

# EMPLOYING CITIZEN SCIENCE TO UNDERSTAND THE CONTEMPORARY NEEDS OF OLDER ADULTS ACCESSING AND USING TECHNOLOGY IN A PANDEMIC

*Hannah R. Marston, Deborah Jane Morgan,  
Gemma Wilson-Menzfeld, Jessica Gates, Carol Ann Maddock,  
Elisabeth J., Jenny Philips, Gavin Bailey, and Julie Nicholson*

## Introduction

The reliance on technology during the COVID-19 pandemic grew considerably, with digital technology being a fundamental tool for education, work, social connection, and civic participation, to name a few. However, the inequitable access of technology use for those citizens who can access and use online support tools, and those citizens who are excluded from this support, heightens existing inequalities, including health inequalities.

The digital divide, or digital exclusion, is the gap between those who are fully connected to technology and those who are not. Historically, this gap was considered as being simply around lack of access to technology, but this understanding has grown, and there are now three recognised levels of the digital divide: access, skills and usage, and the offline tangible outcomes of internet use, i.e. both the personal and civic benefits that individuals derive from being online (Blank & Groselj, 2014; Scheerder et al., 2017; van Deursen & Helsper, 2015). Therefore, digital exclusion may not only relate to access and digital skills but also its possible associations with the lack of interest or understanding of the advantages of use (Yu et al., 2016).

It is imperative to consider digital inclusion as being multifaceted, as even among users with some digital skills, difficulties remain. A recent study completed by some members of the research team highlighted the complexity of digital exclusion, as even older adults who owned smart devices and regularly used social media technology experienced barriers which negatively influenced technology use (Wilson et al., 2021). Several biopsychosocial barriers impacted use of technology; physical functioning (dexterity and visual issues), self-efficacy, fear, culture and communication, and lack of social capital. It is essential to

address the barriers to technology use to reduce this digital divide and increase inclusiveness of the use of technology.

The pandemic brought the ‘digital divide’ to the fore, further widening the divide between those with and without digital technology access or skills. Organisations across the UK responded to this crisis with initiatives aiming to provide digital technology to those without access and to connect them to the internet (e.g., Livingstone, 2021; Vodaphone, 2021) and to promote digital learning remotely (e.g., Good Things Foundation, 2020; Livingstone, 2021). This short-term reliance on technology as a direct outcome of the COVID-19 pandemic will almost inevitably continue to cause longer-term issues. There is now an urgency to continue promoting digital access, and to also develop digital confidence and digital skills, to enable individuals to independently access online content and support.

One solution to address these factors is through inclusive design – co-designing digital devices/social applications with older people. Smartphones and tablets provide an affordable, accessible entry route to the digital world. However, the interfaces are not user intuitive and can be off putting for individuals who lack basic digital skills (Nurgalieva et al., 2019; Williams & Shekhar, 2019). Although there are apps which simplify smartphone interfaces (e.g., Grand Launcher), these have limited functionality: e.g., SOS button, SMS text, and flashlight, and are not representative of the needs of older people. There is an urgent need to co-develop an application that has the functionality to reflect their needs and build digital confidence.

### **The project**

The purpose of the ‘Adapt Tech, Accessibly Technology’ (ATAT) project (2020) was to explore and understand the needs, barriers, and challenges of smartphones and mobile apps experienced by older adults. ATAT aimed to identify, from new user perspectives, by employing a citizen science (Haklay, 2015; Riesch & Potter, 2014) approach with older adults and stakeholders to understand what basic adjustments are needed or should be considered to existing, affordable technology to support digital confidence and literacy among adults who are over the age of 50 years. Continuing with a citizen science approach, the second aim of this study was to identify what technological innovations and prototype applications enable new users to confidently access digital platforms.

### **Ethical approval and informed consent**

Prior to participant recruitment and execution of workshops, ethical approval was sought initially from the research ethics board at Swansea University [22021b] and once approved, enabled respective submissions to be submitted at Northumbria University [2887] and The Open University [HREC/3869/Marston].

### ***Aim of the book chapter***

This book chapter describes the research design and findings from the study ATAT (2020) and contributes to the fields of gerontology, social sciences, gerontechnology, health psychology, human computer interaction (HCI), and research methods. Case exemplars are provided throughout the chapter to illustrate findings from the ATAT project.

