around collaboratively to display data and react to user input (Le Goc et al., 2016). Furthermore, movement on the y-axis can be achieved by using drones or acoustic levitation (Huron et al., 2023, pp. 247–249).

Another solution involves shape displays, where a computer can change the physical shape. Pin-based installations are the most common approach, forming a three-dimensional shape by moving pins up and down (Huron et al., 2023, p. 248). An example is inFORM, shown in Figure 7, where the physical display consists of 900 actuators, which can display shape changes in real-time. This allows the creation of physical elements that can change shape, guide user actions, and move objects on their surface (Follmer et al., 2013).

The techniques used thereby are diverse and range from electromechanical actuation with cheap parts like servo and stepper motors to pneumatic and hydraulic approaches to move objects through acoustic or magnetic forces. Also, responsive materials such as Shape Memory Alloys, which return to their original shape when heated, are discussed. Even organic physicalizations were created by adapting the environmental conditions to influence the growth of a living organism (Gwilt, 2022, pp. 225–226).

Despite its potential, dynamic physicalization faces challenges that demand new approaches, which in turn raise questions about feasibility and best practices. There are no established guidelines based on empirical evidence to standardize these practices (Gwilt, 2022, pp. 231–232). Technically, the field must deal with issues such as missing prototyping tools, miniaturizing actuators, developing more advanced input and output systems, and enhancing energy efficiency (Alexander et al., 2018). Additionally, there is often a conflict between implementation complexity and output quality. This makes it challenging for visualization experts without deep technical knowledge to keep up (Gwilt, 2022, p. 232).

This increased complexity also applies to data mapping in dynamic physicalizations as more parameters come into play. Studies must clarify how users interact with moving elements and how this affects their perception. This raises the question of whether existing information visualization guidelines can be applied (Gwilt, 2022, p. 231).

Figure 6. Zooids: Robots creating data physicalization (Le Goc et al., 2016, p.97)

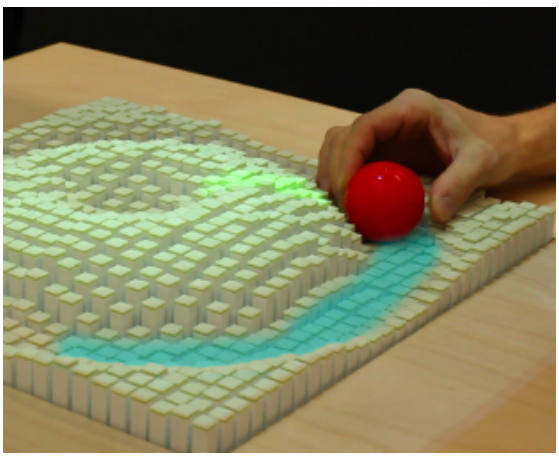

Figure 7. inFORM: Shape display (Follmer et al., 2013, p.417)

2.4.4 Augmented Physicalizations

Augmented data physicalizations are static objects enhanced by overlays that provide further information or interactivity. This approach enables the creation of richer installations without increasing the technical complexity in the form of motors (Djavaherpour et al., 2021). This approach allows users to interact with physical and digital representations, combining their benefits. For instance, physical models allow intuitive manipulation and spatial understanding, while digital elements can provide dynamic data (Gwilt, 2022, pp. 169–171). Augmented physicalizations can be separated into projection augmented and augmented through personal augmented reality (Djavaherpour et al., 2021).

Projection Augmentation involves projecting additional data directly onto a physical model. This adds layers of information, such as highlighting elements of interest. Examples include the depiction of dynamic geospatial data (Dadkhahfard et al., 2018; Millar et al., 2018) and biomedical models (Keefe et al., 2022). A key challenge with this approach is calibrating the projection to align accurately with the model's physical features. Particularly for non-flat surfaces, techniques like 3D scanning might be necessary to adapt scale and rotation properly (Djavaherpour et al., 2021).

The Tangible Landscape system by Millard et al. (2022) shows a practical setup for projection-augmented physicalizations, combining physical and digital models for geospatial analysis. As depicted in Figure 8, the setup includes a physical terrain model, a Kinect sensor for real-time scanning, and a projector mounted on an adjustable armature. The sensor captures changes to the model, processes them, and projects updated data back onto the surface. This allows users to manipulate the terrain directly while receiving instant feedback, such as flow paths or contour maps, projected onto the surface, as shown in Figure 9. The system illustrates how projection-augmented setups enable hands-on exploration by integrating physical interaction with dynamic digital updates.

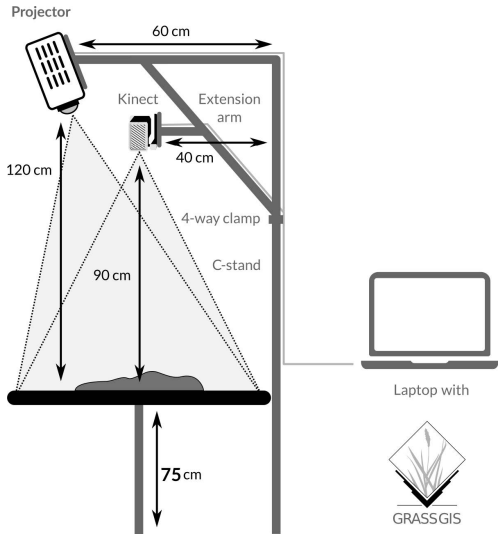

Figure 8. Tangible Landscape setup with a terrain model, projector, and Kinect sensor (Millard et al., 2022)

Figure 9. Projected geospatial data on the physical terrain model (Millard et al., 2022)

Enhancement through Augmented Reality (AR) uses technologies like head-mounted displays or mobile devices to overlay digital information onto the physical model from the user's perspective. This provides a more personalized and immersive experience, allowing users to interact with the data more directly and personally. However, each user must be equipped with AR devices, which can limit accessibility compared to projection systems that are viewable by multiple people simultaneously (Djavaherpour et al., 2021).

Although projects using AR augmentation, mainly relying on personal devices like tablets and smartphones, are rare, Nittala et al. (2015) presented a first approach for improving collaborative tasks in the petroleum industry, as shown in Figure 10. The project allows collaboration in field operations between an overseer in the command center and a field explorer. The overseer stands in front of a 3D-printed replica of the geographical area where the explorer is located in real life. The AR augmentation enables the overseer to visualize real-time geospatial data from the region and the observer's actions, which are mapped on the 3D surface. The overseer can perform actions on the physicalizations, which are directly reported to the explorer and synced with the AR view. The system was implemented using mobile and tablet devices, making it accessible and easy to set up in various environments.

Figure 10. Workflow of collaborative tasks in the petroleum industry using AR augmented data physicalization

As Djavaherpour et al. (2021) analyzed, only a small number of projects currently use augmented physicalization (about 10 percent), with even fewer creators that chose augmentation with personal AR (3 projects out of 141). However, the authors agree with (Keefe et al., 2022) that this area has much potential in this area due to new and broader available technology. For Keefe et al. (2022), making hybrid physicalizations as interactive as their digital-only counterparts will be the key to future work in this field, including supporting features such as selection and filtering that are already standard in digital visualizations.

2.4.5 Artificial Intelligence in Physicalization

Artificial Intelligence (AI) and Machine Learning (ML) are transforming the digital transformation landscape across various domains. Their rapid adoption comes with the potential to enhance decision-making processes and drive innovation (Sarirete et al., 2022). To this point, no published papers specifically explore AI integration into the data physicalization process in relevant academic literature (IEEE, ACM, Dataphys.org). However, there are recent approaches using data physicalization for explainable AI. Explainable AI (XAI) seeks to enhance user trust by showing why AI made a specific decision. Research in this field mainly focuses on providing feedback in the form of text or graphics on screens. Nevertheless, as AI increasingly integrates into tangible or physical user interfaces, the demand for explainability in these contexts is also growing (Colley et al., 2022, p. 22).

Colley et al. (2022) provide a theoretical foundation for combining XAI and physical artifacts. The paper explores how physical objects can embody AI processes, making abstract AI concepts easier to understand. Therefore, the authors suggest design strategies such as adjusting tangible elements that represent different aspects of the AI's decision-making process. This allows users to interact with and understand the AI's logic more hands-on and intuitively.

In 2023, Colley et al. extended their theoretical exploration of Tangible Explainable AI by applying the concept to real-world scenarios through a series of case studies. The goal was to determine if physical depictions can enhance the understanding of AI decisions. The study consists of two tangible interfaces: LEGO blocks and strings, as shown in Figure 11. The LEGO blocks visualize the decision process of a receipt recommendation. The bricks were aligned in the form of two-dimensional bar charts. When the alignment of the blocks was changed, the AI output was also changed. This allows for the mimicking of the AI's decision-making process. The string interface was designed to represent connections between AI components and explore the relationships and dependencies within the system. The physical

interaction helped users to understand complex AI concepts more intuitively (Colley et al., 2023).

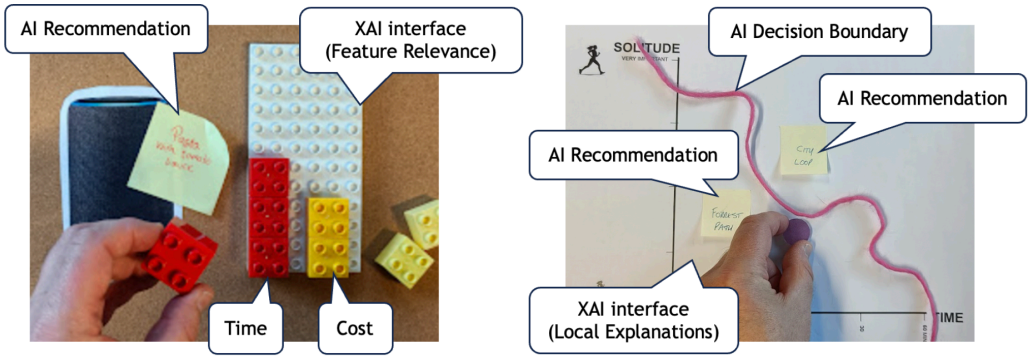

Figure 11. Examples of tangible Explainable AI (Colley et al., 2023)

Another AI-related physicalization was developed as an AI-based feedback system for creative work. The system analyzes design thinking conversations in real-time, focusing on specific semantic variables that indicate creativity. The AI output is depicted in the form of a miniature waterfall. Thereby, the water flows either downwards or upwards using an anti-gravity effect, corresponding to the creativity and effectiveness of the conversation. This interaction allows the participants to receive continuous, fluid feedback without interacting directly with the complex AI-driven data outputs (Georgiev & Barhoush, 2022).

2.5 Chapter Summary

This chapter explored data physicalization as the process of transforming abstract data into tangible forms, allowing users to interact with and perceive information through multiple senses. By leveraging touch, spatial perception, and other sensory inputs, physicalizations enhance cognition, learning, and engagement, offering benefits such as improved accessibility for visually impaired users and richer shared experiences.

Key topics include classification methods, rendering processes, and emerging trends like dynamic and augmented physicalizations. Practical examples demonstrate how physical artifacts can integrate into everyday contexts and support more intuitive and collaborative data engagement. This provides a state-of-the-art overview of data physicalization concepts, trends, and guidelines for building scientifically founded physical data representations.

For this thesis, **dynamic physicalizations are prioritized** due to their ability to adapt to the app's constantly changing data, offering enhanced interactivity and supporting better self-reflection. **Design themes from Khot et al. (2017) will be used to provide a structured and effective framework for the prototype's development.** This framework holistically addresses key aspects of data physicalization, including aesthetics, interaction, and functionality, and will guide the conceptualization and implementation of the prototype, ensuring alignment with best practices.

3 Persuasion

This chapter provides knowledge on persuasion and fundamental aspects of behavior change, as research suggests that persuasive technologies tend to be more effective when grounded in behavior change theories (Aldenaini et al., 2020, p. 30).

3.1 Definition of Persuasion

Persuasion is rooted in classical rhetoric and can be understood as the ability to identify effective strategies for influencing behavior in any given situation. The goal is to encourage individuals to perform a desired behavior (B. J. Fogg, 2003, p. 24).

Persuasion through technological platforms can be classified as *persuasive technology*. According to Oinas-Kukkonen and Harjumaa (2008, p. 202), it is defined as "computerized software or information systems designed to reinforce, change or shape attitudes or behaviors or both without using coercion or deception." For Fogg (2009), a fundamental characteristic of persuasive technology is its ability to automate processes that encourage behavior change.

Changing an individual's behavior can be achieved with *behavior change interventions.* They are complex strategies, designed to modify specific behaviors, by involving techniques and procedures that target the actions of individuals (Michie et al., 2011a, p.2). When computing technology is used to initiate behavior change, it is refered to *digital behavior change interventions (Pinder et al., 2018, p. 1).*

Behavior change interventions can be broken down into specific *behavior change techniques (BCTs).* They are grounded in behavioral science and psychology and provide a theoretical foundation for behavior change interventions. This allows for classifying and understanding how human behavior can be influenced (Thomson et al., 2016). Michie et al. (2011a, p. 2) described them as "active ingredients" that form the core elements of behavior change interventions.

Persuasive design principles are "guidelines to approach a design problem or analyze a given design solution" (Deterding et al., 2011, p. 12). They adopt a design-oriented perspective on behavior change by focusing on features that influence user behavior effectively (Thomson et al., 2016).

Another term that occurs in the field of persuasion is *gamification*. Next to persuasive technology, the concept of gamification represents the second dominant concept for influencing behavior change (Hamari et al., 2014, p. 118). Deterding et al. (2011, p. 9) define gamification as "the use of game design elements in non-game contexts". This paper will not cover gamification as a research area in detail as it would exceed the scope. However, it will be referenced as part of the broader term of persuasion when relevant.

3.2 Behavior Change

The landscape of behavior change research is characterized by a diverse range of different theories, frameworks, models, and techniques. Only a few scientists in this field have introduced multiple approaches, ranging from identifying just a few behavior change patterns to over 100 distinct ones. This variety reflects the complexity of human behavior and the numerous ways it can be influenced or modified. However, these various theoretical approaches lead to a fragmented research landscape, where the application of theory is often inconsistent, and researchers tend to mix up different techniques (Pinder et al., 2018, p. 4). In the following, fundamental concepts and relevant behavior change techniques are introduced.

3.2.1 Motivation

Motivation is a core concept in many behavior change theories, providing the energy and direction necessary for an action to happen. Examples are the COM-B Model (Michie et al., 2011b) and the Fogg Behavior Model (Fogg, 2009), which were introduced later. This chapter briefly introduces motivation as part of the broader approach of understanding and influencing behavior.

Motivation can be broadly categorized into intrinsic and extrinsic. Intrinsic motivation refers to engaging in activities because they are enjoyable or satisfying, often driven by curiosity or personal interest. Extrinsic motivation, on the other hand, involves performing actions to gain external rewards or avoid punishments. It can range from being externally controlled to fully self-endorsed, depending on the level of autonomy involved (Ryan & Deci, 2000).

Regarding persuasion, gamified elements like badges, points, or leaderboards can serve as extrinsic motivators, as they enhance short-term engagement and encourage competition (Weiser et al., 2015, pp. 274–276). Intrinsic motivation, however, can be fostered by designing tasks that align with the user’s goals and

expectations, as well as their attitudes and beliefs, allowing them to strive toward an idealized future self (Weiser et al., 2015, pp. 272–273).

3.2.1.1 Motivation in Behavior Change Theories

According to Fogg (2009), motivation refers to the internal and external forces that drive a person to perform a specific behavior. Fogg breaks down motivation into three core motivators. It starts with pleasure and pain, labelled as immediate factors, as the response is evoked with little previous thinking. More future-oriented motivators are hope and fear, which are anticipations that something good or bad will happen. The last motivation factors, social acceptance and rejection, bring in a social component. They describe the influence of social forces, where individuals are motivated to seek approval or avoid rejection. The different motivators are not ranked. Instead, designers should select the appropriate motivator for their project.

Another definition of motivation comes from the frequently used behavior change theory, The Self-Determination Theory (SDT), which explains motivation along a spectrum from non-self-determined to fully self-determined behaviors. At the non-self-determined end is amotivation, where individuals lack motivation entirely. In general, six types of motivation are distinguished, where actions are driven by external rewards or pressures but vary in the degree the person adopts them. Intrinsic motivation lies at the fully self-determined end, where behaviors are performed for personal satisfaction or enjoyment. Due to SDT, higher levels of self-determined motivation are linked to more sustainable behavior changes, as individuals are more likely to persist when they act out of personal interest rather than external pressure (Deci & Ryan, as cited in Lacroix et al., 2009).

In the COM-B model, motivation is divided into two types: reflective and automatic. Reflective motivation involves conscious planning and decision-making, whereas automatic motivation is influenced by emotions, impulses, and routines. Both types of motivation work together, and their balance can vary depending on the behavior that should be achieved (Michie et al., 2011b).

3.2.2 Habits

Habit, as a term, is commonly used to understand and predict behavior. This led to many different definitions. Gardner (2015) proposes a general definition that resolves inconsistencies between the individual theories. Therefore, habits are learned, automatic behaviors triggered by external situations without conscious thought (Gardner, 2015, p. 280). Pinder et al. (2018) slightly adapt this definition by not referring the term to the behavior itself but seeing it as a memorized

connection between a specific situation and an evoked response. The connection is activated if the same situation occurs, triggering an automatic impulse. Habits are difficult to change because people often are unaware of the internal triggers that drive their actions, as no conscious thoughts drive the behavior (Pinder et al., 2018, p. 2).

In the context of behavior change, habits are an important aspect, as they highly influence our everyday lives. According to Pinder et al. (2018, pp. 3–4), nearly half of our actions and decisions happen automatically. This starts with health and exercise and reaches to the technology we use. While breaking bad habits is tough, there is an opportunity to form good habits, which can lead to lasting change (Pinder et al., 2018).

3.2.3 Behavior Change Theories

Behavior change theories attempt to explain why people behave the way they do. *Behaviorism* and *cognitivism* are the two main approaches that shape the understanding of behavior change (Pinder et al., 2018, p. 10). Aldenaini et al. (2020) also outlined the importance of building persuasive systems based on behavior theories, as these tend to be more effective than strategies that do not rely on theory (Aldenaini et al., 2020, p. 33).

Behaviorism focuses on external factors as key drivers for shaping behavior. According to this perspective, behavior is learned through stimulus-response associations. This means that an action is associated with a specific reaction when it happens repeatedly. Classical and operant conditioning can be distinguished. In the classical approach, there is a certain response to a trigger. In operant conditioning, behaviors are shaped by rewards or punishments. Operant conditioning is more likely to maintain changed behavior in the long term. Positive reinforcements, thereby, are used more frequently than negative ones in the field of digital behavior change interventions. However, behaviorism cannot explain influencing factors like goals and expectations or how habits can be influenced by internal factors such as mood or cognitive processes (Pinder et al., 2018, pp. 10–11).

Cognitivism, on the other hand, focuses on the internal mental processes. A key example is the Theory of Planned Behavior from Ajzen (1991), which suggests that a person’s behavior is driven by their intention to act. This is further influenced by their attitudes, social norms, and the ability to perform the behavior. However, as Pinder et al. (2018) point out, this approach also has limitations, especially in

explaining nonconscious actions, as it assumes the behavior is always rational and intentional.

Next to Behaviorism and Cognitivism, there are also theories that try to combine both aspects for a more complete view of human behavior. Those Integrated models can differ strongly from each other. However, by analyzing the models in this field, shared ideas can be seen. Motivation, for example, is a key aspect in most of the approaches to changing behavior, as it is especially necessary in the early stages (Pinder et al., 2018, pp. 15–17).

In the following, behavior change theories are briefly described. The selection is based on the most commonly applied theories in persuasive technology for physical activity, as identified by Aldenaini et al. (2020), and the foundational theories highlighted by Pinder et al. (2018) to ensure a comprehensive overview of relevant approaches.

3.2.3.1 Transtheoretical Model (Prochaska & Velicer, 1997)

The Transtheoretical Model can also be referred to as the Stages of Behavior Change (Weiser et al., 2015, p. 273). It explains behavior change as a series of six stages: *precontemplation*, *contemplation*, *preparation*, *action*, *maintenance*, and *termination*. These stages represent how ready a person is to change, from not thinking about it (precontemplation) to successfully maintaining the change (maintenance). Termination as the last step occurs if the target behavior is a one-time action or the behavior is 100% stable without any risk of relapse. The model also identifies strategies, like seeking support from friends or professionals or modifying the environment to reduce barriers and make the desired behavior easier to adopt. Aligning these strategies with the current stage of change can enhance the success of an intervention.

3.2.3.2 Goal-Setting Theory (Locke & Latham, 2002)

The Goal-Setting Theory provides insight into how individuals respond to different goals and the factors contributing to goal motivation. For a goal to be effective, the person must perceive it as important, be involved in its establishment, and clearly understand its rationale. Additionally, the goal should be measurable so the progress can be monitored. Furthermore, it should be challenging but still feasible to achieve. Feedback and rewards should be provided regularly throughout the process, not only when the goal is achieved.

3.2.3.3 COM-B Model (Michie et al., 2011b)

The COM-B model provides a framework for understanding behavior change by focusing on three components: *Capability*, *Opportunity*, and *Motivation*. Capability refers to an individual's physical and psychological capacity to perform a behavior. This includes possessing the necessary skills, knowledge, and mental abilities to take action. Opportunity focuses on the external factors that enable or prompt a behavior. These can include access to physical resources and social factors that support the behavior. Motivation describes the processes that drive an individual to engage in a behavior. This includes emotional drivers as well as conscious decisions. For a behavior to take place, all three components must work together.

3.2.3.4 Fogg Behavior Model (Fogg, 2009)

The Fogg Behavior Model (FMB) also declares three key factors that must occur simultaneously for a behavior to occur: *Motivation*, *Ability*, and *Triggers*. Like the COM-B model, FBM recognizes the importance of motivation as the driving force behind behavior and the necessity of ability, which refers to the skills and resources required to act. However, FBM is distinct in focusing on Triggers as immediate prompts that signal when to act. They include reminders, facilitators, or signals that guide the individual toward performing the behavior. Triggers are essential because behavior will not occur without them, even if motivation and ability are sufficient. In contrast, COM-B's broader concept of Opportunity addresses enabling conditions without specifying specific prompts for action.

Figure 12 shows how motivation, ability, and triggers come together. Behavior is most likely to occur when motivation is high, the behavior is easy to perform, and a trigger is present at the right moment. This also includes the concept of an activation threshold. This describes a line on the graph above in which a trigger will lead to a desired behavior. The trigger below will not activate this behavior.

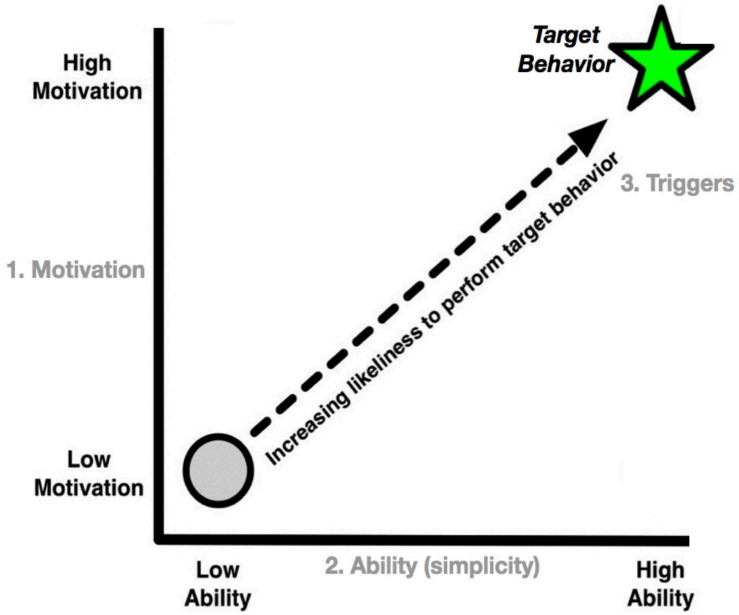

Figure 12. Fogg Behavior Model (Fogg, 2009)

3.2.3.5 Integrating Behavior Change Theories for Data Physicalization Design

"No single theory can account for all of the complexities of behavior change" (Prochaska & Velicer, 1997, p. 41). This highlights the need to integrate key insights from multiple theories to effectively address specific aspects of behavior change. For this thesis, the parts of behavior change theories most relevant to data physicalization have been identified and are applied to guide the design process.

The **Fogg Behavior Model was chosen as a key framework due to its explicit focus on triggers**, which act as immediate prompts to initiate behavior. This focus is particularly suited to data physicalization, which embeds constant, visible cues into the user's environment. Its clear and simple structure makes designing behavior change interventions that focus on actionable outcomes practical.

Goal-Setting Theory is also incorporated, particularly in relation to continuous feedback and rewards. This theory emphasizes the importance of tracking progress and maintaining user engagement over time, which aligns with the dynamic, real-time feedback capabilities of physicalizations. By focusing on these aspects, data physicalization can effectively support users in achieving their goals.

3.2.4 Behavior Change Techniques

Behavior Change Techniques (BCTs) are derived from behavioral science and psychology, offering a theoretical framework for understanding and facilitating behavior change. They identify the necessary components for influencing and sustaining behavioral shifts, including methods such as self-monitoring, goal-setting, feedback, rewards, and social support (Abraham & Michie, 2008). These techniques form the foundation of many behavior change interventions, as they are evidence-based and focus on creating measurable outcomes. However, their application in digital systems is often fragmented, with many apps failing to implement these techniques comprehensively or meaningfully (Thomson et al., 2016). Furthermore, the landscape of behavior change research is characterized by diverse behavior change patterns. Only a few scientists in this field have introduced multiple different approaches, ranging from identifying just a few behavior change patterns to over 100 distinct ones (Pinder et al., 2018, p. 4).

Behavior Change Techniques (BCTs) are not the primary focus of this thesis because they center on Persuasive Design Principles, which are more directly applicable to the design-oriented approach of this research. While BCTs provide a theoretical framework for understanding behavior change, this thesis uses persuasive design principles as they guide the practical implementation from a design perspective, making them more suitable for analyzing an existing app and translating its design principles into a physicalized representation.

3.3 Persuasive Design

This chapter outlines standardized techniques and design guidelines for designing digital behavior change intervention systems. It includes guidelines, mechanics, and elements used in the fields of behavior change and gamification.

3.3.1 Persuasive Design Principles

When designing persuasive systems, designers often rely on persuasive design principles to guide their work. These principles help classify and understand how human behavior can be influenced (Thomson et al., 2016). However, general design principles can sometimes be too abstract to apply directly. In such cases, *design patterns* can help bridge the gap by offering practical methods to implement abstract design principles (Weiser et al., 2015, p. 274). For example, leaderboards or scoreboards can be used to apply the principle of social comparison. (Krath & von Korflesch, 2021). In this thesis, design patterns are not further discussed

because the focus lies on analyzing and adapting persuasive design principles for physicalizing app data. Flatastic (Flatastic GmbH, 2024), the app used in this study, already incorporates persuasive design principles. These principles are directly analyzed and adapted for the physicalization, making it unnecessary to explore design patterns as a layer between principles and implementation.

The following sections introduce key models and frameworks for designing persuasive systems, focusing on their main principles and how they influence behavior change.

3.3.1.1 Persuasive Technology (Fogg, 2002)

Fogg outlines seven key strategies for designing technology that influence user behavior. The first is *reduction*, which simplifies complex tasks to make them easier for users, encouraging desired actions. Second, *tunnelling* guides users through specific steps, reducing distractions and being able to intervene along the way. *Tailoring* involves customizing content based on individual needs, while *suggestion* refers to providing timely prompts to encourage behavior change. *Self-monitoring* helps users track their own progress and stay motivated, while *surveillance* involves observing others to support behavior change. Finally, *conditioning* uses rewards or penalties to reinforce specific behaviors.

3.3.1.2 Persuasive System Design Model (Oinas-Kukkonen & Harjumaa, 2009)

Another set of often relied-on design principles was introduced by Oinas-Kukkonen and Harjumaa (2009). Their persuasive system design model is a framework that offers designers guidance on which aspects they should consider when designing a system or app that is supposed to change users' behavior. It is based on the work of Fogg (2002) and aims to offer a more practical approach as the authors describe Fogg's patterns as "too limited to be applied directly to persuasive system development" (Oinas-Kukkonen & Harjumaa, 2009, p. 486).

Oinas-Kukkonen and Harjumaa (2009) describe 28 design principles. Those principles are categorized into four sections. The first is primary task support, which focuses on how the system can assist the user in achieving their goals (primary task). It contains aspects like *reduction*, which aims to reduce the effort needed for this main task to be completed, and *personalization* and *self-monitoring*. The second aspect is dialogue support, which contains principles that keep the user engaged with the system by providing feedback. Examples are *praise*, *rewards* and *reminders*. The next category is system credibility support. It is based on the assumption that the more trustworthy a system is, the more persuasive it becomes.

Contained aspects include *surface credibility*, which refers to the system's serious aesthetics and *trustworthiness*, achieved through the provision of accurate information. The last section is social support. These principles focus on using social influence and interactions to drive behavior change. This contains elements like *social learning* and *social comparison*, which allow one to compare with the performance of others and give insights into their outcomes.

3.3.1.3 Designing Gamification and Persuasive Systems (Krath & von Korflesch, 2021)

A more recent approach comes from Krath and von Korflesch (2021), who introduced a framework for design principles for successful gamified and persuasive systems by systematically reviewing design principles in this field. Of the 60 identified principles, the most relevant were selected based on their inclusion in at least five of the reviewed articles. These selected principles are categorized into three main areas.

User-oriented principles are divided into those for individual behavior change and those that influence social behavior. Individual principles aim to direct the user toward a desired behavior. Examples are *provide immediate positive feedback*, *offer informational content*, or *introduce behavioral incentives.* Social behavior principles, on the other hand, strive to change behavior through community influence, including *social comparison*, *collaboration*, or *competition*. The second category, system-oriented principles, focuses on enhancing user enjoyment and identification with the system. Examples include *personalizing content and mechanics* or *adjusting the system's difficulty*. The final category consists of context principles, which consider the environment where the intervention occurs. These include aspects such as the *target group*, the *environment* in which the system is placed, or the *prioritization of aesthetic design*.

3.3.1.4 A Taxonomy of Motivational Affordances for Meaningful Gamified and Persuasive Technologies (Weiser et al., 2015)

Weiser et al. (2015) introduced a taxonomy that focuses more on the motivational aspects of persuasive technology and gamification, as it is a key requirement for many behavior change theories. The authors list five design principles for motivational affordance. First, the system should *offer meaningful suggestions* that align with the user's current situation and goals. The following principle is *support user choice*. Users, therefore, should be free to set their own goals and make their own choices. *Providing a personalized experience* should aim to deliver content that is tailored to the user's needs and preferences. The last principle is *design for*

every stage of behavior change. The system should adapt to different stages of behavior change, offering appropriate information and feedback at each phase (Weiser et al., 2015, p. 274).

Next to the design principles, the authors define a layer called Mechanics. These are abstract tools to enable interaction between the system and the user. The most widely used mechanic is *feedback*. It keeps users updated on how they perform in relation to their set goals. Timing and frequency are critical, as the feedback should be linked to a performed task but not interrupt it. The second point is *user education*, which provides knowledge that is necessary to complete a goal. *Challenges* encourage users by providing a difficult task as a benchmark for performance and *rewards* are external motivators that reward a specific achievement. Furthermore, *competition and comparison*, as well as *cooperation,* use social influences to promote behavior (Weiser et al., 2015, pp. 275–276).

3.3.2 Overview of Commonly Used Persuasive Design Principles

The work of Aldenaini et al. (2020) and Krath and von Korflesch (2021) provide a good overview of which persuasive design principles are commonly used.

Krath & von Korflesch (2021) reviewed 30 articles on design guidelines for persuasive systems and gamification to compile a list of included design principles. Five of the design principles were used in ten or more papers. *Offering informational content* takes the lead, with 15 mentions. This can be reached with patterns such as quizzes. *Introducing behavioral incentives* in the second place is linked to elements such as achievements and rewards. It is followed by *personalization, providing immediate positive feedback,* and *social comparison* (Krath & von Korflesch, 2021).

The work of Aldenaini et al. (2020) focuses on persuasive technology for physical activity. Their work is based on the Persuasive System Design (PSD) Model from Oinas-Kukkonen & Harjumaa (2009), described in chapter 3.3.1.2. Design principles were collected by reviewing 170 papers between 2003 and 2019. The most used persuasive strategy is *tracking and self-monitoring,* included in 153 studies. This is more than double the usage of the second-most used strategy, *reminders*, which appears in 72 studies. Third place is *personalization*, followed by r*ewards* and *goal setting.* It has to be mentioned that *goal setting* in fifth place is not explicitly part of the PSD model. The authors argue that not all strategies in the reviewed papers can be linked to one principle.

Although a direct comparison between the two studies is not possible, it is evident that **active reminders and personalization of the experience are crucial for persuasive technology**, as these strategies consistently rank within the top five in both reviews. Furthermore, representing rewards is a widely used principle for supporting behavior change. The high ranking of *tracking and self-monitoring* in Aldenaini et al. (2020), may be due to the study's focus on physical activity, where these strategies play a particularly significant role.

3.3.3 Effectiveness of Persuasive Technology

Aldenaini et al. (2020) analyzed the use of persuasive strategies regarding their effectiveness. Overall, they concluded that **persuasive technologies are more effective when grounded in behavior change theories** (Aldenaini et al., 2020, p. 30). Out of 170 projects in the field of physical activity, 51 percent were marked as fully successful. Furthermore, 29 percent were partially successful. Notably, only two percent were reported as unsuccessful in achieving their goals. The review also highlights the influence of the used platforms on the system's effectiveness, with a detailed summary in Figure 13. It turns out that mobile and handheld devices are the most popular and successful in delivering persuasive strategies. As data physicalization did not appear in their review, the closest comparable technology is ambient and public displays, which are still underrepresented, with only 16 works compared to 61 papers focused on mobile devices. The effectiveness of ambient and public displays showed nine works with successful results, followed by four with partially successful results, making up over 80%. However, two included papers reported unsuccessful results (Aldenaini et al., 2020, pp. 10–11).

