RiDC

Research Report

Disability, data and digital assistive technologies (DigAT)

Understanding the role of digital assistive technology in meeting the needs of disabled people

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THE ROYAL SOCIETY

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About RiDC

The Research Institute for Disabled Consumers (RiDC) is the leading expert in inclusive research involving disabled people

We are an independent, national charity with over 50 years experience in commissioned consumer research and insights in this area. We have a strong track record of delivering unique insights and solutions to businesses, government and charities, including on digital assistive technologies.

We are run by and for people with a personal experience of disability.

Our approach

We always start from the perspective of disabled people. By working in a participatory way - listening to their needs and reflecting on real lives in our research, we make sure nobody is excluded.

Our panel

RiDC was one of the first organisations to establish a UK panel of disabled and older consumers. Our panel now includes over 4,000 people and is the largest pan-disability panel in the UK. It is representative by impairment group, gender and region, based on the overall disability population in the UK as listed in the most recent Family Resources Survey.

Meet Michelle, one of our panel members

Introduction

The RiDC was commissioned by the Royal Society to explore and understand the experiences and views of disabled people using digital assistive technologies (DigAT) to help inform and shape future policy and practice.

DigAT has become increasingly present in contemporary society and as such is becoming ever present in the lives of disabled and older people. More and more of our life is moving onto platforms that allow us to better engage with new technologies, our environment, products and services, and which purport to enable a better life tomorrow. However, unprecedented changes in technology (both in terms of functionality and adoption) call for innovative approaches to understand how disabled and older people can and will interact with that technology.

We understood that the Royal Society wanted to look at the interface between disabled people and current and 'emerging' assistive technologies. As a result, between February and May 2024, we designed and delivered a mixed-methods research study to explore and understand the experiences and views of disabled people using and finding out about digital assistive technologies, with the aim of providing Royal Society with the data needed to inform future policy and practice.

Research questions

The questions that guided our research were as follows:

1. How/do people with disabilities use digital (or 'emerging') assistive technologies to meet their access needs? What are these technologies enabling them to do that they wouldn't be able to do otherwise?
2. How do disabled people discover digital assistive technologies, and what prevents them from using them?
3. What access needs are not being met by digital assistive technologies?
4. What are disabled people's primary concerns when using digital assistive technologies (e.g. knowledge, privacy, security, accuracy, utility, obsolescence, expense, personalization, sustainability, connectivity, unknown risks of AI)?
5. Where do disabled go for access to, or help with, digital assistive technologies (e.g. to obtain, modify, learn, discard, or uninstall them)?
6. How is the impact of these technologies related to other characteristics or circumstances (i.e. how does intersectionality affect this)?