### *Older adults' experiences of digital exclusion*

There is a growing body of literature surrounding experiences of the digital divide, and the impact it can have on citizens both young and old, who are residing in various communities such as rural, urban, and metropolitan environments (DiMaggio et al., 2011; Freeman et al., 2020; Marston, 2019; Marston et al., 2021, 2020a; White et al., 2020; Wilson et al., 2021). Yet, older adults still use the internet to a lesser extent than younger generations, despite the sharp rise in internet use from those over 75 in the last decade (Eurostat, 2017; Office for National Statistics, 2018), and as a result, are more likely to be considered as being digitally excluded (Age UK, 2018). Ihm and Hsieh (2015) note how old age can be a predictor of the lack of access to technology, which in turn may mean that they do not experience the same potential benefits as younger cohorts. It is of course equally important not to consider older adults as one homogenous cohort with the same attitudes to technology, the same digital needs, or having the same digital barriers (van Deursen & Helsper, 2015).

Digital poverty is a further factor associated with digital exclusion, connected to the financial constraints that many citizens experience and plays a pivotal role in the digital divide, coupled with digital literacy varying across age cohorts, with some older adults lacking the digital skills needed to execute basic activities (Nimrod, 2016; Schumacher & Kent, 2020). Son et al. (2021) explore the challenges of reaching vulnerable citizens who do not have access to digital technologies to access resources; Schumacher and Kent (2020) categorise vulnerable citizens as older adults who are the oldest, and who have low incomes, and low education. It is vital to consider this intersectionality of existing inequalities, and its role in digital inequality, which in turn further exacerbates inequalities through lack of digital access.

In some instances, digital inequalities play a key role in older adults being socially excluded, from technology-related leisure activities and access to services because of having limited or no digital literacy skills (Hebblethwaite, 2017). Increasingly digital forms of exclusion are being recognised within conceptualisations of wider forms of social exclusion (Leppiman et al., 2021). Although many citizens had engaged and used various forms of digital devices, and platforms to virtually connect to, and receive social (Gabbiadini et al., 2020) and health-related support (Fisk et al., 2020), many others were excluded, and this added a new dimension to inequality (Seah, 2020).

While cost and access to digital devices/technologies are significant issues, other factors such as perceived usability, and usefulness can impact uptake (Heinz et al., 2013). It could be argued that designing technology with and for older people may overcome some of these barriers. Throughout the pandemic many citizens have been using various forms of digital devices, and platforms to virtually connect to, and receive social support (Gabbiadini et al., 2020) and health-related support (Fisk et al., 2020).

During the ATAT workshops, the older co-designers were encouraged to share their experiences about the different types of barriers, challenges, and concerns that they have encountered with technology and include,

I've got a laptop which I'm using at the moment, and I've also got a smartphone recently err but it's far too small and I don't like using it at all, I much prefer to have a keyboard in front of me.

I predominately use a laptop and I have also got a smartphone and I get lost on it, why, because it is different, why cannot we not have consistency across platforms?

[...] the tablet I think I could use if it didn't have these millions of things on it I've been going back and forth to hospital from surgery etc. and they've been asking for selfies of the condition that I've got, erm so I've had to use my phone for that and send them pictures, but I couldn't do it on the laptop. So, I can do certain things with WhatsApp that I can't do on in an email and so I've got to go between them all, and there's WhatsApp and Messenger, but I'm never quite sure which is the best one to use.

I think one of the disadvantages is cost. Because you have to buy a device but then you have to sign up to a broadband package erm that is really a barrier.

These statements illustrate a wide breadth of concerns experienced by the older co-designers ranging from several apps (pre-installed) onto devices, to the cost of accessing broadband and switching between different platforms, which for many people can be confusing, and irritating. The cost of monthly broadband services is unaffordable for some on a fixed income, resulting in them being categorised as in 'digital poverty'. Digital poverty not only hinders individuals from being able to connect with friends and family members but limits their opportunities of being able to access services and garner important information, (e.g., health and government; Marston et al., 2021).

### *Co-production*

User-centred design is not new, it is however a more passive form of participation, one that older adults are not often engaged in, and as such technology is developed without them in mind (Ivan & Cutler, 2021). This may be because involving older adults in technology design can be perceived as challenging by designers because they are a heterogeneous group with regard to their needs and the way they use and engage with technology (Grates et al., 2019). Alternatively, power imbalances between designers, and older people may mean that the voice of the older person is not prioritised. Even when older people are the focus of technological design, there is often a disconnect between what older adults want and what designers think they need (Mannheim et al., 2019). Often the functionality of applications aimed specifically at older adults is based on stereotypical ageist assumptions of how older people use technology and what they use it for (Mannheim et al., 2019).

