INTERNATIONAL CONFERENCE ON ENGINEERING AND PRODUCT DESIGN EDUCATION
8–9 SEPTEMBER 2022, LONDON SOUTH BANK UNIVERSITY, LONDON, UK

AGEING COLLABORATIONS: CO-DESIGNING FUTURE TECHNOLOGY OPPORTUNITIES

Linda SHORE[1], Shika HURRYDASS[2], Richard THOMPSON[2], Rachel SALZANO[2], James MARSH[2], Zuzanna MARCHEWKA[2], Thelma BABBS[2], Sharon JACKSON-KERR[2], Marta LIS[2], Reece LESLIE[2] and Michael ELLIS[3]
[1]Edinburgh Napier University/Glasgow School of Art, Scotland
[2]Edinburgh Napier University, Scotland
[3]TapintoIT, Edinburgh, Scotland

ABSTRACT
The Ageing experience and increased longevity presents innovation opportunity for emergent technology, e.g., mobile and wearable. In turn, these technologies can enhance quality of life and independence as we age; however, they can also increase social inequalities and exclusion. The Covid-19 pandemic affected how we interact, communicate engage and interact with people and also technologies. People – across the generations were impacted and disrupted, motivating new behaviours in how they conducted everyday tasks and activities. Co-Design approaches have previously revealed successful collaborations between older adults, students, researchers, designers and other disciplines as a means to define unmet needs. Edinburgh Napier University provided funding to the PI (Principal Investigator) as a means to mobilise a 'Creative Cross-Education Team' (CCET) consisting of undergraduate students, research assistants (post-graduate researchers) and other staff colleagues of the University. The CCET worked with members from 'Tap into IT' (a local charity based in Edinburgh with a remit and focus on enhancing and enabling digital technology access for older adults). Two Co-Design workshops were conducted online titled 'Express' & 'Create.' The aim of these workshops was to explore, identify and define unmet needs/gaps expressed by older adult participants as a catalyst to create and generate future conceptual technology opportunities. The workshops were framed around Instrumental Activities of Daily Living (IADLs). The team were broken into groups whereby they were encouraged to collectively collaborate, Express and Create with the participants. This multi-generational and transdisciplinary approach created a democratized outlook where each contributor added value through expression, commentary and creativity. The findings have generated themes which are the basis for new opportunity through education and research with a focus on future technology opportunities.

Keywords: Creative cross-education teams, UX design education, ageing experience, speculative design, co-design

1 INTRODUCTION
Increased longevity and new lifestyle approaches to ageing offers innovation opportunity for emergent technology (Barclays Bank, 2021; Marston et al., 2022).
Emerging technologies including mobile and wearables can offer benefits to quality of life and independence as we age (Shore et al., 2018a, Barbosa Neves & Vetere, 2019); however they can also increase social inequalities and exclusion. In addition, technological applications including Augmented Reality (AR), Virtual Reality (VR), Extended Reality (XR), Mixed Reality (MR), connected services/systems e.g. healthcare, offer research & innovation opportunity (McLaughlin et al., 2018).
Previous research has demonstrated how multi-generational and transdisciplinary approach creates a democratized outlook where each contributor adds value through expression, commentary and creativity. Furthermore, Co-Design methods can enhance successful collaborations between older adults, students, researchers, designers and other disciplines as a means to define unmet needs (Shore et al., 2018b). A research project funded by Edinburgh Napier University facilitated a new collaboration with a local charity in Edinburgh, Scotland that provides ongoing support to enable older adults to access and experience positive interactions with IT and online services.

2 CO-DESIGN IN A PANDEMIC

The Covid-19 pandemic, impacted generations, economies and personal freedoms (Shevlin et al., 2020), with digital technology offering access and connection across various community sectors. In addition, opportunity to innovate can be harnessed and driven through approaches of collaboration, co-creation, universal design and speculative design in order to optimise physical and digital spaces and experiences for all (Marston et al., 2020). Co- Design methods offer rich, democratised and collaborative outputs that are realised through the creative activity, conversations & interactions (Sanders & Stappers, 2008; Shore et al., 2018; Sakaguchi-Tang et al., 2021). Initial Discussions began in March 2021 between the PI at Edinburgh Napier University and the lead contact at 'Tap into IT'. A call was put out to the University community, including undergraduate students, inviting their participation and collaboration to forge a CCET. Despite the pandemic and current lockdown restrictions at that time, there was a positive response and the creative coalition (Manzini, 2015) was mobilised for further development and communications to work with the lead at 'Tap into IT'. The planned workshops were discussed over digital meeting technology (Microsoft Teams) as a means to collectively plan a course of action. MacDonald et al., (2021) discuss the importance of real world contexts and opportunities through a number of tools (e.g., Brainstorming, Design, Messaging, Productivity, Project Management) as important factors to develop students' communication skills and competencies. UX Design by its very nature relies on understanding and communicating with people, as we define unmet needs. The workshops and the nature of communication, creativity & collaboration would enable the students involved to refine and develop skills with communications, particularly with other team member as well as participant interactions (MacDonald et al., 2021).