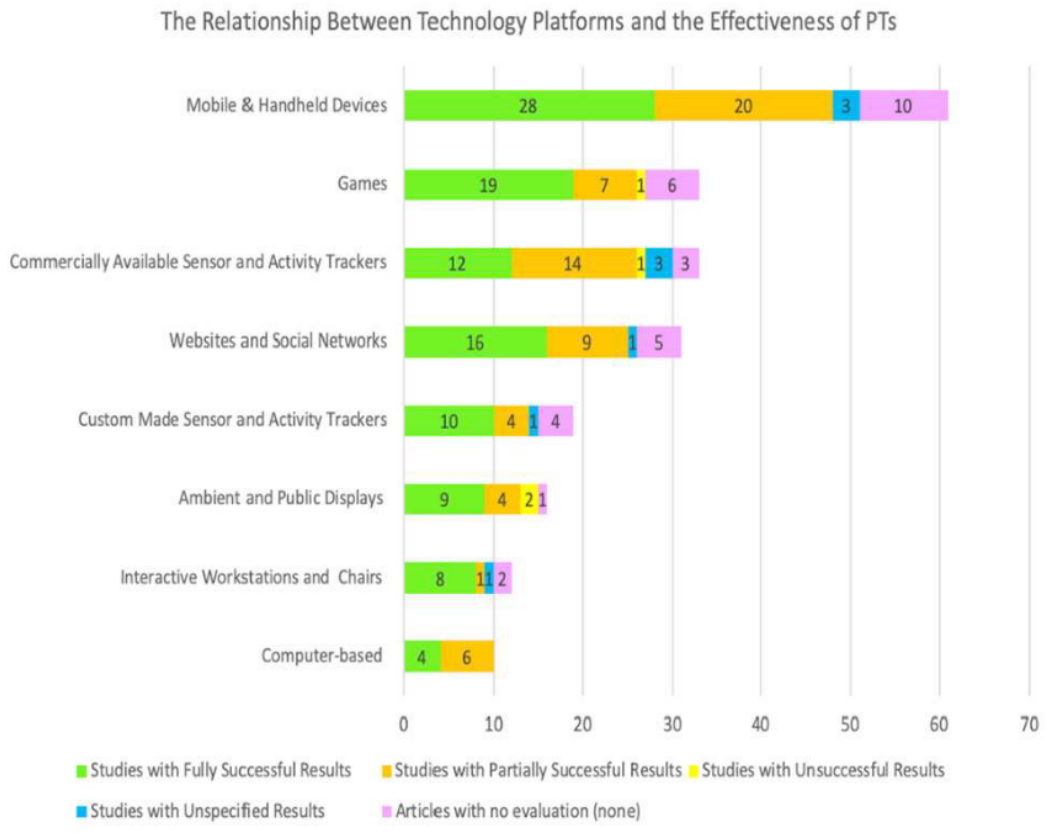

Figure 13. The Relationship Between Technology Platforms and the Effectiveness of Persuasive Technology (Aldenaini et al., 2020, p.11)

3.4 Chapter Summary

This chapter explored the concept of persuasion, emphasizing how behavior change theories and persuasive design principles can facilitate behavior change. Foundational concepts such as motivation, habits, and key frameworks were introduced to establish a theoretical basis. For the overall thesis, **persuasive design principles form the primary foundation for design concepts,** offering actionable guidelines to influence user behavior. Notably, **the frameworks by Oinas-Kukkonen and Harjumaa (2009) and Krath and von Korflesch (2021) are adopted as the core design principles frameworks** for the design work in this study**.** Oinas-Kukkonen and Harjumaa's framework provides a well-established theoretical foundation for persuasive system design, while Krath and von Korflesch's empirically based framework complements it with modern insights.

From the reviewed behavior change theories, **the Fogg Behavior Model is emphasized for its focus on triggers** as immediate prompts for action**.** This

aligns with the strength of physicalization to embed visible and persistent cues into the user's environment, enhancing engagement. Additionally, the concept of **continuous feedback and rewards**, derived from Goal-Setting Theory, will be applied to sustain motivation and encourage user progress over time.

4 Concept

To address **RQ1: How can data from apps that employ persuasive design strategies be transformed into data physicalizations?**, a concept was developed to design and build a data physicalization based on a specific app. This approach explored how app-generated data could be effectively transformed into tangible, physical representations. Therefore, a suitable app had to be chosen as the first step. The criteria were that the app is publicly available, free to download, collects data, and employs persuasive design strategies. Additionally, it had to provide free access to its data. The last criterion reduced the selection as a publicly accessible API had to exist, which allowed data to be fetched. One app that matched all criteria was Flatastic (Flatastic GmbH, 2024), designed to streamline the management of shared household tasks. Although no public documentation is available for the API, the web application allowed access to its endpoints, enabling data retrieval outside the Flatastic app.

The app's collaborative aspect also makes it well-suited for data physicalization. Prior work, such as the Tension Road Charts project (Taylor et al., 2015), demonstrates that physical depictions of data can help residents relate to and understand shared experiences more deeply (Taylor et al., 2015). While previous studies primarily focused on larger communities, they provide a strong starting point for shared data perception within a household.

After selecting a suitable app, a concept was developed to create a physical depiction of the existing app data. Based on insights from existing projects and design guidelines, decisions on the overall approach were made and recorded in an initial sketch. This concept served as the foundation for developing the prototype. An overview is depicted in Figure 14.

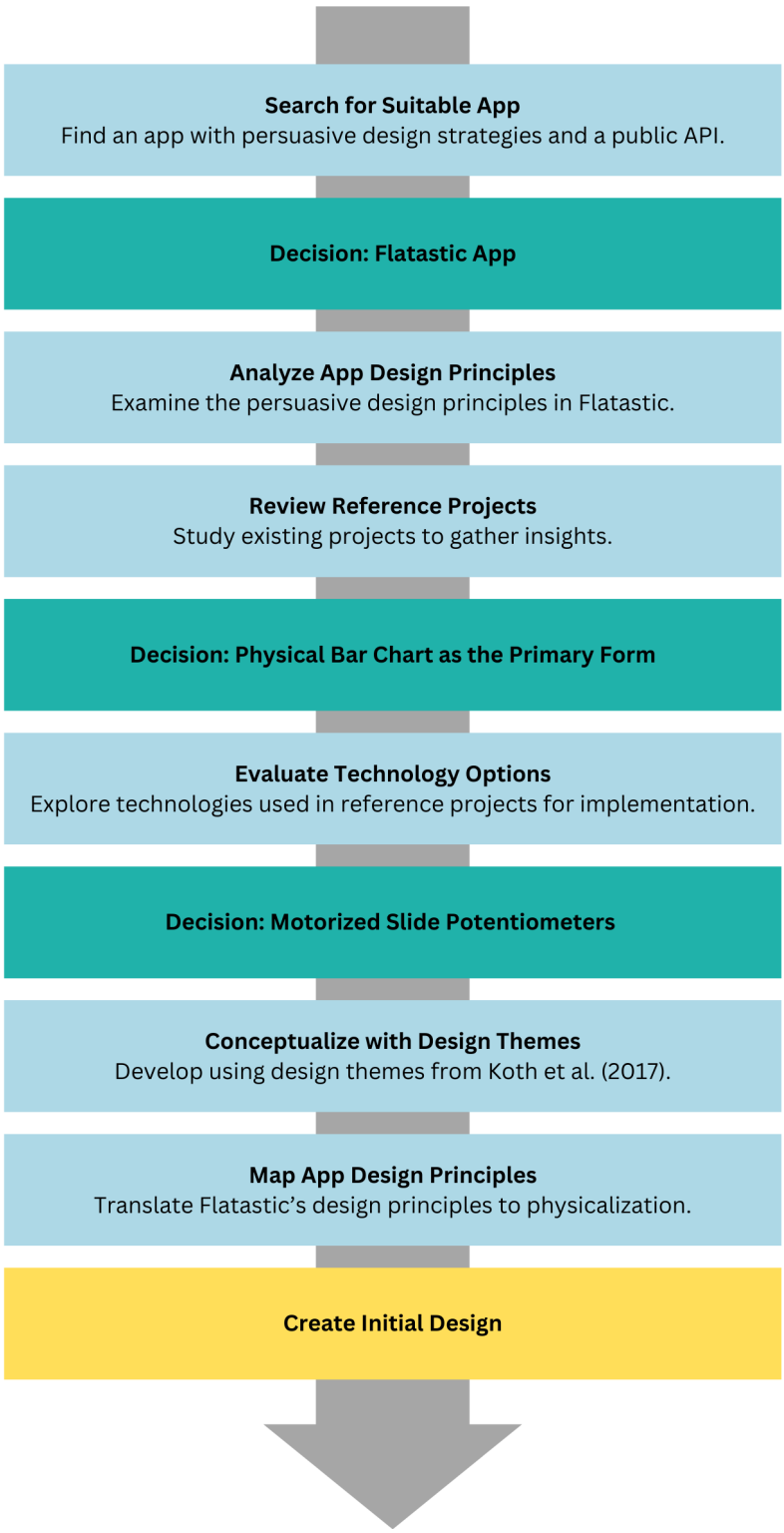

Figure 14. Flowchart of the conceptual design process for transforming app data into a data physicalisation

4.1 Flatastic

"Simplify organizing your home and live together in harmony" - this tagline from Flatastic's website concisely captures the app's goal of improving household organization and supporting harmonious shared living (Flatastic GmbH, 2024). Therefore, the app provides tools to manage common tasks at home. The key features are a shopping list as a shared platform for needed items, expense tracking to overview shared costs, a pinboard to share important information, and a cleaning schedule to assign and monitor household tasks. The app is dedicated to families, shared flats, and couples. The collaborative aspect of the app makes it well suited for turning it into a data physicalization.

The Flatastic app is available on the Android Play Store, with over 500,000 downloads and an average rating of 4.1 out of 5 stars (*Flatastic - The Household App - Apps on Google Play*, 2024), as well as on the iOS App Store, where it holds an average rating of 4.2 (*Flatastic - Manage Your Home*, 2024). The app was first introduced in 2014 and received a major redesign in 2021 (*Flatastic – Flatastic 3.0*, 2021). Developed in Germany and Switzerland, Flatastic has been featured in prominent newspapers such as "Frankfurter Allgemeine" (Gropp, 2014) and "Die Zeit" (Gerstlauer, 2014). It is available in German and English. The app is free to download, with in-app purchases available for a premium plan. This plan removes advertisements and allows more detailed insights into expenses and completed tasks.

The most relevant feature of Flatastic for this thesis is the cleaning schedule, depicted in Figure 15. This tool is designed to distribute household tasks equally among household members, helping to maintain cleanliness and organization. Within the app, users can assign tasks such as taking out the trash, vacuuming, or cleaning the kitchen on a recurring basis or as one-time assignments. Each member can view their responsibilities and receive reminders, ensuring tasks are not overlooked. As the main persuasive strategy, the app includes a points or reward system that tracks task completion, allowing members to earn points for fulfilling their duties. The points of each household member are visualized on a scoreboard. This feature aims to ensure accountability and reduce conflicts over task distribution.

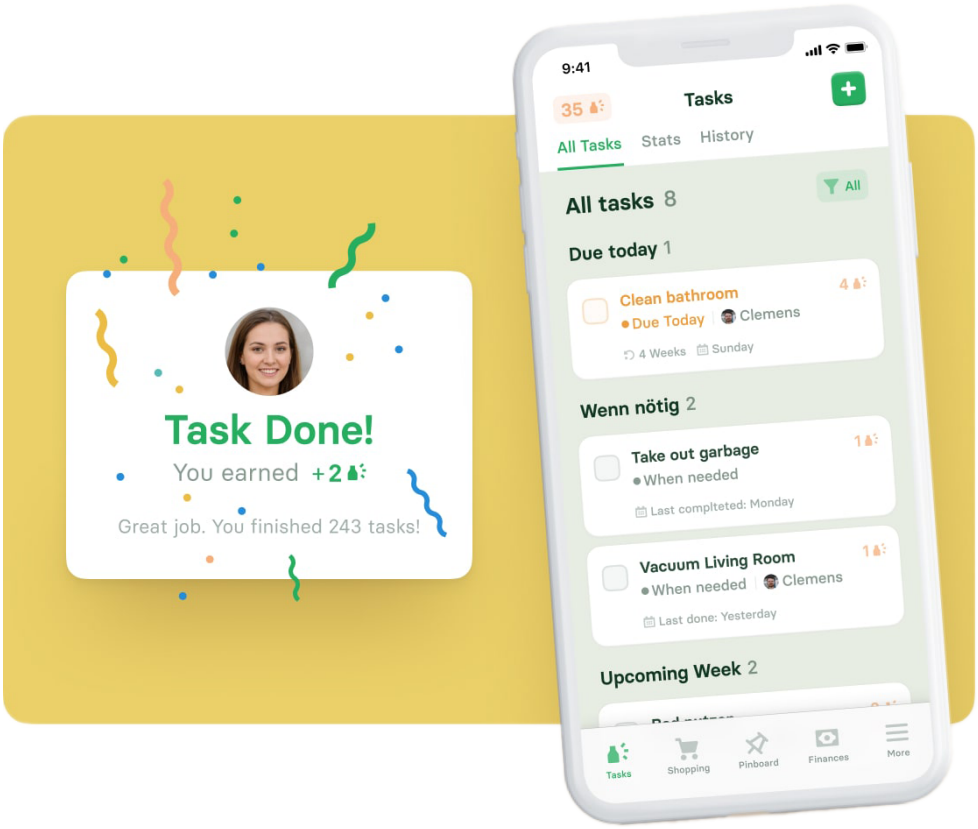

Figure 15. Cleaning schedule of the app Flatastic (Flatastic GmbH, 2024)

4.1.1 Used Design Principles in Flatastic

Understanding the design principles used in the Flatastic app is crucial to this study, as it allows us to examine how these principles contribute to the app's persuasive strategy. This analysis identifies specific persuasive elements embedded in Flatastic's design that support behavior change. It is based on the frameworks introduced in Section 3.1.1 by Oinas-Kukkonen and Harjumaa (2009) and Krath and von Korflesch (2021).

This later allows us to compare these digital design strategies with their physicalized counterparts and evaluate the effectiveness of data physicalization in enhancing or altering the persuasive impact of each principle.

Flatastic incorporates several persuasive design principles, which are included in both papers:

Personalization is provided by customizing the user profile with an individual profile image and choosing tasks and procedures according to the specific needs of the household.

Reduction is implemented by breaking the broad tasks of managing a household into smaller, manageable tasks, reducing the overall complexity.

Self-monitoring is facilitated digitally through a scoreboard that tracks accumulated points. With the premium plan it is also possible to see alle fulfilled tasks from the past.

Rewards also play a role as the app uses pop-up success messages to celebrate task completion. These messages are visible in the dashboard tab to share the achievement with other users, while the points awarded for each completed task are displayed on a scoreboard.

Reminders in the app are implemented through pop-up notifications and by highlighting overdue tasks in red.

Liking means increasing persuasiveness by building a visually attractive system. This was realized by a redesign of the app in 2021 to create an aesthetic experience that reinforces user-friendliness.

In terms of social behavior, the principle of *competition* is used to persuade users. This relies on the natural competitive instinct in humans and is also realized using the scoreboard. By comparing their own points to those of their flatmates or family members, users may feel motivated to complete more tasks.

The analysis of Flatastic's persuasive design principles reveals that **the scoreboard, which displays awarded points for completed household tasks, serves as the core persuasive element.** It supports key principles such as self-monitoring, competition, and rewards with the aim to persue user to fullfill their household tasks.

4.2 Data Physicalization

To create the concept for a data physicalization based on the app Flatastic, a first outline was created around following key requirements derived from the theoretical insights:

- **Physicalization of the Scoreboard**: As the scoreboard is the main persuasive strategy in the app, the phyiscalization should visually and functionally embody the scoreboard, reflecting its central role in persuading users to complete tasks.
- **Dynamic Physicalization**: The physicalization should dynamically adapt to real-time data from the app. This enables the benefits of dynamic

physicalization, as discussed in Section 2.4.3, such as higher self-reflection and interactivity while also consistently reflecting the app data.

- **Incorporation of Persuasive Design Principles**: Based on insights from Chapter 3, the design should include persuasive design strategies, with a focus on tracking progress, actively reminding users, personalizing experiences, and rewarding achievements.

To further develop the concept, reference data physicalization projects were analyzed to identify effective physicalization methods. Based on this analysis, the decision was made to use a **physical bar chart as the main element**. Afterwards, a technology search was conducted, focusing on prior projects and their implementations. This led to the decision to use **motorized slide potentiometers to depict bars**, which provide dynamic and precise adjustments to represent real-time app data.

The detailed conceptualization was guided by the design themes from Koth et al. (2017) to comprehensively address all aspects of a physicalization. Finally, the mapping of persuasive design principles from the app to the physicalization ensured alignment with the app's core strategies, effectively translating elements such as self-monitoring, reminders, and rewards into the physical design.

The resulting design, shown in Figure 16, represents the outcome of these conceptualization steps. It visually integrates the requirements, persuasive design principles, and technical decisions into a dynamic bar chart that aligns with the app's scoreboard functionality.

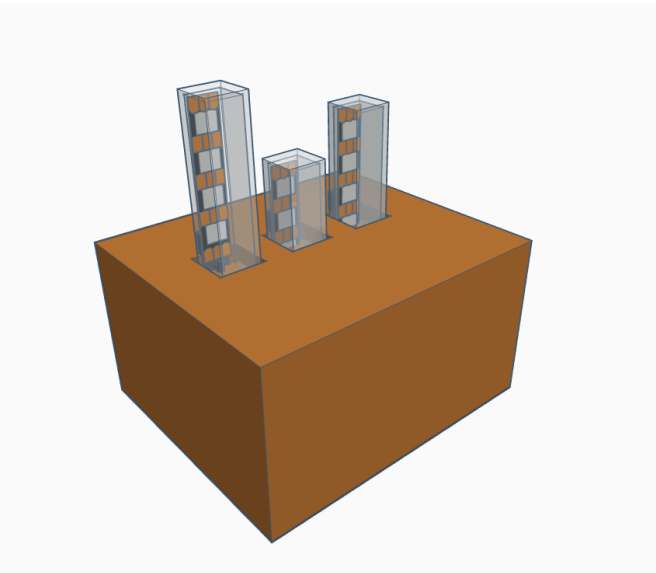

Figure 16. First design for the prototype based on the developed concept

4.2.1 Reference Projects

One study used as foundation was the elicitation study by Altmeyer et al. (2021). The authors investigated how gamification elements such as leaderboards and points can be transformed into physical elements. Based on the results, they derived design recommendations. To create leaderboards, they suggest implementing transparent tubes for each user, displaying the accumulated points for each competitor. Using different colors is an effective way to assign points to each user. They recommend using containers that allow only a single row of items, enabling users to quickly see their points. As part of their work, a leaderboard prototype was built using colored marbles that were guided through a marble track into the transparent tube of each participant, as illustrated in Figure 17. The system is controlled by an Arduino microcontroller, which operates stepper motors to move marbles from designated magazines to output tubes. A NodeJS web server adds a RESTful API layer, enabling remote command execution (Altmeyer et al., 2021, pp. 285–286).

Although this approach provides a solid foundation for designing a physical counterpart for the app Flatastic, it has some limitations. One key challenge is scalability. Representing points with marbles becomes impractical as household members increase since adding more participants requires more containers and space. Additionally, resetting the points requires manual intervention, making it difficult to keep the physical leaderboard in sync with the app in real time. Assigning different point values to tasks also presents a problem, as higher point values would require an unmanageable quantity of marbles, quickly leading to space constraints and limiting the system's effectiveness.

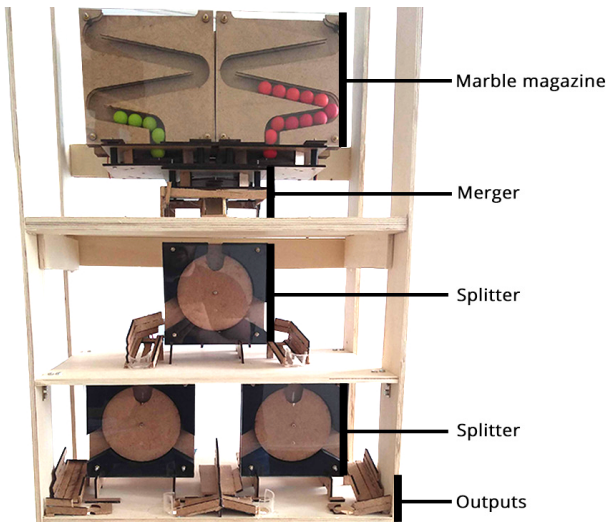

Figure 17. Leaderboard in form of a marble track physicalization (Altmeyer et al., 2021 p.286)

Stacking marbles in a transparent tube strongly relates to the concept of a physical bar chart. Building on this idea, the decision was made to focus on a physical bar chart. Therefore, research on the technical feasibility was conducted.

One approach can be found in the Tenison Road Charts project (Lindley et al., 2017), where traditional chart forms were translated into their physical counterparts. The bar charts were made from measuring tape, covered with colored masking tape as depicted in Figure 18. The height of each bar was dynamically adjusted by stepper motors that powered a rubber wheel, which extended or retracted the measuring tape to display the lengths corresponding to the underlying data. The columns were accompanied by e-ink labels to provide non-digital, paper-like legends (Sweeney et al., 2023).

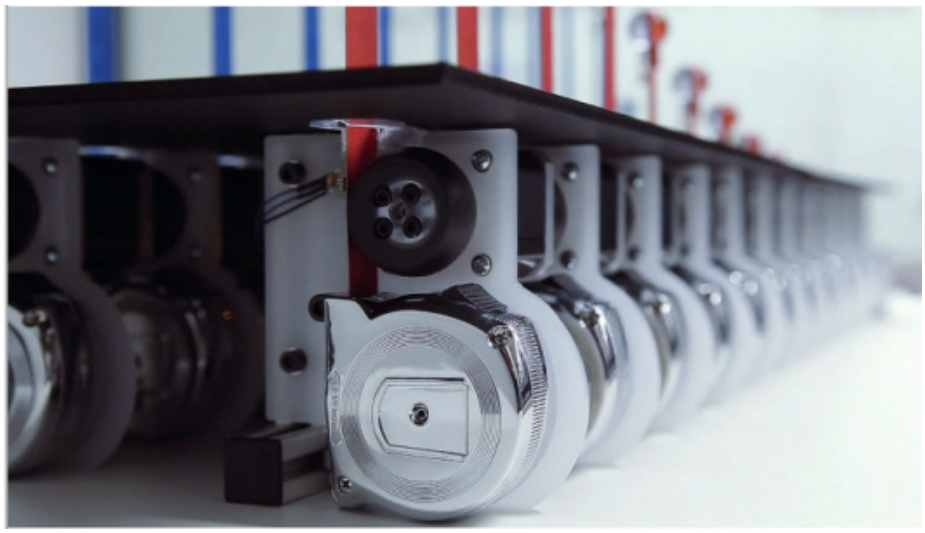

Figure 18. Dynamic bar charts from the Tenison Road Charts using measuring tape (Lindley et al., 2017, p. 260)

Another approach to building physical dynamic bar charts has been used in the inForm project (Follmer et al., 2013) and the EMERGE project (Taher et al., 2017). Both systems use motorized slide potentiometers as core actuation technology, enabling precise vertical movement. These actuators, combined with push rods, provide fine control over the height adjustments of each bar, as the inForm setup in Figure 19 shows. The push rods serve as a linking mechanism, transmitting the motion from the actuators to the bars. Additionally, the motorized slide potentiometers allow users to manually push or pull the bars, offering both automated adjustments and manual control for a more engaging tactile experience. While the EMERGE project used custom motor controller boards

combined with an Arduino microcontroller for computational logic, the inFORM system relied on a computer connected to specially designed circuit boards. Unlike inFORM, which relied on projection mapping for further data encoding, the columns in the EMERGE project were transparent and contained LEDs, adding color as an additional layer of information. Additionally, they were sprayed with frosted paint to diffuse the integrated LED lighting.

The technology with motorized slide potentiometers was chosen for this thesis because it enables fast, precise adjustments while allowing users to play around with their columns manually. Furthermore, this technology has been successfully used in two projects. However, as image 20 shows, its size is too large to fit in a household, requiring the design to be significantly scaled down.

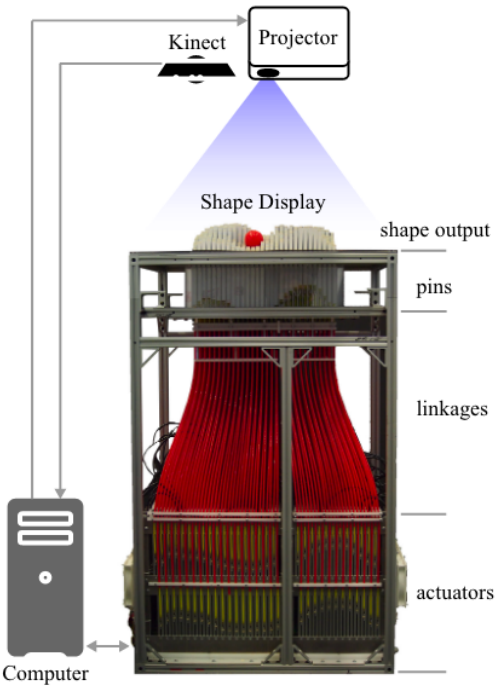

Figure 19. inFORM setup (Follmer et al., 2013 p.424)

Figure 20. Finished EMERGE project (Huron et al., 2023 pp. 294)

4.2.2 Detailed Conceptualization Using Design Themes by Koth et al. (2017)

The concept for this data physicalization builds upon the design themes identified by Khot et al. (2017) for creating engaging and meaningful physical representations of digital data. Following the 10 themes allows to think about all

important aspects of data physicalization (Khot et al., 2017, pp. 91–102). These themes were used to further conceptualize the idea of a dynamic bar chart with motorized slide potentiometers as bars.

First of all, the *purpose* of a physicalization should be defined. In this case, it is intended to enhance the persuasive strategies of the app Flatastic, aiming to increase user engagement and participation in household tasks, as well as to enhance the user experience. The authors distinguish between four different ways in which a purpose can be supported: "eliciting richer reflections on data, rewarding activity, keeping track of progress, and giving testimony to invested efforts" (Khot et al., 2017, p. 92). For this project, the primary focus is on *keeping track of progress*, as the physical representation allows users to monitor their task completions. Additionally, rewarding activity is emphasized through tangible feedback.

The second aspect is which *data* should be depicted in a physical artifact. This is determined by the data collected in Flatastic, specifically the points awarded to users for completing household tasks. These points accumulate into a total score, displayed on the app's scoreboard as a simple numeric value without any graphical visualization. While this straightforward display works well within the app, it presents challenges for physical representation due to its open-ended nature. Users could theoretically continue to collect points infinitely. This makes depiction in physical form difficult, as traditional charts or visualizations with fixed dimensions, such as columns or bars, and physical objects in general, are limited in size and eventually become impractically large or difficult to read. It also comes with another problem, as Weiser et al. (2015) pointed out, based on the work of Oliveira and Petersen (2014). Leaderboards can sometimes decrease motivation for participants who lag significantly behind, as the gap may feel discouraging. To address this issue in the physicalization, not the all-time total score will be displayed, but the score from a predefined period, such as the last two weeks. Another aspect of data processing mentioned by Khot et al. (2017) is *normalization*. This is particularly important in bar chart visualizations, where each bar's height is determined relative to a predefined maximum value. Without this normalization, one bar could be positioned at the minimum (0) while another reaches the maximum height, making the visualization difficult to interpret and frustrating for the household members who are lagging behind. Additionally, as participants earn new points, the columns of others may appear to move down, potentially creating a sense of negative feedback. This issue can be addressed by calculating a maximum value. Since Flatastic allows users to predefine which household tasks should be completed within a specific period and assign points to

each task, estimating the total achievable points within that timeframe is possible. To ensure flexibility, an additional margin can be added to account for unplanned tasks, preventing the physicalization from capping.

The next design theme discussed is *physical properties.* Based on insights from Zhao and Vande Moere (2008), four different dimensions can be distinguished. This physicalization mainly relies on the geometrical dimension, as the points' values are conveyed through the height of the columns. Additionally, the physical-chemical dimension is used, with an LED strip in each column, providing further information using color.

Information mapping is the fourth design theme and focuses on the internal mapping between data and physical depiction. Mapping each user's points to a column thereby provides a clear and easy-to-interpret mapping. Taller columns indicate more points, while shorter columns represent fewer points.

The design theme of *practical purposes* comes next and encourages reflection on possible other utilities of the physicalization that extend beyond the primary purpose. Although a physical bar chart may not initially seem to have many alternative applications, if aesthetically designed, it can integrate into home decoration, offering a unique decorative piece. The LED strips could also function as ambient lighting, contributing to the room's atmosphere. Furthermore, it can also be seen as a come-together point where conversations about necessary household tasks can be started.

The theme of *self-expression* considers how physical representations can reflect individual identities. While challenging in a shared prototype, subtle personalization options can still add a unique touch. For example, interchangeable 3D-printed icons enable each household member to select a unique object to represent themselves, adding a layer of individuality. Additionally, customizable LED colors allow each member to assign a specific color to their column, using it as a personal identifier. Colors and icons could even be changed to reflect the user's current mood or preferences according to recent events or seasons.

The *fabrication process* theme focuses on the practical aspects of physically creating the artifact. The fabrication process for this concept primarily involves additive techniques, particularly 3D printing, which allows for layer-by-layer construction and offers significant flexibility for creating customized shapes and structures. Djavaherpour et al. (2021) point out that 3D printing has become widely accessible, with low maintenance and operating costs, making it an ideal choice for creating complex prototypes and final physicalizations. For the columns, which

need to be transparent, both 3D printing with clear filament and laser cutting of acrylic glass are considered viable options, each providing the desired visibility of the LED strips. The case that surrounds all components can be fabricated from 3D-printed material or wood, providing a stable and aesthetic enclosure for the device. The dynamic behavior of the physicalizations will be enabled by incorporating key technical components, including a microcontroller to fetch data from the app and motorized slide potentiometers to adjust the columns to their correct positions. Regardless of the technique chosen, the manufacturer must strive to be visually appealing to fulfill the persuasive design principle of Liking from Oinas-Kukkonen and Harjumaa (2009).

The theme of *timing* in this project focuses on providing immediate feedback after a task is fulfilled. Each column updates directly upon task completion, serving as feedback and a reward. Additionally, reminders for incomplete tasks should be carefully timed to act as effective triggers. To ensure reminders and awards occur at the most impactful moments, a sensor detects the presence of a user, guaranteeing that feedback is witnessed. Another important aspect of timing is the reset interval for the columns, which determines when points are cleared. Giving households the option to choose a reset interval, such as weekly or biweekly, allows them to restart the competition and keep the members engaged.

Context is another important aspect when creating a data physicalization. This importance is also shared by Krath and von Korflesch (2021) regarding persuasive design principles. They introduced a specific category that deals with context variables such as location and target group. The physicalization will be located in a shared space within a home, making it visible to all household members and visitors. While each column's data is still private and belongs to one individual, its abstract design ensures that household members feel comfortable displaying it. Visitors won't immediately understand its purpose without an explanation. This balance allows it to be a natural part of the home, drawing attention without revealing personal details.

The last design theme is *attachment*, with the goal of sustaining interest over time by consistently providing value. The dynamic behavior of the physicalization ensures that it can continuously displays updated points. Over time, this should lead to its integration as a natural part of the daily routine, and the physicalization itself should blend into the home, becoming a fixture in the household. Additionally, a modular design is essential to accommodate changes in household membership, allowing to change the number of columns as new members join or others depart.

4.2.3 Mapping Design Principles

After analyzing the persuasive design principles of the Flatastic app and establishing the framework conditions for the physicalization, the next step involved integrating these design principles into the physicalization. Each principle was evaluated to determine how it could be effectively represented in a physical form. However, the principles of self-monitoring and competition are not further discussed, as they are already fulfilled by building a physical bar chart showing each user's collected points. Reduction is also sufficiently addressed by the app and not further discussed.

Personalization is achieved by allowing users to customize their column colors and place 3D-printed figures in front of them, as outlined in the self-expression design theme.

For *rewards*, the LED strips display a short animation, fading three times from bottom to top, indicating an upcoming change in column height corresponding to completed tasks. The movement of the column, which captures attention, can also be considered part of the reward. This action is triggered only when the motion sensor detects movement, ensuring the reward is noticed.

As overdue tasks are marked red in the app, this color is also used for *reminders* in the physicalization. When a household member passes by, the concerned user's column turns red and moves up and down a few centimeters three times, drawing attention and enhancing the reminder's memorability.

Liking focuses on the system's aesthetics, making it a crucial principle in designing a data physicalization. Since 3D printing is the primary fabrication technique, selecting an appropriate filament color is essential. For this physicalization, a copper-colored filament is chosen for its shimmery appearance, which conveys a sense of high quality, and its neutral yet elegant tone, which complements a variety of surroundings. Additionally, the system is designed with a wooden baseplate to add weight and ensure a robust feeling.

In addition to the persuasive design principles used in Flatastic, the principle *consider the context and location of the intervention,* mentioned by Krath and von Korflesch (2021), seems to be even more relevant when dealing with data physicalization. In this case, the prototype is intended to be placed in a private home setting. It is crucial to select a room where all household members frequently gather, as this allows the physicalization to serve as a central point for conversations while also reminding and rewarding everyone for their tasks. The chosen location should also align with a natural awareness of household tasks,

making spaces like the living room or kitchen ideal. These areas are often associated with shared activities and household responsibilities. In contrast, rooms like the bathroom may not be suitable, as they are typically visited during moments, such as mornings or evenings when engaging with household tasks is less practical.

4.3 Chapter Summary

The concept for this data physicalization builds on the app Flatastic (Flatastic GmbH, 2024), specifically focusing on representing its scoreboard, which displays points accumulated by users for completing household tasks. **A dynamic bar chart was identified as the optimal visualization method, with motorized slide potentiometers used to create adjustable columns** that reflect real-time data.

The development process involved a comprehensive analysis of *Flatastic*'s persuasive design principles, ensuring the integration of key strategies such as *personalization*, *rewards*, and *reminders* into the physicalization. Design themes from Khot et al. (2017) were applied to guide the conceptualization process, addressing aspects such as *purpose*, *physical properties*, and *self-expression*. Additionally, mapping the app's principles to physical elements ensured alignment with its persuasive strategies, while also tailoring the design to fit a private home context.

5 Prototype

The prototype's implementation process is based on the concept outlined in Chapter 4, which resulted in a first design (Figure 16). To translate this concept into a functional prototype, Figure 21 illustrates the core technical components: transparent 3D-printed columns mounted on motorized slide potentiometers driven by a microcontroller to dynamically display point values for each user. The prototype addresses **RQ1** by practically implementing app data as a dynamic data physicalization.

This chapter outlines the technical and design decisions in translating the concept into a physicalization, which was later evaluated in a field study. The physicalization was developed alongside a web interface, enabling users to adjust settings and link their app accounts. All complementary materials, including source code and 3D models, are available on GitHub[1].

Building the data physicalization prototype involved several design iterations and adjustments to technical decisions to create a functional model. However, the goal was not to develop a production-ready product but to test how app data can be physicalized.

During the design process, the physicalization was created to fit households with three members, meaning it could physically hold three columns. However, the circuit was designed to control only two columns to reduce costs and complexity, as the field study focused on two-person households.