Section 1

Methodology

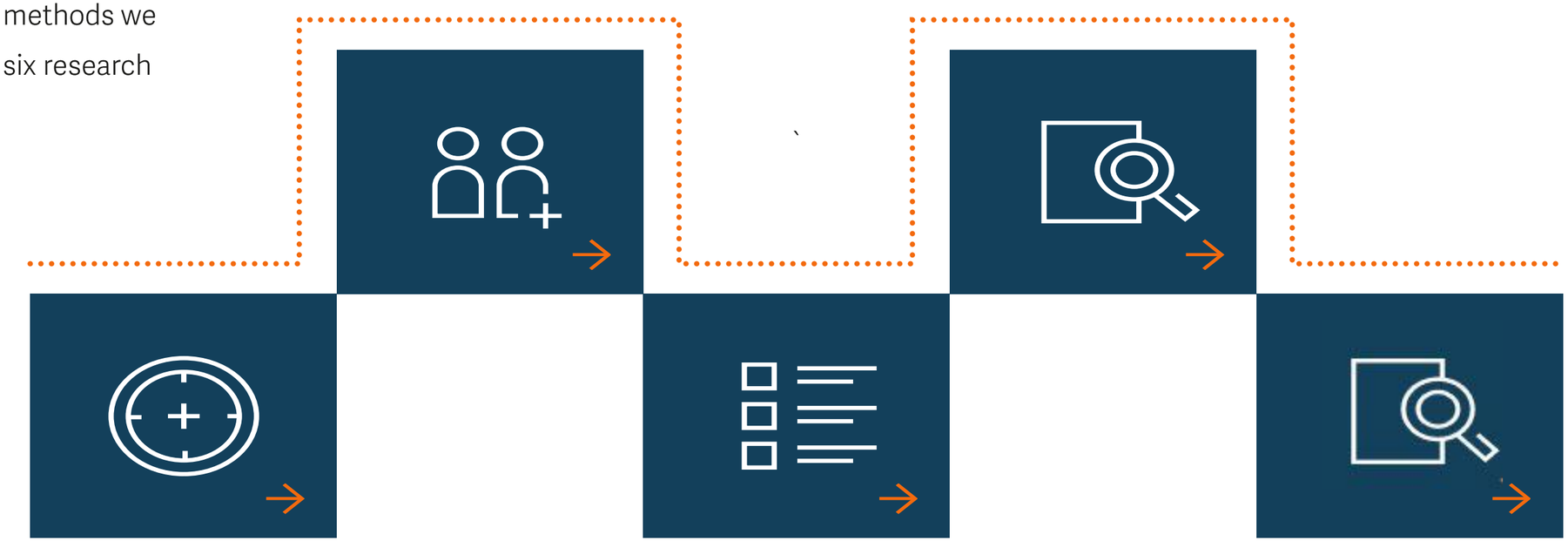
Research Parameters

The following are some key points about how the scope of the research was defined:

- Use of conventional analogue assistive technology (such as glasses or wheelchairs), technologies used by caregivers, genetic modification, and technologies for high performance tasks (such as elite sports) were excluded from the study.
- The research did, however, seek to explore 'emerging' or 'intelligent assistive technology', and hardware or software external to, worn on or implanted in the body (e.g. smart assistants, advanced hearing aids, automated lip reading).
- We expanded the scope of the research by gathering high-level quantitative and qualitative insights into artificial intelligence (AI) and the current and future role it will play in assistive technologies, as we felt it was an important topic to consider when exploring 'emerging' technologies.
- We also expanded the scope of the research by gathering qualitative insights into disabled people's experiences of participating in the design of or user (UX) testing of new digital assistive technologies.
- The main research focus was to understand more about disabled people's attitudes towards DigAT, rather than the technology itself. To get the most out of our research, we focused on people's broader experiences rather than the pros and cons of specific models of DigAT.

Our research approach

The following diagram outlines the mixed research methods we used to answer our six research questions.



1 Rapid evidence review

In February and March 2024, we conducted a review of the Royal Society's and other relevant research about DigAT to help inform our research design and build on existing research.

2 Expert by Experience (EbE) session

In March 2024, we ran a 90-minute online participatory design session with 8 RiDC pan-disabled panel members, to help us design, shape and test our survey.

3 Survey

In April 2024, we sent a survey to the entire RiDC panel to explore their experiences of and attitudes towards using DigAT. This received 851 responses and the findings were used to help inform follow-up focus groups.

4 UX Focus group

In May 2024, we held one 90-minute online focus group with six RiDC pan-disabled panel members recruited from the survey who were identified as having been involved in testing or designing new DigAT. This was designed to explore their experiences and involvement in the process.

5 Focus groups

In May 2024, we held three 90-minute online focus groups with six RiDC panel members in each (18 participants in total) recruited from the survey. These focus groups were grouped by broad impairment type (sensory, mobility and cognitive), and designed to gain a more in-depth understanding of the experiences of and attitudes towards accessing or using DigAT.

Section 2

Key findings

Key findings

How do people with disabilities use DigAT to meet their access needs?