The reason for this is twofold. First, as with any form of design, the idea is based on a premise of who the end-user is and how they will use the prototype (Ivan & Cutler, 2021). Second, designers of technology are typically younger and therefore are less likely to design features that facilitate older people's interaction with technology (Ivan & Cutler, 2021). Furthermore, technological innovation is being driven by feasibility rather than the needs of the end-user (Rießenberger, 2021) thus contributing to the digital divide, and creating a self-fulfilling prophecy through product design and marketing aimed at younger cohorts.

One approach to overcoming issues such as usability, lack of confidence in technology, and low digital literacy is for technology design to adopt a participatory or co-design approach with 'older end-users'. Participatory or co-design is a democratic approach to design where older adults or other end-users are central to the design process. Participatory design is on a continuum, which ranges from doing to (informing and educating) through doing for (engaging and consulting) and ending up with doing with (co-production and co-design) (Slay & Stephens, 2013). It has been argued that to date participatory co-design has been overly paternalistic (Peine et al., 2014; Rießenberger, 2021) and focused at the

‘doing to’ end of the continuum. Indeed, Peine and colleagues (2014) argue that too often older adults have been assigned the role of object rather than subject, as is the case with user-centred design.

Yet participatory design when undertaken at the ‘doing with’ end of the continuum, where older adults are equal partners in the process can overcome many of the issues experienced with technology, instilling confidence in the older person. However, care is needed even within participatory approaches to design to ensure that the participatory approach is neither paternalistic, ageist, or stigmatising for the older adults involved in the co-design (Rießenberger, 2021). This is something the ATAT research team were conscious of during the planning of the co-design workshops.

*How we embedded citizen science and participation throughout the ATAT project*

Embedded throughout the different phases of the ATAT project was active participation and citizen science approaches. Such approaches relating to citizen science related to the engagement of and with the project partners (Digital VOICE for Communities and Digital Communities Wales), to facilitate the recruitment of older people with limited digital skills and who had an interest in co-design. During the online workshops, the older co-designers shared their experiences of using digital technology, which included exploring and understanding the barriers, challenges, and more importantly their needs and expectations from technology.

After each online workshop, members of the research team were able to proceed with the development phase, and in Workshop 3, the continuum of employing citizen science by involving the older co-designers to visualise the design and development of a mobile app launcher and to suggest changes that would overall benefit the design/development phase. This iterative design process enabled the computer scientists to address the challenges and barriers the older co-designers themselves had encountered when using digital technologies such as mobile/smartphones. Such challenges and barriers identified were the font style, the ease of navigation, and ability to understand the different icons available (and installed) on a phone. Employing citizen science approaches further, the older co-designers were able to visualise the prototype during the workshop (through a demonstration); they were also able to engage with the prototype (in their own time) via a link provided by the research team to facilitate additional feedback to the developers. Taking this citizen science approach between the older co-designers and the prototype facilitated the basis and fundamental ethos to the study outcomes, and to participation (with older co-designers), as rather than being passive receivers of this information, (older) co-designers were actively engaged and were able to directly inform the study through citizen science approaches.

Further citizen science approaches were applied in the ATAT by primarily engaging with two project partners and older co-designers in two separate regions of the UK. We were fortunate to engage with a third partner – Age Northern Ireland which resulted in a fourth workshop. The purpose of Workshop 4 was to build on the previous workshops and to demonstrate the prototype, instilling active feedback and engagement, to facilitate the research team to garner more feedback about the barriers and challenges encountered by older people who use mobile/smartphones. Participants received reimbursement of a £25 gift voucher.

*Feedback on the citizen science approach from older adults*

The ATAT project ensured citizen science was integral in the project ethos by positioning older adults as the experts while employing and weaving citizen science approaches throughout the different phases of the project. For example, employing citizen science

from the offset of the project was key to the dissemination activities, as illustrated in the co-developed 'Icon Booklet' (<https://www.open.ac.uk/health-wellbeing/projects/adjust-tech-accessible-technology-ata>) and podcast 'Design for Age – Doing Co-Design Better' (Morgan, 2021). Briefly, the workshops were recorded, and additional interviews were conducted with the stakeholders and older co-designers to explore how they found engaging with the project and what benefits, challenges, and positives they experienced. These recordings were placed into the design and development of a podcast by an external company, and by listening to the content, listeners can understand the value of citizen science.

