Individual project report Lumina – The Interactive Task Tracker

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Abstract
This report presents the process and outcomes of an *Interactive Task Tracker* prototype designed to motivate children towards sustainable lifestyle habits. The development involved researching motivational aspects, children's chores and similar products. Through brainstorming, interviews and a mix of low and high-fidelity prototyping, *Lumina* was crafted with the goal to motivate children by visual feedback. This report explains the design process, key decisions, challenges and implemented solutions. A critical evaluation of Lumina's performance was conducted. Future work suggests including sound feedback, family collaboration and customized stickers.

Author Keywords
task tracker; housework; motivation; prototype development; tangible interface; interaction design.

Introduction
Motivating children to complete their daily chores presents a notable challenge for parents and caregivers. Research indicates that children who learn to do chores at an early age are more likely to have a better understanding of social, academic and life satisfaction competencies later in life [1]. In line with the aim to foster personally sustainable and rewarding lifestyle habits from a young age, there is a growing interest in exploring the question of how. To address this, a prototype has been developed with the intention of motivating children to engage in daily chores and explore if an interactive task tracker effectively could encourage this. Through a combination of brainstorming, user testing and interviews the efficacy of this prototype have been evaluated. The purpose is exploratory, finding out whether this could lead to improvement of task achievements in the target group of children between the age of four to 10.

Related work
With the background that chores help to socialize their children into becoming responsible and independent individuals [1, 2], we wanted to create a prototype to influence children to perform their daily tasks and evaluate if it increases motivation. Creating good habits are critical for supporting long-term goals and could

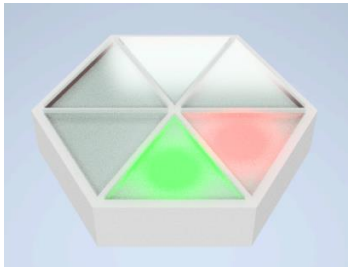

Figure 1: 3D model made in AutoCAD Inventor.

translate into better outcomes related to student learning and well-being [3].

Li and Sims [2018] notes that doing family chores is essential for fostering feelings of gratitude and understanding of social justice, as it allows children to share family burdens and contribute to family goals [4]. With the target group of four to 10, it is relevant to look into their upbringing, as parents play an important role in reinforcing good habits for children.

The authors suggest that the most effective strategy that can teach young children how to behave in a moral manner is to perform tasks within the family which makes them get a better insight into parental roles and responsibilities, where they are engaged collaboratively with parents and/or other adults in determining appropriate limits [4]. To succeed the child needs to have a supporting person checking that the child fulfils the task, and thereby this prototype is aimed for the grown-up audience as well.

Digital apps and gamified platforms have emerged as a complement to ordinary chore boards. Studies have shown that gamification can improve motivation and participation in family housework tasks by making chores more engaging, encouraging motivation and collaboration as well as creating a sense of achievement. By incorporating game elements into household chores, children in the age of 6-12 are more likely to actively participate and enjoy the tasks at hand. The authors discuss the concept of using interactive tangible products, specifically "chore boards," as a prototype to motivate children to engage in household chores [5].

Despite the growing research on chore motivation in children, several gaps exist in our understanding of effective strategies for promoting sustained engagement in household tasks. The authors see a problem with existing gamification apps in that they heavily rely on rewards over motivational factors that the user feels personal fulfilment of [5], which means that current apps designed to encourage household chores among family members, particularly children, may not effectively promote motivation. Therefore, it is of interest to explore this further since we want to create technological innovations that show promising results in engaging children to participate in household tasks without the aspect of gamification.

Design Approach

The target group for the project is children between the age of 4 and ten. The method Double Diamond has been used, chosen for its effectiveness and facilitation of iterative processes. During brainstorming, we used a technique like Crazy 8 to enhance creativity of the Discover and Define phases to try different sketches.

Both high and low-fidelity prototypes presented both advantages and drawbacks in the development of Lumina. According to Benyon [2010], low-fidelity sketches offer quick and simple creation, aiding in rapid testing and concept iteration [6]. Lim et al. [2008] further emphasise the cost-effectiveness of low-fidelity prototypes, particularly for basic design exploration, often by paper sketches [7]. This approach allowed us to experiment with the format, model, and design concept effectively.

After chosen concept [Appendix A] we developed a low-fidelity prototype [Figure 2]. To understand colour

Figure 3: Final Prototype of the Interactive Task Tracker that showcases the design and functionality.

choices, we made an additional 3D model, illustrating light and colours to our participants [Figure 1]. The choice of colour played a significant role, supported by research of children's preferred colour choices of red and green [8].