[1] https://github.com/lukas-jungwirth/Master-Thesis-Making-App-Data-Tangible.git

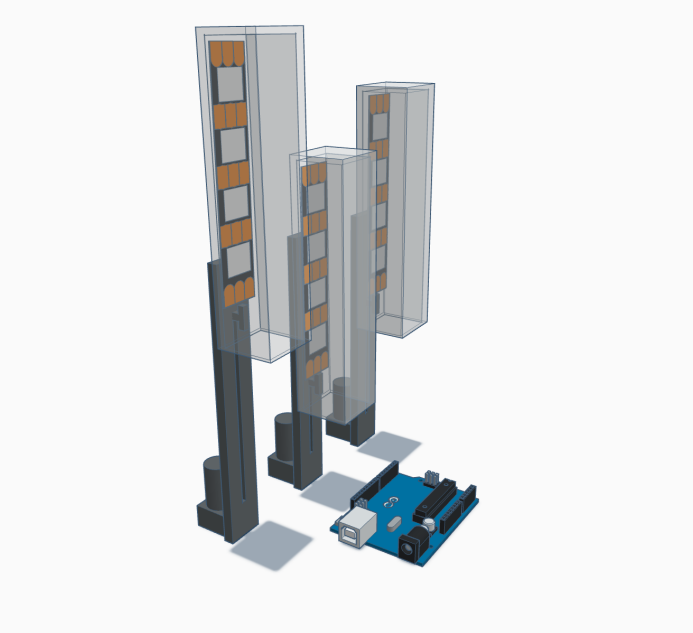

Figure 21. Internal setup of the initial prototype sketch with motorized slide potentiometers, transparent columns and LED strip

5.1 Circuit

Creating a dynamic data physicalization that adapts to user data requires computational power to operate the electronics. The final circuit is shown in Figure 22, while individual design choices are explained in detail below. The core processing unit used was an ESP32-S3, which controlled a 10kΩ linear motorized slider potentiometers for each column via a TB6612FNG motor driver. To provide sufficient power for the slider potentiometers to function properly, a 9V external power source was used. For powering other components, particularly the ESP32, which only requires 5V, an LM2596 buck converter module was used to step down the voltage. The movement detection relies on the HC-SR312 PIR sensor. WS2812B addressable RGB LED strips were employed to illuminate the columns, offering customizable lighting effects.

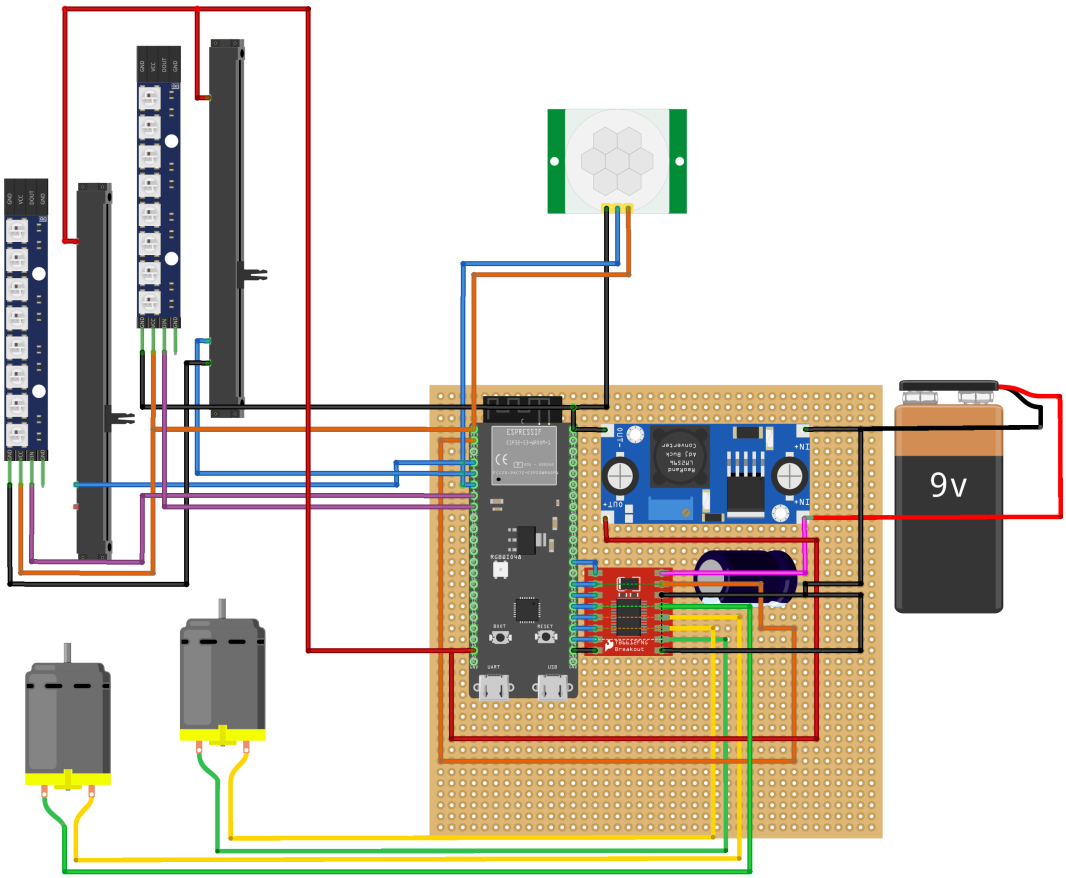

Figure 22. Circuit with all components of the finished prototype (9V battery symbolizes external 9V power supply)

5.1.1 Microcontroller (ESP32-S3)

The microcontroller serves as the central element of the circuit. Initially, the Raspberry Pi Pico WH was chosen due to its built-in Wi-Fi capability with support for soft access point (AP) mode with up to four clients (*Pico-Series Microcontrollers - Raspberry Pi Documentation*, 2024). The compact size and affordable price also made it a proper choice. However, significant issues arose when attempting to configure the device to operate simultaneously in both AP and STA (station) mode, as it caused connection failures. This limitation indicates that the Raspberry Pi Pico WH struggles to handle access point and client operations at the same time. Other users have reported similar challenges, likely due to hardware limitations or software configuration issues with the microcontroller's Wi-Fi functionality (*Simultaneous AP and Client Connections for the Pico W - Raspberry Pi Forums*, 2023).

As an alternative, the ESP32-S3 chip from Espressif was tested (Espressif Systems, 2024) and found to perform well in simultaneous AP and STA mode. It was used in the form of the DevKitC-1 development board, equipped with the WROOM-1 module featuring 16 MB Flash and 8 MB PSRAM. Although the PSRAM was included, it was not explicitly used. This choice provided a reliable solution for handling dual-mode Wi-Fi while providing enough file storage and computing power. Additionally, it includes enough GPIO input and output pins and pins with analog-to-digital converters (ADC) to connect all necessary hardware components. The detailed pinout of the DevKit is depicted in Figure 23.

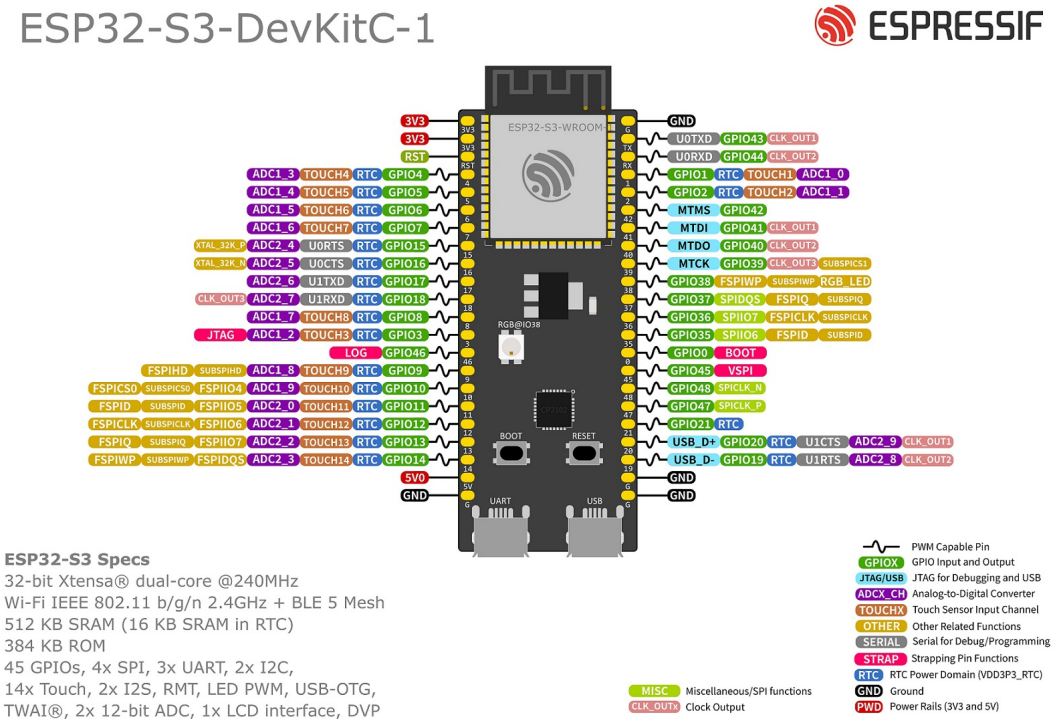

Figure 23. Pinout of ESP32-S3-DevKitC-1 (ESP32-S3-DevKitC-1 v1.1, n.d.)

5.1.2 Motor Driver (TB6612FNG)

A motor driver is essential to regulate current and voltage to control the motorized slide potentiometers, allowing precise movement. Initially, a L298N motor driver module (Rakesh, 2024) was used for its simplicity and availability. However, it was later replaced by the TB6612FNG (*Sparkfun/Motor_Driver-Dual_TB6612FNG*, 2024) due to its higher efficiency, reduced heat production, and compact size, which made it more suitable for this application. The advantages are gained from the different underlying technologies, as the TB6612FNG is based on an MOS

structure, whereas the L298N uses bipolar transistors. Both drivers can power two DC motors.

MOSFET-based drivers, like the TB6612FNG, utilize voltage-driven control, enabling lower power consumption and faster switching due to low on-resistance. This makes them more efficient and suitable for compact, energy-sensitive designs. In contrast, bipolar transistor drivers, such as the L298N, rely on current-driven control, which results in higher heat production (Baliga, 1988).

5.1.3 Motorized Slide Potentiometers

The motorized slide potentiometers used in this project are commonly used in digital mixing consoles and lighting control applications. As depicted in Figure 24, they feature a metal housing with a sliding range of 100 mm, which defines the maximum height of each column. With a 10 kΩ linear resistance, they operate within a voltage range of 4 to 10 VDC. Although the datasheet specifies a starting current of 800 mA, measurements during operation showed that current peaks did not exceed 300 mA (*RSA0N11M9A04 Datasheet*, 2007).

Figure 24. Used motorized slide potentiometer (RSA0N11M9-LIN10K, 2024)

5.1.4 Power Source

The power source for the system was initially considered to be battery-driven, as this would allow for placement independent of a power socket. However, since the physicalization is designed for long-term use, the need for recharging or frequently replacing batteries could lead to interruptions in functionality. A 5V power supply was tested initially, as all components support this voltage. However, moving the

columns reliably was impossible, as they occasionally got stuck due to friction. To resolve this, the power supply was upgraded to a 9V, 1A unit, which provides sufficient power for the system's needs. The system typically draws about 130mA at rest and peaks at approximately 300mA when motors or LEDs are active.

5.1.5 Buck Converter (LM2596)

A buck converter was integrated into the system to efficiently step down the 9V input voltage to 5V, which is required for powering components like the ESP32-S3.

A buck converter is a DC-DC converter that reduces a higher input voltage to a lower output voltage by controlling the energy delivered to the output. The main element is a switch, typically a MOSFET, which alternates rapidly between on and off states. This pulsed operation effectively reduces the average output voltage supplied to the connected load (Soheli et al., 2018, pp. 1–2).

For this project, a LM2596 module was chosen. As visible in Figure 25, in addition to the buck converter switch, this module integrates capacitors positioned before and after the circuit, to smooth voltage fluctuations and ensure a stable output. The module also features an adjustable potentiometer, allowing the output voltage to be adjusted.

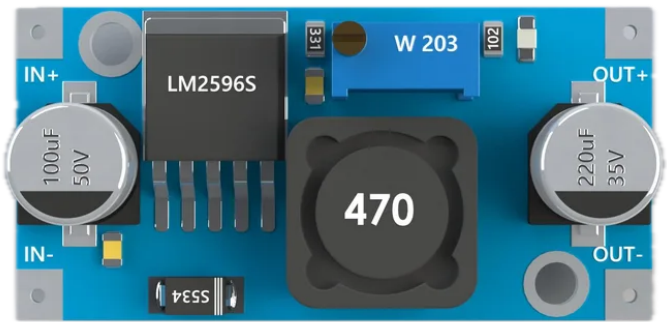

Figure 25. Used buck converter (LM2596 DC to DC Buck Converter Module, 2020)

5.1.6 PIR Sensor (HC-SR505)

Initially, due to its adjustable range and signal duration, the HC-SR501 PIR sensor was chosen to detect users passing by. However, significant interference issues arose during system integration, as the sensor consistently sent a high signal when the Wi-Fi module was active. Attempts to shield the sensor with grounded aluminum foil were ineffective. Consequently, the HC-SR312 sensor was selected as a replacement. This sensor is less sensitive and significantly smaller, which makes it easier to shield by enclosing it in the prototype's housing. Although it lacks

adjustment options for range and signal duration, its default 3-to-5-meter range is well-suited for the application. It operates on 3V, compared to the HC-SR501's 5V. Size difference between HC-SR501 and HC-SR312 can be seen in Figure 26.

A Passive Infrared (PIR) sensor detects motion by measuring changes in infrared radiation within its field of view. It contains a pyroelectric material that generates an electric charge when exposed to infrared radiation. When a warm object, such as a human, moves across the sensor's detection area, it causes a rapid change in infrared energy, leading to a corresponding change in the sensor's output voltage (Pawar et al., 2018).

Figure 26. Comparison of PIR sensor; left: HC-SR312, right: HC-SR501 (Created by author)

5.1.7 LED Strip (WS2812B)

The initial attempt to illuminate the columns involved placing a single multi-color LED at the bottom. However, this approach proved ineffective due to limited visibility and the inability to create advanced lighting effects beyond basic blinking. A better solution was achieved by using a WS2812B addressable RGB LED strip, glued to the back of each column. It allows to digitally address each LED, allowing for advanced effects such as light fading. Two types of LED strips were tested: one with 60 LEDs per meter and another with 144 LEDs per meter. Although the denser strip provided higher brightness, the 60-LED strip was sufficient to effectively light up the column while reducing power consumption. Ultimately, six LEDs per column from the 60-LED strip were used. The LED strip was powered at 25% brightness to ensure the illumination was not too bright.

5.1.8 Temperature Sensor (GY-21 HTU21)

Although not part of the original circuit design, the GY-21 HTU21 temperature and humidity sensor was integrated into the circuit case for testing purposes. Its primary goal was to monitor potential overheating and ensure that the closed case did not lead to heat buildup during operation. The sensor was configured to send

temperature readings every 10 minutes over a one-week testing period. The case temperature was approximately 1.5°C warmer than the ambient temperature. No significant temperature spikes or extreme increases were observed, indicating that the system produced only moderate heat and maintained stable thermal conditions.

5.2 Case

The case was 3D-printed to allow for high customization and fast iterations. All case parts were printed with copper-colored PLA, selected for its aesthetic appeal. The 3D models were designed using Autodesk Fusion (Autodesk Inc., 2024). Initially, all components were housed in a single box, as shown in Figure 27. This design featured three holes on the top for the columns to rise, one hole on the front for the PIR sensor, and a side opening for the power supply cable. The base plate was made of wood to provide stability. However, in a later design iteration, the system was adapted to make it more modular, ensuring it could adjust to changes in the number of household members. To achieve this, **the box for the circuit was decoupled from the columns**.

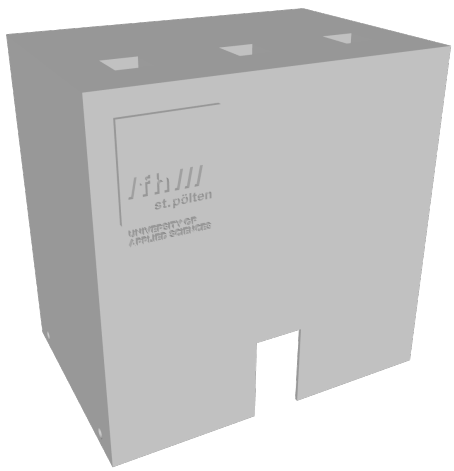

Figure 27. First 3D design of the physicalization housing, single-case design

5.2.1 Circuit Box

The circuit box was redesigned to reduce its height, requiring only the space to house the electronics. At the back, three slots were added to allow the columns to slide in easily, as shown in Figure 28. These mechanisms included holes to route

the cables from the columns into the circuit box. The side hole for the power supply cable remained unchanged. Initially, the hole for the PIR sensor was positioned at the bottom front of the box. However, it was later resized and relocated to the top to accommodate the smaller HC-SR312 sensor and maximize the distance from the WiFi antenna. The base plate continued to be made of wood, with screw holes left in the 3D print of the box to ensure secure attachment. The final dimensions of the circuit box were 14 cm in width, 8 cm in height, and 12 cm in depth.

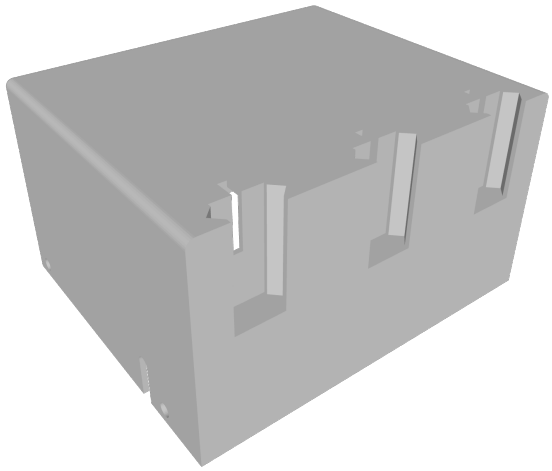

Figure 28. 3D model of the final case, showing the back view of the circuit box with slots for column counterparts to slide in

5.2.2 Columns

The design of the columns involved two main components: creating the movable columns based on motorized slide potentiometers and constructing the case that holds and positions all components. Unlike prior work, no push rods were used to extend the actuators. Instead, the column was mounted directly onto the handle of the slide potentiometer, as shown in Figure 29, reducing the overall size of the prototype and making it more compact for users to integrate into their homes.

Each column was placed in its own box during the redesign, as shown in Figure 30. This modification required two iterations, as the columns needed to be widened to provide sufficient room for the cables to bend. The final dimensions were 16 cm in height, 4.5 cm in width, and 7 cm in depth. Each box consisted of an opening at the top for the column to move through, two holes on the bottom for attaching the cover to the base plate, and a mounting counterpart on the front to attach the column to the circuit box.

Figure 29. Inside the columns: 3D printed transparent column mounted on a motorized slide potentiometer

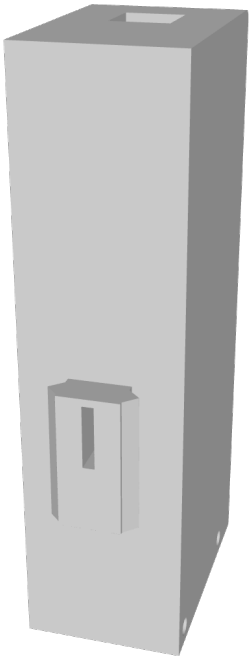

Figure 30. 3D model of the column housing

Inside, a mounting system was developed to hold the slide potentiometer vertically. This system was designed to fit the potentiometer precisely. The accurate measurements ensured that no adhesive was needed to secure the column in place. As depicted in Figure 31, early prototypes included a flat base with screw holes for attachment to a wooden plate. Later iterations combined the baseplate and mounting system into a single 3D-printed unit to simplify the assembly. Holes were added for 3D-printed pins to connect plate and cover. A third design iteration added a cable mount to prevent interference when the column moved up and down.

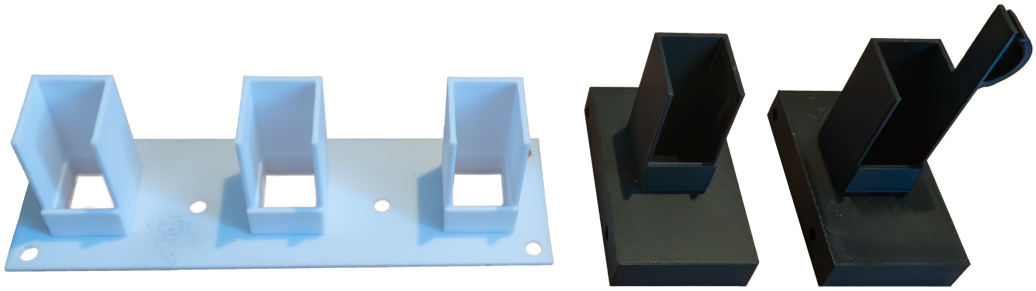

Figure 31. Design iterations of the mounting system to keep the motorized slide potentiometer upright, shown from first to last (left to right)

The transparent columns for the vertical bar chart were also 3D-printed, with several versions tested. As they were mounted directly onto the slider handle, a whole was added at the bottom to fit exactly. Although the fit was tight enough to hold the columns in place, super glue was used to ensure they stayed in place even during rapid movements. When designing the measurements, adjustments were made to hold the column tightly enough to avoid wobbling but loosely enough to prevent excessive friction. Different materials were tested as well, including TPU (thermoplastic polyurethane) and PLA (polylactic acid). TPU offered flexibility, creating a more pleasant experience as the column could be slightly squeezed, and the sound during movement was more subtle. However, it caused excessive friction, which made smooth movement difficult. Consequently, PLA, being harder and less flexible, was chosen as it proved more suitable for reliable operation.

Weight considerations were addressed to allow the slider to hold the column in place without requiring the motor to remain continuously active. To achieve this, the walls of the column were designed to be only 1 mm thick. The final column measured 14 cm in total height (including the mounting system), with a width and depth of 15 mm, and weighed about 9 grams. The maximum extension length was 10 cm, limited by the range of the slide potentiometer. This design ensured that the column could maintain its position when the motor was inactive while still allowing smooth and controlled movement.

Once the columns were built and secured, the final step was wiring. Therefore, seven cables were required for each column:

- 3V logic supply for the slide potentiometer
- Data cable to read the potentiometer's position
- Two cables for the DC motor (to reverse polarity for directional control)

- 5V power supply for the LED strip
- Data cable for the LED strip pattern
- Ground cable

These cables were routed through the holes in the connection elements between the column and the box to maintain a clean design.

5.2.3 Customizable Icons

To further personalize the physicalization, users could place a small figure in front of their column. A selection of four different Super Mario™ characters was provided, as shown in Figure 32. These figures were 3D-printed in silver and included a pedestal for easy placement. The models were sourced from the 3D printing community Thingiverse (Thingiverse.com, 2022).

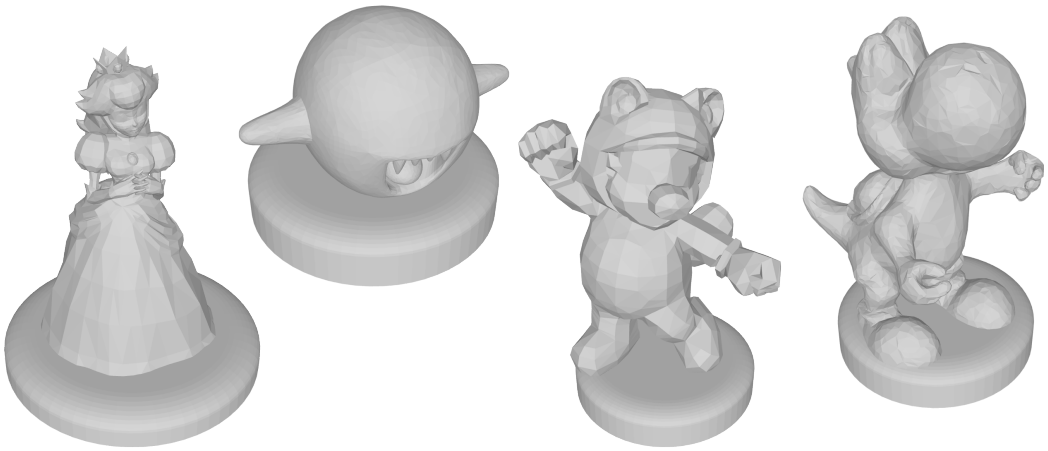

Figure 32. 3D model of Super Mario™ characters used for further personalisation

5.3 Software

For coding, the source code editor Visual Studio Code was used, enhanced with the PlatformIO IDE extension (PlatformIO, 2024). This extension enables building and uploading code to the ESP32-S3, managing third-party libraries, and debugging programs. Before starting, the CH34xVCP driver for the USB-to-serial

chip had to be installed to enable proper communication between macOS and the ESP32-S3.

The code for the ESP32-S3 was written in C++. The program's starting point is in a central file, main.cpp, which includes multiple header files that contain specific logic for components such as the motorized slide potentiometer and the LED strip. Modular design was a key focus. Therefore, columns were organized in a central array that contained objects for each column. Each entry defines all necessary pins for potentiometer and LEDs. All further actions are based on this definition, which allows easy addition or removal of columns without requiring significant changes to the rest of the code.

5.3.1 Lifecycle

The program begins with the setup function, executed once at the start. All components are initialized during this phase, including the PIR sensor, LED strips, slide potentiometers, and temperature sensor. Stored data, such as Wi-Fi credentials and the start timestamp of the current period, is retrieved. The setup also initializes the web server, starts the access point, and attempts to establish a Wi-Fi connection if valid credentials are available.

The loop function handles the program's main runtime operations, running continuously. It processes DNS requests in each iteration and checks the Wi-Fi connection status. If the connection is lost, the program tries to reconnect every ten seconds. When connected, the system reads the PIR sensor value to detect motion, which serves as the main trigger for subsequent actions. The system distinguishes between a first interaction when a user enters the room and a continuous interaction when the user stays within the sensor's range.

If motion is detected, the LED strip turns on, and the system fetches user points from the Flatastic API. To avoid blocking, API requests are limited to one every 30 seconds. During a first interaction, the system checks for overdue tasks. If overdue tasks are found, the corresponding user's column is illuminated in red and moves up and down three times. This feedback is limited to once every two hours to prevent this feedback from becoming frustrating. If no motion is detected, the LED strip is turned off to conserve power.

Feedback mechanisms provide visual indicators to users during operation:

- Both columns blinking yellow: Indicates the system is restarting
- Red LEDs on a column: Signals overdue tasks for the corresponding user

- Both columns are colored red: Lost Wi-Fi connection
- All LEDs turned off: Indicates no motion is detected, conserving power

5.3.2 Getting Points

This function is central to the system as it handles fetching points from the Flatastic API, mapping them to column heights, and moving the columns to their target positions. Points are measured and displayed within a defined time frame, after which they are reset to allow for a fresh start in the competition. The starting point of each time frame is defined by a Unix timestamp and referred to as "reset date". The timestamp is retrieved through a server request and stored in the filesystem during the initial setup. The reset date is only updated if the system was actively reset or the interval duration has been exceeded. Whenever the system restarts, the current timestamp is fetched. During runtime, the elapsed time since the program started (using millis()) is added to the initial timestamp to get the current time. If this calculated time exceeds the reset date plus the interval duration, points are reset, and a new reset date is stored.

A maximum value must be defined to display points as a bar chart. Therefore, a dedicated function calculates the maximum expected points within the time frame after each reset. This function loops through all tasks created in the app, checking the intervals at which tasks should be completed and the points awarded for each. Starting with the next scheduled date for each task, it calculates how often it will occur within the time frame and sums the corresponding points. The total is divided by the number of household members, as tasks are typically done alternately, and an additional 50% is added to be prepared for unexpected tasks.

Once the reset date and maximum expected points are determined, an HTTP request is triggered to fetch the awarded points from the Flatastic API. Therefore, the chore history API endpoint is used, which returns the fulfilled tasks beginning with the last one. Although it is a premium feature in the app, the endpoint can also be fetched for nonpremium users. All tasks done after the reset date are summed up. As the system stores which Flatastic user ID belongs to which column during the setup process, it can map each user’s points to their respective column. Finally, the columns are moved to the correct positions based on the retrieved points.

5.3.3 Moving Columns

To move the columns to a specific point value, the Flatastic points are mapped to potentiometer values ranging from 0 to 4095. The movement begins by checking

the current potentiometer value. The column moves downward if the current value is higher than the target. If it is lower, it moves upward. Based on this comparison, the appropriate output is sent to the motor driver to move the motor in the correct direction. During the movement, the potentiometer value is continuously monitored, and the motor stops as soon as the target value is reached.

This process is not straightforward because the motor's speed, which determines how much power is supplied, needs to be carefully managed. Moving the column upward requires more power than moving it downward, and shorter distances must be traveled at slower speeds to avoid overshooting the target value. To address this, a function calculates the optimal speed based on the direction of movement and the remaining distance. This function is continuously called during movement, ensuring that the motor slows down as it approaches the target.

Another challenge involves handling minor fluctuations in the potentiometer values. Reaching the exact target value is impractical, as the system would constantly adjust the position, causing unnecessary movements. To solve this, two thresholds were introduced:

1. The **position threshold** defines an acceptable range around the target value within which the slider can stop (10 units above or below the target value)
2. The **movement threshold** prevents the motor from activating for minor distances, with movement only starting if the target value is more than 50 units higher or lower than the current position

These thresholds ensure smooth operation by reducing unnecessary position updates and ignoring minor variations that would not impact the visual representation.

5.3.4 Prototype Instrumentation

As the prototype is tested in a field study in external households, monitoring whether they are functioning properly is crucial. The prototype was instrumented using the ESP32 to send data for all key actions to achieve this. Therefore, a Pocketbase instance (PocketBase, 2024) was installed on a Linux server to serve as the backend. Pocketbase is an open-source backend-as-a-service based on an SQLite database. It was chosen for its simple setup process. The ESP32 sends entries to a collection that logs interactions, containing the prototype ID and the interaction type, such as "first" and "stop" when the sensor detects movement and when movement stops, "reconnect" if the system restarts, and "settings" when the settings page is accessed via the access point. This system allows effective

monitoring and helps diagnose issues, such as frequent prototype restarts, by identifying unusual log patterns.

Additionally, the system periodically sends its internal temperature to another collection every 10 minutes. This ensures continuous feedback on the system's functionality, confirming that it is operating correctly and that the internal temperature remains stable.

5.4 Web Interface

The web interface has three main goals: connecting the physicalization to the local Wi-Fi, logging into the Flatastic account, and assigning user data and colors to the columns of the physical bar chart. To achieve this, the ESP32 operates simultaneously in both Access Point (AP) mode and Station (STA) mode. In AP mode, it creates a local Wi-Fi network that allows user devices to connect and modify settings. In STA mode, it connects to the local Wi-Fi network to fetch data from the Flatastic API.

5.4.1 Captive Portal

The prototype employs a captive portal to facilitate easy access to the settings page. A captive portal is a system that intercepts network traffic and redirects users to a designated web page, typically used for authentication or configuration in public Wi-Fi networks (Ali et al., 2019). In this implementation, the captive portal ensures that users connecting to the prototype's Wi-Fi network are automatically redirected to the configuration page without the need to manually enter an IP address.

The captive portal is implemented by setting up a DNS server, using the builtin support of the Arduino core library for ESP32 (*Espressif/Arduino-Esp32*, 2025), which handles domain name queries by redirecting all traffic to the ESP32's local IP address. This ensures that any attempt to access a website leads to the prototype's configuration interface.

5.4.2 Web Server

To serve the required webpages, after a user is redirected to the captive portal, a web server is implemented, using the ESPAsyncWebServer library (Gochkov, 2024) to handle HTTP requests. The server hosts various endpoints for user interaction, such as pages for managing Wi-Fi connections, logging in, and

configuring settings. Pages are delivered as static HTML with internal CSS and JavaScript to simplify the request. The files are stored on the SPIFFS file system and served dynamically based on the user's interaction and the current state of the prototype. AJAX requests are used to fetch API data and send changes to the server. This ensures a responsive user interface without requiring page reloads.

5.4.3 Setup

The initial state of the web interface is the Wi-Fi setup page, as shown in Figure 33. This page appears only if the device cannot establish a Wi-Fi connection. After completing the setup, users are asked to enter their Flatastic credentials, as depicted in Figure 34. The system stores the returned API key to enable future API requests. Only credentials from one user are necessary, as this allows the retrieval of data from the whole household. These first two steps are required only during the initial setup if no changes occur during usage.

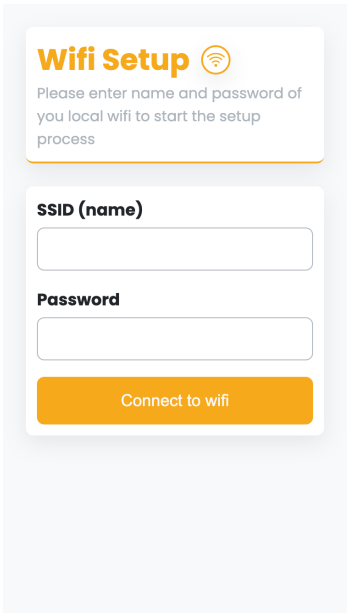

Figure 33. Wifi setup screen

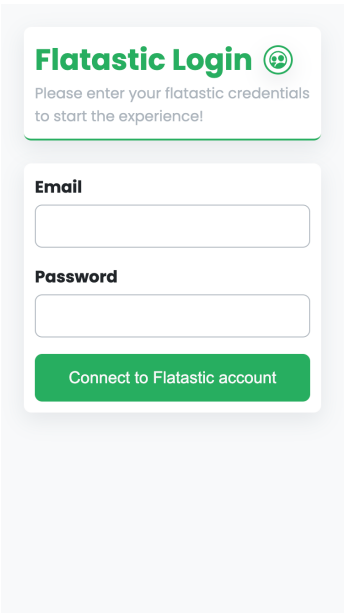

Figure 34. Flatastic Login screen

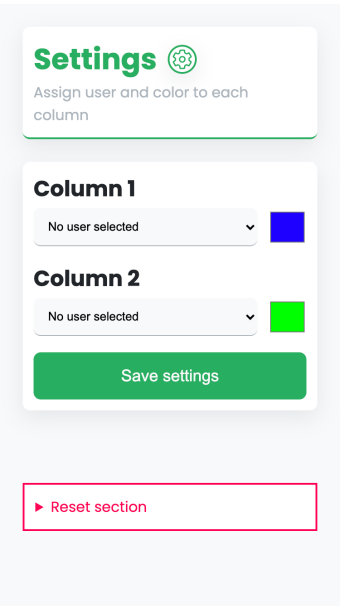

Figure 35. Physicalization settings screen

During regular use, only the third screen, shown in Figure 35, will appear. This screen allows users to assign a household member to each column. The options in the dropdown menu include the household members registered in the app. Next to the user selection, a color picker is available to customize the color of each column. Additionally, there is a reset section, which allows households to reset their points if they wish to restart.

5.5 Result

Figure 36 shows the final prototype, as it was used in the field study. The prototype has a width of 14 cm, a depth of 19 cm, and a height of 16 cm with retracted columns, extending to 26 cm with the columns at their highest position. The image also includes two selected custom figures, demonstrating the personalization options available to users.