3 METHODOLOGIES

It was envisaged that Co-Design and research through design approaches would identify research opportunity by defining new concept directions. This collaborative coalition of academic, charity and older adult participants engaging in the co-design workshops would act as a catalyst to innovation opportunity. Students can benefit from collaborative activities as a means to enhance education and learning (Nel, 2017). Two interactive/digital Co-Design workshops were devised with objectives aimed at exploring, identifying and defining unmet needs/ gaps expressed by older adult participants. The workshop topic and headers were framed around IADLs – Instrumental Activities of Daily Living (Lawton & Brody, 1969). In addition, there was a planned timeline of delivery agreed collectively by the CCET (see Table 1).

Table 1. Planned timeline of delivery and activities

Day 1	meet with the team to strategize and develop the programme of the workshops.	01.06.2021 @2pm (2-5pm)
Day 2	launch information session to 'Tap into IT' members to promote and discuss the workshops. This will be online and possibly over Zoom	08.06.2021.2021 @ 2pm (meet/available 1-4pm)
Day 3	Administration re information and consent documents	17.06.2021 perhaps a one hour meeting that day).
Day 4	Day one of the Co-Design workshop titled: Express	21.06.2021: 2-4/4.30pm (some admin time that day)
Day 5	Day 2 of the Co-Design workshop titled: Create (this will be hosted three days after the Express workshop)	25.06.2021: 2-4/4.30pm (some follow up admin wrap up)
Day 6	brainstorming and debrief to develop themes collectively	28.06.2021: one hour and plan research and analysis for Tri 3

Table 1 highlights the themes and tasks as required, to prepare workshops and also debrief and interpret findings. In addition, Day 2 was significant as we launched and discussed our plan for the Co-Design workshops with the members of 'Tap into IT'.

The areas of enquiry (IADLs) were introduced and discussed, groups were formalised and encouraged to collaborate, express, and create. The discussion and workshops presented opportunity for the CCET to collate experiences and future perceptions by the older adult participants. This project intended to

familiarise the PI, undergraduate students, and research assistants of unmet needs by older adults in relation to IADLs Instrumental Activities of Daily Living (Lawton & Brody, 1969)
Managing Finances, such as paying bills and managing financial assets.
Managing Transportation, either via driving or by organizing other means of transport.
Shopping & Meal Preparation. This covers everything required to get a meal on the table. It also covers shopping for clothing and other items required for daily life.
House Cleaning & Home Maintenance. This means cleaning kitchens after eating, keeping one's living space reasonably clean and tidy, and keeping up with home maintenance.
Managing Communication, such as the telephone and mail.
Managing Medications, which covers obtaining medications and taking them as directed.
There was identified research opportunity to understand and engage with the older adult members of 'Tap into IT' as a means to collaboratively consider the present challenges with technology and envisage solutions for the future.

3.1 Digital Co-Design Workshops

The workshops were attended by up to 18 participants plus the CCET. There were sections of the workshops that the whole group would discuss and then dispatch to breakout rooms. Each group of approx. 7 older adults would also include student volunteers and research assistants (at least one of each to each older adult group). Students who were involved and chose to pursue and develop research based on the workshop themes were given an opportunity to gain 20 credits to undertake research with a defined strategy that could be utilised and converted to post-grad, post-doc or external funding research (as identified in project overview) opportunity with collaborative partners such as the groups and members who engaged with the initial workshops or others. Each of the sessions would provide intervals with accompanying easy listening jazz type music e.g., Sam & Max season 1 OST (https://www.youtube.com/watch?v=YJrYs6pPYtw). This was a pleasant surprise observing the reaction and comments to the pleasant easy music and timeout opportunity from the screens. It offered light laughter and a refresh moment to make tea or look out to the garden etc.,

3.2 Express

The first of the two workshops was titled 'Express' this was designed to offer opportunities to the participants to express current and share experiences relating each of the IADLs. The participants entered breakout rooms, whereupon there were minimum of two team members from Edinburgh Napier University. Many stories were shared relating to the IADLs and participants everyday experiences.

3.3 Create

The second workshop was scheduled for three days later, and as per the latter part of the Express workshops, participants were encouraged to reflect and put together some thoughts as part of preparation for the Create session. The team members met after the initial workshop to de brief, discuss and evaluate the merits of what was highlighted/discussed by the participants and the commonalities or not between the various groups.

