Smart Jewelry Prototyping with Children as Part of a Service Design Process

VIRVE INGET, University of Lapland, Finland
MARI SUOHEIMO, Oslo School of Architecture and Design, Norway
JONNA HÄKKILÄ, University of Lapland, Finland

In our research, we address a special domain among wearable computing, smart jewelry. We present our work-in-progress on co-designing smart jewelry concepts with children. In a design session, children (n=4) were asked to come up with a smart jewelry concept, which they could use when in Covid quarantine. We use play-dough type low-fi prototyping materials, and seek to refine a suitable toolkit for the second phase of our forthcoming research, which integrates service design and jewelry design.

CCS Concepts: • **Human-centered computing → Systems and tools for interaction design**.

Additional Key Words and Phrases: Smart jewelry, wearables, prototyping, co-design, design with children

1 INTRODUCTION

Smart jewelry forms a special area within wearable computing, binding together the aesthetics, cultural meanings, and functionality within the same device design. Whereas products related to wellness, health and sports generally dominate the market sectors of wearable gadgets [4, 8], with smart jewelry, also fashion and communications have emerged as key use cases [8]. It has been reported that with wearable technology, making the design to match to the wearer's own style and preferences plays a major role [5]. This is even more important with smart jewelry. Digital jewelry provides possibilities to emphasize the personal aesthetics and emotional aspects in the design. Smart jewelry design can also balance between public and private aspects for its use cases, for instance by selecting different locations on the body for wearing it [3].

In this paper, we present our work-in-progress, where smart jewelry concepts were designed withe children. This is an initial study in our larger design project, where in the second phase, service design will combined with smart jewelry design for a holistic service concept creation. In the first study reported here, we wished to pilot the co-design workshop process with children, and get initial understanding on what kind of directions children's concept ideas take. We take low-fidelity prototyping as an approach for the early concepting phase. Low-fidelity prototyping with smart jewelry concepts has been presented before, for instance by Li et al. [6] and Fortmann et al. [1]. In our on-going research, we involve a jewelry artisan as part of the research team to get insight from the jewelry design point of view.

2 DESIGN APPROACH

2.1 Jewelry Design as Background

Simple technique to design jewelry is the lost wax casting used centuries by jewelry artists. Today goldsmiths still craft wax models that can be used to produce beautiful and intricately detailed jewelry pieces through the lost wax casting method. Soft wax is shaped by hand or carved with different tools to produce the desired model. Piece can then be set inside a steel flask and covered with plaster investment, leaving a funnel to reach the wax through the hardened plaster. The flask is put into a kiln and the wax models are "lost" as they burned out of the flask. The flask is placed in a casting machine and the void left behind in the plaster is filled with molten metal to get final metal version of the model. An alternative method is to take silicon mould from the model and use that mould to produce several wax copies. Similar to professional soft wax shaping, modern materials like polymer clays can be used to design original models. Major

Fig. 1. Low-fi prototyping with play-dough.

brands of polymer clays have been tested and are certified to be non-toxic when used as directed. This makes polymer clay suitable material for adults and children to do prototyping.

Professional wax are produced in restricted colors while polymer clays can be found in variety of colors that can be further minded to obtain new colors. This provides the designer better possibilities in design-wise to prototype final colors of the model.

With this background information on jewelry making with wax, we defined the method for a low-fi prototyping workshop around smart jewelry. We approached the concept creation and prototyping with a methodology resembling designing with wax, and used play-dough type clay as the design material. This formed the toolkit for our design process, as described in the following.

2.2 Piloting a Design Workshop with Children

We conducted a concept creation design session with children four children (11, 11, 12, and 14 years), all girls. As the technology background, all participants had smart phones, but none had smart watches. We provided play-dough and some stickers resembling jewels and pearls as low-fi prototyping materials, see Figure 1. After completing the designs, children were asked to explain their concepts verbally. In addition, they had an opportunity to use pens and paper to draft the design and/or to explain it.

The task was to imagine and make a jewelry type of smart device which they could use during Covid-19 isolation to keep in touch with friends or family, or which could tell them something health related information. This use context was selected because later, in the second phase of our research, we will focus on a similar design context in the service design process. All participants in this study had spent time in quarantine (at home) during Covid-19 pandemic either being sick or exposed to the virus, so the context was familiar for them. During pandemic, the remote school period had also familiarized them with social isolation and extensive technology use during the period [2].

The design workshop session, Figure 1, lasted for 30-45 minutes. The creations made by children are presented in Figure 2. The use cases with smart jewelry concepts related either to keeping in touch with friends, or using the mobile phone more easily. Three out of four participants designed a device, which would ease the use of mobile phone either with shortcut buttons to start calls, or by creating a hologram display to access the smart phone. Rings were a popular form factor, as, according to the participants, rings were nice and they liked wearing them, and they were easily at hand for interaction. Participants demonstrated how they would wear a ring and press a jewel-looking button integrated in it to start a call or pico-projector to show a projected phone screen.

Fig. 2. Designs by children.