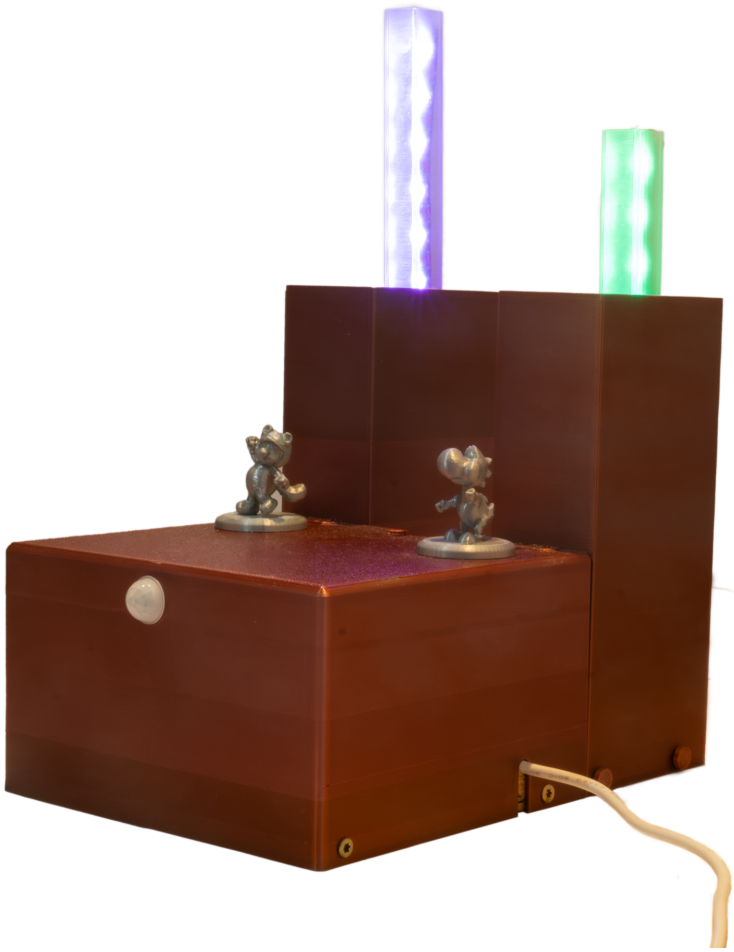

Figure 36. Finalized prototype as used in the field study

6 Field Study

To investigate **RQ2: How does transforming app data into a data physicalization impact the persuasiveness and user experience of apps with persuasive design strategies?,** a field study was conducted using the app Flatastic and the prototype described in Chapter 5. The study aimed to evaluate whether and how physical data representations enhance or modify the app's persuasive impact and overall user experience.

6.1 Design

The study was carried out as a between-subjects design with two distinct conditions:

1. **App-only**: households that use only the app for household task management
2. **App + Physicalization**: households that use both the app and the physical prototype

Three households were assigned to each condition based on preselected demographics to ensure both test groups were as comparable as possible, resulting in six households participating in the main study. The households were grouped into pairs by matching those most comparable in age and employment. Within each pair, one household was randomly assigned the prototype. The main study spanned two weeks, during which participants integrated the app Flatastic into their daily lives, using it as a tool to manage household tasks. Throughout this period, participants create tasks that need to be completed, which are rewarded with points as soon as they are marked as fulfilled in the app.

The dependent variables for evaluating persuasiveness included the number of fulfilled tasks per household during the test period, the number of overdue tasks (tasks that exceeded their defined deadlines), the average delay of overdue tasks, and an adapted version of the Perceived Persuasiveness Scale by Drozd et al. (2012), administered at the end of the first week and again at the end of the study. Furthermore, a questionnaire on the effectiveness of individual persuasive design principles was administered.

To measure the user experience, the Short User Experience Questionnaire (UEQ-S; Laugwitz et al., 2008) was used alongside the short German version of the Intrinsic Motivation Inventory (IMI; Wilde et al., 2009) to measure factors such as enjoyment, competence, choice, and pressure.

For qualitative insights, short focus group sessions lasting 5 to 20 minutes were conducted with all household members to explore their experiences, engagement, and perceptions of the system.

6.2 Participants

The study included 12 participants from six households (N = 6), with each household consisting of two adults. A criterion for selection was that households had not previously used the Flatastic app for tracking household tasks in their current household. One participant (physicalization group) had used the app in a prior household but not in the current one, while another household (App-only group) had used the app exclusively for finance tracking and not for managing tasks.

Participants were aged between 24 and 42 years, with an average age of 29.6. The age distribution is visualized in Figure 37. Gender distribution was balanced, with seven females and five males, as shown in Figure 38. Educational backgrounds included university degrees (Bachelor's or Master's) for five participants, secondary school diplomas for three, apprenticeships for two, one participant with a vocational college qualification (*Kolleg*), and one with a technical school qualification (*Fachschule*). Employment situations varied, with seven participants working full-time, two part-time, one in education, and two combining education with part-time or project-based work. Employment distribution by group is detailed in Figure 39.

6.2.1.1 App-only Group

The App-only group (Households 2, 3, 6) comprises 6 participants (4 females, two males) with an average age of 25.8 years. Educational backgrounds were predominantly university degrees (4 participants), with 2 participants holding secondary school diplomas or vocational qualifications. Employment included two full-time workers, two part-time workers, and 2 combining education with part-time or project-based work.

6.2.1.2 App + Physicalization Group

The App + Physicalization group (Households 1, 4, 5) also included 6 participants (3 females, three males), with an average age of 31.3 years. Educational backgrounds included two university degree holders and 4 participants with secondary school diplomas or apprenticeships. Most participants worked full-time (5 participants), while 1 participant was in training or education.

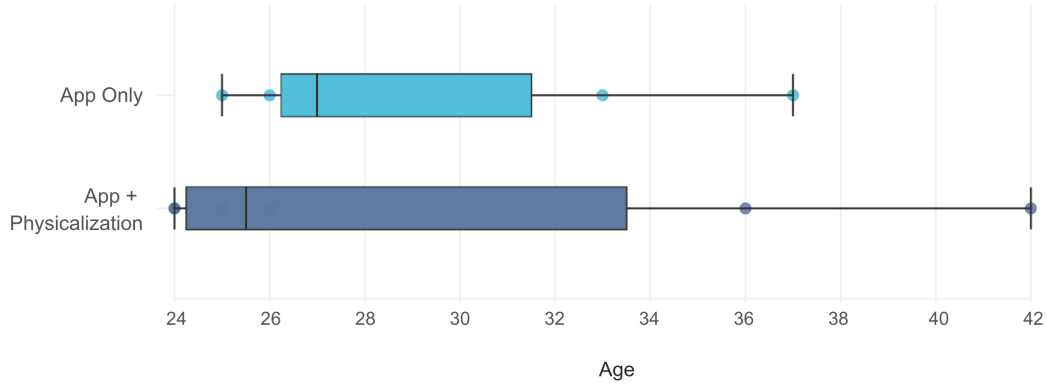

Figure 37. Age distribution comparison between the App-only and App + Physicalization group

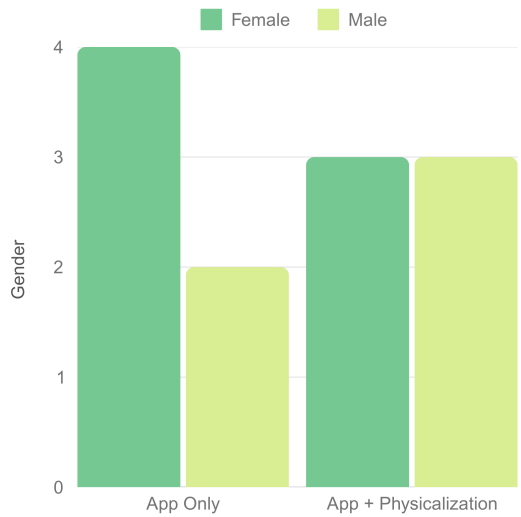

Figure 38. Gender distribution comparison between the App-only and App + Physicalization group

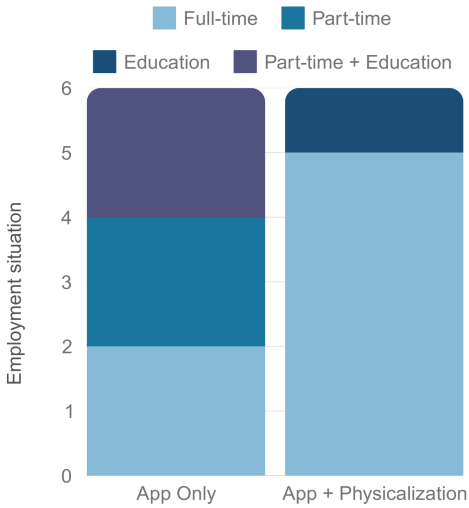

Figure 39. Employment status distribution within the App-only and App + Physicalization group

6.3 Apparatus

The study apparatus included the household management app Flatastic, which provides a digital platform where participants can assign tasks, track completions, and collect points. For the setup process, each household was provided with an instruction sheet (see Appendix A) that contained a step-by-step guide on how to setup the app including predefined login credentials to ensure a clean start and facilitate data collection for analysis. Additionally, an optional list of suggested tasks was attached to assist participants in setting up their tasks and assigning appropriate point values.

The physicalization prototype described in Chapter 5 was used for the App + Physicalization group. Three identical prototypes were built to enable simultaneous deployment across all households. Additionally, an introduction sheet with instructions on how to set up and connect the prototype supported the setup process (see Appendix B). To maximize visibility, participants were asked to place the physicalization at a location where all household members are frequently passing by. Household 1 placed it on the dining table (Figure 40), Household 4 positioned it next to the TV in the living room (Figure 41), and Household 5 placed it between their work desks in the home office (no image provided).

Task related data was collected via the app's API, allowing precise tracking of the number of completed and overdue tasks. All other dependent variables were measured through questionnaires administered via Google Forms. All were conducted in German. The Short German Intrinsic Motivation Inventory (IMI) and the Short User Experience Questionnaire (UEQ) were used in their original form.

For measuring the persuasiveness of each system, the Perceived Persuasiveness Scale by Drozd et al. was used and adapted in the same way as done by Orji et al. and Altmeyer et al. (Altmeyer et al., 2021, p. 288; Orji et al., 2017, p. 1017). This scale has been used in previous research on persuasion and consists of four questions. Participants rated each statement on a 7-point Likert scale (1 = Strongly Disagree, 7 = Strongly Agree). (Orji et al., 2017, p. 1017). For this study, the questions were adapted as follows:

- "The system would influence me."
- "The system would be convincing."
- "The system would be personally relevant for me."
- "The system would make me reconsider my engagement in household tasks."

The questionnaire corresponding to specific design principles implemented in the app and the physicalization was developed to gain deeper insights into the influence of individual persuasive design principles. These statements assessed the persuasiveness of each principle and were answered as well in the form of a 7-point Likert scale. The approach of evaluating the persuasiveness of a system on the basis of its design principles is inspired by the work of Orji et al. (2017). However, the specific questions used in this study were uniquely developed to address the objectives of this thesis without relying on pre-existing questions. The following questions were asked:

1. Personalization: "The ability to personalize the system persuaded me to complete household tasks."
2. Self-Monitoring: "Seeing my progress persuaded me to complete household tasks."
3. Comparison/Competition: "Comparing my progress with others persuaded me to complete household tasks."
4. Rewards/Feedback: "Receiving feedback or rewards after completing tasks persuaded me to complete household tasks."
5. Reminders: "Getting reminded persuaded me to complete household tasks."
6. Liking: "The design and aesthetics of the system persuaded me to complete household tasks."

Figure 40. Placement of the prototype in household 1

Figure 41. Placement of the prototype in household 4

6.4 Procedure

Figure 42 depicts a brief overview of the procedure. The study began with a one-week pilot test involving one household to validate and refine study materials and procedures. In the pilot phase, one participant completed the full procedure planned for the main study, including questionnaires and test focus group sessions at the end of the week.

Feedback from this pilot test highlighted two main issues. First, the interval of reminders was too frequent and became annoying, as they were triggered every time the sensor detected a user, if overdue tasks were present. The interval was adjusted to fire only every two hours to address this. Second, a software bug caused the columns to move all the way to the top when no data was received from the API. These issues were resolved to ensure a smoother user experience in the main study.

The main phase started after all households were assigned to a test group and was conducted between November 25 and December 17, 2024. Each household

received setup instructions and was guided through downloading and configuring the Flatastic app. A brief follow-up ensured that the setup was completed correctly and any questions were addressed. A monitored setup session was conducted for the physicalization group to hand over the prototype and resolve any potential issues.

At the end of the first week, participants completed the Perceived Persuasiveness Scale and the Intrinsic Motivation Inventory. At the end of the test period, the Perceived Persuasiveness Scale was conducted once again as well as the questionnaire on design principles and the usability questionnaire. The split was made to avoid overwhelming participants and to ensure more thoughtful and accurate responses.

The questionnaires were followed by 5–20-minute semi-structured focus group sessions conducted with household members to gain qualitative insights. Both groups discussed how the system influenced their motivation and engagement in completing household tasks. The App + Physicalization group also described the added impact of physical components on their motivation. Both groups were invited to suggest improvements to enhance the system’s persuasiveness.

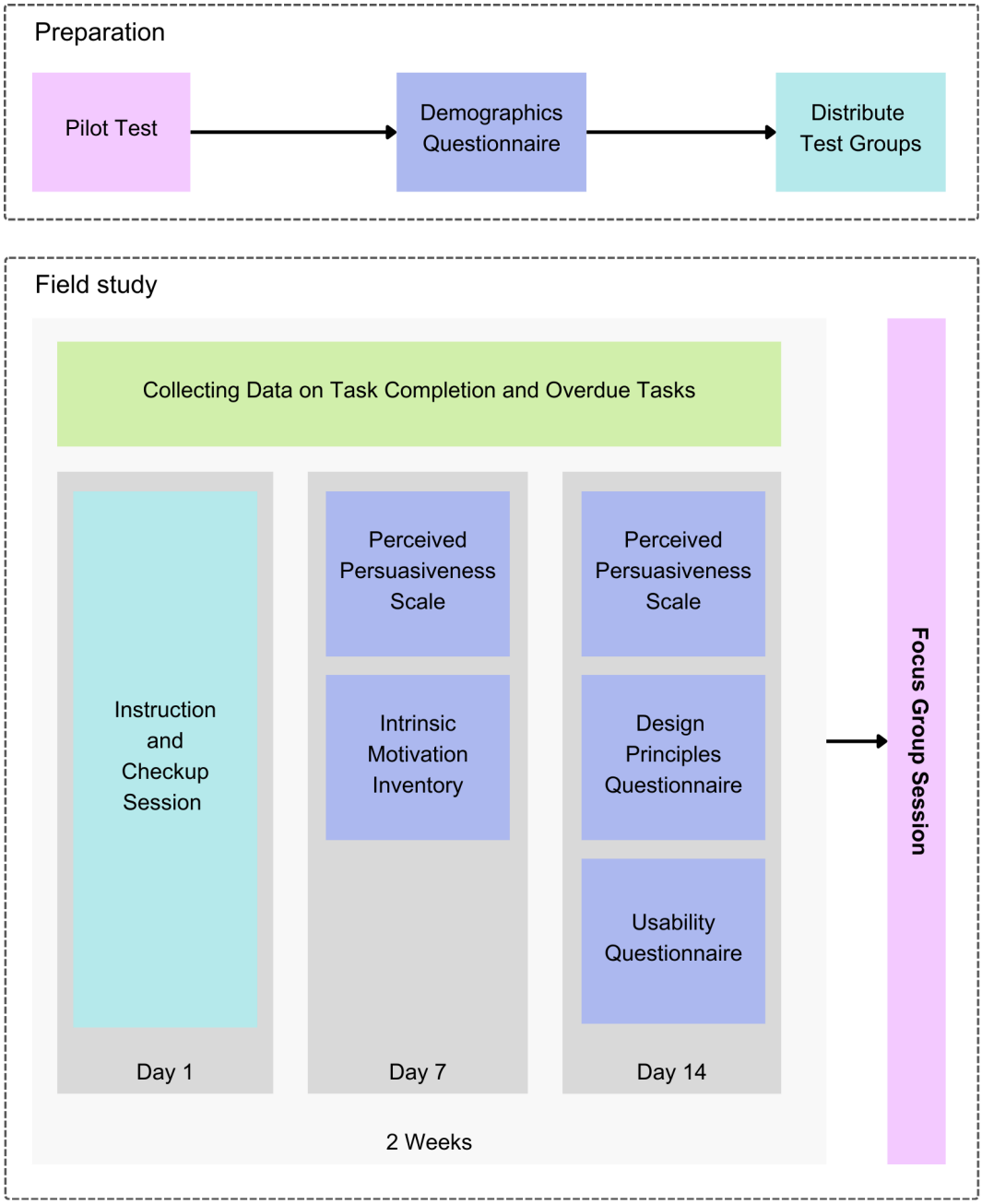

Figure 42. Flowchart of field study procedure

6.5 Data Collection & Analysis

Data for this study was collected through questionnaires, app usage data, and focus group sessions. Task completion data was extracted through the app's API, while all other dependent variables were collected through questionnaires. Statistical variables such as mean, standard deviation, and median were

calculated and the data was analyzed to identify patterns, outliers, and trends relevant to the study's research questions.

Independent samples t-tests were conducted on the Perceived Persuasiveness Scale and the Short User Experience Questionnaire with an alpha level of 0.05 to determine statistically significant differences between the App-only and App + Physicalization groups.

For the focus group session data, audio recordings were transcribed, and qualitative analysis was performed. Key statements were highlighted and categorized based on their relevance to the study's themes, such as task awareness, engagement, and design principles. The frequency of similar responses across households was noted. Focus group session findings were then cross-referenced with questionnaire results to identify overlapping themes and contextualize quantitative findings.

6.6 Results

The results of this field study are presented through a combination of quantitative and qualitative findings, focusing on the measured dependent variables and insights from focus group sessions with all households. Table 1 provides an overview of all dependent variables, summarizing key metrics such as perceived persuasiveness, task behavior, user experience, and motivation. To complement these findings, Figure 43 displays the most frequently mentioned keywords from the focus group sessions for both test groups.

The study results reveal notable differences between the App-only and physicalization groups across various dependent variables. Quantitative findings show that the physicalization group scored higher in perceived persuasiveness and user enjoyment. Task completion was also higher for the physicalization group, although the difference was minimal when excluding the outlier. Interview data further highlight that the physicalization group benefited from the prototype's constant visibility and tangible feedback, which enhanced task awareness and engagement. In contrast, the App-only group reported limited behavioral impact and faced challenges creating awareness and engagement.

Table 1. Dependent variables of the field study

	App-only	***Physicalization***
IMI Enjoyment ***scale from 3-21***	*M = 11.50, SD = 4.14, Mdn = 13.00*	*M = 18.67, SD = 3.27, Mdn = 20.50*
IMI Competence ***scale from 3-21***	*M = 16.67, SD = 3.27, Mdn = 17.0*	*M = 15.83, SD = 4.45, Mdn = 17.50*
IMI Choice ***scale from 3-21***	*M = 18.67, SD = 3.20, Mdn = 20.00*	*M = 18.83, SD = 2.14, Mdn = 19.00*
IMI Pressure ***scale from 3-21***	*M = 7.50, SD = 4.93, Mdn = 6.50*	*M = 7.50, SD = 2.88, Mdn = 7.5*
Persuasiveness (day 7) ***scale from 4-28***	*M = 13.67, SD = 6.59, Mdn = 13.50*	*M = 22.17, SD = 4.88, Mdn = 24.50*
Persuasiveness (day 14) ***scale from 4-28***	*M = 13.33, SD = 6.59, Mdn = 15.00*	*M = 20.50, SD = 6.77, Mdn = 23.00*
UEQ-S Pragmatic ***scale from 1-7***	*M = 5.58, SD = 0.52, Mdn = 4.63*	*M = 6.00, SD = 0.95, Mdn = 6.38*
UEQ-S Hedonic ***scale from 1-7***	*M = 3,58, SD = 1.42, Mdn = 4.63*	*M = 6.71, SD = 0.60, Mdn = 6.13*
Tasks completed ***Flatastic tasks (14 days)***	*M* = 30.00, *SD* = 14.11, *Mdn* = 28.00	*M = 47.00, SD = 30.35, Mdn = 31.00*
Overdue tasks ***tasks not completed by their defined deadline***	*M = 13.67, SD = 8.08, Mdn = 15.00*	*M = 16.33, SD = 11.02, Mdn = 11.00*
Overdue task delay ***in hours***	*M = 93.33, SD = 6.79, Mdn = 94.35*	*M = 74.88, SD = 46.96, Mdn = 69.00*

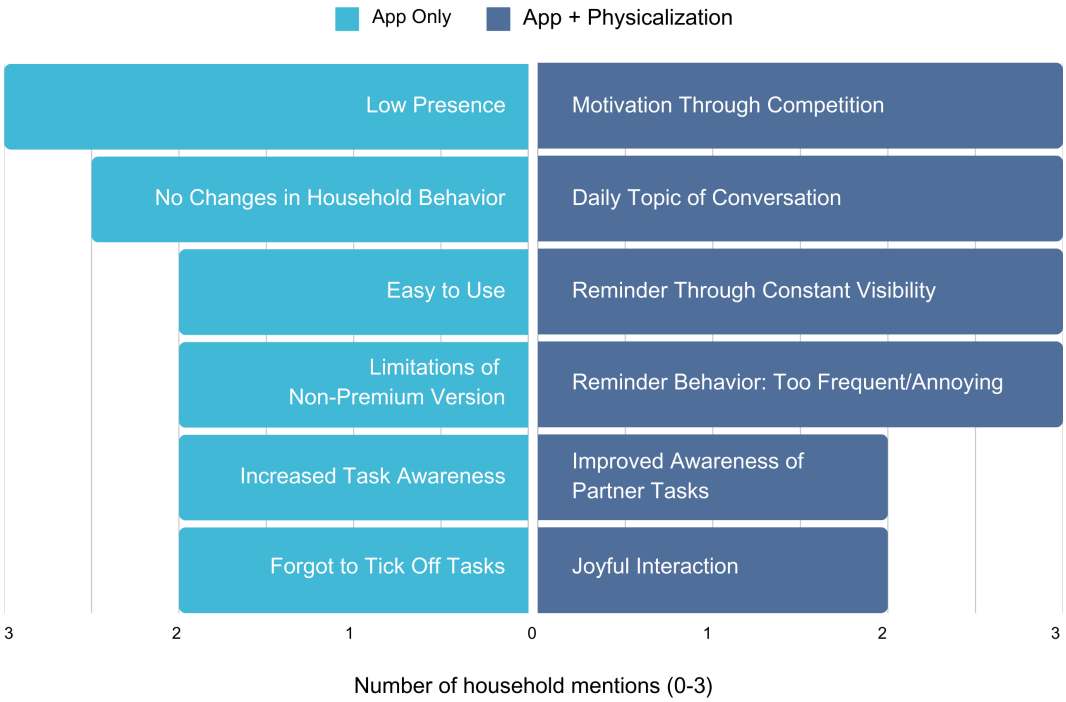

Figure 43. Most mentioned keywords from focus group sessions

6.6.1 Circumstances Affecting Results

Two households (H1, H2) reported that external factors, such as busy work periods or holidays, significantly influenced the number of completed tasks. For example, approaching Christmas reduced available time for household tasks. Illness also played a role, with one physicalization household (H4) and one App-only household (H2) reporting fewer completed tasks due to one or both members being sick. Two participants (H2, H5) noted that the system was beneficial for less frequent tasks but not essential for regular or habitual chores. One App-only household (H2) assigned uniform point values, disregarding task difficulty. One household (H5) mentioned that defining appropriate task intervals was challenging, requiring trial and error to determine the most suitable frequency for each task. Another household (H3) noted that choosing appropriate point values for each task was challenging.

Additionally, one member of H3 (App-only) mentioned a general difficulty with using such systems as to-do lists, stating that they tend to forget about them every time. Similarly, one H1 (physicalization) member expressed that they are generally not strongly influenced by apps or similar tools, as they will still choose not to complete tasks they do not want to, regardless of the number of reminders.

6.6.2 Persuasiveness

To measure the systems' persuasiveness, the Perceived Persuasiveness Scale was administered on Day 7 and Day 14 of the field study. A significant difference was observed between the App-only and physicalization groups. The mean score for the physicalization group was 8.5 points higher on day 7 (p = .03) and 7.2 points higher on day 14. These results indicate that **the system with data physicalization was perceived as more persuasive**.

As shown in Figure 44, no significant differences were found when examining the development over time. In the App-only condition, the scores remained largely unchanged between Day 7 and Day 14. In the Physicalization condition, there was a slight decrease of approximately 1.5 points.

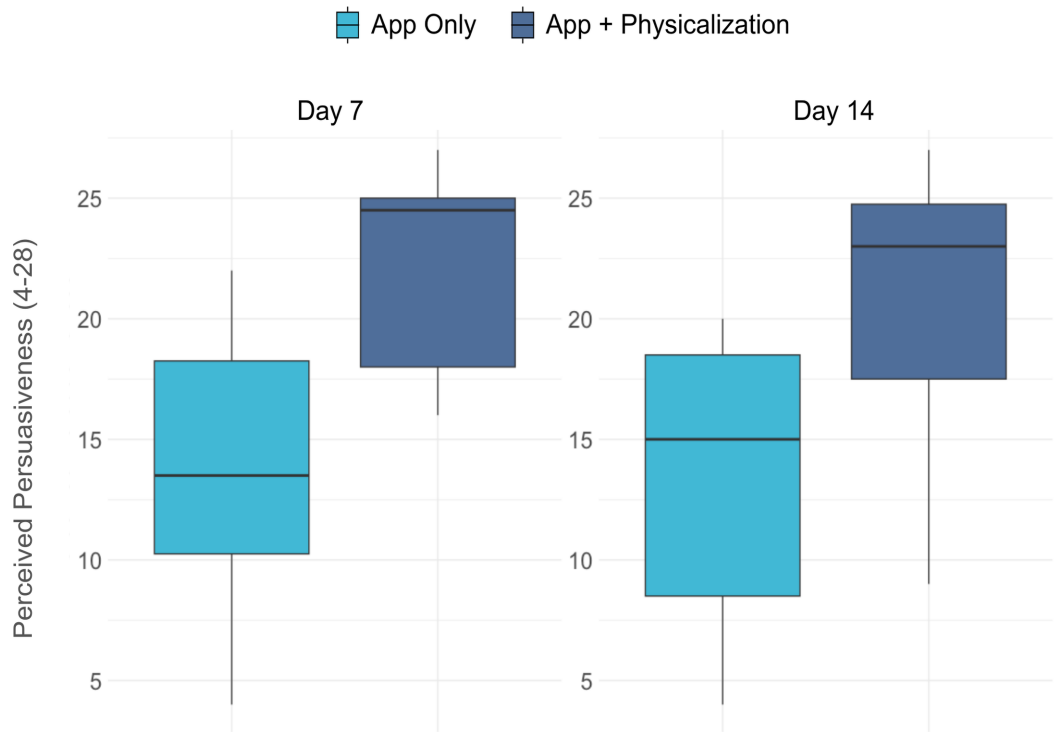

Figure 44. Results of Perceived Persuasiveness Scale

6.6.2.1 Interview Insights on Perceived Persuasiveness

The focus group sessions also revealed that the physicalization enhanced the system's perceived persuasiveness. All physicalization households attributed their increased motivation or effort to the system's constant physical presence, which they described as engaging.

In contrast, all App-only households reported no notable changes in motivation or engagement directly related to the app. However, two households (H2, H3) noted a slight increase in task awareness, which they linked more to their participation in the study than to the app's features.

6.6.3 Engagement & Task Behavior

The number of completed tasks per household was the central aspect of measuring engagement and task behavior. Additionally, the number of overdue tasks (tasks that exceeded their defined deadlines) and the overdue task delay (the average time by which overdue tasks exceeded their deadlines before completion) were collected and displayed in Table 2. When comparing each household in the physicalization group to the most comparable household in the App-only group (H1 with H6, H5 with H2, and H3 with H4), it was observed that **all households in the physicalization group completed more tasks than their App-only counterparts**. For example, H1 (physicalization group) completed 28 tasks, compared to 17 tasks by H6. This trend is consistent across the groups, even if the differences were only slight in some cases. The mean number of completed tasks in the physicalization group was notably higher compared to the App-only group (M 47 to 30). However, **the median values for physicalization and App-only** (Mdn 31 to 28) **did not significantly differ**, as Figure 45 shows. H5 (physicalization group) was marked as an outlier as this household achieved the highest score with 82 fulfilled tasks. This exceeded the second-highest score from H2 (App-only) by over 80 percent.

Table 2. Measured task data for each household

	H1	*H2*	*H3*	*H4*	*H5*	*H6*
Group ***(A = App-only, B = App + Physicalization)***	*B*	*A*	*A*	*B*	*B*	*A*
Tasks completed	*28*	*45*	*28*	*31*	*82*	*17*
Overdue tasks ***tasks exceeding the defined deadline***	*9*	*21*	*15*	*11*	*29*	*5*
Overdue task delay ***in hours***	*69*	*86*	*94*	*125*	*31*	*100*

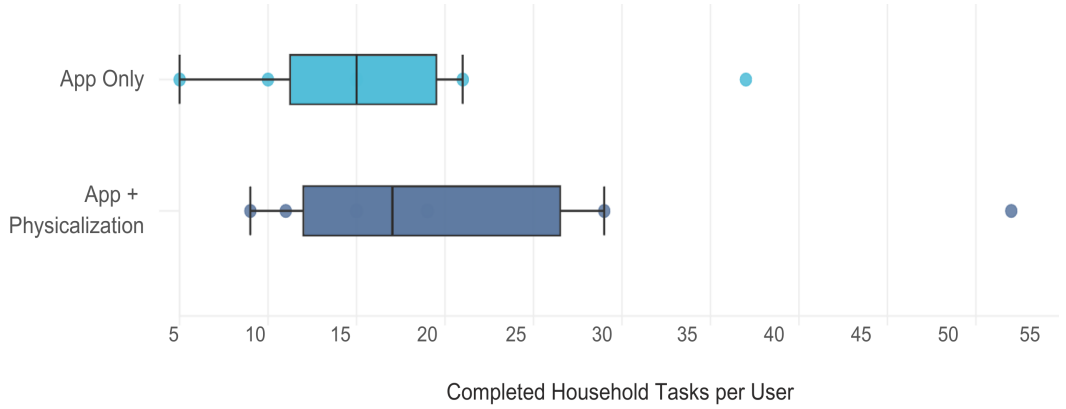

Figure 45. Completed household tasks per user for the App-only and App + Physicalization group

6.6.3.1 Interview Insights on Engagement & Task Behavior

Focus group sessions showed that **existing household routines significantly impacted engagement**. For instance, one participant (H6) consistently performed tasks on specific days, influencing the system's effectiveness. H5 agreed with this, mentioning that tasks typically completed by one person before the study were still not fulfilled by the other household member, even if they would have earned a significant number of points.

In the App-only group, all three households reported difficulty reminding themselves to tick off completed tasks. H6 explicitly mentioned that opening the app to mark tasks as completed was a barrier, making the seemingly simple action of ticking off tasks difficult. H6 stated that they would have completely forgotten to do so if they were not reminded by being part of the field study. In the physicalization group, only H1 reported occasionally forgetting to track progress in the app immediately after completing tasks.

6.6.4 Persuasive Design Principles

The evaluation of design principles on a 7-point Likert scale showed that the **data physicalization group tended to rank each principle higher than the App-only group**, with an average difference of 2.8 points and a median difference of 3.3 points. The aggregate scores (SUM) also demonstrated this pattern, with the physicalization group generally achieving higher scores with an increase of nearly 90%. Most principles, including personalization, self-monitoring, and comparison/competition, aligned with this general trend, as depicted in Figure 46.

The Reminder principle was the only one showing only a minor difference between both groups and was also the lowest-rated principle in the physicalization group. The average difference here was less than 1 point. In contrast, principles such as Feedback & Reward and Liking showed a notably higher impact in the data physicalization group. Both showed an increase of about 4 points compared to the App-only group. Detailed results for each principle and the overall scores are presented in Table 3.

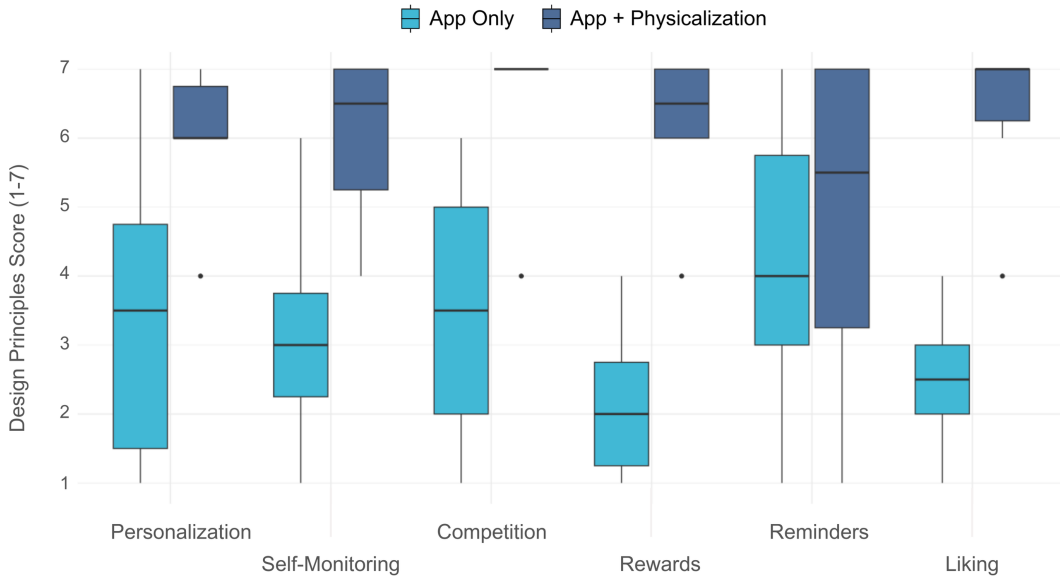

Figure 46. Boxplots showing the scores for each persuasive design principle for the App-only and the App + Physicalization group

Table 3. Average score of each design principle for both test groups

	App-only	***Physicalization***
Personalization **scale from 1-7**	*M = 3.50, SD = 2.35, Mdn = 3.50*	*M = 6.00, SD = 1.10, Mdn = 6.00*
Self-Monitoring **scale from 1-7**	*M = 3.17, SD = 1.72, Mdn = 3.0*	*M = 6.00, SD = 1.26, Mdn = 6.50*
Comparison / Competition **scale from 1-7**	*M = 3.50, SD = 2.07, Mdn = 3.50*	*M = 6.50, SD = 1.22, Mdn = 7.00*
Rewards / Feedback **scale from 1-7**	*M = 2.17, SD = 1.17, Mdn = 2.00*	*M = 6.17, SD = 1.17, Mdn = 6.50*

Reminders *scale from 1-7*	*M = 4.17, SD = 2.23, Mdn = 4.00*	*M = 4.83, SD = 2.56, Mdn = 5.50*
Liking *scale from 1-7*	*M = 2.50, SD = 1.05, Mdn = 2.50*	*M = 6.33, SD = 1.21, Mdn = 7.00*
SUM *scale from 6-42*	*M = 19.00, SD = 8.86, Mdn = 20.50*	*M = 35.83, SD = 4.88, Mdn = 34.50*

6.6.4.1 Interview Insights on Design Principles

Focus group sessions underscored the impact of specific design principles. ***Competition*** **was declared the most potent motivator in all physicalization households**, with participants frequently comparing the height of their columns. In contrast, competition was not perceived as significant in the App-only group. H2 found it irrelevant, H6 described it as stressful, and H3 appreciated the point system but focused more on collecting points than comparing progress with their partner.

