HACK YOUR AGE: OLDER ADULTS AS PROVOCATIVE AND SPECULATIVE IOT CO-DESIGNERS

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Introduction

This research explores whether the co-design of provocative prototypes with older adults can scaffold critical thought concerning ethics, trustworthiness, security, and privacy of age-oriented Internet of Things (IoT) products and services, and associated data-driven technologies (DDT). By inviting older adults to co-design IoT and DDT that addressed their hopes and fears for the future, we encouraged them to imagine a revolution in 'technology for aging'.

Previous research suggests that older adults have different cybersecurity values and perspectives (Nicholson 2019, Redmiles 2017, Grimes, 2010). They can be uniquely

vulnerable and are often targeted specifically (Grimes 2010, Peek 2016). This threat is compounded due to the proliferation of ubiquitous computing and the IoT leading to less opportunity to 'opt out' of using the internet, with more complex and ambiguous interfaces. Meanwhile, a common assumption is that older people reject new technologies because they are inaccessible to them. However, Knowles (2021) argues that this can often instead be due to the unacceptable social consequences older adults are uniquely positioned to anticipate: a quiet revolution.

Our research demonstrates that older adults are capable of critiquing the security and ethics of IoT and DDT for their own use, for architectural considerations (Mikusz 2019, Zanella 2020), and for society as a whole (Knowles 2018). We offer user-centric methods which provide effective scaffolding for this critique.

Methodology

In November 2022, a design researcher, creative technologist, and theatre company worked with 15 adults defining themselves as 'experiencing or anticipating old age' to explore their changing relationship with technology and perceptions of IoT and DDT. Over three workshops utilizing theatre and design research approaches including speculative design (Dunne 2013) and co-design of provocative prototypes and social design fiction (Pilling, 2019), participants discussed their imagined futures for aging and technology.

Participants had diverse experiences of technology; some who had been engineers and programmers displayed a great deal of legacy knowledge (Nicholson 2019), while others avoided computers their whole lives and actively chose not to own televisions, microwaves, or freezers. All participants were from Edinburgh, with an average age of 68 (standard deviation: 5.59) and a ratio of 5:2 declared gender female to male.

Participants started by discussing their future imaginings of aging before modelling the internet as they understood and imagined it. They were then introduced to sensors, actuators and machine learning through interactive demonstrations. Four randomly formed groups ideated ways these technologies could be applied to earlier identified hopes and fears for the future of aging. Over the following week creative technologists created a rudimentary working prototype which prompted a second round of iteration. Participants wrote and performed performances incorporating these prototypes, which explored cybersecurity and cyberharm (Agrafiotis 2019). Six participants also partook in post-workshop semi-structured interviews.

3. Findings & Analysis

Workshops shone light on perceptions and experiences of older adults with regards to age-oriented IoT and DDT, some of which we touch upon below, but this is an evaluation of the workshop methods in unlocking this discourse, not the discussion itself.

3.1. Modelling the internet

Participants arrived with different 'technological biographies' (Knowles 2021). This exercise used modelling (P1) to reveal participants' understandings and imaginings of the internet. Participants also demonstrated existing experiences: either choosing e-mail or online shopping as an activity to model.

The models provided a co-created taxonomy to refer to throughout the workshops. All models described data processing, storage and handling. Some referred to privacy, security and resilience. This allowed us to refer to models when describing elements of IoT and DDT: avoiding technical jargon while ensuring discussion was grounded in technical understanding.

P1. Imaginings of the internet:
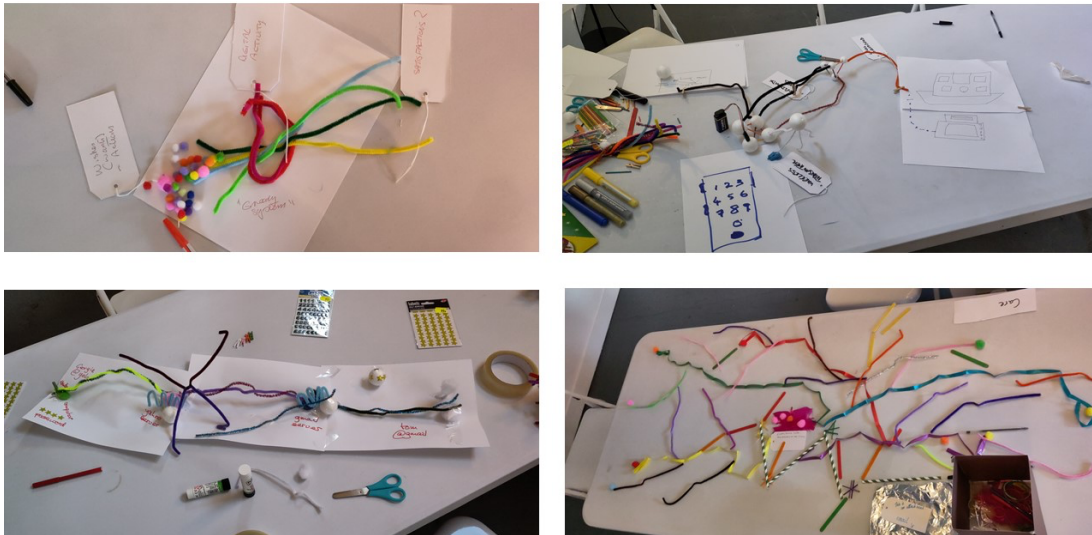
## 3.2. Prototype ideation and development

During a demonstration of existing IoT and DDT participants brainstormed possible benefits and harms. Concerns raised were identifiable in the prototypes and performances, and confirmed that acceptability is as important as accessibility (Knowles 2021). This included themes of data bias and reliability, and of losing control of the world around them. Topics that were notably absent at this point were those related to privacy, security and safety.