Iterating through the Discover and Define phase, an interview guide got created focusing on the prototype's engagement, motivation, and usability for children. Qualitative interviews maintained open structure and quantitative questions provided insights into specific design aspects [Appendix C]. User tests involved three participants, two from school and one externally. A convenience sampling approach were used because they were recruited from our vicinity [9]. Theoretical aspects addressed learning, inclusiveness, and longevity. Physical prototype evaluations were made by showing the 3D-model to be able to test visual feedback, user experience and colours. The Lab UX Study method, chosen for controlled conditions, suited our timeframe. Tests, led by pairs, lasted approximately 15 minutes each.

We used a thematic analysis approach to interpret the collected data, which is a suitable method for analysing qualitative data [10]. Important interview insights were highlighted, forming themes for adjustments. Quantitative questionnaires were averaged for evaluation. The analysis identified themes for further development [10]. Results suggested potential of our design to boost children's motivation, e.g. sound feedback. While optimism exists, there's uncertainty regarding behaviour change in children already accustomed to chores and introducing the product to children who are new to them might give better results.

As noted by Lim et al. [2008], low-fidelity prototypes may suffer from limited functionality, posing challenges in comprehension [7]. Iterating through a new developing phase with higher fidelity, we incorporated electronic components and magnets [Figure 3]. Both filtering (what the prototype represents) and manifestation dimensions (how it is represented) was important because they allowed us to make choices about final design by exploring different design dimensions [7]. Lim et al. [2008] present how different manifestation dimensions can influence people's perception of a prototype [7] and we focused on material choice (magnets, frosted acrylic plastic, 3D-printed box) and filter dimensions as appearance (hexagonal shaped box, triangle pieces, stickers, transparency and light) since we wanted them to fit for our target group [7]. The lights connected to it were crucial for showing the prototype's capabilities.

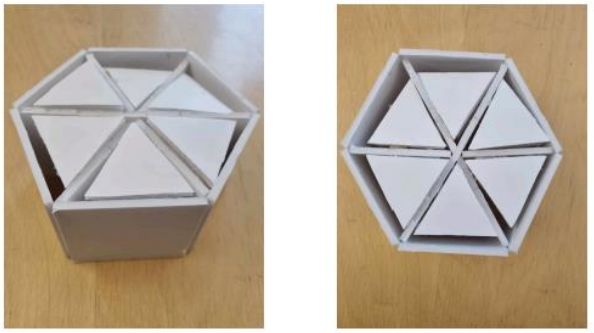

Figure 2: Low fidelity prototype of Kappa board and rubber bands.

Prototype Evaluation

This type of project entails testing the prototype with children, though this presents ethical challenges

Future Work

- Connect several task trackers
- Implement sound
- Light show patterns
- Enable customised stickers

regarding interview methods. When interviewing parents, the reliability of their insights into their children may be questionable. Understanding the unique characteristics of each child complicates the grasp of the entire user group's scope, necessitating interviews with a broader range of individuals for a full understanding. Opinions on engaging and fun interactive interfaces may vary across different age groups, posing difficulty for parents to fully comprehend. Our aim was to secure more participants, but finding suitable participants within the time-frame presented a challenge. Our goal was to recruit approximately 20 participants to ensure a comprehensive range of perspectives and to get reliable results.

Following the quantitative evaluation, we observed that three out of four questions scored above the value five. However, there are several areas identified for improvement to enhance overall satisfaction. Of particular concern is the need to enhance the product's fun and inviting attributes, as this aspect received a score below five. It's worth noting that the digital 3D-model may have influenced participants' responses. The absence of a partially functioning physical model could have led participants to subconsciously fill in expected feedback, potentially distorting their perception of the prototype's intended outcome. The digital model would not accurately convey the appearance of the final physical product, thereby limiting the feedback received.

Feedback on colour choices should be viewed with scepticism, as digital models may not accurately represent real-world colours due to software limitations. Moving forward, user tests should be conducted on the high-fidelity prototype to gauge improvements based on the feedback received. One drawback of high-fidelity prototypes is their time-consuming nature [7], which influenced our decision not to fully implement our initial idea of implementing patterns of light shows. When crafting a prototype to showcase specific aspects of a design concept, careful consideration of material and detail resolution is essential. Understanding the anatomy of prototypes, including material and fidelity choices, enabled us to make informed decisions aligned with user requirements.