Regarding *Feedback & Rewards*, one participant from the physicalization group (H1) explicitly mentioned that observing the progress bar move upward was an enjoyable reward. In the App-only group, H3 criticized the lack of rewards, stating that the value of collecting points felt limited without a meaningful outcome. However, one member of H3 appreciated the confetti animation displayed after task completion, describing it as "cool".

All participants in the physicalization group consistently highlighted reminders. Significantly, **the physical component was appreciated for its constant visibility, providing an effective passive reminder** as it was always present when walking by. H4 and H5 also added that the colors and sounds of the physical elements were more impactful than digital reminders. However, the active reminder behavior, such as the columns moving up and down, was criticized by all three households as being too frequent, annoying, and even frightening when triggered at inappropriate moments. One participant from H1 also mentioned the app's push notifications as very helpful and praised the interplay between those and the physical reminder.

For the App-only group, the primary reminders were push notifications. Participants from H2 and H3 generally found them useful and supportive. However, one participant from H2 noted that the notifications were vague, often stating only that Flatastic had "something new" without providing details. This required them to

actively remember to tick off tasks. In contrast, H6 reported not receiving push notifications and stated that such reminders would likely have led to completing more tasks.

6.6.5 User Experience

The Short User Experience Questionnaire (UEQ-S) results indicate that **the physicalization group had a significantly better overall user experience** compared to the App-only group. As shown in Figure 47, the physicalization group achieved a significantly higher overall score, with an average difference of approximately 1.8 points ($p < .001$). Benchmark scores, depicted in Figure 48, classify the App-only group's overall user experience as below average (50% better, 25% worse), whereas the physicalization group reached an "excellent" rating, placing it among the top 10% of results.

For *Pragmatic Quality*, the physicalization group showed a slight tendency toward higher ratings ($M = 6.0$) compared to the App-only group ($M = 5.8$). This minor difference aligns with the T-test result, which indicated a non-significant difference. Benchmark scores placed the App-only group in the "good" range (10% better, 75% worse), while the physicalization group maintained an "excellent" rating.

Hedonic Quality results demonstrated a significant advantage for the physicalization group, with significantly higher scores ($M = 6.7$) compared to the App-only group ($M = 3.8$) ($p = .002$). Benchmark analysis further classified the App-only group's score as "bad", while the physicalization group's score was rated "excellent."

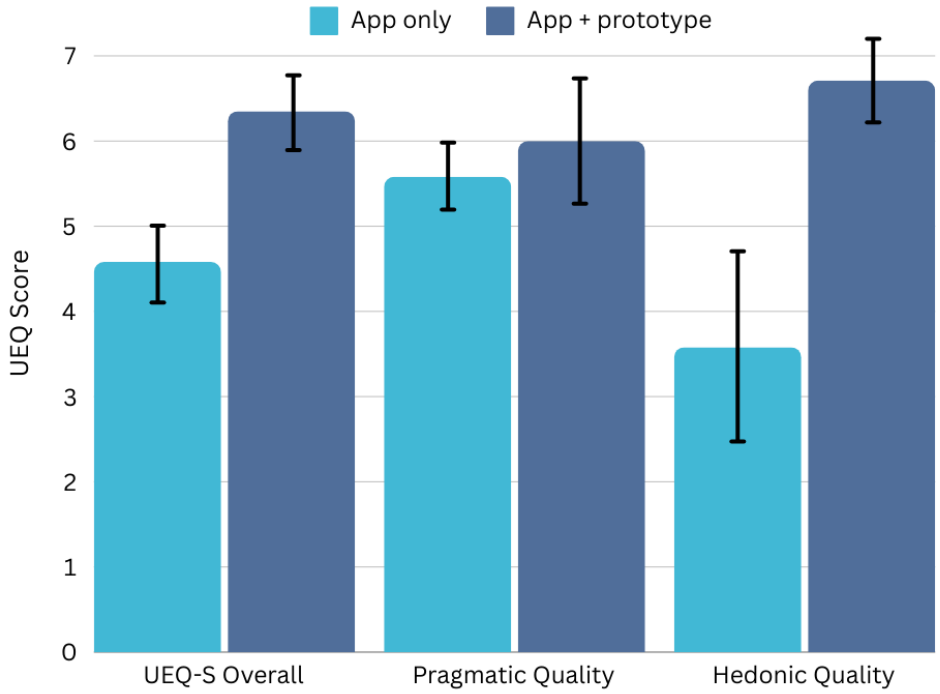

Figure 47. UEQ score comparison between test groups

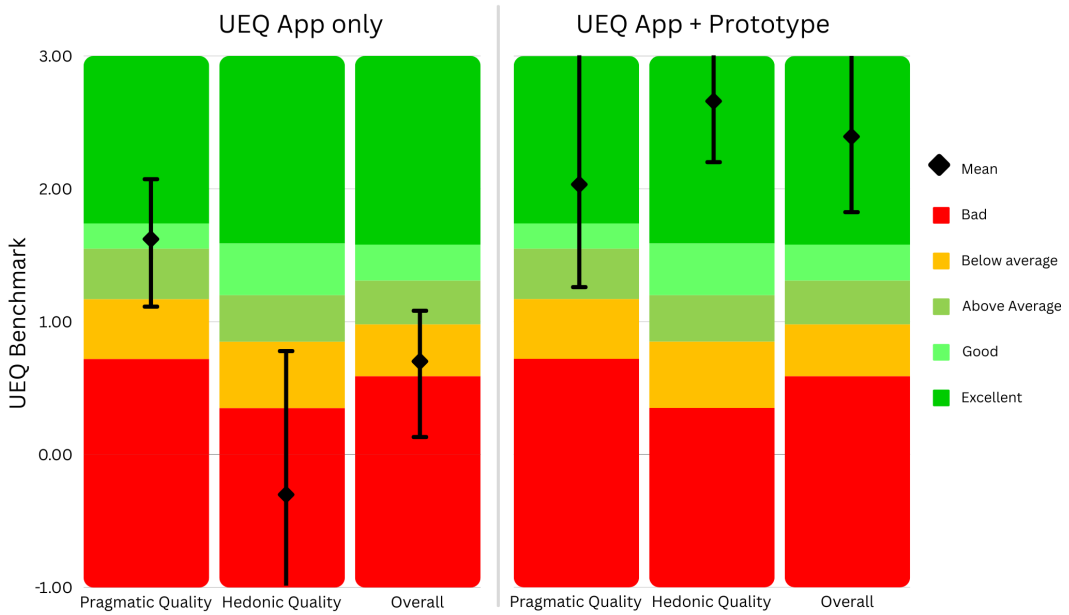

Figure 48. UEQ score for both groups compared to the UEQ benchmark

6.6.5.1 Short Intrinsic Motivation Inventory (IMI)

The results of the Intrinsic Motivation Inventory (IMI) are visualized in Figure 49. **IMI Enjoyment showed a clear tendency toward higher scores in the data physicalization group** (*M* = 18.7) compared to the App-only group (*M* = 11.5)**.** No significant differences were found between the groups for Competence, Pressure, or Choice.

Two scatterplots were analyzed to examine the correlation between UEQ and IMI. The first scatterplot, depicted in Figure 50, displays the relationship between UEQ Hedonic and IMI Enjoyment. It indicates a positive correlation, as higher hedonic quality scores tend to be associated with higher enjoyment scores. The second scatterplot, as shown in Figure 51, examines the relationship between UEQ Overall Score and IMI. It also shows an upward trend. Higher overall user experience scores are slightly associated with higher motivation scores, with data points more closely clustered around the line of best fit.

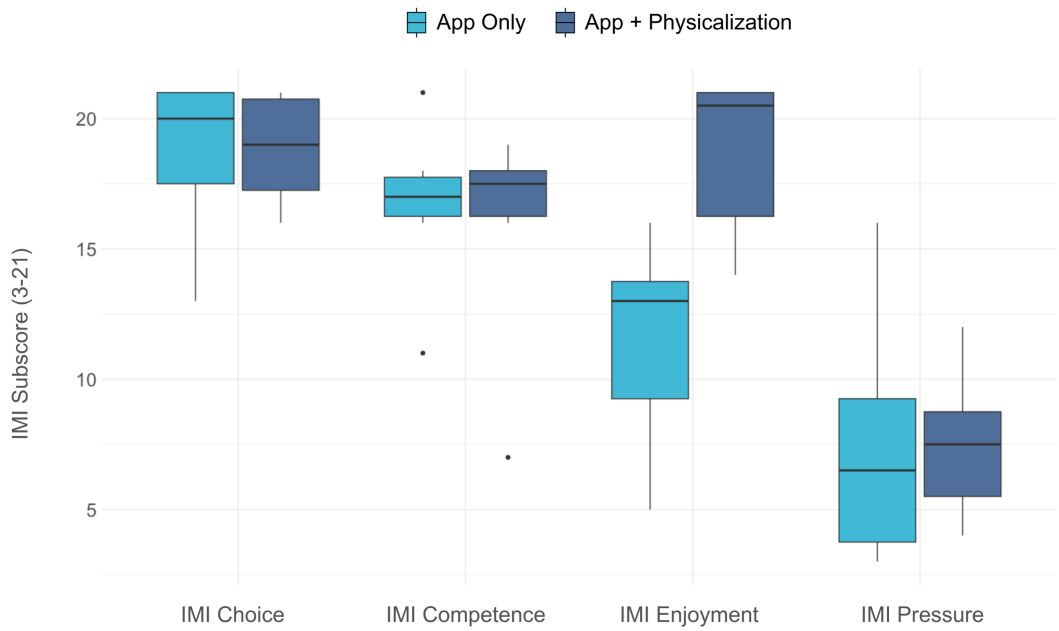

Figure 49. IMI subscores for the App-only and App + Physicalization group

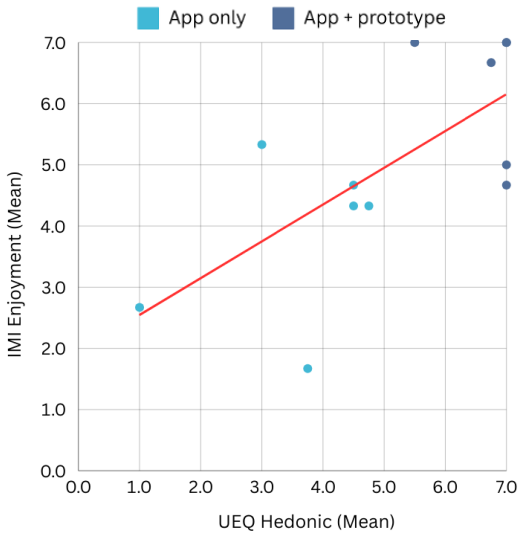

Figure 50. Correlation between IMI Enjoyment and UEQ Hedonic

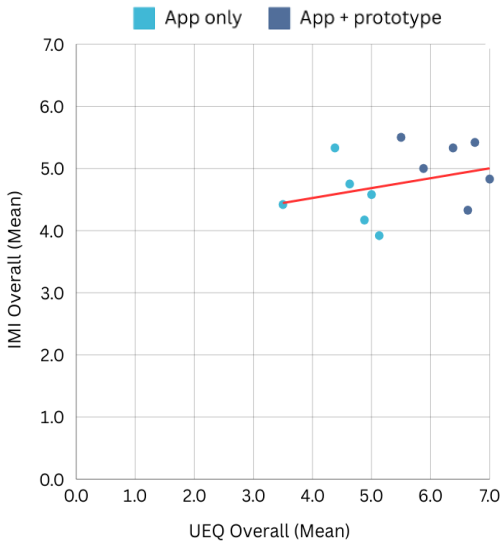

Figure 51. Correlation between IMI Overall and UEQ Overall

6.6.5.2 Interview Insights on User Experience and Motivation

In the focus group sessions, participants frequently commented on the visibility and accessibility of the physicalization. In addition to the reminding factor, **the physicalization became a daily topic of discussion for all participants**. Furthermore, H1 stated explicitly that this led to talks about household tasks and responsibilities. Moreover, two households from the physicalization group (H1, H4) highlighted an increased awareness of their partner's contributions when looking at a change in the partner's column.

App-only households noted a lack of similar visibility or presence. All three households expressed frustration about the app's limitations, particularly the absence of premium features, which restricted access to detailed task history, as mentioned by households H2 and H3. This limitation hindered their understanding of their partner's contributions or coordinating household efforts effectively. One household in the physicalization group (H5) also mentioned the lack of premium features but did not link it to awareness. Instead, they suggested that premium features might support task sharing.

6.6.6 Prototype Feedback and Future Usage

The physicalization's functionality was generally well-received, with most households reporting smooth performance throughout the study. Household H4 successfully set up the prototype independently using the provided instruction sheet. Households H1 and H5 followed the instructions correctly but encountered

an issue where completed tasks were not reflected in the physical movement of the columns. This issue was resolved in both cases by rebooting the ESP32, though the root cause could not be identified.

During the two weeks, the system was described as responsive and reliable. Households H1 and H4 reported no further issues after setup, and the prototype consistently displayed updates without delay. However, Household H5 experienced a bug during the final two days of the study, where the column did not respond correctly. Despite this, the household noted that the system worked well for most of the study.

6.6.6.1 System Feedback and Improvements

All physicalization households highlighted issues with how the prototype handled reminders for overdue tasks. When a task was overdue, the corresponding column turned red and moved up and down three times whenever a user passed by, at a maximum interval of every two hours. While participants acknowledged the reminders as practical, the behavior was criticized. The sound of the columns moving was described as annoying and, in some cases, even frightening when triggered at inappropriate moments, such as early in the morning or during the night.

Additionally, two households (H1, H5) reported false positives from the PIR sensor, where the system activated reminders despite no motion being detected. In one instance, H1 noted that the columns started moving up and down during the night, which was frightening at first, but stated that they got used to it. The frequency of the reminders was also considered too frequent, with all households describing them as occurring more often than necessary.

When asked for improvements, participants provided several suggestions to enhance the physicalization's functionality and usability:

- **Adjustable Reminder Behavior:** Allow users to customize the frequency and type of reminders, including adjustable intervals, the option to turn off reminders, or alternative methods such as blinking lights instead of column movement.
- **Feedback Through Display:** Add a small display to provide explicit feedback on completed tasks, such as displaying the task name and points earned (e.g., "Washing dishes +2").
- **Sounds After Task Completion:** Introduce customizable or pre-determined sound notifications upon task completion. Participants suggested this feature

as an additional motivational factor, encouraging other members when they hear the success sounds.

- **Integration Into Everyday Objects:** Embed the physicalization into everyday objects, such as clocks or sculptures, to make the design more compact and suitable for limited spaces.
- **Adding Levels or Rewards:** Implement a leveling system with extra benefits after completing a specific number of tasks. Suggestions included unlocking customizable sounds or dispensing small rewards, such as sweets.

Although improvements for the app Flatastic were not the primary focus of this thesis, nearly all participants from both test groups criticized the inability to skip tasks if they could not complete them at a given time. Participants proposed a "snooze" button, allowing users to delay or skip tasks temporarily while providing a reason for doing so.

6.6.6.2 Future Usage

When asked about the physicalization's future usage, households expressed mixed intentions. Two households (H1, H4) stated they would likely continue using the prototype if the reminder sounds could be adjusted to be less frequent or disruptive. H5 appreciated the physicalization’s overall concept but preferred a more compact version. They were even inspired by the physicalization and mentioned plans to develop and install a similar system.

When asked about the potential of data physicalizations for other apps, several participants mentioned that they could imagine a similar concept applied beyond household management. They noted that data physicalization could be especially beneficial for apps with gamification elements, such as language learning or sport tracking. One household highlighted that the approach could be particularly interesting for marketing purposes and suggested that the idea should be pursued further to explore its broader applications.

7 Discussion

This thesis explored whether app-generated data could be feasibly and effectively transformed into data physicalizations to support an app's persuasive strategies and enhance the overall user experience. The research focused on two primary objectives: developing a technical concept and prototype (**RQ1**) and evaluating its impact on the app's persuasiveness and user experience (**RQ2**).

7.1 Feasibility of Data Physicalization (RQ1)

The study demonstrated that **app data can be feasibly transformed into physicalizations**, as illustrated by the prototype representing the points-based task system of the Flatastic app. The prototype successfully conveyed the app's scoreboard for household tasks as an interactive, tangible element. For the concept, **established guidelines provided solid guidance for creating the physicalization.** The structured development process, which included app analysis, project reviews, and analysis of design principles, ensured the prototype was built on a strong foundation. However, this structured approach may have limited opportunities for more experimental or innovative design solutions.

Technically, the prototype's design, powered by an ESP32-S3 microcontroller and motorized slide potentiometers, proved robust and functional. Feedback from the field study highlighted its reliability, as households described the physicalization as responsive and capable of operating without supervision.

During the prototype development, several notable findings emerged. The use of **a captive portal to access the physicalization settings proved to be a suitable option**, as it eliminated the need for users to manually enter an IP address, significantly enhancing the user experience. To address the problem of interference between the PIR sensor and the Wi-Fi signal, the distance to the Wi-Fi antenna was increased, and a less sensitive sensor model was chosen, effectively resolving the issue. Furthermore, **motorized slide potentiometers were confirmed as an excellent choice for representing physical bar charts** due to their responsiveness and enjoyable user interaction, although fine-tuning the motor speed required iterative adjustments to achieve precision.

Despite its successes, the prototype had limitations, such as occasional false positives from the PIR sensor, which highlight areas for refinement. Participants

also suggested integrating the physicalization into existing household objects, such as clocks or decorative items, to enhance aesthetic appeal and address space concerns. This feedback aligns with the abstraction step outlined by Sauvé and Houben (2022), which emphasizes embedding physicalizations seamlessly within their contextual environment, allowing them to blend into surroundings when not actively engaged. While the prototype did not achieve this level of integration, **the findings underscore the importance of balancing functionality and aesthetics in future designs**.

7.2 Impact on Persuasiveness and User Experience (RQ2)

The physicalization positively influenced both persuasiveness and user experience, as evidenced by higher scores across nearly all measured variables compared to the App-only group. **The Perceived Persuasiveness Scale revealed a significant improvement in the physicalization group**, with an average score eight points higher than that of the App-only group. This aligns with prior research from Altmeyer et al. (2021) and even exceeds their findings, where the difference was reported with a 3 points higher mean score.

Enhanced enjoyment emerged as a particularly strong advantage of the physicalization. Unlike Altmeyer et al. (2021), a higher score in the IMI Enjoyment subscale for the physicalization group was detected. This also aligns with the evaluation of the UEQ. Whereas pragmatic quality is not significantly influenced by physicalization, the hedonic quality value shows a significant increase for the physicalization group. This leads to the conclusion that the app worked nearly equally well in both cases, but the enjoyment was higher for the physicalization group. Focus group sessions reinforced this, with participants describing the physicalization as competitive and fun, in contrast to the more pragmatic experience of App-only use.

While the physicalization group completed more tasks, the difference was not statistically significant after removing outliers. This suggests that external factors, such as household routines and individual circumstances, played a role in influencing task completion rates. The results underline the complexity of measuring engagement in real-life contexts.

7.2.1 Passive vs. Active Reminders

Despite the prototype's overall success, **the active reminder mechanism emerged as a significant pain point for participants**. Designed to move columns up and down to indicate overdue tasks, this feature was universally described as too frequent and annoying by the physicalization households. This aligns with the results of the questionnaire on individual design principles, where reminders received the lowest ranking among physicalization users.

In contrast, interview insights highlighted the strength of passive reminders provided by the physicalization itself. All prototype households emphasized the value of its constant visibility, which served as an effective and unobtrusive reminder within the user environment. This passive reminder was one of the most frequently mentioned and positively received features, underscoring its importance as a core advantage of the system.

This suggests that **data physicalizations are excellent passive reminders when integrated into the user environment**. They require only minimal additional active reminding behavior, which can otherwise feel overwhelming. The effectiveness of reminders in the physicalization group also aligns with the Fogg Behavior Model (B. Fogg, 2009), which emphasizes the necessity of well-timed triggers for action, even when motivation and ability are present. Data physicalizations perform effectively in this role, as their continuous visibility ensures they serve as subtle but consistent triggers when users pass by.

7.2.2 Awareness and Premium Features

Another noteworthy insight concerned premium features. Both groups used the non-premium version of the app, which restricted access to certain features like task history. With the premium version, users can view the task history, providing information on which tasks were completed by which household member in the past. While most prototype users appreciated that the physicalization increased their awareness of their partners' tasks, members of the App-only group did not achieve the same level of awareness, attributing this to the lack of access to the task history. This suggests that the **data physicalization effectively compensated for the app's limitations** by providing a clear and accessible visualization of task data, even when showing only information available to both groups.

7.3 Limitations

Despite the study's success, several limitations must be acknowledged. The built physicalization, while functional, represented a prototypical implementation that does not reflect the robustness or refinement of a production-ready system. Technical difficulties could influence the user experience. Furthermore, the focus on translating existing design principles from the Flatastic app limited the exploration of more innovative features, such as direct interaction with the physicalization to modify app data or complete tasks.

Additionally, the study's small sample size (N = 6 households) restricts the generalizability of the findings. Moreover, the results are tied to a household management app, and the effectiveness of data physicalizations may vary significantly across different app domains. For instance, applications in health or education may require different designs and approaches, meaning that the findings from this study may not be directly applicable to other contexts.

8 Conclusion

This thesis has explored how app-generated data can be effectively translated into interactive physical forms to enhance persuasive strategies, improve user experience, and create joyful interactions. By focusing on the physicalization of data from everyday smartphone usage, this research addresses a gap in transforming digital information into meaningful experiences in the physical world. Using the Flatastic app as a case study, the study demonstrated how a concept based on persuasive design principles and technical considerations can come together to create impactful data physicalizations.

The findings reveal that data physicalizations not only enhance the accessibility of digital data but also amplify the app's visibility and presence in users' daily lives. By embedding digital insights into the physical environment, these physicalizations provide a distinctive advantage in a competitive market, enabling apps to stand out through tangible, memorable interactions that leave a lasting impression on users.

To generalize the findings and offer practical guidance to developers and designers, the following five recommendations summarize best practices for building data physicalizations based on app-generated data:

1. **Leverage Existing Guidelines and Projects**: Building on prior research and established principles, such as the design themes proposed by Khot et al. (2017), provides a solid foundation for designing effective data physicalizations. These resources facilitate consideration of all aspects before practical implementation. Additionally, existing data physicalization projects can serve as valuable references, offering both inspiration and technical guidance for implementation.
2. **Incorporate Existing Persuasive Design Principles**: Analyzing the persuasive design principles of the app that should be augmented through a physical form is crucial. This process not only enhances understanding of the app's core strategies but also ensures that the physicalization effectively supports the app's objectives and maximizes its impact.
3. **Do Not Underestimate the Power of Passive Reminders:** Research highlights that the physical presence of a data physicalization already acts as a strong reminder. While additional active reminders can be beneficial, they should be used sparingly to avoid overwhelming or annoying users.

4. **Design for Multi-Sensory Engagement:** When designing a data physicalization, it is worth considering moving beyond just the visual sense. Incorporating tactile or auditory cues can create a distinctive user experience that leverages the possibilities of physical space, offering a unique selling point compared to digital-only apps.
5. **Integrate Seamlessly with Existing Objects and Spaces:** Data physicalizations should fit naturally into users' environments. Most users do not want an extra gadget taking up space with limited use. By embedding them into existing objects, designers can make them more practical and easier to adopt as part of daily life.

By following these principles, designers can create data physicalizations that are not only aesthetically appealing but also contextually relevant and impactful. This study highlights the potential of data physicalizations to transform how we interact with digital information, offering an innovative solution for apps to enhance their persuasiveness, create joyful experiences, and stand out in a crowded market.

Future work could explore the broader applicability of data physicalizations across a variety of contexts, assessing their suitability for apps beyond household management. Additionally, advancing the prototypical implementation by collaborating with app developers to incorporate corporate identity (CI) into data physicalizations could enable the creation of more production-ready products that seamlessly integrate into existing household objects. Furthermore, expanding functionality, such as modifying app data or triggering specific actions through engaging with the physicalization, would go beyond replicating existing persuasive design principles, introducing innovative features unique to the physical form. Moreover, longer-term studies with larger and more diverse participant groups would also provide valuable insights into long-term usage patterns and user acceptance.

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List of Figures

List of Tables

Appendix

A. Instruction Sheet App

Anleitung Flatastic

Vielen Dank, dass ihr bereit seid, mich bei meiner Masterarbeit zu unterstützen! Für die nächsten zwei Wochen möchte ich euch bitten, die App Flatastic in euren Alltag zu integrieren. Der Fokus liegt hierbei auf dem Feature „Aufgaben", mit dem Haushaltsaufgaben geplant und Punkte für deren Erledigung gesammelt werden können.
Wichtig ist, dass ihr die App möglichst natürlich und ohne Druck verwendet. Es geht nicht darum, „die Besten" zu sein oder jede Aufgabe perfekt zu erledigen. Vielmehr möchte ich untersuchen, wie gut die App euch im Alltag unterstützt. Falls Aufgaben einmal vergessen werden, ist das völlig in Ordnung. Ziel ist es, die Unterstützung der App zu testen, nicht eure Leistung im Haushalt zu bewerten. Anbei folgt eine kurze Anleitung wie ihr alles aufsetzen könnt. Bei weiteren Fragen oder Problemen bitte jederzeit bei mir melden.

Schritt 1

App Flatastic herunterladen und anmelden. Ich habe euch bereits Accounts erstellt.

flatastic-app.com

User 1	User 2
E-Mail: master0-0@lj-dev.at Passwort: ********	E-Mail: master0-0@lj-dev.at Passwort: ********

Schritt 2

Nachdem ihr euch erfolgreich angemeldet habt, könnt ihr im Tab „Einstellungen" euer Nutzerprofil sowie den Haushalt individuell anpassen.
Es ist möglich, den Namen des Haushalts, die Usernamen, Profilbilder und weitere Elemente zu ändern. **Bitte E-Mail-Adresse und Passwort nicht ändern.**

Schritt 3

Nun kommt der wichtigste Schritt: Im Tab „Aufgaben" könnt ihr alle Haushaltsaufgaben anlegen, die ihr in den nächsten zwei Wochen erledigen möchtet. Die App macht euch bereits ein paar Vorschläge, die ihr gleich hinzufügen könnt. Weitere Aufgaben könnt ihr rechts oben beim grünen „+" hinzufügen. Ihr könnt dabei festlegen, welche Aufgaben anfallen, wie oft sie erledigt werden sollen und wie viele Punkte man für deren Erledigung erhält (Ohne Wertung, Normal = 1 Punkt, Groß = 2 Punkte, Riesig = 4 Punkte).
Zusätzlich zu den Vorschlägen der App habe ich euch hier noch ein paar Vorlagen erstellt. Diese könnt ihr benutzen, müsst aber nicht. Nehmt einfach die Aufgaben in dem Intervall, wie es für eure Situation am besten passt.
Das Scoreboard mit euren gesammelten Punkten könnt ihr dann ebenfalls rechts oben einsehen.

Staubsaugen Wöchentlich 2 Punkte	**Boden wischen** Wöchentlich 2 Punkte	**Wäsche waschen** Alle 5 Tage 1 Punkt	**Wäsche aufhängen** Alle 5 Tage 2 Punkte	**Wäsche verräumen** Alle 5 Tage 2 Punkte
Bad & Klo putzen Wöchentlich 4 Punkte	**Küche putzen** Wöchentlich 4 Punkte	**Einkaufen gehen** Alle 2 Tage 1 Punkt	**Kochen** Alle 2 Tage 2 Punkte	**Gassi gehen** Täglich 2 Punkte
Bettwäsche Alle 2 Wochen 2 Punkte	**Abstauben** Wöchtentlich 2 Punkte	**Pflanzen gießen** Wöchentlich 1 Punkt	**Zusammenräumen** Wöchentlich 2 Punkte	

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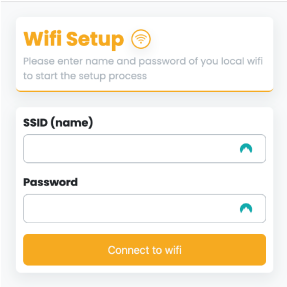
B. Instruction Sheet Prototype

Anleitung Prototyp

Zusätzlich zur Nutzung der App erhaltet ihr einen physischen Prototyp, der das Scoreboard aus der App (im Tab „Aufgaben“ unter „Statistik“) nachbildet. Dieses physische Säulendiagramm zeigt eine Säule für jede Person in eurem Haushalt. Bitte stellt den Prototyp an einem Ort auf, an dem ihr euch regelmäßig gemeinsam aufhaltet. Achtet darauf, dass der Bewegungssensor (die kleine weiße Kuppel) in den Raum zeigt. Der gewählte Standort sollte über ein stabiles WLAN-Signal verfügen. Anschließend müsst ihr den Prototyp nur noch an die Stromversorgung anschließen, und der Setup-Prozess kann beginnen.

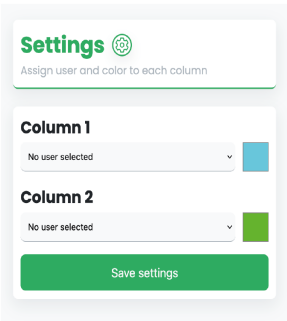
Schritt 1

Sobald ihr den Prototyp angeschlossen habt, erstellt dieser ein eigenes WLAN mit dem Namen „Data Physicalization“. Verbindet euch mit diesem WLAN. Daraufhin öffnet sich automatisch eine Seite (ähnlich wie bei öffentlichen WLANs). Falls die Seite nicht sofort erscheint, erhaltet ihr eine Push-Benachrichtigung, die euch auffordert, euch im WLAN anzumelden. Klickt auf diese, um die Seite zu öffnen. (Teilweise kann es etwas dauern bis die Push-Nachricht erscheint, dann am besten ein paar Mal neu mit dem Wlan verbinden und immer wieder probieren oder ein anderes Gerät verwenden) Anschließend sollte die Seite, wie im Bild rechts, angezeigt werden. Tragt dort eure WLAN-Zugangsdaten ein. Nach erfolgreicher Verbindung wechselt das System automatisch zur Einstellungsseite. Es kann passieren, dass die Seite abstürzt, dann einfach kurz warten und neu verbinden.



Schritt 2

Euer Flatastic-Konto ist bereits im Prototyp hinterlegt, daher müsst ihr euch nicht mehr anmelden. In den Einstellungen könnt ihr festlegen, wer welche Säule zugewiesen bekommt und in welcher Farbe eure Säule leuchten soll. Für eine zusätzliche Personalisierung könnt ihr euch eine der beiliegenden 3D-Figuren aussuchen und vor eure Säule platzieren. Gerne könnt ihr auch andere Deko Elemente hinzufügen.
Nachdem ihr alles eingestellt habt und in der App alle gewünschten Haushaltsaufgaben eingetragen habt, klickt bitte **einmalig** auf „Reset“ in der roten „Reset section“. Vergesst nicht, nach dem Setup wieder in euer eigenliches Wlan zu wechseln, da ihr im Wlan des Prototyps kein Internet habt.



Funktionsweise

Säulenaktivität:

- Säulen leuchten wenn eine Bewegung erkannt wurde (30 Sek. Mindestdauer).
- Höhe der Säule passt sich an, wenn eine Aufgabe erledigt wurde und ihr im Sensorradius seid. (Aktualisierung nach max. 30 Sek.)

Farbcodes:

- Rot und Säule fährt rauf und runter: Überfällige Aufgaben sind vorhanden.
- Beide rot: Wlan-Verbindung verloren (verbindet sich wieder automatisch).
- Gelb blinkend: Neustart des Systems.

Manuelle Justierung:

- Säulen können per Hand hoch- oder runtergeschoben werden. Ihr könnt also gerne damit herumspielen.

Sollten Probleme oder Fragen auftreten meldet euch gerne jederzeit bei mir.
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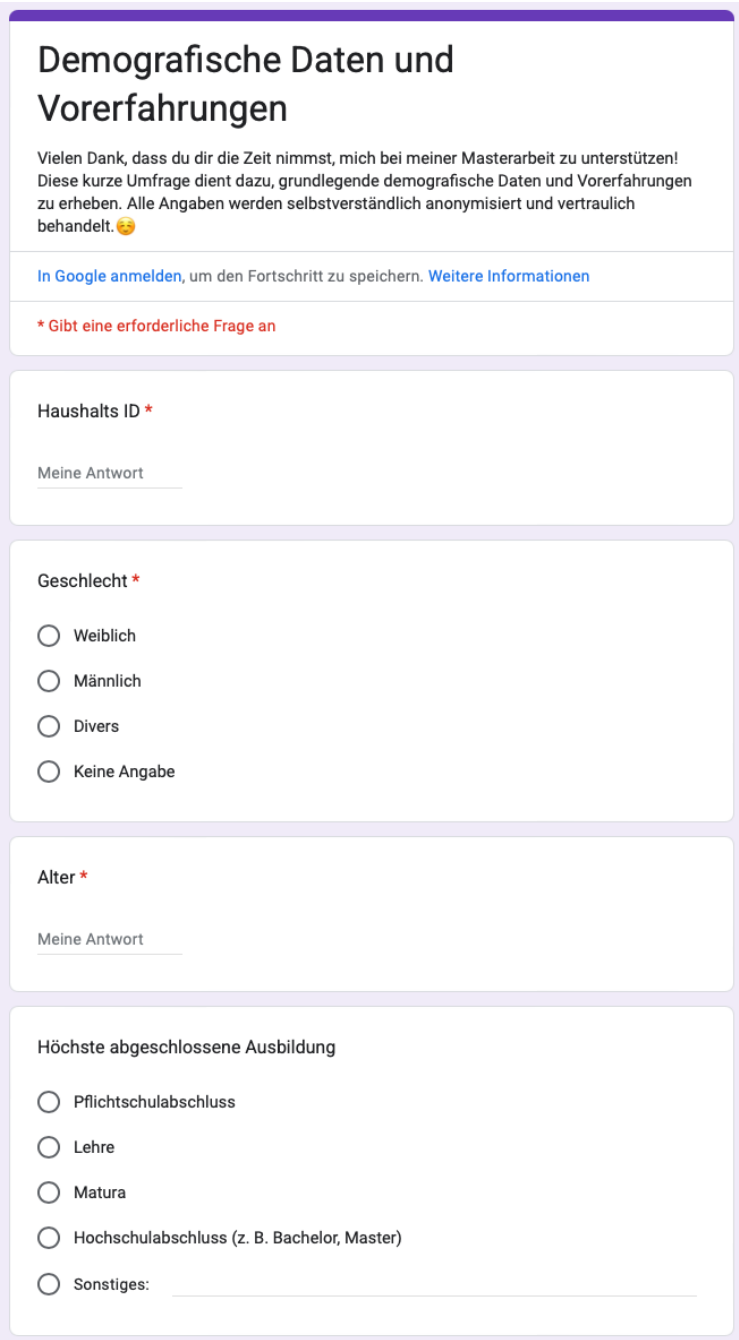
C. Questionnaire Demographics



Demografische Daten und Vorerfahrungen

Vielen Dank, dass du dir die Zeit nimmst, mich bei meiner Masterarbeit zu unterstützen! Diese kurze Umfrage dient dazu, grundlegende demografische Daten und Vorerfahrungen zu erheben. Alle Angaben werden selbstverständlich anonymisiert und vertraulich behandelt.☺️

In Google anmelden, um den Fortschritt zu speichern. Weitere Informationen

* Gibt eine erforderliche Frage an

Haushalts ID *

Meine Antwort

Geschlecht *

- ◯ Weiblich
- ◯ Männlich
- ◯ Divers
- ◯ Keine Angabe

Alter *

Meine Antwort

Höchste abgeschlossene Ausbildung

- ◯ Pflichtschulabschluss
- ◯ Lehre
- ◯ Matura
- ◯ Hochschulabschluss (z. B. Bachelor, Master)
- ◯ Sonstiges:

Berufliche Situation *

- [ ] In Ausbildung/Studium
- [ ] Teilzeit berufstätig
- [ ] Vollzeit berufstätig
- [ ] Nicht berufstätig
- [ ] Sonstiges: _____

In welcher beruflichen Branche bist du tätig?