It is unclear whether inventions were limited by the participants' preexisting experiences. We were careful in early explorations of IoT to not place limits and did not present 'off-the-shelf' products. However, prototypes 2 and 4 suggest that designs were grounded in experienced technologies.

The speculative IoT prototypes, running on MicroBits and RaspberryPis, allowed participants to see their ideas brought to life. All interviewed participants commented that this was very useful for considering the technology they did not understand or know of. The inventions were, by their designers' own admission, problematic. This provided a celebrated opportunity to critique their own ideas and the technologies involved.

The four prototypes were: A biometric scanner which can order custom-made haute couture clothing for unique ways older body shapes change (P1); a speaker which can give voice commands to other voice-activated devices in the home when a user's voice is feeble: enhancing and repeating a command or replacing entirely via prerecords when buttons are pressed (P2); a pair of exoskeletal leg braces, which could detect environmental and biometric data to offer extra strength and mobility (P3); and, a "Smart meter" which automatically cuts supply and arranges engineer visit upon gas leak detection (P4)

Fig2. Provocative prototypes:
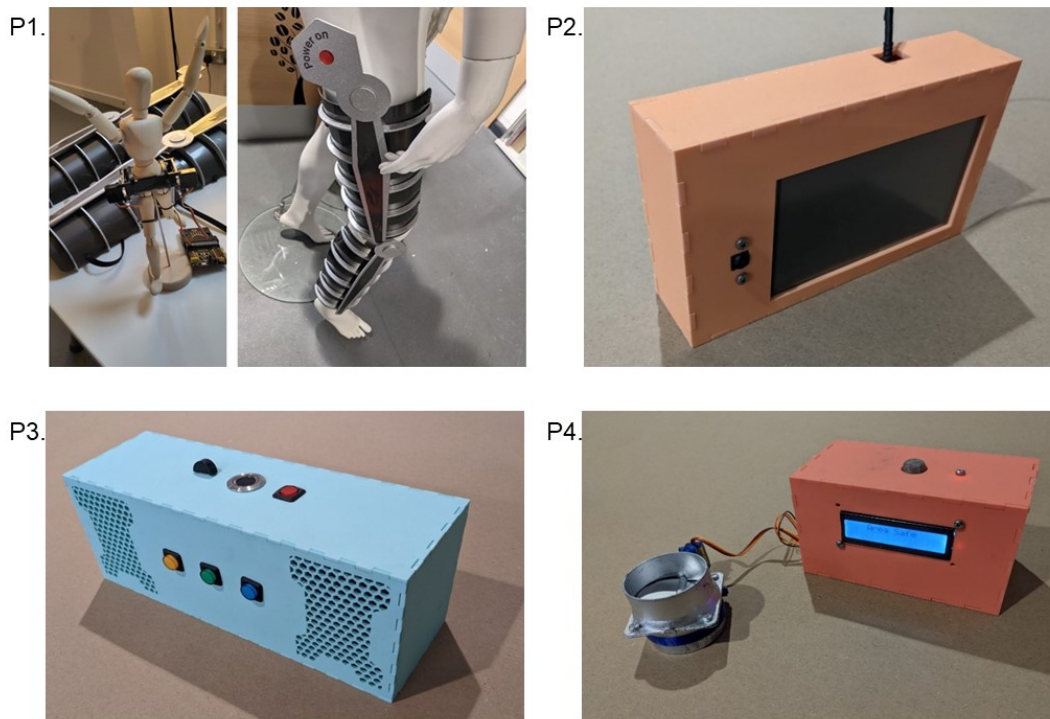
3.4. Performances:

In the final workshop, participants were presented with their prototypes and supported to write a short performance which explored potential harm. Many elaborated on themes that had been introduced earlier such as 'technology being made by young people for young people', affordability, accessibility, and automation creating laziness. Some were technical in their critique including instances of hacking, unreliable data and the consequences of ubiquitous and invisible computing leading to a 'buttonless world'. Performances also explored potential psychological harms of surveillance; pride and social stigmas of assistive technologies; trust in technology increasing risk taking; the

dangers of reliance on technology one does not understand; and, user labor. All spoke of the changing skills needed to keep up with a changing world (Barnard 2013, Marler 2021). Many commented in workshops and post-workshop interviews that power was being taken away from them and that they did not know how or if they could take the power back.

Theatre, supported by the prototypes, provided a vehicle for communication of these complex issues in a way which had not been possible through prior workshop discussions. One participant suggested: "The performances gave you so many insights as to how this impacts people and the dynamics and how ideas and technology falls on one person is different to somebody else".

4. Conclusion:

Methods developed in this research scaffolded critical thought concerning the ethics, trustworthiness, security, and privacy of age-oriented IoT, and associated DDT, regardless of experience or existing knowledge. The methods created spaces and prompts for all participants to be comfortable discussing cybersecurity. Participants found it easy to interrogate the ethics, privacy, and security of their speculations because, while they may not have been technically scalable or feasible, they understood them.

These methods could be adapted to different marginalized groups. We intend to repeat the above workshops with a mixture of technical experts and older adults to catalyze dialogue between different expertise.

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