- Over half of survey respondents who used DigAT said that without it, they **could not live the way they did** or **that their daily life would be significantly more difficult**. Just over 6 in 10 agreed that they needed it to access critical services (such as medical services, online banking, or education).
- The research highlighted that **a vast range of technology was being used and considered by disabled people as DigAT**. This DigAT enabled users to meet their specific needs and fulfil a wide variety of tasks that would otherwise be difficult or impossible to complete independently in multiple contexts (particularly in the home, for leisure and travel).
- Survey respondents described using their DigAT for varied tasks which could be grouped according to three broad functions: **performing context-specific tasks; aiding communication;** and **addressing specific access needs**.

How do disabled people discover DigAT, and what prevents them from using it?

- New DigAT was **mostly discovered online (i.e. via websites or social media),** with nearly 7 in 10 survey respondents selecting this means of discovery. Being informed by organisations (such as disability groups, charities, community groups, and manufacturers) was the next most popular means of discovery, with disability groups being the most significant category within this subset.
- Of those who did not use DigAT, over half (55%) said they did not need to use DigAT for their disability, access need, and/or health condition, **while 19% felt they did not know enough or feel confident enough to use it.**
- Nearly 6 in 10 of those who did not use DigAT said they would use it **if they knew what types of DigAT were on the market**, while nearly 4 in 10 said they would use it **if training was available to show them how to do so.**
- Those who used DigAT felt that **the biggest disadvantages of using new DigAT** related **to cost** (61%) and **the risk of it being replaced by something better** soon after purchasing or installing it (51%).

What are the reasons why DigAT can fail to support access needs?

- **A failure to involve disabled users in the design and testing** of DigAT and **inaccessible DigAT instructions** or **a failure to provide a customer service** were cited as reasons for access needs not being met.
- Over half of survey respondents believed that **Artificial Intelligence (AI) could bring improvements** in four main areas: creating impairment-specific aids; improving access to digital technology; reducing social barriers; and improving access to care.

Key findings

What are disabled people's primary concerns when using DigAT?

- Survey respondents were most concerned **that DigAT companies would replace their human support-teams with chat bots or AI**, with the result that they would not be able to obtain the support they needed.
- Half of survey respondents said they had concerns about **AI being used in a way that could discriminate against disabled people**, believing that this discrimination could arise from how AI is used or relied upon by society (resulting in reduced efforts to minimise structural barriers), or AI's inability to take full account of disabled people's experiences or provide reliable support and accurate information.
- Nearly half of survey respondents (49%) were concerned that **disabled people were not involved in the testing of DigAT**, and that this could result in inaccessible DigAT features or users' access needs not being met.
- 46% felt that **if they themselves lacked awareness of the latest DigAT, nobody else would help them access it.**
- 43% were concerned about **how much data is gathered from disabled users** and **how this data is employed when DigAT is in use**, particularly in relation to AI-powered DigAT.

Where do disabled people go for access to, or help with DigAT?

- 6 in 10 survey respondents felt that they **were able to research and find suitable solutions to problems with DigAT online**. Older participants and those with cognitive conditions, however, reported a lower likelihood of being able to find suitable solutions to problems online. Women were also less confident in finding online solutions.
- Just under 3 in 10 respondents (29%) **did not have anybody they could rely on for help with their DigAT**. However, 53% had someone who could provide support and over three thirds (66%) felt comfortable asking for help.
- DigAT customer support issues raised by participants included **lack of timely or satisfactory responses** and **lack of human support as a fallback.**

What societal changes regarding DigAT do disabled people want?

- Survey respondents considered it **most important that more DigAT companies test their products with disabled people.**
- Just over 7 in 10 respondents considered **policy changes aimed at removing day-to-day disadvantages disabled face with DigAT** (such as increased cost, data security issues, and compatibility) as 'very important'.
- Nearly two thirds of respondents (60%) considered it 'very important' that there would be **a cultural shift towards society viewing accessible products positively.**

Section 3

Rapid evidence review

Rapid evidence review

With our evidence review, we wanted to outline the current knowledge base surrounding DigAT (particularly in terms of how it is categorised) and create a structure on which we could use the knowledge to inform our research processes.

We used evidence from both academic and social contexts to create categorisations of the existing DigAT landscape, creating two models of how the technology is currently categorised and used by disabled and older people.