Additional insight can be found through the lens of the older co-designers who for some identified their confidence was a barrier to using and engaging more so with technology,

I feel it has enriched things for me because, I'm looking at it now and feeling just more capable with it all and I think, like, I am able to do it, it's just that, confidence certainly wasn't there before, and I just felt like... the group gave me that really, and the people running it, it was all very interesting

I felt comfortable with them I didn't expect that initially, because I thought, [...] I didn't know what level I'd feel at, [...] I enjoyed learning more about terminology and hearing what the other participants comments were, because we could all discuss what the issues were, what we found difficult

I was confident about using technology to a certain point, but technology changes and you have to move with the times

This positivity is supported by feedback from Digital Communities Wales who note the co-designers,

[...] felt good about their part in the process and felt they left with more confidence, not only in their digital skills, but in general. That was fantastic to hear.

Another older co-designer describes how she felt her workshop involvement, was not only beneficial to herself, by learning from other attendees, but also knowing the information that she was sharing was going to benefit other people:

What interest me about the project was a new way of doing things, learning new technology, learning how to live to other people, and to connect with a much wider audience, and you know learning from each other [...] reconnecting, reducing social isolation, because, when you reconnect with people, especially for us in rural worlds we are really isolated, you know. And when you get to speak to people, and people come back to you, and you learn from one another, it's fantastic, its fabulous participating in something which would be beneficial to others was great, because we was able to share our ideas, and say what was good, what was bad what was accessible to other people, [...] taking part in something that would meet individual peoples' needs [...]

Being made to feel valued and respected as part of the wider research team was important to one individual, knowing that mutual respect was integral to the participatory approach and ethos of the project afforded this older member of the co-design team to realise the value of her contribution,

[T]here wasn't this assumption that we you know, they won't know anything, [...] the respect of the team, [...] our ideas were valued that was very important

### *Benefits of citizen science approaches*

Fostering a positive relationship with stakeholders is one of the critical factors to employing participatory approaches, and, embedding early engagement, coupled with direct involvement from project partners and older co-designers themselves in the context of technology.

Digital VOICE for communities in Newcastle describes the benefits they perceive in co-design by directly involving older adults early on to ensure the design of the product will meet the needs of the participants. Implementing a citizen science approach can add benefits to older adults being co-designers, facilitating greater understanding of how the technology and/or product can benefit them, and relate to them specifically in their day-to-day lives.

This interactive approach facilitates the research team's understanding of the issues and concerns that older adults' experience to a greater extent. It is seldom we hear how research projects can impact other partners and Digital Communities Wales share their insights into being a partner on the ATAT project,

I learned a great deal about what co-design means in practice and will use this learning in my future practice as it is a really transferable approach to service design.

From a personal perspective, the ATAT project facilitated individual learning experiences of those who work directly within the community,

I learned how co-design and co-production can be really inclusive and beneficial to end users, not just in terms of ending up with a better product but also in terms of empowering and giving a voice to people who sometimes don't feel listened to.

Although we have shared the value from the co-designers' perspective, we can also share the value perceived by a research partner, working collegially across different expertise, and maintaining respect throughout; while acknowledging the challenges the rewards for everyone can result in greater outcomes,

I loved being part of a multi-disciplinary team and felt that it was a perfect example of people being respectful and valuing different areas of expertise (not just academic expertise). I can see how this approach is difficult and presents many challenges but is ultimately both rewarding for the participants and results in better outcomes.

Looking to the future, this two-way approach can inform various actors of the opportunity to learn and implement a different approach to product/service life cycles by hearing direct experiences that can afford a change in behaviour for the better.

### **Lessons learned**

We provide a series of lessons learnt which we hope will afford readers the ability to instil and implement into their projects:

- 1 Keep it informal and friendly: avoid using PowerPoint if possible- think about the implicit message tools such as PowerPoint can make to older people, by making it too formal -too academic can affect the power balance.
- 2 Make it your mission: to co-design at the outset and consider what the needs of the end-user might be and how you can enable co-designers to work with you. Think about the language you use – too often we slip into academic speak or acronyms which mean nothing to the people we are working with.
- 3 Time: having plenty of time at the outset for preparation not just yours but the end-user and in this context the older co-designers who are giving up their time to co-design with you.
- 4 Time to explain and explore: older adults in the ATAT project had lots of questions and not always directly relevant to the project. It is important to work at the speed of the group- rather than be led by your own agenda.