Lim et al. [2008] emphasise that the selection of what to exclude is consistently guided by the intended goal of prototyping [7]. The choice of filters, manifestations, and the fidelity level of the prototype should align with specific design process goals and prioritise what needs to be demonstrated. Ultimately, the final prototype should focus on showcasing functionality to ensure users understand the interaction [7] and thereby, in the limited time frame, we prioritised coding to achieve desired functionalities, such as transitioning between different colour appearances when adding each piece on the surface.

Future Work

In the future, connecting several task trackers to encourage collaboration between family members could be explored. The potential of this concept extends beyond household chores. By focusing on the principles of motivation and positive reinforcement, future iterations could empower individuals of all ages to tackle tasks in education or workplace settings.

Further iterations of the design would focus on developing sound feedback such as melodies or chimes upon task completion as well as extended light show patterns. Future developments might also explore incorporating customizable stickers to enhance personal connection and investment in the chore completion process

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Appendices

Appendix A: Collection of Images

The following appendix contains a collection of images that supplement the main content of the report.

Figure 4: Sketching session with team members generating initial ideas for the prototype.

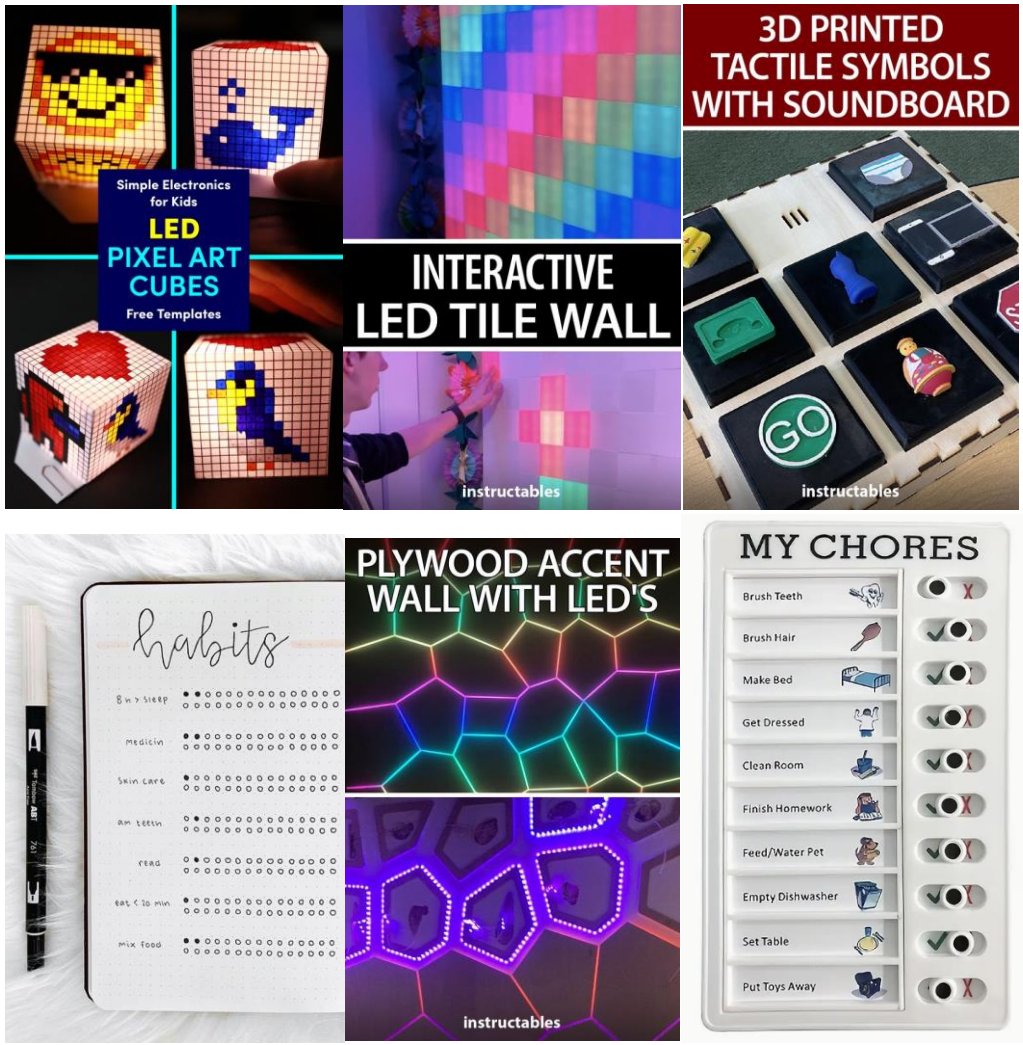

Figure 5: This collage captures the dynamic process of benchmarking and idea generation within the group, exploring solutions and gathering inspiration.