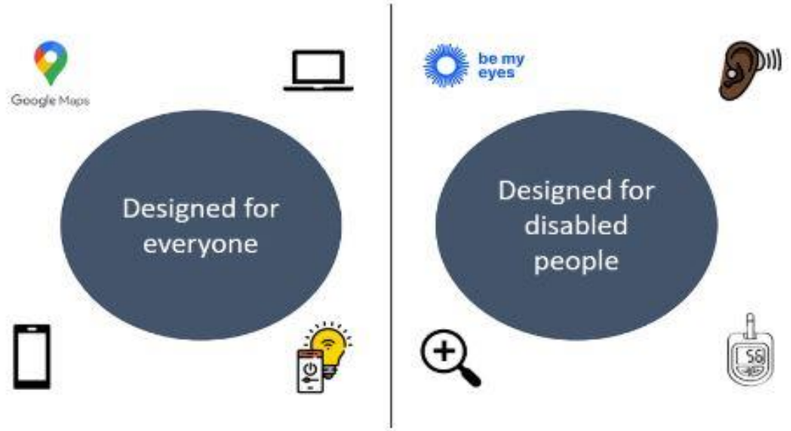
We focused on creating classifications to help us build and analyse our survey and inform subsequent research stages. We therefore created two main ways of categorising DigAT which build on literature produced by the Royal Society as well as findings from wider research (see references in appendix).

When looking into the variety of DigAT available, it seemed that the technology could be grouped under the following two groups, depending on its target audience:

- **Technology designed for everyone** which serve a secondary assistive function (such as remote or app-controlled lighting or heating, Google Maps, or virtual assistants like an Amazon Alexa). These devices are common in society but do not stand out as assistive despite being a significant help to users with a wide range of access needs.

- **Technology designed for disabled People** which serve a primary assistive function (such as Bluetooth hearing aids, Be My Eyes and SeeingAI apps for the visually impaired). These devices and applications are designed with disabled people in mind to ensure that they are able to access different aspects of daily living.

Figure 1: The Primary/Secondary Functionality Divide



We used these two broad categories to help us assess the most common technologies people use and to see if there was a correlation between a product's initial design and the ways people use it in their day-to-day lives.

Rapid evidence review

We identified four major categories of DigAT based on all of the literature we reviewed (see references in appendix). The compass on the right is divided into two axes: **access** and **social presence**. By '**access**', we mean anything that could support or limit a person's ability to purchase or use DAT (e.g. cost, usability, obsolescence, availability, other factors). By **'social presence'** we mean how easy it is to find out about these products (e.g. whether they are widely available in stores, marketed by charities or organisations, publicised on social media or the news).

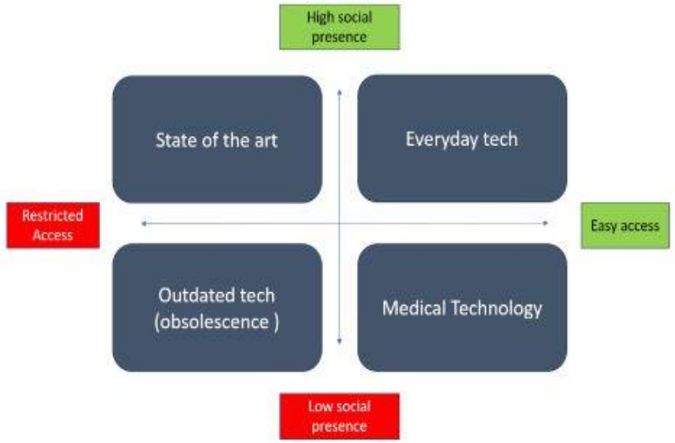
State of the art – This category includes devices which are **difficult to access** but have a **high social presence** (e.g. Envision, Meta glasses, Google glass). This is likely because they are too expensive or use complicated programmes which are difficult to learn. Their social presence is high because companies are likely to want to advertise about their newest inventions, and such technology is often covered by the news or social media.