Meine Antwort

Wie gut gelingt es dir, deinen Haushaltsaufgaben regelmäßig nachzukommen? *

	1	2	3	4	5	
sehr gut	○	○	○	○	○	sehr schlecht

Wie schätzt du deinen Umgang mit grafischen Darstellungen von Daten ein (z. B. Lesen und Erstellen von Diagrammen, Infografiken)? *

	1	2	3	4	5	
Sehr gut	○	○	○	○	○	Sehr schlecht

Wie schätzt du deine Vorerfahrung im Bezug auf Gamification ein? (Spielerische Elemente wie Punkte, Belohnungen oder Fortschrittsbalken in Apps oder Systemen, um Motivation und Engagement zu steigern.) *

	1	2	3	4	5	
Viel Vorerfahrung	○	○	○	○	○	Keine Vorerfahrung

D. Questionnaire Interim Survey (App-only)

Zwischenbefragung A

Folgende Fragen beziehen sich darauf, in welcher Weise du dich von der App Flatastic beeinflusst fühlst

In Google anmelden, um den Fortschritt zu speichern. Weitere Informationen

* Gibt eine erforderliche Frage an

ID *

Meine Antwort

Das System würde mich beeinflussen *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Das System wäre überzeugend *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Das System wäre für mich persönlich relevant *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Das System würde mich dazu bringen, mein Engagement im Haushalt zu überdenken *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Zwischenbefragung A

Die Nutzung der App hat mir Spaß gemacht. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Ich fand die Nutzung der App sehr interessant. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Die Nutzung der App war unterhaltsam. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Mit meiner Leistung in der App bin ich zufrieden. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Bei der Nutzung der App stellte ich mich geschickt an. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Ich glaube, ich war bei der Nutzung der App ziemlich gut. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Ich konnte die Nutzung der App selbst steuern. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Bei der Nutzung der App konnte ich wählen, wie ich es mache. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Bei der Nutzung der App konnte ich so vorgehen, wie ich es wollte. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Bei der Nutzung der App fühlte ich mich unter Druck. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Ich hatte Bedenken, ob ich die Nutzung der App gut hinbekomme. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Bei der Nutzung der App fühlte ich mich angespannt. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

E. Questionnaire Interim Survey (App + Physicalization)

Zwischenbefragung B

Folgende Fragen beziehen sich darauf, in welcher Weise du dich von der App Flatastic und dem physischen Säulendiagramm beeinflusst fühlst

In Google anmelden, um den Fortschritt zu speichern. Weitere Informationen

* Gibt eine erforderliche Frage an

ID *

Meine Antwort

Das System würde mich beeinflussen *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Das System wäre überzeugend *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Das System wäre für mich persönlich relevant *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Das System würde mich dazu bringen, mein Engagement im Haushalt zu überdenken *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Zwischenbefragung B

Die Nutzung von App und physischem Säulendiagramm hat mir Spaß gemacht. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Ich fand die Nutzung von App und physischem Säulendiagramm sehr interessant. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Die Nutzung von App und physischem Säulendiagramm war unterhaltsam. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Mit meiner Leistung bin ich zufrieden. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Bei der Nutzung von App und physischem Säulendiagramm stellte ich mich geschickt an. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Ich glaube, ich war bei der Nutzung von App und physischem Säulendiagramm ziemlich gut. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Ich konnte die von App und physischem Säulendiagramm selbst steuern. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Bei der Nutzung von App und physischem Säulendiagramm konnte ich wählen, wie ich es mache. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Bei der Nutzung von App und physischem Säulendiagramm konnte ich so vorgehen, wie ich es wollte. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Bei der Nutzung von App und physischem Säulendiagramm fühlte ich mich unter Druck. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

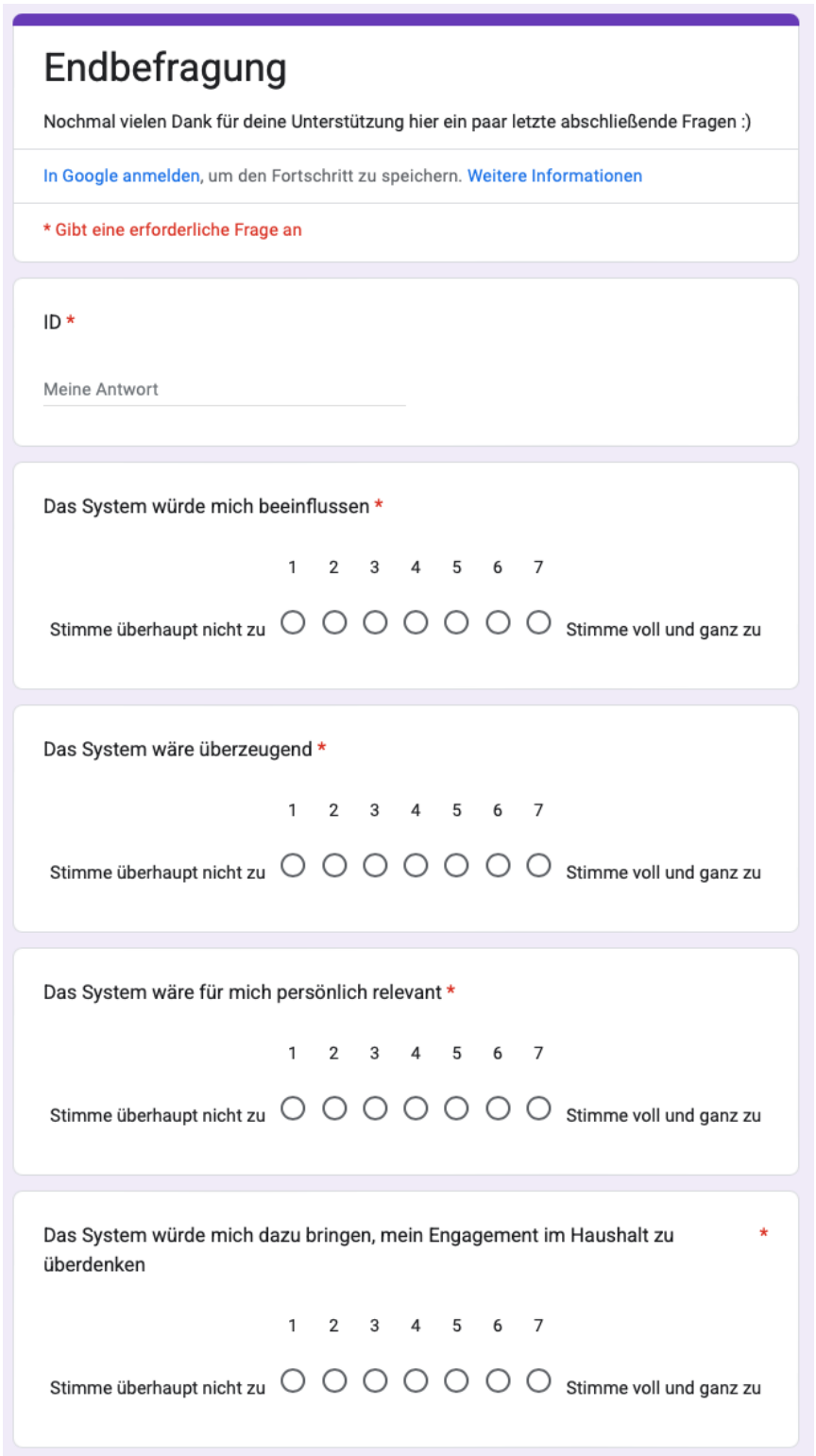
Ich hatte Bedenken, ob ich die Nutzung von App und physischem Säulendiagramm gut hinbekomme. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Bei der Nutzung von App und physischem Säulendiagramm fühlte ich mich angespannt. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

F. Questionnaire Final Survey (App-only)



Endbefragung

Nochmal vielen Dank für deine Unterstützung hier ein paar letzte abschließende Fragen :)

In Google anmelden, um den Fortschritt zu speichern. Weitere Informationen

* Gibt eine erforderliche Frage an

ID *

Meine Antwort

Das System würde mich beeinflussen *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Das System wäre überzeugend *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Das System wäre für mich persönlich relevant *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Das System würde mich dazu bringen, mein Engagement im Haushalt zu überdenken *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Einfluss einzelner Faktoren

Folgende Fragen beziehen sich darauf, welche Aspekte die App aus deiner Sicht überzeugend gestalten.

Die Möglichkeit, die App zu personalisieren, hat mich überzeugt, Haushaltsaufgaben zu erledigen. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Meinen Fortschritt zu sehen, hat mich überzeugt, Haushaltsaufgaben zu erledigen *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Der Vergleich meines Fortschritts mit meinem Partner hat mich überzeugt, Haushaltsaufgaben zu erledigen. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Das Erhalten von Feedback oder Belohnungen nach der Erledigung von Aufgaben hat mich überzeugt, Haushaltsaufgaben zu erledigen. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Von der App erinnert zu werden, hat mich dazu überzeugt, Haushaltsaufgaben zu erledigen. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Das Design und die Ästhetik der App haben mich überzeugt, Haushaltsaufgaben zu erledigen *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

User Experience

Glb hier bitte eine möglichst spontane Einschätzung ab, wie du deine Erfahrung mit der App beschreiben würdest.

*

	1	2	3	4	5	6	7	
behindernd	○	○	○	○	○	○	○	unterstützend

*

	1	2	3	4	5	6	7	
kompliziert	○	○	○	○	○	○	○	einfach

*

	1	2	3	4	5	6	7	
ineffizient	○	○	○	○	○	○	○	effizient

*

	1	2	3	4	5	6	7	
verwirrend	○	○	○	○	○	○	○	übersichtlich

*

	1	2	3	4	5	6	7	
langweilig	○	○	○	○	○	○	○	spannend

*

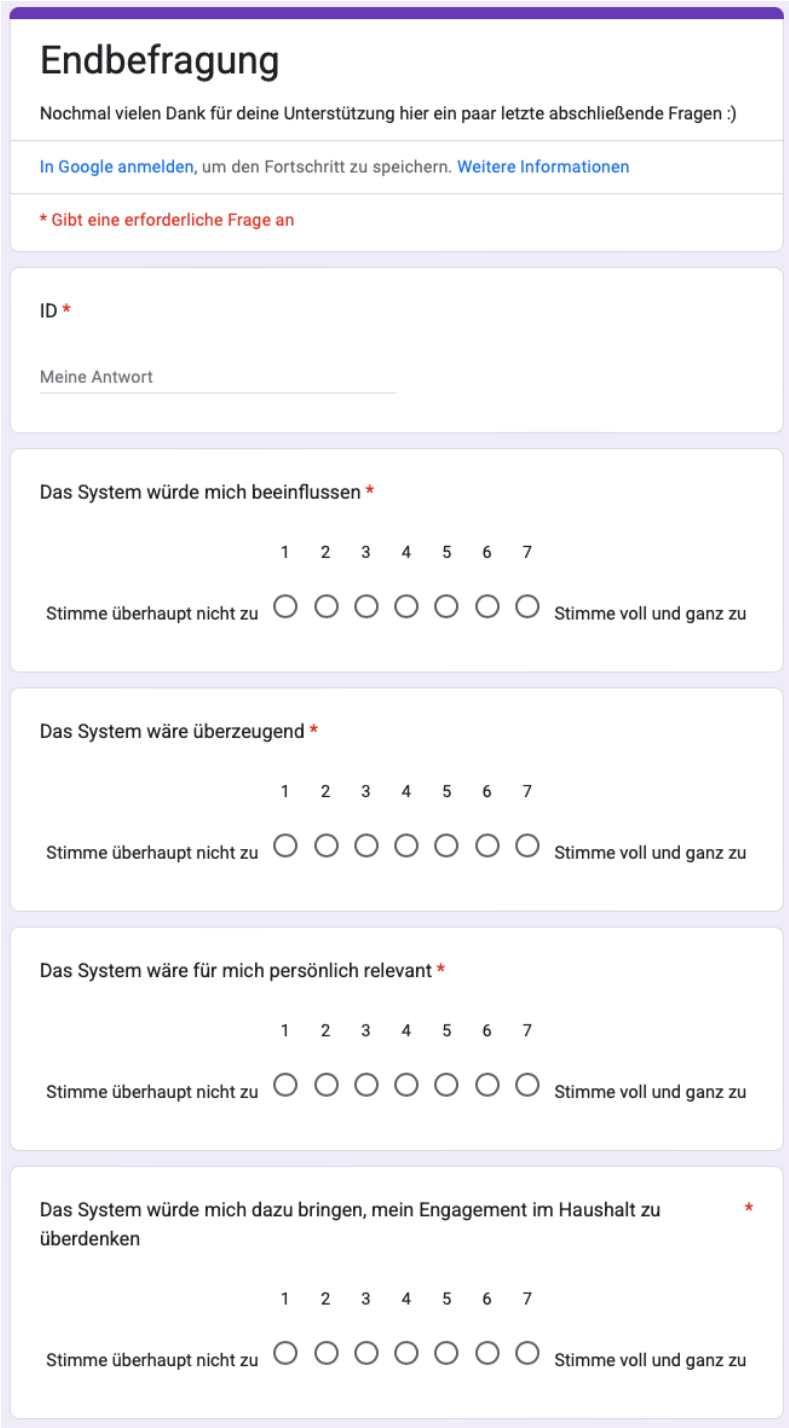
	1	2	3	4	5	6	7	
uninteressant	○	○	○	○	○	○	○	interessant

*

	1	2	3	4	5	6	7	
konventionell	○	○	○	○	○	○	○	originell

	1	2	3	4	5	6	7	
herkömmlich	○	○	○	○	○	○	○	neuartig

G. Questionnaire Final Survey (App + Physicalization)



Endbefragung

Nochmal vielen Dank für deine Unterstützung hier ein paar letzte abschließende Fragen :)

In Google anmelden, um den Fortschritt zu speichern. Weitere Informationen

* Gibt eine erforderliche Frage an

ID *

Meine Antwort

Das System würde mich beeinflussen *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Das System wäre überzeugend *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Das System wäre für mich persönlich relevant *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Das System würde mich dazu bringen, mein Engagement im Haushalt zu überdenken *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Einfluss einzelner Faktoren

Folgende Fragen beziehen sich darauf, welche Aspekte die Kombination aus App und physischem Säulendiagramm aus deiner Sicht überzeugend gestalten.

Die Möglichkeit, App und Säulendiagramm zu personalisieren, hat mich überzeugt, Haushaltsaufgaben zu erledigen. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Meinen Fortschritt zu sehen, hat mich überzeugt, Haushaltsaufgaben zu erledigen *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Der Vergleich meines Fortschritts mit meinem Partner hat mich überzeugt, Haushaltsaufgaben zu erledigen. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Das Erhalten von Feedback oder Belohnungen nach der Erledigung von Aufgaben hat mich überzeugt, Haushaltsaufgaben zu erledigen. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Erinnert zu werden, hat mich dazu überzeugt, Haushaltsaufgaben zu erledigen. *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

Design und Ästhetik haben mich überzeugt, Haushaltsaufgaben zu erledigen *

	1	2	3	4	5	6	7	
Stimme überhaupt nicht zu	○	○	○	○	○	○	○	Stimme voll und ganz zu

User Experience

Gib hier bitte eine möglichst spontane Einschätzung ab, wie du deine Erfahrung mit der Kombination aus App und physischem Säulendiagramm beschreiben würdest.

*

	1	2	3	4	5	6	7	
behindernd	○	○	○	○	○	○	○	unterstützend

*

	1	2	3	4	5	6	7	
kompliziert	○	○	○	○	○	○	○	einfach

*

	1	2	3	4	5	6	7	
ineffizient	○	○	○	○	○	○	○	effizient

*

	1	2	3	4	5	6	7	
verwirrend	○	○	○	○	○	○	○	übersichtlich

*

	1	2	3	4	5	6	7	
langweilig	○	○	○	○	○	○	○	spannend

*

	1	2	3	4	5	6	7	
uninteressant	○	○	○	○	○	○	○	interessant

*

	1	2	3	4	5	6	7	
konventionell	○	○	○	○	○	○	○	originell

*

	1	2	3	4	5	6	7	
herkömmlich	○	○	○	○	○	○	○	neuartig

H. Focus Group Session H1

[00:00:00.510] - Interviewer

Gut, wir starten die Aufnahme. Passt das für euch?

[00:00:02.118] - User 1

Ja

[00:00:02.912] - User 2

Ja

[00:00:03.000] - Interviewer

Perfekt. Wir starten mal mit so einer generellen Nutzungserfahrung. Wie leicht oder schwer war es für euch, die App in euren Alltag einzubauen?

[00:00:14.540] - User 1

Sehr simpel. Ich kannte die App bereits so vor. Ich habe vor einigen Jahren in einer Wohngemeinschaft gelebt und die App hat meine Mitbewohnerinnen und mich sehr unterstützt. Und auch dieses Mal war war die App und die Erinnerung an die Aufgaben sehr unterstützend für mich.

[00:00:39.050] - User 2

Ja, den kann ich mich eigentlich nur anschließen. Also im Umgang mit der App, das war spielend leicht.

[00:00:49.530] - Interviewer

Okay, perfekt. Und wie habt ihr die Nutzung über den Zeitraum in den zwei Wochen erlebt?

[00:00:55.260] - User 1

Mal mehr und mal weniger intensiv. Es gab Tage an denen hat man Aufgaben recht flott erledigt und auch recht flott eingetragen. Dann gab es wieder Tage, in denen hat man die App wieder weniger genutzt, weil man den Aufgaben nicht richtig hinterhergekommen ist oder man Tätigkeiten nicht gleich eingetragen hat und die dann halt einige Tage darauf erst abgehakt hat, sozusagen.

[00:01:26.570] - User 2

Ja, ich habe es so wahrgenommen, dass ohne diese Push Nachrichtungen, glaube ich, hätte ich es sehr wenig genutzt.

[00:01:44.050] - Interviewer

Okay, das heißt, die war für dich ein wichtiges Element. Sehr gut. Wie zufrieden seid ihr mit eurer Leistung im Rückblick?

[00:01:50.650] - User 1

Ja, im Großen und Ganzen ganz gut. Mir persönlich geht es da jetzt nicht darum, möglichst viele Aufgaben zu erledigen oder möglichst viele Punkte zu erreichen, sondern Aufgaben besser im Überblick zu behalten. Wie zum Beispiel Aufgaben, die man vielleicht nicht allzu regelmäßig macht, wie zum Beispiel Geschirrspüler reinigen oder aufwischen. Ich finde, gerade Tätigkeiten, die man nicht allzu oft erledigt, die sind da schon eine große Unterstützung.

[00:02:29.810] - User 2

Kannst du die Frage bitte noch mal stellen?

[00:02:31.290] - Interviewer

Wie zufrieden du mit deiner Leistung bist.

[00:02:36.510] - User 2

Ja, ich finde, man muss ein bisschen von außen betrachten. Sprich, wie ist jetzt mein Arbeitsalltag et cetera. Ich finde dafür, dass ich immer sehr spät unter der Woche heimkomme, glaube ich, habe ich das schon recht gut gemacht, vielleicht sogar besser als die letzten Monate.

[00:02:54.720] - Interviewer

Perfekt. Das bringt uns eh gleich zur nächsten Frage: Habt ihr irgendwelche Veränderungen in euren Haushaltstätigkeiten wahrgenommen in dieser Testphase im Vergleich zu davor?

[00:03:06.270] - User 1

Ich persönlich nicht sonderlich da … Muss ich kurz überlegen. Um mich wohlzufühlen, habe ich es einfach gern ordentlich in meiner Umgebung, daher erledige ich so oder so meine Aufgaben, wobei ich sagen muss, das Abhackern von gewissen Aufgaben, das ist dann schon ein recht schönes Gefühl, wenn man was erledigt hat und sozusagen von seiner To-Do-Liste streichen kann.

[00:03:36.320] - User 2

Ich finde, es macht sehr aufmerksam, wie viele Kleinigkeiten der andere macht. Zum Beispiel, ich nenne ich jetzt den Geschirrspüler auszuräumen. Das ist eigentlich so eine Tätigkeit, wenn man es sieht, dann macht man sie. Oder man geht auch manchmal gerne vorbei und tut es nicht. Aber man merkt immer so diese Kleinigkeiten, die der eine für den anderen macht oder für die Gemeinschaft.

[00:04:04.740] - Interviewer

Und gibt es irgendwelche Elemente, sei es an der App oder an dem physischen Barchart, dass ihr getestet habt, die euch besonders motiviert haben?

[00:04:16.150] - User 2

Ich finde schon, dass man die … Also dürfen wir das jetzt wechseln?

[00:04:19.410] - Interviewer

Ja, ja, sicher.

[00:04:20.570] - User 2

Ich finde schon, dass das Physische vom Gerät an sich schon ein sehr guter Reminder, dass man auch sieht, wie vorher gesagt, was der Partner macht, weil man kennt es, man sagt immer, es sollte ausgeglichen sein. Ja, oft ist es auch wie bei uns, einfach nicht so. Es macht der eine, mehr, der andere macht ein bisschen weniger. Es kann sich auch ändern. Ich spreche jetzt davon, wenn jetzt wer in einer gewissen Zeit im Jahr einfach besser Zeit hat, dann würde sich das auch in der Theorie ändern. Aber es hat mir in den letzten Wochen oder in den letzten zwei Wochen einfach aufgezeigt, wie viel meine Partnerin im Vergleich zu mir macht.

[00:05:02.420] - Interviewer

Also das schafft auch Bewusstsein der Vergleich, dass man sieht: „Okay, wo steht die Säule von meinem Partner?

[00:05:08.220] - User 2

Ja, genau. Das ist treffend.

[00:05:11.010] - User 1

Ja, dem kann ich mich anschließen.

[00:05:14.870] - Interviewer

Sehr gut. Dann gehen wir noch mal ein bisschen genauer auf dieses physische Barchart hat ein. Was ist so die Bestandsaufnahme? Was würdet ihr sagen, hat gut funktioniert? Was hat schlecht funktioniert?

[00:05:35.870] - User 2

Die Eintragungen in der App, die Übermittlung von den Daten in der App zum Gerät an sich, war sehr flott. Wenn man davon ausgeht, dass du es selber eigentlich gemacht hast, dass du es wirklich selbst gebaut hast. Sehr überraschend gut. Ich

habe am Anfang geglaubt, das wird jetzt so circa immer 15 Minuten dauern, bis die Übertragung stattfindet. Also von dem her bin ich sehr positiv überrascht gewesen. Jetzt geht es da einen die positiven Aspekte.

[00:06:04.130] - Interviewer

Nein, du kannst gerne noch negative Aspekte sagen.

[00:06:06.280] - User 2

Okay. Wir haben ja da vorher schon kurz privat drüber gesprochen. Die Geräuschkulisse vom Gerät an sich, mitten in der Nacht. Ich würde es jetzt so einschätzen, wenn das Gerät neben meinem Kopfpolster gewesen wäre, ich meine, das ist jetzt kein richtiger Platz, aber die Lautstärke schon - Man erschreckt sich sehr. Wenn ich im Nebenraum gesessen bin und ich habe das auf einmal wahrgenommen, dass das Gerät sich neu justiert - was jetzt nicht unglaublich schlimm war, aber beim ersten Mal -man gewöhnt sich dann mit der Zeit daran, das muss ich auch dazu sagen, aber bei den ersten zwei Mal habe ich mich wirklich gefragt, was passiert oder wie was, wo hinunter gefallen ist.

[00:06:47.600] - Interviewer

Würde das sagen, würde es da helfen, dass man sagt, okay, in der Nacht, in bestimmten Zeiten, passt sich das Gerät nicht an und reagiert nicht auf Input?

[00:06:55.840] - User 1

Ja, das wäre eine Möglichkeit, genau. Ja, Ich finde auch, dass das Säulendiagramm eine wirklich tolle visuelle Unterstützung war, weil man ja wirklich, je nachdem, wo man das Gerät platziert, tagtäglich mehrmals daran vorbeigeht und somit auch seine Aufgaben und auch seinen Fortschritt im Überblick behält. Und wenn ich auch etwas zu kritisieren hätte, dann wären das die Geräusche, die das Gerät macht. Prinzipiell im Alltag stellt es für mich kein Problem dar, wobei ich mich morgens einige Male erschrocken habe, wenn ich vorbeigegangen bin und sich dann der Bewegungsmelder, wie sagt man? Aktiviert. Ja, der Bewegungsmelder reagiert hat auf meine Bewegung und dann hat sich das Säulendiagram wieder bemerkbar gemacht.

[00:07:53.700] - Interviewer

Okay. Also es könnte ein bisschen sanfter sein - also grundsätzlich, das erinnert werden durch die Bewegung?

[00:08:00.620] - User 1

Ja, genau.

[00:08:00.890] - User 2

Ich finde das Zusammenspiel ganz lustig, weil es erinnert dich ja dann natürlich sofort daran, auch mal wieder in die App zu schauen, wenn du nicht schon eine Push- Benachrichtigung bekommen hast, die dich gewählt. Das Zusammenspiel fand ich ganz nett. Okay.

[00:08:15.070] - Interviewer

Sehr gut. Wie findet ihr grundsätzlich die Idee, physische Komponenten als Unterstützung für eine App herzunehmen?

[00:08:27.020] - User 2

Ja, prinzipiell sehr gut. Auch die Ausführung, die wir zum Testen hatten, wie es da steht, ist sicher nicht hundertprozentig ausgereift, aber der Grundgedanke, der ist einfach sicherlich nicht schlecht. Ich meine, ich habe das schon mal angesprochen, das ist marketingtechnisch vielleicht gar nicht so schlecht, das weiter zu verfolgen Ich könnte es mir in einer abgewandelten Version eigentlich sehr gut vorstellen.

[00:08:50.170] - Interviewer

Auch für andere Apps?

[00:08:55.830] - User 2

Ich bräuchte jetzt ein konkretes Beispiel. Ich bin jetzt gerade in diesem Haushalts Block drinnen.

[00:09:03.370] - Interviewer

Aber da würdest du sagen, funktioniert es gut?

[00:09:05.450] - User 1

Da funktioniert es auf alle Fälle. Auf alle Fälle.

[00:09:06.770] - Interviewer

Mir würde jetzt vielleicht einfallen, eine App oder grundsätzlich irgendwas, wo man Feedback bekommt, sei es Sprachen lernen oder irgendwas in die Richtung.

[00:09:15.530] - User 1

Ja, wo es deine Fortschritte vielleicht aufzeigt. Ich denke schon, dass das...

[00:09:20.480] - Interviewer

Sportaktivitäten wäre auch so was, wo man sich es überlegen könnte.

[00:09:23.630] - User 1

Ja, auf alle Fälle. Ich glaube, dass das für viele Menschen zusätzlich eben eine visuelle Erinnerung und Unterstützung ist, die einen dann noch motiviert, eben bestimmte Aufgaben und Tätigkeiten regelmäßig zu erledigen.

[00:09:39.540] - User 2

Wenn ich anmerken darf, ich glaube, es gibt verschiedene Typen Mensch. Es gibt Menschen, wie es jetzt zum Beispiel ich als Person bin, auch wenn wir da 100 Anzeigen hätten, wenn ich es ignoriere, dann ignoriere ich es, ob ich jetzt zum Sport geht oder nicht. Es gibt aber dann Millionen – ich weiß nicht, wie viele Menschen –, aber extrem viele, die auf das anspringen, für die das wichtig ist, die sich vielleicht auch innerlich dann so ein bisschen - soll ja kein negativer Druck in dem Sinne sein - aber die einfach einen positiven Ruck dann dadurch auch verspüren, eben Aktivitäten anzugehen.

[00:10:16.210] - Interviewer

Okay. Wie würdet ihr so diesen gemeinschaftlichen Faktor sehen, von dem - ihr habt schon angesprochen:„Das Teil ist immer da, ihr habt es immer im Bewusstsein? Redet man da vielleicht auch öfter drüber? Ist das ein Thema, oder?

[00:10:30.080] - User 2

Ich würde sagen, ja. Es wurmt einen natürlich auch. Wenn der andere zu einem sagt: „Schau, was ich jetzt alles erledigt habe und wie hoch meine Leiste ist. Ich finde schon, es war eigentlich, wie ich meine, fast täglich ein Gesprächsthema. Wenn es nicht … oft nicht tatsächlich die Aufgabe, vielleicht sondern oft auch die Geräuschkulisse war. Ja, aber man spricht schon, Oja!. Wir haben schon sehr oft darüber gesprochen und auch mit den Aufgaben. Also das bringt einen sehr nah zu dem Gesprächsthema.

[00:11:10.660] - Interviewer

Würde euch noch irgendwas einfallen, was ihr hinzufügen würdet zu dem Aufbau, so wie ihr da steht, dass es noch motivierender, noch effizienter ist für euch?

[00:11:25.920] - User 2

Ja, es ist schwierig jetzt, weil an sich die Grundidee habe ich ja schon vorher gelobt. Man hat das Handy in Kombination dazu. Ich finde, es wäre lustig, wenn jetzt zum Beispiel ein Bildschirm dran wäre und der dir anzeigt, User 1 hat zum Beispiel jetzt erledigt: Geschirrspüler ausräumen +2. Ein Beispiel jetzt.

[00:11:48.170] - Interviewer

Also dass man ein kleines Display vielleicht vorne macht.

[00:11:50.840] - User 2

Genau. Oder vielleicht noch ein Geräusch dazu. Zum Beispiel, das haben wir am Anfang nämlich gesagt, so ein Lieblingssong oder irgendwie so ein Meme, der eingespielt wird. Ich weiß es nicht. Irgendwas motivierendes. Irgendeine Audiodatei, irgendwas, was man sich selbst aussuchen kann, wo man auch vielleicht den anderen eben damit nerven kann und sagen kann: „Ja, schau, es würde nicht so oft abgespielt werden, wenn du deine Aufgaben erledigen würdest. Ich kenne das aus einem Vertrieb, zum Beispiel mit der Glocke, wenn wer einen Abschluss hat, das quält einen. Wenn da das Pendant zu dir oder in deinem Team jemand was abschließt - man freut sich sehr oft miteinander - aber wenn man zum Beispiel selber keine Erfolge hat, lange Zeit, das geht auch schon in die Richtung, finde ich. Dass man, wenn man längere Zeit nichts macht, hat man natürlich auch nichts vorzuweisen und dann quält es einen schon fast, wenn dann zum Beispiel immer wieder dasselbe Lied kommt.

[00:12:44.910] - Interviewer

Okay, ja. Das ist eine sehr gute Idee. Danke. Könntet ihr euch vorstellen, das System auch in Zukunft weiter zu verwenden?

[00:12:46.979] - User 1

Ja, wenn das System beziehungsweise das Säulendiagramm bezüglich der Geräuschkulisse noch optimiert wird, dann sehr gerne, weil wie gesagt, ich finde, das ist eine sehr tolle visuelle Unterstützung und Erinnerung, weil man eben, je nachdem, wo man das Säulendiagramm aufstellt, wirklich regelmäßig daran erinnert wird und auch indem das Säulendiagramm, nachdem man eine Tätigkeit erledigt hat, einen Sprung sozusagen in die Höhe schießt und einen motiviert.

[00:12:47.700] - User 2

In der Theorie kann ich mich dem nur anschließen, aber für mich selbst, muss ich sagen, ohne Partnerin, glaube ich, würde ich es nicht allein nutzen. Ich glaube, es kommt auch viel drauf an, wie es der andere sieht und ob es für den wichtig ist. Da würde ich es natürlich weiter nutzen.

[00:12:47.780] - Interviewer

Das wäre es dann von meinen Fragen auch soweit. Habt ihr noch irgendwas, was ihr anmerken wollt?

[00:12:53.270] - User 2

Danke, dass wir das testen durften.

[00:12:54.500] - User 1

Ja, das war sehr spannend zu testen, vor allem weil wir mit so einer Erfahrung im Vorhinein noch nie in Berührung gekommen sind. Deswegen war das sehr interessant, zwei Wochen lang in Kombination mit der App, die ich zum Beispiel im Vorhinein schon kannte, so noch mal testen zu dürfen und noch mal ein Stück mehr motiviert zu werden.

[00:13:14.590] - Interviewer

Das freut mich. Dann sage ich vielen Dank.

[00:13:17.260] - User 1

Gern geschehen. Danke schön.

[00:13:18.460] - Interviewer

Es gibt noch einen kurzen Nachtrag:

[00:13:19.660] - User 2

Genau. Wir haben uns gedacht, es wäre vielleicht noch sehr positiv, wenn es so etwas wie ein Belohnungssystem geben würde. Wie es jetzt zum Beispiel ab zehn Stufen, einen Snack ausspuckt. Wäre vielleicht eine ganz witzige Idee. Plus vielleicht auch noch das Thema mit dem freischaltbaren Sounds, dass man zum Beispiel sagt: „Nach zehn Punkten habe ich die Möglichkeit, noch eine weitere Audio Datei hinzuzufügen, oder welche, die vorgegeben sind von der App, oder vom System. Das finde ich noch mal sehr, sehr spannend und auch sehr witzig. Würde vielleicht noch mal auch ein bisschen Spaß in den Alltag bringen.

I. Focus Group Session H2

[00:00:00.00] - Interviewer

Dann starte ich jetzt die Aufnahme. Das passt für euch beide?

[00:00:04.12] - User 1

Ja.

[00:00:04.30] - User 2

Ja

[00:00:05.15] - Interviewer

Perfekt. Gut, dann starten wir gleich rein. Ihr könnt gerne durcheinander reden, also nicht durcheinander, aber abwechselnd die Reihenfolge ändern. Es müssten auch nicht beide antworten, je nachdem, wie euch gerade was einfällt. Wie leicht oder schwer ist es euch gefallen, die App in den letzten zwei Wochen in euren Alltag zu integrieren?