Start with the older person and how they would like to resolve those issues

- 1 Partner organisations are a bridge: make sure you have the right partners, and they are part of the team.
- 2 Keep the same people in multiple sessions: building rapport, helps you dig a little deeper-enabling the participants to feel heard throughout.
- 3 Listen: we were able to identify something en route (Icon booklet) that we are translating into a resource for the individuals and the partner organisations we worked with – something tangible that they have identified, are proud of and which others will benefit from.
- 4 Keep it fun: Have fun along the way – research and data collection is a serious activity but you can still have fun with it, and it helps break down those barriers – for all who are participating in the co-production or design.

We chose the Zoom platform because members of the project felt it was the most accessible and familiar platform for the older people and most commonly used during the pandemic (Evans, 2020; Karl et al., 2021; Sherman, 2020). A Zoom link was created to enable older adults to access and familiarise themselves with the platform, ahead of the workshops. Meetings were scheduled for 90 minutes per workshop to reduce the risk of ‘Zoom fatigue’ (Busby, 2021; Karl et al., 2021), and the same Zoom link was used throughout. Support from project partners ensured that help was on hand for anyone experiencing difficulties before or during the workshops.

Conducting online workshops via a communications platform, facilitated the research team to easily connect with everyone, enabling a diverse group of older adults from different parts of the UK to connect. Employing this approach enabled all attendees (older adults, project partners, and research team) to connect with each other. Whereas had we been in a pre-pandemic society, workshops would have been conducted separately at on-site locations and participants would not have had the opportunity to engage with each other.

Employing a citizen science approach, the older co-designers identified an issue in relation to understanding icons used in technology (e.g., via smartphones). As such we co-designed an Icon booklet with them to help support them and others. During the online workshop conversations, several of the older co-designers expressed how they sometimes found it difficult to understand the meaning of icons on their respective smartphones. The published booklet is a template comprising some of the key icons found on both Android



and iOS platforms. In the booklet, we have included various ‘apps’ that can be downloaded and installed onto smartphones. While the apps in the booklet may not be directly of interest to all participants the purpose of including them was to illustrate the wide array of apps available for download via the respective app stores. We discussed with the group what would be helpful from their perspective (older people and third-sector charity partners do not often access traditional academic outputs), and this type of output was suggested and received positively. The development and production of outputs such as the podcast ‘Design for Age – Doing Co-Design Better’ (Morgan, 2021), includes narration by the project lead (Morgan), coupled with sound bites from all members of the research team. We believe this type of output is very rewarding, and tangible because it can be shared and accessed across existing platforms, and audiences. Finally, and more importantly, it continues the participatory approach and demonstrates the citizen science ethos of what we as a research team set out to achieve. Our co-designers (older adults and stakeholders) were invited to share their experiences of being involved coupled with the opportunity of the project partners to share the podcast across their networks in an accessible format.

### **Conclusions**

The ATAT project demonstrates the importance of implementing participatory approaches and citizen science to overcome product design issues from the context of interdisciplinary research teams. To garner beneficial and positive insights relating to participatory discourse and engagement, we believe the ATAT project affords readers with a blueprint for future research projects. Moreover, what is integral to any research project, but specifically interdisciplinary research where inclusion and participatory approaches are central, is trust.

However, from the discourse presented here and via the podcast, we would disagree. The positive feedback about the project from all co-design team members (both stakeholders and participants themselves) demonstrates trust and integrity were achieved. Outputs such as the podcast and the design and development of the ‘Icon booklet’ are evidence of responding to identified needs and this trust in listening and actioning accordingly. The podcast and booklet are resources which can and are currently being distributed not only to the participants themselves and stakeholders but also to wider communities across the country including researchers, and many others who have an interest and are delivering online services to communities and individuals with limited digital skills.

We are pleased to have been able to share our research with Policy Connect<sup>1</sup> a think tank in the UK and who work closely across different all-party parliamentary groups (APPGs) such as Assistive Technology (Policy Connect). This in turn has led to the ATAT being included in the report ‘Smarter Hones for Independent Living Putting People in Control of Their Lives’ (Gilbert, 2022) as a case study to demonstrate the gold standard of participatory approaches while bridging various disciplines. This approach is imperative if positive changes and behaviours are to take place for societal benefits now and in the future.

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## Note

- 1 Policy Connect <https://www.policyconnect.org.uk/>

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