Everyday technology – These devices are likely to have a secondary assistive function whilst their primary function is more general. They are **easy to access and** have a **high social presence** and include smart phone, laptops, and virtual assistants which are used by most people in society daily. Assistive technology is often integrated into the device.

Outdated technology – Disabled and older people can find it difficult to adopt new technologies either in the form of a new device or software update which can result in them using out of date technology (such as old iPhone) or using technology that is no longer supported by up-to-date systems (such as older screen-reader that no longer supports new web browsers. This means that the devices are **difficult to access** due to a lack of support from the manufacturers and have a **low social presence** as society and the industry are only focused on the latest innovations.

Medical Devices – Medical devices have their own category for the purpose of devices which are **easy to access** in the UK through the NHS, and yet have a **low social presence** as it is hard to find information about the newest technologies and how to access them. These devices are often not the most advanced solutions due to budget issues associated with the NHS.

Figure 2: The Digital Assistive Technology Compass



These four categories helped us think more broadly about the different types of DigAT disabled people may use and how certain factors (i.e. access and social presence) could impact uptake and continued use of the product.

Section 4

Expert by Experience (EbE) session

Who took part in our EbE session?

After conducting our Rapid Evidence Review, we ran an **Expert by Experience (EbE) session** with eight RiDC panel members who used DigAT. The purpose of this session was to help us design, shape, and test our survey and ensure that we used appropriate language and questioning throughout our research.

This 90-minute session was conducted over Zoom in March 2024.

Gender

- 5 were female
- 3 were male

Age

- 2 were between 18 and 39 years of age
- 5 were between 40 and 59 years of age
- 1 was between 63 years of age

Ethnicity

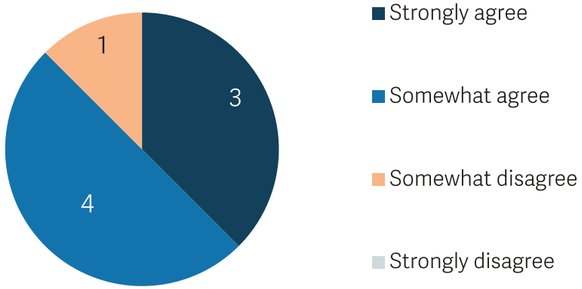
- 6 were white
- 2 were Asian

Impairment type

- 6 had a mobility impairment
- 6 had a cognitive impairment
- 1 had a hearing impairment
- 1 had a dexterity impairment
- 1 had a communication impairment

Most of the EbE participants told us in a screener survey that they liked to use the latest innovations in DigAT as soon as they became available.

"I like to use the latest innovations in assistive technology as soon as they become available"



EbE findings

During the EbE session, we discussed how we should best define digital assistive technology and capture disabled people's use of and attitudes towards it. We also sought to understand the typical barriers disabled people face and the biggest concerns they have when using DigAT, the context in which it is used and the possible intersectional characteristics that could impact its use.

We co-formulated a definition of DigAT

To help survey respondents and focus group participants understand what would be classified as DigAT, we asked our EbE participants what their thoughts were about a definition of DigAT we planned to use in our survey and focus groups. With their help, we refined the definition of DigAT to mean: "**Any digital technology that processes information to help make your life easier.**" Participants also asked that we provide examples to illustrate the definition of DigAT.

We discarded an over-simple pre-defined categorisation of DigAT in favour of a more nuanced data derived one

Initially we had planned to ask survey respondents to categorise their DigAT into two groups: **Mainstream technology** which serve a secondary assistive function (such as an Amazon Alexa) and **technology designed for disabled people** which serve a primary assistive function (such as a screen-reader). However, the feedback was that this dichotomy was over-simple and unclear, with participants perceiving DigAT as covering several and sometimes overlapping categories. For example, an iPhone is a piece of mainstream technology but includes in-built accessibility features specifically designed for disabled users.