[00:00:28.03] - User 1

Ich muss sagen, am Anfang war es einfacher als jetzt am Schluss.

[00:00:32.56] - User 2

Ging mir ganz ähnlich.

[00:00:33.51] - User 1

Einfach, weil die Motivation natürlich da war, das brav zu machen und gegen Ende ist es sehr schleißig geworden bei mir.

[00:00:44.32] - User 2

Liegt aber auch an mehreren Faktoren, wenn man mal dazwischen krank ist und mal sich nicht fühlt und dann ist das alles so … Bei mir war es einfach jetzt mehr wieder Arbeit. Ich kann jetzt sagen, okay, gemacht habe ich es zwar, aber dann habe ich mehr das Bedürfnis gehabt, mein Handy mal auf die Seite zu legen und einmal an gar nichts denken. Das liegt aber auch am Weihnachtsstress. Da ist auch der Zeit ein bisschen mitspielend.

[00:01:08.25] - Interviewer

Okay, das passt. Wie würdet ihr sagen, wie präsent war die App grundsätzlich in eurem Alltag?

[00:01:19.13] - User 2

Also schon ein bisschen präsenter gegenüber anderen Apps, die bei mir jetzt laufen, weil natürlich immer wieder Benachrichtigungen gekommen sind mit „Jetzt Wäsche waschen, Küche putzen oder sonstiges." Okay, das finde ich eigentlich schon sinnvoll, weil es ist besser, lieber irgendwo beim Handy, wo man eh ständig draufschaut, benachrichtigt zu werden, als wenn man sagt: Okay, ich komme nach Hause, „Da war ja noch was". Also da bin ich schon mental ein bisschen vorbereiteter und weiß: „Okay, das muss ich noch machen. Gut, ich weiß es. Dieses Vorwissen, dieses mentale Vorbereiten ist schon für mich sinnvoll.

[00:01:57.19] - User 1

Ich muss sagen, für mich war es so für diese Für die Aufgaben, die man eher webschiebt, war es gut. Für die Aufgaben, die man sowieso täglich macht - bei uns ist es das Katzennapfputzen - Das ist bei mir in der Früh so im Prinzip mein Aufgabengebiet, sage ich mal, außer wenn ich gerade krank bin. Und das ist was, was ich sowieso mache, da war es mehr so ein … Jetzt muss ich das einfach noch eintragen, wo man denkt: „Ja, wieso? Das ist eigentlich logisch.

[00:02:27.24] - Interviewer

Okay. Das heißt, wenn man dann sagt: „Wie habt ihr die Nutzung erlebt? Grundsätzlich unterstützend? Kann man das sagen?"

[00:02:36.41] - User 1

„Fifty-fifty, würde ich für mich sagen. Ein bisschen spannend zu sehen natürlich.

[00:02:42.07] - User 2

Praktisch kaum, aber theoretisch sehr, also mental gesehen ja. Also ich sehe es schon als Unterstützung, wenn man eben immer wieder durchs Handy daran erinnert wird. Es kann schon seinen Nutzen haben. Es kommt halt auch auf viele andere Faktoren an, eben jetzt gerade die Gelegenheiten wie Weihnachten oder wie jetzt wenn wer krank ist, das waren bei uns jetzt gerade zwei Faktoren, warum es wahrscheinlich so abgemildert ist jetzt die letzten paar Tage. Mhm war ich eigentlich auch begeistert davon. Praxishaltung, immer wieder aufs Handy schauen und noch Hackerl setzen. Wenn es in der Benachrichtigung jetzt noch ein Häkchen geben würde, dann würde ich eher auf dieses Häkchen drücken, sobald ich es erledigt habe. Also, gar nicht in die App gehen. Weil das stört es mich. Es stört mich. Und erst dann, wenn ich es abhackerln kann geht es weg.

[00:03:30.22] - User 1

Ein Klassiker, die Checklisten.

[00:03:32.51] - User 2

Ja, natürlich.

[00:03:35.37] - Interviewer

Okay. Würdet ihr sagen, dass das irgendwelche Veränderungen in euren Haushaltstätigkeiten hervorgerufen?

[00:03:44.25] - User 1

Also wo wir noch aktiver waren, definitiv, aber mehr noch so dieses „Das habe ich jetzt gemacht. Cool. Oder „Das muss ich jetzt noch machen." Jetzt am Ende nicht mehr. Aber kann ich jetzt nur von mir reden.

[00:04:02.29] - User 2

Ja, also praktisch im Sinne von … Entschuldigung, noch mal die Frage, damit ich es auch richtig beantworte.

[00:04:11.41] - Interviewer

Hast du irgendwelche Veränderungen im Verhalten in Bezug auf die Haushaltstätigkeiten festgestellt, die du der App zuschreiben würdest?

[00:04:20.03] - User 2

Nicht wirklich jetzt der App zuschreibend, aber es ist eine Stetigkeit. Da habe ich keine Veränderung gemerkt im Vergleich.

[00:04:27.26] - User 1

Ich denke einfach, ein bisschen mehr Bewusstsein vielleicht, aber eine riesen App-Veränderung jetzt nicht.

[00:04:37.52] - Interviewer

Okay. Wie sehr würdet ihr sagen, war die App Thema im Alltag bei euch?

[00:04:42.51] - User 1

Die App selbst? Also so zum Gespräch, gar nicht. Sie ist ja schon vorher bei uns im Alltag integriert, einfach für die Finanzen, ist es bei uns ja bis jetzt gewesen.

[00:04:56.44] - User 2

Bislang noch nicht, bis wir jetzt da die Unterstützung angeboten haben, dass wir eben hier die ganze Geschichte auch fördern. Und ja, ich finde es an sich, wie gesagt, schon noch praktisch. Es ist schon was machbar draus.

[00:05:13.44] - Interviewer

Okay. Gibt es vielleicht bestimmte Aspekte an der App, die ihr sagt, sie haben euch besonders geholfen? Das Erinnern ist jetzt zum Beispiel angesprochen worden?

[00:05:21.22] - User 1

Also was ich spannend finde, wo ich mir aber schwergetan habe, ist natürlich dieses: Wie bewertet man eine Hausaufgabe, wie viel sie wert ist? Also da habe ich jetzt einfach mal was eingetragen. Ich habe überall nur einen Punkt eingetragen, was aber nicht richtig ist eigentlich, aber das muss man mehr gemeinsam mal absprechen. Das haben wir in dem Fall aber gar nicht gemacht, sondern einfach nur mal eingetragen. Also das finde ich insofern schon cool, aber

wir haben uns da zu wenig Zeit genommen dafür, wahrscheinlich das durchzusprechen. Und sonst? Positiv? Du darfst auch was sagen.

[00:06:13.04] - User 1

Ansonsten positiv ... Also kommt noch das bezüglich negativ, oder soll ich das jetzt anfangen?

[00:06:24.06] - Interviewer

Also es kommt noch eine Frage dazu, was ihr verbessern wollt.

[00:06:29.04] - User 1

Okay, gut.

[00:06:32.07] - Interviewer

Okay, dann passt es mir so weit. Ihr habt die Punkte kurz angesprochen. Wie relevant waren die für euch, also das Punktesammeln in Bezug auf eine Competition haben oder einfach für sich selbst die Punkte sammeln wollen?

[00:06:44.34] - User 1

Ich muss ehrlich sagen, dadurch, dass wir es nicht besprochen haben, wie wir die Punkte verteilen auf die Aufgaben, eigentlich nicht.

[00:06:51.41] - User 2

Nicht relevant.

[00:06:53.01] - User 1

Da war es nicht relevant. Wenn wir das vielleicht gemacht hätten, viel expliziter, dass wir sagen, wir bewerten das gemeinsam, was das wird, dann wäre es wahrscheinlich was anderes.

[00:06:59.53] - User 2

Und wenn es eine Belohnung dazu gegeben hätte, natürlich mit den Mehrpunkten, dass der und der sich was aussuchen darf, okay, dann kann man schon was daraus machen.

[00:07:08.10] - User 2

Aber wir haben es leicht übersprungen, sozusagen.

[00:07:11.29] - Interviewer

Okay, perfekt. Ich kann noch einmal ganz kurz zurück zu dem „Erinnert werden". Da würde Sie sagen, hat das gut funktioniert oder war es teilweise auch so, dass

man sich noch mal selber erinnern musste, „Okay, ich habe die Aufgabe gemacht, ich muss das jetzt eintragen?" Oder war das für euch eigentlich immer klar?

[00:07:29.09] - User 2

Ich hätte schon öfter erinnert werden müssen, dass ich es noch abhackerln muss. Ich habe es zwar gemacht, aber dann ja…

[00:07:35.31] - User 1

Ja, ich muss auch sagen, da habe ich auch eigentlich ein bisschen mehr dahinter sein müssen. Ich meine, ich habe zwar schon oben dieses Symbol gehabt: „Okay, Flatastic, hat eine Benachrichtigung, aber ich habe es auch, glaube ich, so eingeschaltet, dass ich eben nicht irgendein Pop-up oder so habe. Ich weiß nicht, ob es das hätte, wenn dann habe ich es ausgeschaltet. Ich habe nur das Symbol „Flatastic hat irgendwas", aber nicht explizit. Da musste ich schon selber immer wieder mal sagen: „Okay, jetzt muss ich das noch abhackern, sozusagen.

[00:08:02.11] - Interviewer

Könntet ihr euch vorstellen, das auf lange Sicht auch zu verwenden oder dass es auf lange Sicht auch einen Mehrwert bringen kann?

[00:08:10.10] - User 1

Nur, wenn man sich wirklich mal die Zeit nimmt vorab und einmal diese Punkte Bewertung oder so durchspricht und dann noch mal wirklich alles einträgt und so. Dann vielleicht, weil sonst macht es keinen Sinn. Wenn man sich dem nicht widmet, wirklich. Ob es für uns jetzt da zukunftsrelevant ist ...

[00:08:28.28] - User 2

Das wird sicher jetzt eh zeigen.

[00:08:32.29] - User 1

Kann ich nicht wirklich beantworten.

[00:08:33.46] - User 2

Wir nutzen die App auf jeden Fall das app weiterhin.

[00:08:35.08] - User 1

Ja, die App aber für die Finanzen, das ist sicher.

[00:08:35.59] - User 2

Und dann, wenn es aufpoppt, wahrscheinlich wird es schon so seinen Ansporn haben mit der Zeit. Es ist jetzt eben jetzt gerade die Test Phase. Ist mal okay, ich

weiß noch nicht gut ... Eben den Erinnerungsaspekt, den finde ich schon erfrischend.

[00:08:56.34] - Interviewer

Okay, dann kommen wir zur letzten Frage und das wäre, was ihr verbessern würdet, was ihr euch noch gewünscht hättet an der App, das es vielleicht besser funktioniert hätte?

[00:09:05.29] - User 1

Wir haben ja jetzt nicht eine Premiumversion von der App und da ist es so, dass du ja, wenn du jetzt den Punktestand anschaust, siehst du zwar, wie viel Punkte der hat, aber du kannst keine Details sehen. Da musst du ein Premium holen. Das ist zum Beispiel so ein Thema, wo ich sage: „Okay, ja - danke. Und das ist so, okay, das ist dann für mich eigentlich irgendwo überflüssig, weil dann sehe ich auch nicht … Weil so denke ich mir halt, wenn man sieht, was derjenige gemacht hat, sieht man vielleicht da ist irgendwo ein Ungleichgewicht, dann kann man schauen, welche Aufgaben gibt es, was übernehme ich vielleicht. Man kann ja eingeben, wer als Nächstes die Aufgabe übernimmt. Wenn man es jetzt übernommen kann, dann kann man sagen: „Ich übernehme es, oder das nächste Mal ist der dran. Da habe ich das Gefühl, das hat nicht immer so richtig funktioniert, weil ich habe zum Beispiel dann öfters mal eingeben: „Okay, das nächste Mal mache ich es ich. Und dann, wenn ich dann gesagt habe, Ich habe das jetzt gemacht, dann ist gekommen: „Du übernimmst diese Aufgabe für User2", wo ich mir denke: Nein, das habe ich eigentlich nicht eingegeben.

[00:10:01.46] - User 1

Da habe ich das Gefühl gehabt, habe ich irgendwas falsch verstanden oder dass das nicht so ganz funktioniert hat, muss ich sagen.

[00:10:20.31] - User 1

Warte mal. Irgendwas war noch. Bei mir ist nur das eine Feedback mit den kleinen Häkchen, in der Benachrichtigungsleiste und erst wenn das Häkchen drauf ist, kann ich es wegwischen.

[00:10:45.32] - User 2

Das ist eine Banalität, aber vielleicht sogar effizient.

[00:10:52.20] - User 1

Ja, wie gesagt, so dass man dann die App öffnen muss für das, da ist die Frage, ob das mit dem so einen Pop-up vielleicht sogar einfacher wäre.

[00:11:00.31] - User 2

Weil es muss stören. Es muss auf deinen Handybildschirm kleben. Ja, es muss nerven. Sonst ist es ja nicht wirklich da. Und das Geschirr, zum Beispiel, wenn es dich anlächelt, nervt es dich ja auch.

[00:11:15.22] - Interviewer

Also es müsste noch ein bisschen präsenter sein, ein bisschen mehr auf sich aufmerksam machen.

[00:11:22.32] - User 2

Mhm

[00:11:23.09] - User 1

Ja

[00:11:23.13] - User 1

Und eben so dieses, keine Ahnung, dass man sagt, man macht einmal im Monat, werden die Punkte abgeglichen und man macht es eben vielleicht, dass man die Möglichkeit hat, sich auszumachen, der, der dann weniger hat, der muss dann schon vorab ein kleines Geschenk oder eine kleine Überraschung machen. Das wäre vielleicht auch noch ein nettes Zusatzding.

[00:11:49.10] - User 2

Das motiviert noch mal mehr. Ja, genau.

[00:11:54.57] - Interviewer

Okay, sehr gut. Eins, was mir jetzt noch eingefallen ist: Wie würdet ihr sagen, was mit der Awareness bezüglich dem, was der andere jetzt gemacht hat? Hat das etwas verändert?

[00:12:04.45] - User 1

Das ist eben das Thema, wo ich sage, das ist ein großes Manko, wenn man da nicht die Premiumversion hat und sie nicht gekauft hat, weil du siehst ja nicht was ... Du siehst, der andere hat sechs Punkte und ich habe 15, zum Beispiel, aber, du kannst nicht schauen, was der gemacht hat, finde ich. Also das ist nicht einsehbar, ohne Premium. Und das ist zum Beispiel was, wo ich dann denke, okay, das ist eher negativ von dem Ganzen.

[00:12:29.53] - Interviewer

Habt ihr sonst irgendwelche Anmerkungen?

[00:12:32.38] - User 1

Ja, das betrifft aber dieses Finanz-Tool. Ich weiß nicht, ob das für dich auch interessant ist. Da finde ich, weil es ist jetzt immer fifty-fifty aufgeteilt, wo ich nicht weiß, ob es das gibt, aber was mir zum Beispiel fehlt, ist, man verdient ja nicht gleich. Also eigentlich muss man ja fifty-fifty prozentual auf dem Gehalt, auf die Einnahmen gerechnet, aufteilen. Und das fehlt mir zum Beispiel in der App, dass man jetzt sagen kann, okay, die App rechnet mir das sogar schon aus. Ich trage sozusagen ein, was verdient jeder und dann wird das prozentual ausgerechnet und dann auch auf diese ganzen Finanzeinträge prozentual sozusagen gemacht. Das wäre noch cooler, weil jetzt ist es halt wirklich fifty-fifty, ist okay, aber kann ja auch komplett viel Unterschied sein und dann ist es ja eigentlich auch nicht mehr so ganz fair. Das vermisse ich eigentlich, dass es das gibt.

[00:13:22.43] - User 2

Sonst Anmerkungen hätte ich jetzt keine mehr. Wir haben es getestet, wir haben es gemacht.

[00:13:28.44] - User 1

Mehr oder weniger. Manchmal mehr, manchmal weniger.

[00:13:31.45] - User 2

Aber eben die Punkte sind klar. Soweit, ja.

[00:13:35.59] - User 1

Auch die Bedienbarkeit vom Einstellen, und so war eigentlich einfach.

[00:13:41.38] - User 2

Also ich hätte es mir schwerer vorgestellt. Wenn ich es so sage, zusammenfassend, Ja, ich hätte mir das Ganze am Handy herumdipseln und da hätte ich mir wirklich schwer vorgestellt. Aber es war wirklich dann so, ich habe es angeklickt, ich habe schnell den Überblick gehabt. Das ist auch noch mal ein gutes Feedback. Ja, und ich weiß sofort, was Sache ist.

[00:14:00.15] - User 1

Das, was ich jetzt noch gar nicht weiß, auf das habe ich nie geachtet. Lass mich kurz reinschauen in die App, wie die Sachen sortiert sind.

[00:14:10.00] - User 1

Ja, ja. Ist so weit jetzt okay, jetzt sind wir oben natürlich, was noch nicht gemacht wurde. Dann kommen die Sachen, die immer sind und dann ist grün ganz unten.

Ja, ich meine, ja, es kommt drauf an, wie lange die Liste ist. Man findet es eigentlich eh schnell - ob man da noch irgendwie eine Art Sortierung, eine bessere machen könnte oder so. Also ob man nicht überlegen könnte, ob man es noch übersichtlicher gestaltet oder so. Ich meine, wir haben eigentlich bei allen bei Bedarf eingestellt und nirgends jetzt in zwei Tagen fällt. Wahrscheinlich wird das dann noch mal anders gefiltert und sortiert, wahrscheinlich wenn es ein Tag ist oder zwei Tage oder so. Ja, das kann ich nicht beantworten, weil wird das dann nicht so eingetragen haben.

[00:14:52.59] - User 2

Da bin ich zu laienhaft für solche Sachen.

[00:14:58.07] - Interviewer

Okay, dann passt es. Wenn es sonst nichts mehr gibt, sage ich vielen Dank.

[00:15:02.37] - User 1

Gerne. Du erzählst und dann eh das Ergebnis von dem Ganzen. Das würde mich nämlich interessiert.

[00:15:09.03] - Interviewer

Natürlich! Dann beende ich mal die Aufnahme.

J. Focus Group Session H3

[00:00:00.00] - Interviewer

Die Aufnahme läuft. Das passt für euch beide?

[00:00:04.59] - User 2

Ja.

[00:00:05.32] - User 1

Ja

[00:00:06.25] - Interviewer

Perfekt. Dann fangen wir gleich mal an mit der ersten Frage, um einen Überblick zu verschaffen. Wie leicht oder schwer ist es euch gefallen, die App in den letzten zwei Wochen in euren Alltag zu integrieren?

[00:00:22.34] - User 2

Ich fand, Ich musste mich ein paar Mal daran erinnern, dass wenn ich was gemacht habe, dass es eben die App gibt und ich es dann abhaken kann. Am Anfang habe ich es mal vergessen, dass es das gibt. Aber sonst fiel mir es eigentlich eher leichter, das Ganze mit zu integrieren.

[00:00:55.49] - User 1

Bei mir war es so, dass ich eigentlich die ganze Zeit vergessen habe. Ich wurde immer nur mit Push-Nachrichten von User 2 daran erinnert, dass ich die App benutzen muss. Bin aber allgemein sehr schlecht in App-Benutzung, wenn irgendwas in To-Do-Listen eingetragen wird. Aber war gut, dass sie da war. Da konnte ich mich zumindest erinnern, dass ich mal Staubsaugen muss.

[00:01:22.42] - Interviewer

Okay. Das heißt, wie präsent, würdest du sagen, war die App in eurem Alltag?

[00:01:29.55] - User 1

Ich würde sagen, ein wenig präsent, weil wenn ich sie offen hatte, dann hatte ich sie eben nur zum Abhaken der Dinge offen, weil User 2 die ganzen Sachen bereits eingetragen hatte, die man dann einfach regelmäßig abhaken konnte, eigentlich am ersten Tag.

[00:01:51.23] - User 2

Ja. Ich habe nicht jeden Tag Aufgaben im Haushalt. Ich Ich habe einfach nicht jeden Tag was im Haushalt gemacht. Deswegen habe ich die App auch nicht jeden Tag offen gehabt. Deswegen war es nicht super präsent.

[00:02:11.05] - Interviewer

Und wenn wir jetzt von der Präenz weggehen bezüglich ich habe die App jetzt offen, aber auch, wie habt ihr drüber geredet im Alltag? War das ein Thema für euch?

[00:02:21.48] - User 1

Ja. User 2 hat immer gesagt, ich habe schon so viele Punkte in Flatastic und du nicht.

[00:02:34.17] - Interviewer

Okay. Würdet ihr sagen, eure Haushaltstätigkeit hat sich irgendwie verändert in diesen zwei Wochen, dadurch, dass ihr die App jetzt verwendet habt?

[00:02:47.16] - User 1

Also bei mir nicht.

[00:02:53.19] - User 2

Nicht wirklich, weil ich mich auch nicht immer daran gehalten habe, wenn die App irgendwie gesagt hat, dass das heute fällig ist und ich aber an dem Tag keine Lust oder keine Zeit hatte, habe ich es dann halt erst später gemacht. Ja, deswegen eher weniger.

[00:03:14.49] - User 1

Ja, ich habe mich auch nicht wirklich an Deadlines gehalten.

[00:03:18.40] - Interviewer

Gab es irgendwelche Aspekte an der App, die euch besonders motiviert haben, wo ihr sagt, das hat eigentlich gut funktioniert?

[00:03:25.24] - User 1

Ich fand das mit dem Punktesystem eigentlich cool, dass man das quasi sammeln kann, diese Punkte. Wir haben jetzt natürlich nur die eingeschränkte Beziehung gehabt, ich weiß nicht, ob man mit den Punkten irgendwas machen kann oder so, damit ich so einen Purpose habe, die Punkte zu sammeln. Aber sonst, die Punkte sammeln war halt Nice, irgendwie. Aber es hat dann am Endeffekt der Reward gefällt.

[00:03:48.37] - User 2

Ich fand das cool, dass dann Konfetti kamen, wenn man die Aufgabe abgehakt hat. Das fand ich sehr süß. Aber was ich normalerweise von To-Do-Apps eher kenne, dass wenn man es abgehakt hat, dass es dann wegfällt. Und mich hat es am Anfang sehr verwirrt, dass die Aufgabe einfach drinnenbleibt und dann nur unten dabei steht, wann sie zum letzten Mal erledigt wurde. Und da haben wir auch am Anfang ein bisschen Startschwierigkeiten gehabt, deswegen, weil wir das nicht bestanden haben.

[00:04:27.08] - User 1

Da habe ich vielleicht dreimal was abgehakt.

[00:04:30.54] - Interviewer

Okay, das heißt, ihr habt schon die Punkte erwähnt, die euch motiviert haben. Habt ihr generell das Gefühl gehabt, es hat dazu beigetragen, die Awareness zu steigern, was der Partner macht, oder?

[00:04:46.40] - User 2

Ich finde, da war es vielleicht auch, weil es die eingeschränkte Version war. Aber ich finde, man sieht ja, glaub ich, nur die Gesamtpunktzahl. Und wenn ich jetzt aber noch mehr sehen würde, wie das aufgeschlüsselt ist und irgendwie an welchem Tag wie viele Punkte abgearbeitet wurden oder man halt bekommen hat, wäre es, glaube ich, motivierender.

[00:05:14.44] - User 1

Ja, ich glaube, da bin ich bei dir, wenn man so sieht, wie oft jemand schon was gemacht hat. Zum Beispiel User eins, also ich habe zum Beispiel fünf Mal den Geschirrspüler schon ausgeräumt und User zwei halt kein einziges Mal, aber dafür macht User zwei was anderes. Ja, so was wäre eigentlich cool zu sehen. Wir haben auch die Punkte unterschiedlich vergeben. Wir haben gesagt, ich glaube, Wäschewaschen waren zwei Punkte.

[00:05:38.59] - User 2

Nein, aber es gab halt drei Teile vom Wäschewaschen.

[00:05:41.58] - User 1

Okay, das war das.

[00:05:43.04] - User 2

Badputzen waren zwei Punkte. Ich glaub Küche putzen zwei.

[00:05:46.31] - User 1

Genau, und diese kleineren Tätigkeiten waren dann nur ein Punkt.

[00:05:49.25] - User 2

Ja. Ich fand es ein bisschen schwierig, auch einzuschätzen selber, welcher Aufgabe man jetzt, welche Punkteanzahl gibt, weil für mich persönlich ist es so, dass Wäschewaschen jetzt nicht so der riesen Aufwand ist, aber jetzt zum Beispiel dafür irgendwas anderes, einfach individuell für mich mehr ist, was jetzt zum Beispiel dann bei meinem Partner anders wäre. Ich finde, die Gewichtung ist manchmal ein bisschen schwer einzuschätzen.

[00:06:20.25] - Interviewer

Okay, vielen Dank. Es wurden vorher auch schon die Reminder, also das Erinnertwerden angesprochen, dass das vielleicht nicht unbedingt immer funktioniert hat, dass man sich selbst dran erinnert, das Handy herauszunehmen. Denkt ihr, das hätte man noch irgendwie verbessern können?

[00:06:39.44] - User 1

Es war mit den Push-Benachrichtigungen eigentlich gut, weil das ist eigentlich die einzige Möglichkeit, wie ich mich an Apps erinnere, mit Push-Benachrichtigungen. Von selber komme ich nicht drauf, dass ich da jetzt reinschauen müsste, weil es keine App ist, die ich im Alltag die ganze Zeit benutze, wie irgendwie Social-Media-Sachen oder so. Also war schon sehr hilfreich, definitiv. Ich hätte nicht noch mehr gemacht. Zu viel wäre zu nervig.

[00:07:03.33] - User 2

Ja, wenn, einfach auch zu oft Erinnerungen kommen, führt es bei mir eher dazu, dass ich dann was tendenziell eher weniger mache, weil ich dann genervt davon bin. Deswegen ja.

[00:07:18.23] - Interviewer

Aber so wie die Push-up-Benachrichtigungen dann eingestellt waren, das hat gepasst für euch?

[00:07:22.39] - User 1

Ja, das hat gepasst.

[00:07:25.40] - Interviewer

Okay. Dann würdet ihr irgendwas hinzufügen zur App, dass ihr sagt, das wäre für euch noch überzeugender?

[00:07:34.33] - User 2

Genau. Was ich schade fand, dass man eine Aufgabe nicht gemeinsam machen kann. Also zum Beispiel wir gehen immer gemeinsam einkaufen, wenn der Wocheninkauf stattfindet, da es alleine einfach super anstrengend ist. Und ich finde, das ist schon auch eine Aufgabe, der ich mehrere Punkte geben würde, weil ich das persönlich super anstrengend finde und dass man das dann nicht einfach eintragen kann, sozusagen es ist eine gemeinsame Aufgabe von User Eins und Zwei, fand ich ein bisschen schade. Also das wäre was, was ich mir zum Beispiel wünschen würde Und eben, wie vorher schon kurz angesprochen, ich glaube, dass es eben in der Pro-Version drinnen ist, dass man so einen Überblick hat über den Verlauf und wer wann wie viele Punkte gesammelt Das fände ich auch sehr interessant.

[00:08:34.35] - Interviewer

Dann haben wir noch eine abschließende Frage: Wie würdet ihr sagen, habt ihr die Nutzung über diesen Zeitraum von den zwei Wochen erlebt? Hat sich da etwas verändert? Oder war es eher recht gleich?

[00:08:46.05] - User 1

Ich glaube, für mich war es recht gleich. Für dich?

[00:08:54.31] - User 2

Ja. Was sich ein bisschen verändert hat, war so, ich sage jetzt mal, die Awareness, wie viel Anstrengung oder Kapazität manche Aufgaben im Haushalt brauchen. Wie gesagt, für mich ist zum Beispiel Wäschewaschen relativ easy, aber dafür eben andere Sachen schwieriger. Das hat es irgendwie so ein bisschen visualisiert.

[00:09:20.13] - User 1

Ja, bei mir war es eher recht gleich, aber vielleicht so ein innerlicher Stress dabei, weil diese Aufgaben noch gemacht werden müssen.

[00:09:30.56] - Interviewer

Okay, alles verständlich. Habt ihr sonst noch was, was ihr gerne anmerken würdet?

[00:09:37.11] - User 1

Nein, das war eigentlich alles. Von mir zumindest kam nichts mehr und deines war eh das Einzige mit dem Partnerding.

[00:09:43.01] - User 2

Genau, mit dem Partner und dass man Ich glaube, wenn man eine Übersicht hat, dass es vielleicht auch noch mal ein bisschen einen anspornen kann.

[00:09:52.32] - User 1

Was ich mir halt geil vorstelle, ist, wenn man das zum Beispiel in einer WG ab drei, vier Leuten hat, die App. Kann ich mir sehr gut vorstellen, weil da, glaube ich, ist es eher wahrscheinlich, dass Aufgaben dann halt nur zwischen zwei oder drei Personen statt durch vier geteilt werden. Und ich glaube, da macht es definitiv Sinn, das zu benutzen.

[00:10:11.11] - Interviewer

Okay. Wird das für euch in Zukunft auch Sinn machen, das weiterzubenutzen?

[00:10:16.00] - User 1

Ja, ich würde schon sagen. Aber ich glaube, mit der Pro-Version dann eher.

[00:10:21.46] - User 2

Ja, wenn man die Pro-Version hätte, dann wäre es einfacher. Was mir jetzt noch gerade eingefallen ist zum Thema, wenn man in der WG mit mehreren Leuten ist. Als ich in der WG mit mehreren Leuten gelebt habe, war es so, dass eine Woche lang eine Person für Haushaltstätigkeiten verantwortlich war. Und ich glaube, wenn man da die Möglichkeit hat, das Ich weiß jetzt nicht, wie gut das umsetzbar ist, aber zu sagen, man hat immer Wochenblöcke, wo eine Person verantwortlich ist, die dann abhaken kann und das dann automatisch dann auf die nächste Person erinnert, wann die Person dann dran ist. Ich glaube, das würde in WGs gut funktionieren.

[00:11:06.16] - Interviewer

Okay, dann sage ich vielen Dank. Wenn ihr sonst nichts mehr anmerken wollt, wärs das von mir.

[00:11:15.12] - User 2

Ja, klar.

[00:11:16.22] - Interviewer

Gut, dann stoppe ich mal die Aufnahme.

K. Focus Group Session H4

[00:00:00.00] - Interviewer

Die Aufnahme ist gestartet. Passt das für euch beide?

[00:00:07.13] - User 1

Ja.

[00:00:07.49] - User 2

Ja

[00:00:08.42] - Interviewer

Perfekt. Dann legen wir gleich mal los. Es geht so ein bisschen drum, die letzten zwei Wochen zu rekapitulieren. Ihr könnt gerne getrennt antworten. Die Reihenfolge ist auch nicht so wichtig. Wem was einfällt, einfach gerne äußern. Fangen wir mal mit einem generellen Überblick an. Wie leicht oder schwer ist es euch gefallen, die App in in den letzten zwei Wochen in euren Alltag zu integrieren?

[00:00:35.46] - User 2

Na ja, dadurch, dass wir beide einmal krank waren, kackt uns das bisschen rein. Dadurch, dass wir beide krank waren, ist das nicht so akkurat, aber sonst, wenn wir gesund waren, hat es eigentlich gut funktioniert. Also besser als sonst.

[00:00:59.30] - User 1

Ja Ich fand das auch sehr gut und fand, es relativ leicht, die App zu bedienen und den Haushalt damit zu regeln.

[00:01:08.44] - Interviewer

Was hast du mit besser als sonst gemeint?

[00:01:13.24] - User 2

Das wir uns regelmäßig am Haushalt beteiligt haben.

[00:01:18.47] - Interviewer

Okay, perfekt. Wie habt ihr die Nutzung über die zwei Wochen erlebt? Ihr habt generell schon gesagt, die Krankheit hat ein bisschen mit reingespielt. Hat es sonst noch irgendwas gegeben, was sich verändert hat über die zwei Wochen?

[00:01:30.23] - User 1

Ja, der kompetitive Sinn ist sehr gut. Es war sehr förderlich in der Erfüllung der Haushaltstätigkeiten.

[00:01:39.45] - User 2

Wenn einer was gemacht hat, dann war der andere auch dazu sehr stark motiviert, noch mehr zu machen, die Punkte wieder aufzuholen.

[00:01:50.53] - User 2

Vor allem, wenn man es auch dauernd gesehen hat.

[00:01:53.31] - User 1

Ja.

[00:01:55.01] - Interviewer

Okay. Und wie präsent, würdet ihr dann sagen, war die App und in Kombination mit dem physischen Balkendiagramm, wie präsent war das in eurem Alltag?

[00:02:03.08] - User 1

Sehr, weil es steht beim Fernseher und jedes Mal, wenn man sich auf die Couch setzt, wird man daran erinnert. Was ein bisschen problematisch war, weil sie so viel auf der Couch schlafen musste. Aber sonst hat das sehr gut gepasst, weil man dadurch erinnert worden ist, wenn man sich hingesetzt hat, zum Beispiel, hat man dann gemerkt: „Okay, ja, kann ich zum Beispiel fernstehen, aber ich sollte noch was machen".

[00:02:25.37] - Interviewer

Okay, und würdet ihr sagen, es war präsenter vielleicht als andere Apps in eurem Alltag

[00:02:36.59] - User 2

Ja, schon. Ich glaube, es ist was anderes, wenn man das jetzt vor sich sieht, die Farben oder die Geräusche, als wenn man da jetzt nur irgendeine Benachrichtigung am Handy bekommt oder so.

[00:02:51.41] - Interviewer

Habt ihr in zwei Wochen irgendeine Veränderung in eurer Haushaltstätigkeit wahrgenommen?

[00:03:00.31] - User 1

Tatsächlich habe ich mich mehr motiviert gesehen, die Küche zusammen zusammenzuräumen, weil es mehr Punkte gebracht hat.

[00:03:08.15] - User 2

Und ich habe viel Wäsche gewaschen.

[00:03:10.15] - User 1

Das stimmt. Und jetzt, seitdem sie nicht mehr läuft, das Teil. Sie sind auf die hauptsächliche Tätigkeit wieder ein bisschen zurückgegangen.

[00:03:21.41] - Interviewer

Okay. Also ich würde schon sagen, dass dieses Gerät, das bei euch gestanden ist, einen Einfluss darauf gehabt hat.

[00:03:26.58] - User 2

Ja

[00:03:26.58] - User 1

Ja, auf jeden Fall.

[00:03:30.05] - Interviewer

Okay. Gab es bestimmte Elemente daran, die euch irgendwie besonders motiviert haben?

[00:03:35.59] - User 1

Der Vergleich.

[00:03:37.11] - User 2

Ja, dass man das sieht, den Höhenunterschied. Das es immer wieder, wenn man daran vorbeigegangen ist, geblinkt hat und dann wieder dran erinnert hat: „Schau, soweit ist der andere und du bist nur soweit.

[00:03:55.06] - Interviewer

Okay. Also für euch war die Competition sehr wichtig, kann man sagen?

[00:03:57.59] - User 2

Ja!