4 FINDINGS

Despite the digital space of interaction on Microsoft Teams, there was also a reliance on Miro boards to assist creativity and collaboration. In addition, there was consideration to taking breaks as opportunities to make tea & reflect with some specially selected music. In addition, the students involved at undergraduate level were invited to share reflection on the experience and how if any it may benefit their learning, as noted below:
"From the perspective of an undergraduate student, the possibility to take part in the project was a very exciting opportunity. My input and preparation before workshops included writing open-ended questions, taking part in the meetings and sharing ideas with my colleagues. Taking part in the project and collaborating with experienced researchers was an outstanding experience, that positively impacted my education and growth. By the end of the project, I feel much more confident as a student and future designer. The workshop was a beautiful experience where designers found a universal language with participants, a space where we freely shared and talk about new ideas and everyday struggles." (Student voice).

4.1 Express

The groups worked within the breakout rooms, and during the first day/session focussed on expressing current experiences as per each of the IADLs. The findings are summarised below:

Managing Finances: Participants noted the impact of the pandemic and how observations such as the physical interactions and services in a bank had been affected not only as a result of 'lockdowns' but also as a business practice witnessed in recent years. In addition, there was commentary relating to cashless transactions with one participant commenting: "*It's amazing how I can pay for milk with my card now*". Other discussions related to managing finances related to trust, security, online apps and how 'Age-Friendly' some banks were – or not.

Managing Transportation: focussed on ability to move from A-B. Participants expressed reasons to use public transport – enjoying bus trips locally to reasons they disliked public transport access - particularly with assistive technology (wheelchairs) or hybrid – walk to the shops and take the bus home "*Buses only allow one wheelchair at a time; this can prompt a long wait till the next bus*".

Shopping & Meal Preparation: The Covid-19 Pandemic again was a focus with some participants who expressed the adaptation to shopping and food preparation. Batch cooking was commented on as was 'garden to microwave' approaches by those who took an interest in growing their own vegetables and/or fruit. Accessibility with some packaging was expressed as challenging – "*packaging can be a hassle, especially milk cartons*" as was online shopping, particularly in the first lockdown (Spring 2020) with issues expressed regarding location and post code errors by delivery drivers and supermarkets not advising or updating customers of shop issues until the last minute.

House Cleaning & Home Maintenance: Some participants noted how the pandemic had influenced cleaning behaviour around the home with some stating how they cleaned less as they were no longer receiving visitors – "*since lockdown and no visitors, I clean a little less*". There was positive expression towards community supports, however some services such as 'Care & Repair' presented difficulties to accessing tradespeople due to long waiting lists.

Managing Communications: This section generated interesting conversations regarding past experiences and again the current pandemic. Technology and digital communication tools such as Zoom or Microsoft Teams were discussed with lack of trust raised by some, ease of use by others and hearing capacity when interacting with others on these platforms. Participants shared how despite hearing challenge; they sometimes find further support on the 'chat' options - "*I have a hearing problem;* [the] *chat box on Zoom works really*".

Managing Medications: Pill and medication packaging was discussed with participants expressing difficulty opening blister packaging. There was expressions of satisfaction with some healthcare professionals, e.g., additional supports/reliance on pharmacists. Participants also shared numerous ways medications are accessed – online prescription requests to reminders as per 30 day pill planners, or technology reminders such as Alexa or smart-phone, or "*Getting text when prescription is ready to collect*".

These themes highlight research opportunity that could be developed, particularly in a real and face to face time post-pandemic. There was at times some reluctance or discomfort expressed during the Create sessions which was mainly considered relating to the uncertainty or doing something that wasn't correct or might be perceived silly. Previous experience of this activity in a face to face event type would appear to have offered more comfort with the design activity.

4.2 Create

The Create workshop was opened three days later with no change to attendees, however one was unable to attend due to illness. There was a positive energy, and perhaps a small amount of uncertainty to what was expected for the session ahead. Again, there was a reliance to assign groups to breakout rooms and Miro boards. This session mixed attendees from the previous session to offer collaboration, creative expression & ideation. A selection of the ideation and creative opportunity are summarised below, initially as a point of view (POV) statement to a how might we (HMW) as displayed on Table 2:

Table 2. POV & HMW samples for the Create session

IADL type	Point of view (POV)	How-Might-We (HMW)
Managing Finances	In the future cash and coin may remain as a digitalised asset to support transactions, but how do we educate understanding of coin	HMW apply money management and awareness education to students in order to minimise security, trust and risk in a digital space?