We identified important insights to gather in the survey

The EbE session helped us sharpen the focus of our survey and plan its subsequent analysis. For example, the insights helped us create a series of statements aimed at exploring respondents' concerns about DigAT and frame questions about policy approaches that might improve the usefulness of DigAT for users. The analysis also benefited from a prior understanding of the possible intersectional characteristics that could impact access to and use of DigAT (such as age, impairment, and digital skills).

View the EbE discussion guide in appendix

Section 5

Who completed our survey and took part in our focus groups?

Survey sample

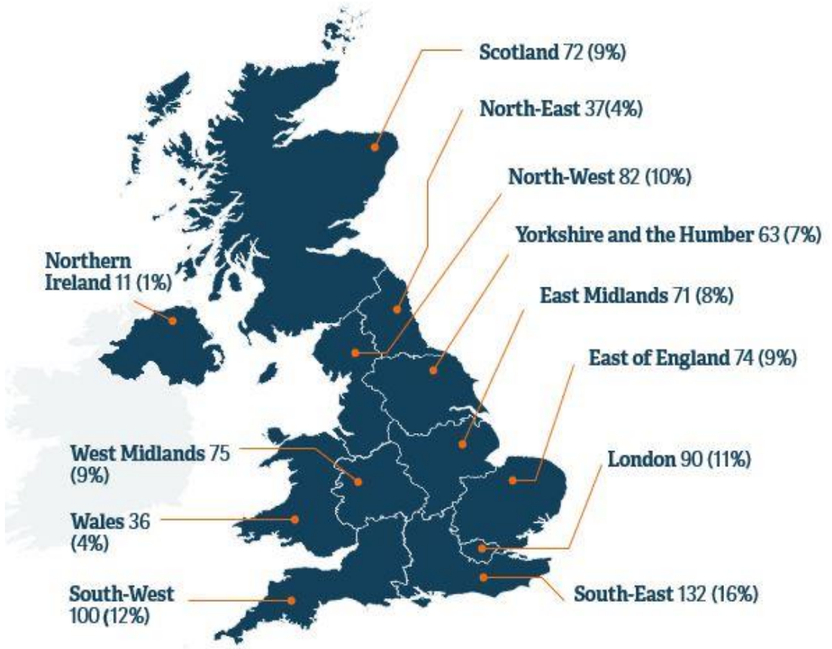
Our survey was sent to the entire RiDC panel to explore their experiences of and attitudes towards using DigAT.

The survey was live between the 9th and 24th April 2024 and **received a total of 851 responses**. The recorded demographic details of survey respondents are provided below.

Age group	n	%
Under 18	3	0%
18-39	98	12%
40-59	302	36%
60-79	388	47%
80 and above	40	5%
Total	831	100%

Gender	n	%
Female	475	56%
Male	360	42%
Other	10	1%
Prefer not to say	6	1%
Total	851	100%

Region (n= 844)



Impairment type	n	%
Mobility	721	85%
Dexterity	355	42%
Cognitive	335	40%
Visual	293	35%
Hearing	210	25%
Communication	124	15%
Total (count)	2,038	-

*Please note that many panel members have more than one impairment so therefore fall into multiple impairment groups.

Ethnicity	n	%
White	770	92%
Ethnic minority	55	7%
Prefer not to say	8	1%
Total	833	100%

The above demographics are closely representative by age group, gender, and impairment, based on the overall disability population in the UK as listed in the most recent Family Resources Survey (2022-2023)

View the survey script in appendix

UX focus group sample

6 participants, identified as having been involved in designing or testing new DigAT, were selected to take part in a 90-minute UX focus group. The aim of this focus group was to explore their experience and involvement in the process.

The focus group was conducted online via Zoom in May 2024.

Gender

- 4 were male
- 2 were female

Age

- 2 were between 18 and 39 years of age
- 2 were between 40 and 59 years of age
- 2 were between 60 and 79 years of age

Impairment type

- 4 had a mobility impairment
- 4 had a dexterity impairment
- 3 had a visual impairment
- 2 had a cognitive impairment
- 1 had a communication impairment

*Please note that many participants had more than one impairment.

