Demo Abstract: Participatory Design Fiction for Innovation in Everyday Wearable IoT Systems

Helen Oliver
koliver@turing.ac.uk
The Alan Turing Institute
London, United Kingdom

ABSTRACT

This demo will invite attendees to experience a novel technique of Participatory Design Fiction, which uses storytelling to elicit users' ideas for new kinds of wearable IoT devices, starting from a blank slate. The demo will also feature the Gallery Necklace technology probe, an IoT-enabled neckpiece with an ePaper display, which is the first design artifact of the study so far. Overall, this demo will illuminate how Participatory Design Fiction can give insight into what users really want from wearable computing.

CCS CONCEPTS

• **Human-centered computing** → **Ubiquitous and mobile computing design and evaluation methods**.

KEYWORDS

participatory design fiction, wearable computing, internet of things, design fiction, science fiction prototyping, participatory design, user-centred design, research through design

1 INTRODUCTION

There is little variety in the forms and functions of wearable computing for independent adults in routine situations - what we will call "everyday wearables" (dominated by the fitness band and smartwatch). Furthermore, everyday wearables are surprisingly little studied compared to wearables for medical, assistive, occupational or specialist domains - devices which are worn with an extrinsic motive. By contrast, everyday wearables are devices for people who *don't* have to wear them. How do we find out what kinds of wearables users would *like* to wear, even though they don't have to? Although there is increasing acknowledgement of the need for a more user-centred focus in the design of wearable computing [5], there is more literature on individual devices than on deciding what devices to make. Participatory studies offer valuable insights

on the design of preselected device types [7], but not into what kind of device to design starting from a blank slate. Participatory studies often recruit minors or care home residents; but lack of autonomy can affect participants' choices [3]. Supposing we recruited a group of independent adults, and just asked them? Although a user-centred approach is recommended, the recommendation does not extend to asking users *what* to make. Mueller et al., 2005 [6] was the only study we found of everyday wearables that attempted this, seemingly without success: "rather conventional ideas, mostly variations from gadgets they have seen in movies." Yet much of the design of our commonly used technology was inspired the same way [2]. Mueller's participants wanted to make real what they saw in fiction, and the movies that inspired them could arguably be seen as Design Fictions [1].

The central question of this study is: *can we use Participatory Design Fiction to ask users what kind of wearable computing they want?* Thus far, it seems we can. The Gallery Necklace (Figure 1) is the first fruits of this inquiry, which is the first ever study in the wearable IoT domain to:

- Start from a blank slate with no predefinition of form or function of the device to be designed, and
- Elicit Participatory Design Fictions from independent adult users, and
- Take actionable insights from the Design Fictions and apply them to the user-centred design and build of wearable IoT devices, and
- Release the wearable devices to the users for evaluation in-the-wild.

2 APPROACH AND IMPLEMENTATION

2.1 Storytelling

Pilot studies were conducted at Makespace in Cambridge in October 2017 with members of the public, as part of the Cambridge Festival of Ideas 2017; and with Design Informatics students at the University of Edinburgh. Following this, an inaugural workshop was held with members of the public, with the goal of recruiting at least six volunteers for a two-year longitudinal study. Eight volunteers were recruited, of whom one moved cross-country and one participates intermittently, leaving six regular volunteers. The workshops consisted of storytelling and paper prototyping. Creative toolkits [8] were assembled from craft materials and costume items, as well as a writing prompt adapted from Johnson?s "Five Steps" for a Science Fiction Prototype [4]. The researcher gave an example by presenting a story based on the children's book "Many Moons" [9]. Participants were free to depart from the Five Steps,

Figure 1: A Gallery Necklace. Cat photo by "Three-hahns", reformatted as b&w bitmap. [Public domain], via Wikimedia Commons. Licensed under the Creative Commons Attribution-ShareAlike 3.0 Unported license (https://commons.wikimedia.org/wiki/File:Female_tuxedo_cat.JPG).

and could write an original story or derive works from existing media.

2.2 User-Centred Design of Technology Probe

After the longitudinal study participants finalized their stories, there were six Design Fictions to work with. 1-1 interviews were conducted to ensure the researcher's best understanding of each user and their motives. Based on this, the researcher devised eight proposed real-world device designs, and presented them at another workshop, after which the participants chose one design by ranked voting.

2.3 Design, Build, Release

The selected design was a "Gallery Shirt" to be realized in eInk. For the technology probe, Adafruit's eInk breakout board was selected for ease of use, and because of its size the shirt became a necklace. A Wi-Fi connection was essential for the necklace to connect to the user's personal data store, the Hub-of-all-Things (HAT) (https://www.hubofallthings.com). Thus the Adafruit Feather M0 Wifi was used as a microcontroller, which added bulk. Rather than hide the hardware, the casings became a "statement" type necklace (a lanyard for the male volunteer) styled to reflect each user's taste based on their paper prototypes. The necklaces were released to the users in January 2019. First impressions ranged from moderate to unbridled enthusiasm, which may or may not survive actual wear; the necklaces are heavy (~70g), bulky, and fragile. The microcontroller could be replaced by a much smaller component in future versions, but some users indicated that they might prefer to keep it the way it is.

3 DEMO SCRIPT

The original workshop format must be adjusted to improvise for the churn of a potential audience passing through the demonstration room. First the researcher will skim the example story, then worksheets will be offered with the adapted Five Steps and visitors invited to either devise a story on the spot, or write one and bring it back later. Either before or after someone has created a story they will be invited to make a paper prototype from the creative toolkit materials, which will be laid out on a nearby table. Visitors will then be invited to pin their stories and prototypes to a board for display. The researcher will wear the Gallery Badge throughout, and explain it at appropriate moments.

ACKNOWLEDGMENTS

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