[00:03:58.55] - User 1

Mhm

[00:03:59.38] - Interviewer

Wie sehr, würdest du sagen, hat das Awareness geschaffen, dass man doch ein bisschen besser mitkriegt, was der andere so alles macht im Haushalt?

[00:04:08.44] - User 1

Ja, schon sehr gut, weil wenn man dann gemerkt hat auf einmal, der Balken ist ganz woanders als vorher oder der andere hat mich überholt, dann ist es sehr deutlich gewesen.

[00:04:17.36] - User 2

Man sieht schon, wenn so was Großes zusammengeräumt wird, sieht man das natürlich, ja, aber so Kleinigkeiten, die fallen halt vielleicht nicht sofort auf. Aber wenn dann der Balken erheblich größer ist, dann schaut man vielleicht auch in der App nach, „Okay, was hat sich jetzt genau getan? Und dann fällt einem das schon mehr auf.

[00:04:34.58] - Interviewer

Okay, also es war eine gute Unterstützung zur App?

[00:04:40.14] - User 2

Ja.

[00:04:41.13] - Interviewer

Passt. Dann gehen wir noch mal auf dieses physische Bar chart ein bisschen genauer ein, dass ihr da stehen gehabt die letzten zwei Wochen. Ihr habt eh schon ein paar Punkte genannt und vom Einfluss her habt ihr, glaube ich, auch gemeint, das war eher positiv. Habt ihr da irgendwas, was ihr anmerken wollt bezüglich dem Einfluss dieses physischen Gegenstands?

[00:05:04.05] - User 1

Ich fand das Blinken auch relativ häufig mit dem Rotblinken von der Frequenz. Das war noch ein bisschen zu häufig, fand ich, ich weiß nicht genau, in welchem Abstand das jetzt war, aber es ist gefühlt dann häufiger gewesen, als ich es, glaube ich, gebraucht hätte um zu wissen, okay, ich muss was machen.

[00:05:20.22] - User 2

Und in der Nacht hat es auch geblinkt, wie ich geschlafen habe. Wenn ich mich bewegt habe, dann hat es auch geklinkt. Aber das passiert ja normalerweise nicht, aber ja.

[00:05:31.28] - Interviewer

Okay, dann machen wir eine kurze Bestandsaufnahme. Was hat für euch gut funktioniert? Wo würdets ihr sagen, wäre noch Verbesserungspotenzial darüber hinaus?

[00:05:43.05] - User 1

Eigentlich hat bei uns alles gut funktioniert. Auch die Installation war bei uns problemlos. Von dem her, es war relativ einfach zum Einstellen und es hat dann auch gut funktioniert. Wie gesagt, das Einzige fand ich in der Benutzung, dass das es so relativ häufig geblinkt und sich aktiviert hat. Das war ein bisschen bisschen anstrengend und mühsam, weil irgendwann …

[00:06:02.46] - User 2

Ja, da wäre es cool, wenn man irgendwo die Möglichkeit hätte, dass man das einfach einstellen kann, wie häufig das blinken soll.

[00:06:09.57] - User 1

Voll. Aber sonst … Da schließe ich mich dem an. Hatte ich gar nichts. War sehr komfortabel und es hat sich auch selber immer wieder geupdated mit den Punkten

und so. Das heißt, ich musste jetzt auch nicht in der App, also musste ich schon die Punkte eingeben, aber ich musste das jetzt nicht noch mal aktualisieren und überprüfen, weil das hat es man alleine gemacht.

[00:06:26.43] - Interviewer

Okay. Sehr Schön. Wie würdest du generell eine physische Darstellung von Appdaten bewerten? Würdest ihr das grundsätzlich als sinnvoll ansehe?

[00:06:38.57] - User 1

Ja, zuerst war ich ein bisschen skeptisch, aber ich war noch unvoreingenommen und wusste nicht ganz, was ich davon halten soll noch, aber wie ich es dann gesehen habe, vor allem mit dem Spielerischen, im Vergleich, passt das sehr gut und ich glaube, das ist besser, als virtuell eigentlich, weil du es direkt vor Augen hast und es präsenter ist. Ja, würde ich auch so sagen.

[00:07:01.18] - User 2

Ich meine, es kommt natürlich drauf an, was für Daten man darstellen möchte, aber im Allgemeinen ist es für die meisten, glaube ich, ansprechender, wenn man es einfach noch mal in echt vor Augen hat, als jetzt nur in einer App.

[00:07:12.53] - Interviewer

Könntet ihr euch das auch für andere Apps vorstellen?

[00:07:16.46] - User 2

Ich glaube schon.

[00:07:18.20] - User 1

Ja.

[00:07:21.44] - Interviewer

Okay. Dann hättet ihr noch irgendwas, was ihr hinzufügen würdet zu dem Prototypen, den ihr hattet, damit es noch besser funktioniert?

[00:07:33.16] - User 1

Wie gesagt, die Frequenz zum Einstellen, dass man es selber anpassen kann. Wie oft das ist, weil ich kann mir vorstellen, dass andere Leute es vielleicht sogar häufiger haben wollen oder so, aber sonst habe ich eigentlich nichts hinzuzufügen. Mir fällt jetzt auch gerade nichts ein.

[00:07:48.44] - Interviewer

Okay, perfekt. Das war es dann auch schon von meinen Fragen. Wollt ihr noch irgendwas anmerken?

[00:07:56.14] - User 1

Nein, hat Spaß gemacht.

[00:07:57.15] - User 2

Ja, war cool.

[00:07:59.53] - Interviewer

Ja. Das freut mich. Dann beende ich die Aufnahme.

L. Focus Group Session H5

[00:00:04.16] - Interviewer

Perfekt. Die Aufnahme ist gestartet. Das passt für euch beide?

[00:00:08.09] - User 2

Ja.

[00:00:08.27] - User 1

Ja

[00:00:09.40] - Interviewer

Passt. Okay. Ihr könnt gerne durchwechseln mit den Antworten. Einfach, wer gerade was sagen will. Wir brauchen da jetzt keine genaue Reihenfolge einhalten. Meine erste Frage wäre mal, einfach das generell aufzugreifen: Wie gut ist es euch damit gegangen, die App in euren Alltag zu integrieren in den letzten zwei Wochen

[00:00:32.58] - Interviewer

Eigentlich problemlos, schlicht und ergreifend deswegen, weil du machst mit der App nicht viel.

[00:00:37.12] - User 2

Du machst die Aufgabe, machst die App auf. Ich höre meistens nebenbei Musik oder Hörbücher. Deswegen habe ich das Handy sowieso bei mir mit, weil unsere Wände sind so dick, dass mein Bluetooth gerade mal zwei Räume hält und danach

abbricht. Das heißt, das Handy ist sowieso bei mir und dann bist fertig und drückst einfach in der App fertig. Aufgabe erledigt. Weiter.

[00:01:01.05] - User 1

Ich muss schon ab und zu mein Handy suchen, aber sonst kann ich es ja zur Not auch über das Handy von User 2 machen. Also ja das funktioniert ganz gut.

[00:01:14.33] - Interviewer

Okay, perfekt. Wie präsent, würdet ihr sagen, war sowohl die App, als auch dieses physische Sohlendiagram in eurem Alltag?

[00:01:26.14] - User 2

Während diesen zwei Wochen, würde ich schon sagen, sehr präsent. Auf lange Sicht gesehen ist natürlich der Gewöhnungsgrad zu bedenken. Wir haben das Ding hier zwischen uns stehen gehabt im Büro und das fällt schon auf. Vor allem, es macht ja Geräusche, auch wenn die Säulen hin-und herfahren, Das heißt, wenn es einen erinnert, dass man irgendwas vergessen hat, haben wir in der Zeit darauf reagiert oder zumindest ich habe darauf reagiert, indem ich dann arbeiten machen gegangen bin, damit sie weiterhin erinnert wird. Aber Die Frage ist halt, wie stark man sich dann im Laufe der Zeit daran gewöhnt.

[00:02:10.30] - User 1

Es ist auch selbst, wenn man es nicht vor der Nase hat, hat man mehr daran gedacht, was noch so ansteht, finde ich.

[00:02:22.03] - Interviewer

Okay. Wie habt ihr die Nutzung von der App generell erlebt über die letzten zwei Wochen? Unterstützend oder eher nicht?

[00:02:31.45] - User 2

Die App selber ist mühsam. Die Funktionalität der App ist extrem beschränkt in manchen Gebieten, wo man sich denkt, Ja, die App hat ja selber, dass du mit Abo dann Zusatzfunktionen kriegst, aber du kriegst auch nicht die Funktion, die du eigentlich bräuchtest. Wie zum Beispiel, wenn der Wochenplan irgendwann so fällt, dass Du bist am Nachmittag essen oder einen ganzen Tag weg bist, du kannst aber deine Tätigkeit nicht überspringen. Das heißt, du wirst daran erinnert, dass du deine Tätigkeit nicht gemacht hast, obwohl du sie nicht hast machen können. Das heißt, die App an sich, so ist sie einfach zu bedienen, aber es fehlt einfach Funktionalität, von der man sich eigentlich erwarten würde, dass sie von Haus aus in der App eingebaut ist, wo man dann die Augen schon ein bisschen verdreht:

„Warum habt ihr das nicht gemacht? Ihr habt so ein Abomodell, aber so einfache Sachen wie überspring den Tag, sind nicht drinnen. Also das ist sehr seltsam.

[00:03:34.41] - User 1

Es ist auch ein bisschen schwer, das wirklich teilweise zu planen. Ich habe dann versucht, ich weiß nicht, Küche aufräumen, alle drei Tage einzutragen. Dann ist mir aufgefallen, das ist zu viel. Dann habe ich es wieder umgeschrieben. Vielleicht kommt man ja auch irgendwann an den Punkt, wo man sagt, man hat den Rhythmus, dass man weiß, wo es wirklich realistisch ist. Aber einfacher wäre es halt zu sagen, einfach mal zu sagen: „Okay, es würde jetzt zwar anstehen, aber es ist nicht nötig. Oder Katzenkloß sauber machen. Ja, Wenn du sagen könntest, nein, ist nicht, müssen wir nicht.

[00:04:03.28] - User 2

Tatsächlich wäre es so eine Funktionalität, dass du sagst: „Wir fangen jetzt einfach an mit den Aufgaben und schauen dann einfach - ich überspringe das einfach am nächsten Tag, überspringe das noch einmal und er passt den Zeitraum dementsprechend an. Wäre zum Beispiel super - gibt es nicht.

[00:04:20.07] - Interviewer

Also an einen Snoose-Button, quasi.

[00:04:22.19] - User 2

Ja, wie ein Snoose-Button. Am besten auch noch mit einer Begründung reinschreiben, dass du kurz begründen kannst, warum du nichts gemacht hast, dann an dem Tag, das wäre vielleicht nett, damit man sich später dran erinnert, wenn man vielleicht - ich weiß nicht, ich kann dir nicht sagen, wie der Verlauf von der App dann ausschaut, weil der ist hinter dem Abo-Modell is - wenn man dann das Abo-Modell hat, dann kann man wahrscheinlich dann noch mal besser nachvollziehen, wann wer was, wie gemacht hat. Und da wäre natürlich eine Anmerkung schön wie zum Beispiel: Waren essen.

[00:04:55.25] - Interviewer

Okay, sehr gut. Wenn wir dann trotzdem noch mal auf die Haushaltsaufgaben per se zurückgekommen? Wie würdet ihr sagen, hat die Nutzung von dieser Kombination aus App und physischer Komponente eurer Haushaltstätigkeit verändert? Habt ihr irgendwelche Veränderungen in den letzten zwei Wochen wahrgenommen?

[00:05:22.19] - User 2

Man war trotzdem bemühter. Man wird physisch erinnert und dieser physische Faktor. Und natürlich, der Test oder deine Arbeit ist ja darauf hinausgelaufen, zu schauen, was Gamification bewirkt. Und natürlich, wenn man mit dem Gedanken reingeht, man spielt gegeneinander bis zu einem gewissen Grad. Zumindest bei mir war das dann natürlich, vor die Reaktionen von User 1 darauf waren halt sehr witzig, was dann dazu geführt hat, dass ich mich natürlich mehr angestrengt habe als sonst. Einfach und schauen, wie reagiert sie drauf. Also es hat zumindest einen Spaßfaktor in den zwei Wochen gebracht.

[00:06:12.31] - User 1

Längerfristig, denke ich, würde es aber trotzdem was bringen, weil man sich halt wirklich mal Gedanken machen muss. Wir haben uns nie Gedanken gemacht, was eigentlich in der Woche so gemacht werden muss. Und allein das hat ja schon dazu geführt, dass es sich nicht so anhäuft.

[00:06:27.16] - User 2

Das fand ich ganz spannend. Der physische Teil ist sehr spannend. Ich meine, das ist jetzt nur ein Prototyp, aber so was wie ein Dartboard könnte ich mir vorstellen oder ein Bild, wie ein Bild an der Wand, das dir dann quasi mit Säulen anzeigt, wie viel du gemacht hast. Ich denke, da kann man schon witzige Sachen machen und es kann auch so platziert werden und so angebracht werden im Haushalt selber, dass es nicht stört und auch sichtbar ist ständig, wodurch du immer daran erinnert wirst: "Mach einfach deine Haushaltsaufgaben". Da denke ich schon, dass das was bringen könnte. In der Form vielleicht auf Dauer würde er wahrscheinlich nicht dastehen, einfach weil er zu klobig ist in seiner Prototypversion, aber das ist, wie gesagt, ein Prototyp.

[00:07:22.45] - Interviewer

Ihr habt diesen kompetitiven Faktor angesprochen, was euch sehr geholfen haben dürfte. Gab es auch noch andere Elemente, wo ihr sagt, „Das hat mich jetzt besonders motiviert" oder war es wirklich dieses „Okay, wir spielen jetzt quasi gegeneinander?"

[00:07:42.07] - User 2

Nicht nur. Es ist auch einfach die Tatsache, dass du nicht nachdenken musst. Du musst nicht nachdenken: „Habe ich das jetzt gemacht?, sondern du schaust in der App passt: „Ich habe die Küche saubergemacht, weil es sind dann Natürlich, es geht die Kleinigkeiten, wie zum Beispiel Geräte putzen, weil wenn du kochst, das Öl lagert sich dann trotzdem überall ab, wenn du frittierst oder brätst. Hast du in letzter Zeit das weggemacht? Siehst es vielleicht nicht beim ersten Durchschaue - vor allem wenn es jetzt im Winter so früh finster wird, du kommst später nach

Hause, es ist schon dunkel, das Licht mit LED-glühbrinen, wie wir es jetzt alle haben, ist nicht so gut. Habe ich das jetzt saubergemacht oder nicht? Für solche Sachen, finde ich, ist es schon sehr hilfreich, die App zu haben.

[00:08:36.49] - User 1

Ja, ich habe auch gemerkt, dass man eher an so Sachen mal denkt, die man sonst erst tut, wenn sie schon ziemlich schlimm sind. Ich habe die Woche vielmehr einfach mal eine Spüle saubergemacht oder einen Ofen gereinigt oder ein Zeranfeld, was ich sonst immer mache, wenn es dann schon richtig schlimm ist und mir das dann halt auffällt.

[00:09:00.41] - User 2

Wobei der lustige Faktor war, bei ihr war es so, dass User 1 dann quasi auch mal Sachen gemacht hat, die ich normalerweise mache, wie Spüle sauber machen oder so, was normalerweise ich noch mache. Aber es gibt auch Bereiche, da hat sie überhaupt nichts gemacht trotzdem. Auch wenn man da theoretisch total viele Punkte hätte bekommen, hat sie einfach nicht gemacht. Weil wir haben zum Beispiel einen Punkt gehabt: Müll raus bringen, weil wir haben nur relativ kleine Mistklübel. Das macht sie einfach nicht. Und ich habe dadurch unheimlich viele Punkte, weil wir müssen fast einmal am Tag mit den Katzen, mit den Katzenfutter, Dosen und so weiter, mit ihren Milchpackungen und so, wenn sie Kaffee trinkt, das landet alles im Plastikmüll und du musst trotzdem einmal am Tag rausgehen.

[00:09:52.23] - User 1

Die Aufgaben, die vorher schon bei dir waren, die haben ich dirr gelassen.

[00:09:56.10] - User 2

Also das, was quasi vorher schon eingefahren war bis zu einem gewissen Grad oder wo klar war, das macht der eine oder der andere, das hat sich nicht wirklich geändert.

[00:10:03.28] - User 1

Nein, das hat sich nicht verändert.

[00:10:07.13] - Interviewer

Okay, dann gehen wir noch mal genau auf diese physische Komponente ein. Ich glaube, dass ihr es sinnvoll haltet, das zu der App zu machen. Habt ihr eigentlich beide schon bejaht. Könntet ihr euch das grundsätzlich auch noch für andere Apps vorstellen?

[00:10:26.59] - User 1

Ja, du hast es halt ständig im Blickfeld. Also Ich bin auch ein Fan von diesem, was manche auch machen: die machen so auch mit Arduino, dass sie alte Tablets oder so verwenden und dann so Wetterdinge irgendwo darstellen oder die aktuellen E-Mails anzeigen in der Früh oder so. Das finde ich schon ganz spannend, weil man dass einfach immer mal schnell im Blick hat. Ich denke, wenn man das für so praktische Sachen nimmt, man sieht es halt eher. Ich nehme mein Handy nicht so oft in die Hand, tatsächlich, dann würde ich auch nicht die App aufmachen. Da siehst du es halt. Vor allem das Spannende ist ja auch, dass mittlerweile die Dinge wesentlich kleiner sein können.

[00:11:06.41] - User 2

Das wäre ja vor ein paar Jahren gar nicht gegangen. Einfach, weil du hast es, wenn dann aufwendigst, selber bauen müssen, die Teil war nicht so klein oder noch gar nicht entwickelt. Aber wie du gezeigt hast mit dem Arduino und dem, man kann da schon relativ kompakt mittlerweile was bauen. Und ich denke auch, dass man wie man mittlerweile sagt, so schön mit einem Gag oder als Gadget, kann man das schon, denke ich mal, irgendwo unterbringen im Haushalt, als Bilderrahmen oder in Form von irgendeiner schönen Skulptur oder so. Da kannst du es ja mittlerweile überall einbauen. Und ich denke, mit so einer physischen Komponente, wo man erinnert wird, das kann natürlich auch multifunktional sein. Es kann auch in einer Uhr verbaut sein, die man sich aufhängt oder so. Also ich denke, dass die physische Komponente schon sinnvoll ist und auch für … Ich weiß nicht, für wie viele andere Apps das sinnvoll sein würde. Vor allem im Hinblick, wenn man es jetzt auf Gamification betrachtet, wird mir jetzt aus dem Stehgreif nichts einfallen, ehrlich gesagt.

[00:12:25.11] - Interviewer

Mein Gedanke in die Richtung wäre so was gewesen, dass alles, wo man Punkte und Fortschritte sammelt, wird zum Beispiel eine Sprachlern-App.

[00:12:32.37] - User 2

Ja, ja, ja. Denke ich, denke ich, würde sogar sehr gut funktionieren, wenn du siehst, wenn du irgendwelche Lern-Apps oder Wissens-Apps benutzt, dass du da deinen Fortschritt angezeigt bekommst bis zum nächsten Kapitel oder bis du den Teilbereich abgeschlossen hast, denke ich, könnte schon funktionieren.

[00:12:55.36] - Interviewer

Oder natürlich Sport.

[00:12:56.37] - User 1

Bei Udemy gibt es auch so was, dass du immer erinnert wirst, dass du den Kurs weitermachst. Da gibt es ja auch so was. Der Vorteil ist, wir haben sehr unterschiedliche Mobilfunk, Nutzungsdisziplin oder Verhalten.

[00:13:18.12] - User 2

Ich habe meins irgendwann mal komplett auf lautlos geschaltet. Ich benutze meins gar nicht mehr mit Ton oder so und ich schalte die meisten Benachrichtigungen auch aus, weil ich schaue einfach nicht drauf, weil durch die Arbeit ist es … Ich benutze mein Mobiltelefon momentan in der Arbeit nicht wirklich, also zum Audiobook hören, aber ich schaue nicht drauf. Deswegen ist mir wurscht, was da ankommt. Wenn, dann muss ich sowieso von Hand drauf schauen und dann kann ich auch antworten, wenn ich irgendwas Wichtiges bekomme. Aber der Rest interessiert mich nicht, weil ich nicht die Zeit dafür habe. Und natürlich, ich schalte das Handy am Abend dann nicht wieder auf laut und die Benachrichtigungen alle ein, das bleibt dauerhaft. Und da ist natürlich eine physische Komponente schon interessant, weil das ist was unabhängig von der Plattform, die ich da gerade wie auch immer benutze. Das ist halt am Punkt.

[00:14:15.25] - User 1

Was auch noch gehen würde, ist so was wie Einkaufen, dass man so eine Einkaufsliste hat und dann man so eine Erinnerung machen kann: „Hey, bitte, das ist dringend. Kannst du das vielleicht einschieben? Dass man das in der Küche sehen würde, wenn man vorbeigeht oder so, wenn man zu Hause ankommt, zum Beispiel oder irgendwie so was. Wenn man nicht aufs Handy guckt, dass man zumindest sieht: „Hey, das ist vielleicht dann so langsam dringend. Für so was könnte ich es mir auch vorstellen.

[00:14:39.41] - Interviewer

Okay, dann danke. Haben wir noch einen letzten Punkt. Da dürftet würdest du jetzt gerne den Prototyp an sich zerlegen oder gut heißen, wie auch immer ihr wollt? Was wäre eure Bestandsaufnahme? Was hat gut funktioniert? Was hat nicht gut funktioniert?

[00:14:56.47] - User 2

Es ist auf jeden Fall so, wie er gebaut worden war immer ersichtlich, wer von den Punkten führt. Das war nicht das Problem. Das einzige Problem war eben, jetzt am Ende von den zwei Wochen hat am Ende die Funktionalität komplett gesponnen, bevor er dann sich resettet hatte. Ansonsten, der Bewegungssensor war vielleicht ein bisschen zu sensibel. Also zeitweise hat er aktualisiert, Ich nehme mal an, er aktualisiert nur, wenn der Bewegungssensor aktiviert ist. Teilweise hat

er aktualisiert, wo niemand sich jetzt in seiner … Also keiner Ahnung, wie der Bewegungsmelder da Alarm geschlagen hat. Das war hin und wieder ein bisschen unheimlich, weil theoretisch schaut der Bewegungsmelder zwischen uns nach hinten an die Wand und wir sitzen beide hin und er aktualisiert sich einfach. Es hat sich aber niemand bewegt. Es ist nichts passiert, aber er aktualisiert sich.

[00:16:05.51] - User 1

Ich denke, dass der so 180 Grad hat, so was.

[00:16:08.20] - User 2

Ja, aber er hat es nicht immer gemacht. Das war ja das selte.

[00:16:10.53] - Interviewer

Es kann auch da sein, dass es so False Positives gibt durch irgendwelche Lichtreflexionen.

[00:16:16.43] - User 2

Ja, aber sonst, ich denke mal, für einen Eigenbau hat er super funktioniert.

[00:16:28.11] - User 1

Ich habe mich auch ein bisschen manchmal gespielt und mit den Säulen manchmal so ein bisschen einfach aus Spaß. Wenn ich auch gemerkt habe, dass er zu weit gefahren ist oder so, dann hat er sich ja immer trotzdem korrigiert, aber zwischendurch haben wir dann manchmal damit herum gespielt.

[00:16:40.19] - User 2

Aber ich finde die Technik interessant, weil im Endeffekt schubst du einfach die Säule nach oben, ohne dass dass irgendwie eine Skala drinnen ist, die was hochfährt, wenn ich das richtig verstanden habe.

[00:16:51.16] - Interviewer

Genau. Also im Endeffekt kann man sich es vorstellen, wie ein großer Widerstand und je nachdem, wo er gerade ist, kriegt er einen anderen Wert zurück und er fährt halt, bis der Wert erreicht ist und dann passiert es halt manchmal, dass er zu schnell ist.

[00:17:06.32] - User 2

Ja, interessant gemacht auf jeden Fall.

[00:17:09.40] - User 1

Ja, ist fast sehr lustig. Mich hat halt das Erinnern hat mich tierisch genervt.

[00:17:14.43] - User 2

Seit dem dritten Tag oder so des Versuchs, habe ich mindestens einmal am Tag gehört: „Schatz, der mobbt mich schon wieder.

[00:17:26.00] - Interviewer

Man kann sagen, es war ein tägliches Gesprächsthema.

[00:17:29.23] - User 2

Ja, Es war definitiv ein tägliches. Auch wenn es nur sie aufgegriffen hat und sich beschwert hat, dass sie schon wieder gemoppt wird. Aber es ist täglich darüber gesprochen worden.

[00:17:39.25] - User 1

Ja, mir ging es jetzt ein paar Tage nicht so gut und dann habe ich auch gesagt: „Ich mache das jetzt nicht und das hat er nicht so ganz akzeptiert."

[00:17:48.44] - Interviewer

Würdet ihr euch da vielleicht was wünschen, dass man das auch mal teilweise deaktivieren kann oder dass die Erinnerungen vielleicht eine andere Natur haben, dass sie nicht ganz so extrem sind?

[00:17:59.50] - User 1

Ja, generell wäre es vielleicht ganz gut, dass man entscheiden könnte, ob das Ding einen überhaupt erinnert und dann vielleicht nicht mit dem Ständigen hoch und runterfahren, sondern vielleicht einfach nur mit Blinken oder so. Das wird ja auch schon reichen. Wenn die Säule dauerhaft irgendwie sich so bewegen würde mit so leuchten, wie wenn sie sich aktualisiert, dann wüsste man ja, okay, da ist irgendwas. Aber so ist es halt ein bisschen nervig.

[00:18:24.30] - User 2

Ja, du bist einfach nur gemobbt worden. Das war dein Problem. Es ist nicht nervig, sondern du bist gemobbt worden, weil die Aufgaben nicht gemacht hast.

[00:18:32.43] - Interviewer

Würdet ihr noch irgendwas empfehlen?

[00:18:37.16] - User 2

Ja, wie gesagt, als Prototyp denke ich ist schon, okay, aber halt in der Form … Also wenn, dann müsste das Ganze noch kompakter sein und vielleicht irgendwo

in irgendwas integriert sein, was man sowieso im Haus stehen hat oder was man so auch haben würde. Also quasi irgendein multifunktionales Gerät.

[00:19:10.02] - User 1

Na ja, tatsächlich überlege ich, was in die Richtung zu machen. Also jetzt irgendwie entweder analog oder irgendwas Digitales. Man könnte ja auch ein altes Tablet für so was nehmen, zum Beispiel, das anzuzeigen. Tatsächlich hatte ich schon so ein bisschen paar Ideen jetzt entwickelt, was ich eigentlich machen könnte damit.

[00:19:27.40] - Interviewer

Sehr cool, dann haben wir noch eine abschließende Frage. Ich glaube, ihr habt das eh schon teilweise beantwortet, aber könntet ihr euch vorstellen, diese Kombination aus App und Prototyp auch in Zukunft weiterzuverwenden?

[00:19:45.11] - User 1

Also den speziell nicht, weil ich glaube, er ist einfach zu unhandlich und zu groß. Aber sonst?

[00:19:54.28] - User 1

An sich die Idee schon, ja.

[00:19:55.31] - User 2

Also generell die Idee ist gut. Wie gesagt, nur er selber ist natürlich - wir haben auch nicht wirklich viel Abstellfläche, weil wir haben ein relativ kleines Haus und wir sind immer ein bisschen am Suchen nach Abstellfläche. Und das, wo jetzt steht, ist auch noch eine Notlösung, weil im Endeffekt steht er jetzt in der Katzerstraße, wo die Katze dann immer durchlaufen … Weil zwischen den Stühlen haben wir, siehst du, diesen Hocker da oben am Tisch, der ist fest angemacht und da liegt die Katze immer drauf und jetzt steht er im Endeffekt davor. Das heißt, im Endeffekt steht er dann momentan der Katze im Weg.

[00:20:37.21] - User 1

Ja, aber in der Küche wollte ich ihn auch nicht stehen lassen. In der Küche saut man ihn an. Deswegen war dann die Idee, den hierher zu stellen. Ja, ist halt ein bisschen klobig. Aber so an sich ist es super.

[00:20:49.02] - Interviewer

Perfekt. Das wäre es dann von meinen Fragen auch. Habt ihr noch irgendwas, was ihr anmerken wollt?

[00:20:58.36] - User 1

Ja, danke, dass wir uns mal Gedanken über unsere Hausaufgaben gemacht haben. Dass wir da vielleicht auch mal ein bisschen System reingekriegt haben. Also tatsächlich, da werden wir uns jetzt was überlegen.

[00:21:57.13] - Interviewer

Passt.

[00:22:08.17] - User 2

Ansonsten danke, dass du uns da mit einbezogen hast. Waren recht witzige 14 Tage.

[00:22:25.44] - Interviewer

Das freut mich. Ich sage danke.

[00:22:29.41] - User 2

Ich hoffe, du hast viel Erfolg mit deiner Masterarbeit.

[00:22:32.11] - Interviewer

Ja, es waren sehr coole Inputs auch wieder und dann werden wir das alles zusammenfassen. Vielen Dank.

[00:22:40.37] - User 2

Dann dir noch einen schönen Abend.

M. Focus Group Session H6

[00:00:00.02] - Interviewer

Okay, die Aufnahme läuft. Das passt für euch beide?

[00:00:09.55] - User 2

Ja.

[00:00:10.17] - User 1

Ja

[00:00:12.11] - Interviewer

Perfekt. Dann starten wir mit der ersten Frage zu einer so generellen Bestandsaufnahme: Wie leicht war es für euch, die App in den Alltag zu integrieren?

[00:00:23.16] - User 1

Es war einfach, aber dadurch, dass ich mich immer daran erinnern musste, sie aufzumachen, nachdem ich was getan habe, war es wiederum schwer. Es war schwer, mich daran zu erinnern, dass ich es mache. Ich glaube, ich habe mich hauptsächlich daran erinnert, weil wir daran teilnehmen.

[00:00:43.26] - Interviewer

Das heißt, sonst wäre es für dich schwierig gewesen, das regelmäßig aufzumachen?

[00:00:48.13] - User 1

Ja, sonst hätte ich keinen Grund gesehen, das zu machen. Und du?

[00:00:54.23] - User 2

Ja, da ich nur an einem Tag immer Hausarbeit mache, war es nicht so schwer. Ich habe halt alles gemacht, ist dann in der App angekreuzt.

[00:01:03.14] - Interviewer

Okay, passt. Ihr könnt es gerne abwechselnd antworten. Ihr müssen auch nicht beide antworten, je nachdem, wie ihr gerade was sagen wollt. Wie habt ihr generell die Nutzung über diese zwei Wochen erlebt mit der App?

[00:01:15.35] - User 1

Na ja, es gab Dinge, die fand ich merkwürdig. Zum Beispiel, wenn ich auf meinem Handy was ankreuzen wollte, was eigentlich seine Aufgabe gewesen wäre, wurde da gleich abgefragt, ob ich für ihn das abhakeln will oder für mich. Und das ist nervig empfunden, weil wenn ich es auf meinem Handy, auf meinem Account abhake, dann ist es ja klar, dass ich es gemacht habe und nicht er. Und ich glaube, da sind auch einige Fehler passiert. Das hast du aber auch komisch gefunden, oder?

[00:01:49.08] - User 2

Ja, das war schon verwirrend, wenn man das sagt, man hat das gemacht und dann wird man noch mal gefragt.

[00:01:55.10] - User 1

Ja. Und dann vergisst du, bin ich eigentlich User 1 oder User 2?

[00:02:03.01] - Interviewer

Würdet ihr sagen, dass die App irgendwie Einfluss auf eure Haushaltstätigkeit genommen hat?

[00:02:11.41] - User 1

Überhaupt nicht. Dadurch, dass ich die App extra öffnen muss und extra die Punkte suchen muss, wo auch immer sie in der App stehen, nein, hat mich überhaupt nicht beeinflusst.

[00:02:42.28] - Interviewer

Aber es gab jetzt auch keine Aspekte, wo der sagt, das würde euch grundsätzlich motivieren von der App?

[00:02:53.59] - User 1

Die ersten paar Tage hat User 2 sich ein bisschen lustig über mich gemacht, dass er mehr Punkte hat, aber sonst nein.

[00:03:02.22] - Interviewer

Okay, so ein bisschen die Competition vielleicht, aber …

[00:03:06.29] - User 1

Ich habe einfach nicht mehr auf die Punkte geschaut. Dann ging es mir wieder gut.

[00:03:09.05] - Interviewer

Okay, perfekt. Würde euch irgendwas einfallen, wie man das Ganze verändern könnte?

[00:03:25.52] - User 1

Was ich vorhin genannt habe, dass wenn ich auf meinem Account gehe, dass er automatisch versteht, dass das für mich ist und nicht für User 2, auch wenn das seine Aufgabe war, weil das heißt, ich habe das jetzt erledigt. Und sonst? Ich weiß nicht, ob es in dieser App eine Einstellung gab, dass man Benachrichtigungen für die Punkte bekommt. Gab es das?

[00:03:54.08] - Interviewer

Ja

[00:03:54.50] - User 1

Okay, dann haben wir sie beide ausgemacht.

[00:03:57.08] - Interviewer

Also für die Punkte per se nicht. Es Es gibt theoretisch Nachrichten, wenn man eine Aufgabe erledigen soll. Genau. Und am Dashboard, erscheint dann kurz so ein Feedback, wenn man eine Aufgabe erledigt hat. Das schon.

[00:04:14.38] - User 1

Ja, Also mich hätte es, glaube ich, wenn ich ständig Benachrichtigungen bekommen würde, wer wie viele Punkte bekommen hat, das hätte mich schon ein bisschen nervös gemacht. Ja, ihn nicht, weil er macht es ja sowieso. Aber ich glaube, ich hätte ein bisschen mehr beigetragen.

[00:04:31.25] - Interviewer

Okay. Und wie präsent, würdet ihr sagen, war die App in eurem Alltag?

[00:04:39.24] - User 2

Einmal in der Woche, zwei Minuten. Also nicht sehr.

[00:04:47.10] - User 1

Ja, ungefähr so. Sie war nicht besonders präsent. Ich habe mich immer daran erinnert, weil ich mir gedacht habe: „Ich soll das ja machen, ich soll das ja aufzeichnen, aber ich würde die app nie nutzen, wenn ich es jetzt nicht müsste.

[00:05:05.59] - Interviewer

Okay, also wenn ihr nicht teilgenommen hättet, wäre es noch weniger Erinnerung gewesen daran, die Aufgaben abzuhalten.

[00:05:14.44] - User 1

Ja.

[00:05:14.56] - Interviewer

Okay, perfekt. Das war es dann schon von meinen Fragen. Habt ihr noch irgendwas, was ihr anmerken wollt?

[00:05:22.52] - User 2

Nein

[00:05:23.08] - User 1

ja, ich glaube, auch nicht.

[00:05:27.03] - Interviewer

Okay, dann sage ich vielen Dank für eure Unterstützung.

[00:05:31.23] - User 1

Gerne.

[00:05:31.17] - Interviewer

Ich stopp die Aufnahme.