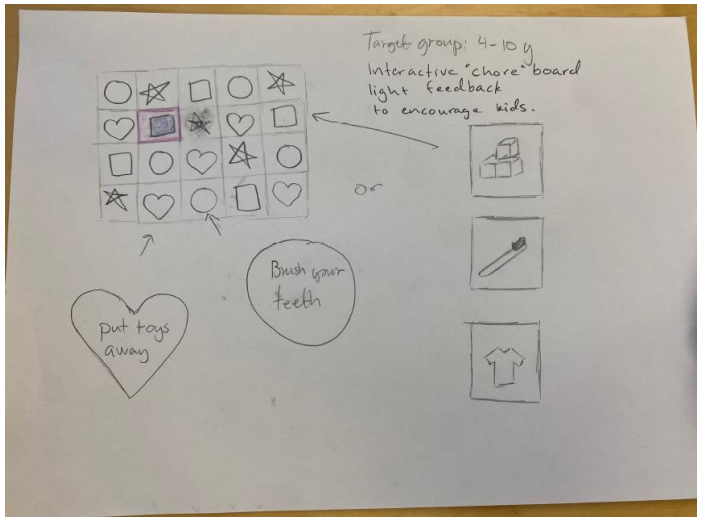

Figure 6: specific details of the design are not clarified, this sketch captures our decided concept during ideation phase, showcasing the core elements and key features.

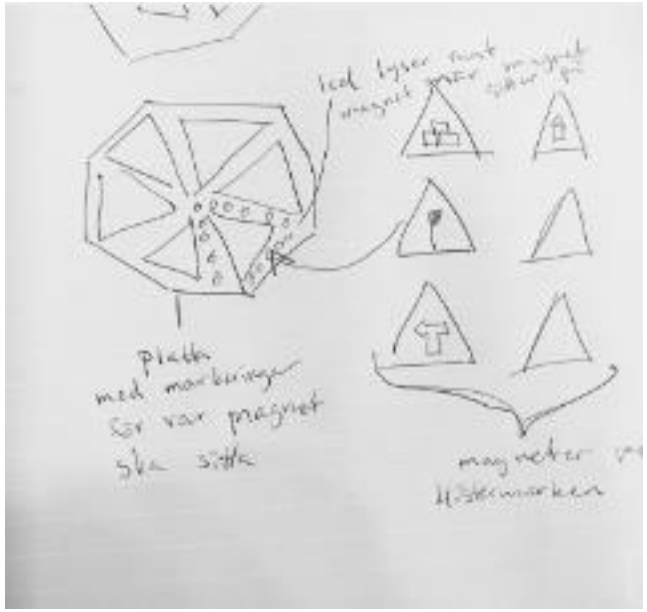

Figure 7: An additional sketch illustrating the chosen concept with our refined design idea.

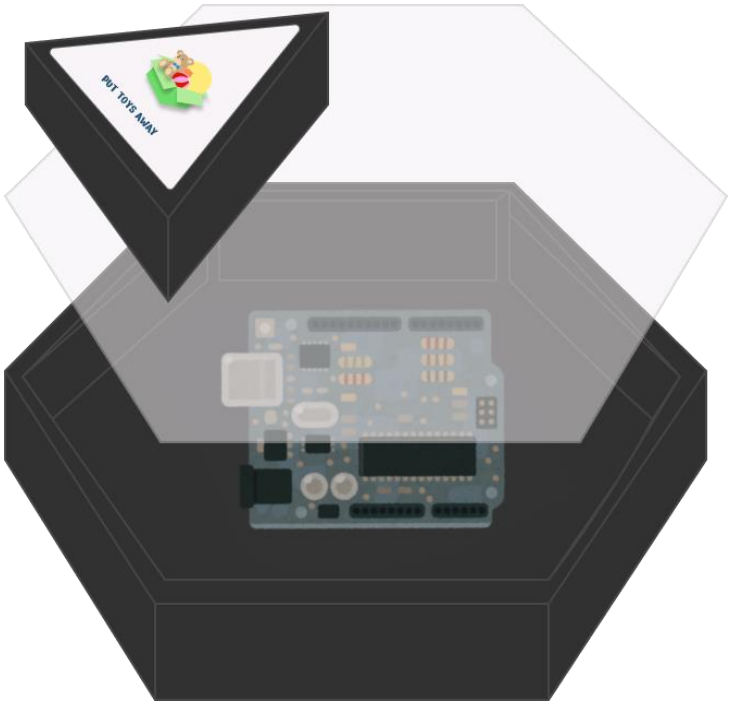

Figure 8: Ahis prototype created using sketching software, showing visual design choices regarding colour, stickers and box design.