The theme of friendship was dominant in children's design. With ring concepts, starting a phone call to one's friend by pressing a button on a ring or by tapping it was mentioned in all descriptions. Two participants came up with a use case where they could more easily set up communication with their remote friends, and the proposed smart jewelry form factors for this were a bracelet and a batch that could be worn as an earring, see Figure 2. The color-chancing bracelet would indicate when your best friend was available for a video call, and the rose-shaped badge would include a camera and shortcut buttons in petals to start a call to your four friends, one assigned to each petal. In addition, one smart ring concept included two similar rings which were meant to be worn by the best friends, the rings being tokens for friendship, as illustrated in Figure 2.

3 DISCUSSION AND NEXT STEPS

The play-dough type prototyping clay worked well in the design session with children. We were surprised though, that in the concept ideas, mobile phones were so central. This may result us to re-considering how the design task is given to children. It was also interesting to see, how clearly the themes of friendship and keeping in touch with friends emerged in proposed concepts. This was no doubt important for the children. We acknowledge that our research is limited by the small sample of participants. Nonetheless, we believe we gained valuable experiences and findings from the design workshop.

As the next step, our aim is to integrate smart jewelry design with a service design process for a holistic service concept creation, and take into account both jewelry making as well as service design aspects. Service design has sprung from interaction design and cognitive psychology [7]. According to Stickdorn et al. [9] there are five basic principles that service designers apply in the development process: A) user-centeredness, which is to place the user in the center, B) co-creative, that means to develop with the users and the stakeholders, C) sequencing, visualizing the different processes and service journeys, D) evidencing, making often the intangible issues visible, and E) holistic, it is essential to include many perspectives and stakeholders in the process. By involving the users and stakeholders it is more probable that their needs will be heard and attended.

The next design sessions will be organized across two locations, and a low-fi prototyping toolkit for the set of design materials will be needed. Service design often utilizes a set of different low-fi prototyping and experience design

methods which are easily integrated in the participatory design process. In our design process, we defined that the toolkit for smart jewelry prototyping consists of wax, or play-dough, type material, as this resembles the jewelry creation process the artisans use. Wallace has pointed out that although smart jewelry type devices are emerging, the development is dominated by approaches that come from the outside of the actual field of contemporary jewelry [10]. Play-dough is a familiar material for everyone to play with, and allows shaping it into different form factors without limiting the creativity, which e.g. ready-made modules could do. The results of the initial workshop reported in this paper were encouraging, and function as a basis for putting together the low-fi prototyping toolkit which we will use in the follow-up smart jewelry workshops.

ACKNOWLEDGMENTS

This research is part of TechFashion project, funded by Academy of Finland.

REFERENCES

[1] Jutta Fortmann, Erika Root, Susanne Boll, and Wilko Heuten. 2016. Tangible apps bracelet: Designing modular wrist-worn digital jewellery for multiple purposes. In *Proceedings of the 2016 ACM Conference on Designing Interactive Systems*. 841–852.

[2] Jonna Häkkilä, Mari Karhu, Matilda Kalving, and Ashley Colley. 2020. Practical family challenges of remote schooling during COVID-19 pandemic in Finland. In *Proceedings of the 11th Nordic conference on human-computer interaction: Shaping experiences, shaping society*. 1–9.

[3] Virve Inget, Heiko Müller, and Jonna Häkkilä. 2019. Private and public aspects of smart jewellery: a design exploration study. In *Proceedings of the 18th International Conference on Mobile and Ubiquitous Multimedia*. 1–7.

[4] Pradthana Jarusriboonchai and Jonna Häkkilä. 2019. Customisable wearables: exploring the design space of wearable technology. In *Proceedings of the 18th International Conference on Mobile and Ubiquitous Multimedia*. 1–9.

[5] Pradthana Jarusriboonchai, Emma Napari, Oskar Juhlin, and Jonna Häkkilä. 2019. Exploring non-emissive wearable display as a clothing accessory. In *Adjunct Proceedings of the 2019 ACM International Joint Conference on Pervasive and Ubiquitous Computing and Proceedings of the 2019 ACM International Symposium on Wearable Computers*. 89–92.

[6] Hong Li, Pradthana Jarusriboonchai, Heiko Müller, Emmi Harjuniemi, and Jonna Häkkilä. 2020. Emotional communication between remote couples: Exploring the design of wearable ambient displays. In *Proceedings of the 11th Nordic Conference on Human-Computer Interaction: Shaping Experiences, Shaping Society*. 1–5.

[7] Piia Rytilahti, Satu Miettinen, and Hanna-Riina Vuontisjärvi. 2015. The theoretical landscape of service design. In *Design, user experience, and usability: design discourse*. Springer, 86–97.

[8] Yulia Silina and Hamed Haddadi. 2015. New directions in jewelry: a close look at emerging trends & developments in jewelry-like wearable devices. In *Proceedings of the 2015 ACM International Symposium on Wearable Computers*. 49–56.

[9] M Stickdorn. 2013. Principles of Service Design Thinking. M. Stickdorn ve J. Schneider (Ed.) içinde. *This is Service Design Thinking* (2013), 33–45.

[10] Jayne Wallace. 2007. *Emotionally charged: A practice-centred enquiry of digital jewellery and personal emotional significance*. Ph. D. Dissertation. Sheffield Hallam University (United Kingdom).