	'value' and crypto currency to children/students in formative years	
Managing Transportation	British roads are deemed not suitable for self-driving cars with limited consideration to other users such as pedestrians in city environments	HMW create a shared safe environment for pedestrians who select walking as their preferred access to city spaces?
Shopping & Meal Preparation	As we age, conditions like diabetes may manifest as a result of poor diet attention to nutrition and portions	HMW develop lifespan guides to nutrition that are interesting and invitation to optimise nutrition curiosity to adults and older adults?
House Cleaning & Home Maintenance	Adults who live independently may be at risk of becoming dependent due to illness or physical limitations as a result of reduced autonomy and/or ability	HMW retrofit and apply building principles to incorporate lifespan design and technology/robotic assistance to support housecleaning and home maintenance?
Managing Communications	Interfaces and new technology can be a challenge to learn 'by keyboard'	HMW create a design principle to include accessible tutorial sections in a variety of formats (e.g., video, book, digital, slides)?

5 DISCUSSIONS

The capacity to collaborate and research through design despite a pandemic has been demonstrated through the Express and Create workshops. The themes presented in this paper offer detailed insights to progress conceptual innovation opportunity. The CCET worked well together, accepting responsibilities and roles to deliver experience and expression through the planning and preparing sessions before the workshops, and the integration and working together with the members of 'Tap into IT'. The Student experience is optimized when experiential learning is facilitated in supported settings as demonstrated in this paper.

REFERENCES

[1] Barbosa Neves B., and Vetere F. (2019). Ageing and Emerging Digital Technologies. In B. Barbosa Neves and F. Vetere (Eds.), *Ageing and Digital Technology* (1 ed.). Springer Nature.

[2] Barclays Bank. (2021). *Active Ageing: Maximising the demographic dividend*. Retrieved 06/04 from https://www.investmentbank.barclays.com/our-insights/Active-Ageing-Maximising-the-demographic-dividend.html?cid=paidsearch

[3] Lawton M. P. and Brody E. M. 1969. Assessment of older people: self-maintaining and instrumental activities of daily living. The gerontologist, 9(3_Part_1), pp.179-186.

[4] MacDonald C. M., Rose E. J. and Putnam C. (2021). How, Why, and with Whom Do User Experience (UX) Practitioners Communicate? Implications for HCI Education. *International journal of human-computer interaction*, 1-18. https://doi.org/10.1080/10447318.2021.2002050

[5] Manzini E. (2015). *Design, When Everybody Designs: An Introduction to Design for Social Innovation*. MIT Press.

[6] Marston H. R., Shore L. and White P. J. (2020). How does a (Smart) Age-Friendly Ecosystem Look in a Post-Pandemic Society? *International journal of environmental research and public health*, *17*(21), 8276. https://doi.org/10.3390/ijerph17218276

[7] Marston H. R., Shore L., Stoops L. and Turner R. (Forthcoming-2022). Transgenerational Technology and Interactions for the 21st Century: Perspectives and Narratives. *Emerald Publishing.* ISBN 9781839826399.

[8] McLaughlin A. C., Matalenas L. A. and Coleman M. G. (2018). Design of human centered augmented reality for managing chronic health conditions. In *Aging, technology and health* (pp. 261-296). Academic Press.

[9] Nel L. (2017). Students as collaborators in creating meaningful learning experiences in technology-enhanced classrooms: An engaged scholarship approach. *British journal of educational technology*, *48*(5), 1131-1142. https://doi.org/10.1111/bjet.12549

[10] Sakaguchi-Tang D. K., Cunningham J. L., Roldan W., Yip J. and Kientz J. A. (2021). Co-Design with Older Adults: Examining and Reflecting on Collaboration with Aging Communities. *Proceedings of the ACM on Human-Computer Interaction*, *5*(CSCW2), 1-28.

[11] Sanders E. and Stappers P. (2008). Co-Creation and the new landscapes of design. CoDesign, 4, 5-18.
[12] Shevlin M., McBride O., Murphy J., Gibson Miller J., Hartman T. K., Levita L., Mason L., Martinez A. P., McKay R., Stocks T. V. and Bennett K.M. 2020. Anxiety, depression, traumatic stress and COVID-19-related anxiety in the UK general population during the COVID-19pandemic. *BJPsychopen*, *6*(6) https://doi.org/doi:10.1192/bjo.2020.109
[13] Shore L., Power V., De Eyto A. and O'Sullivan L. W. (2018a). Technology acceptance and user-centred design of assistive exoskeletons for older adults: A commentary. Robotics, 7(1), 3.
[14] Shore L., Kiernan L., DeEyto A., Nic A Bhaird D., White P., Fahey T. and Moane S. (2018b). Older adult insights for age friendly environments, products and service Systems. Design and Technology Education: an International Journal, v. 23, n 2,, p. 40-58,. Retrieved Date accessed: 10 oct. 2018., from < https://ojs.lboro.ac.uk/DATE/article/view/2327 >.