Appendix B: Participants and result

Participant	Age	Gender	Occupation	Relation to Kids (age 4-10)
1	25	Male	Student	No relation other than having two baby brothers (10 vs 8 y younger)
2	27	Female	Student	Worked with childcare
3	28	Female	Assistant nurse	Mother of two (3, 6 y old)

Figure 9: Table of participants

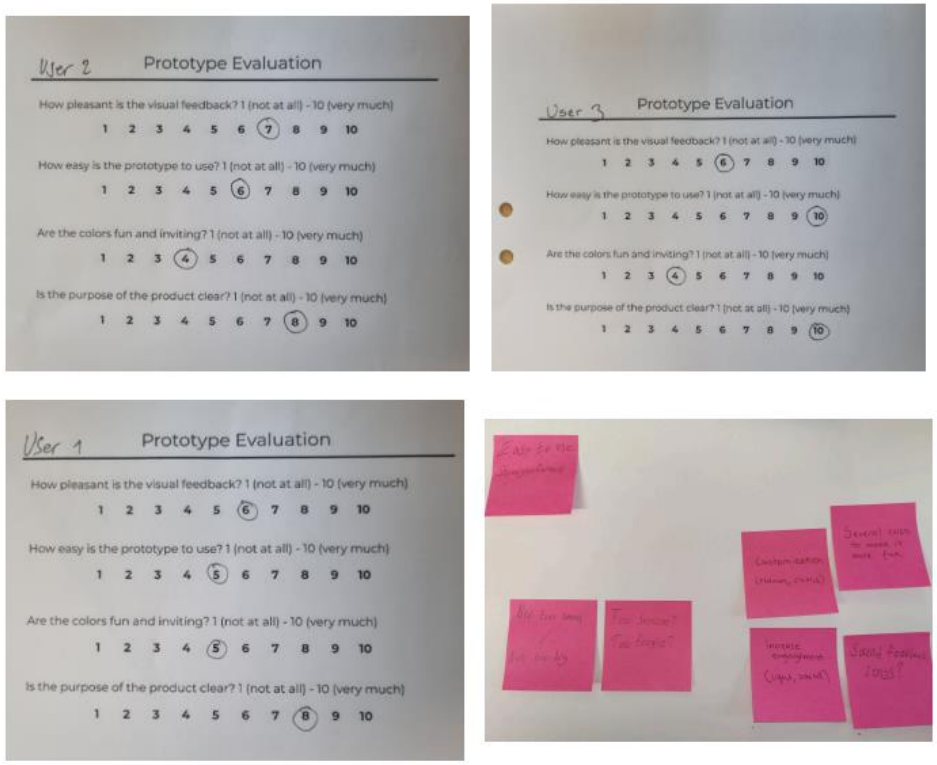

Figure 10: The result of quantitative interviews and thematic analysis

Appendix C: Interview Guide

Background

- What is your relationship with kids? (what role, kids age..)

First impression

- What is your first impression of seeing the prototype?
- Can you describe what you think the intention is of children using this

Usability

Test the prototype

- How do you think it would be for a child to interact with this? (easy, difficult, fun..?)
    - why ?

- Do you believe that the use of this product will affect a child's behavior or feelings/mood?
    - Why ?
    - How ?
- On a scale 1-10, how easy is the prototype to use?
- O a scale 1-10, how clear is the purpose of the product?

Design

- What do you think about the design?

- On a scale 1-10, how fun and inviting are the colors?
- On a scale 1-10, how pleasant is the visual feedback?

Learning

- In what ways do you think this prototype could support children's learning and development?

Inclusiveness

- Do you think the prototype would be suitable to a wide range of children, including those with different abilities or preferences?

    - Are there any adjustments or additions you would suggest to make the prototype more inclusive?

Longevity

- How likely do you think it is that children would continue to engage with this product over time?

- Are there any features that might become outdated or lose appeal quickly?

Conclusion

- What are your overall thoughts on the prototype?
- Do you believe the product effectively meets the needs of its intended users?

- Are there any specific changes you would recommend to improve the product?
- Any other thoughts or things you want to add?