Ethnicity

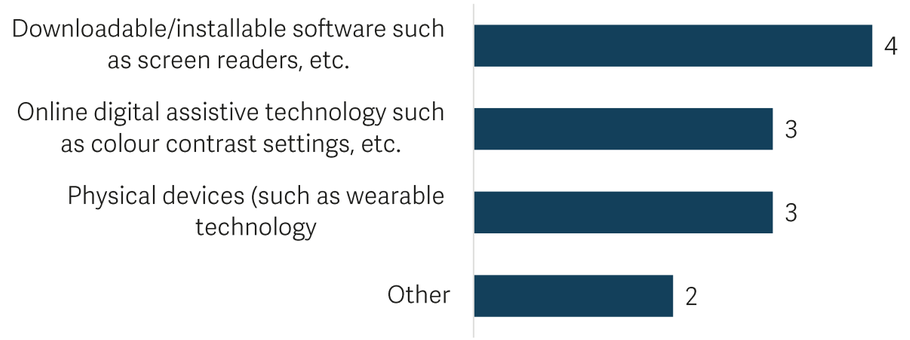
- 4 were White
- 1 was Asian
- 1 was Mixed Race

Region

- 1 was based in the South-West
- 1 was based in East Midlands
- 1 was based in London
- 1 was based in Wales
- 1 was based in Yorkshire and the Humber
- 1 was based in East of England

Most participants had been actively involved in testing or designing a wide range of DigAT including downloadable/installable software or applications (such as Google's speech recognition software, diabetes management apps, Soundscape app), online digital assistive technology (such as TextHelp, NVDA screen-reader) and physical devices or wearable technologies (e.g. to monitor or manage different health conditions).

Types of DigAT involved in testing or designing



View the UX focus group discussion guide in appendix

Focus group sample

18 participants were selected from the survey to take part in a follow-up focus group to further explore their experience of and attitudes towards accessing or using DigAT.

Three 90-minute focus groups were conducted over Zoom in May 2024, and each consisted of six participants. These focus groups were organised by three broad impairment groups – **sensory** (i.e. visual and hearing), **cognitive** (i.e. learning differences, dyslexia, autism or ADHD), and **physical** (i.e. mobility and/or dexterity).

Gender

- 11 were female
- 5 were male
- 2 did not disclose their gender

Age

- 9 were between 18 and 39 years of age
- 7 were between 40 and 59 years of age
- 2 were between 60 and 79 years of age

Impairment type

- 13 had a cognitive impairment
- 11 had a mobility impairment
- 8 had a visual impairment
- 7 had a communication impairment
- 6 had a hearing impairment
- 5 had a dexterity impairment

*Please note that many participants had more than one impairment.

Ethnicity

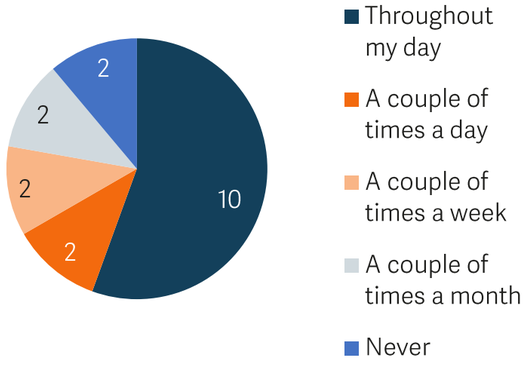
- 11 were White
- 2 were Black
- 2 were Asian
- 3 were Mixed Race or 'Other'

Region

- 5 were based in London
- 4 were based in the West Midlands
- 3 were based in the South-East
- 2 were based in Yorkshire and the Humber
- 1 was based in the East of England
- 1 was based in the East Midlands
- 1 was based in Scotland
- 1 was based in the South-West

More than half of participants used DigAT **throughout their day**, while 6 used it a **couple of times a day, week or month.** 2 participants **never** used DigAT but indicated that they would use it if it was more affordable, easier to use or designed with their access needs in mind.

Frequency of using DigAT



View the focus group discussion guide in appendix

Section 6

Survey and focus group findings

How/do disabled people use digital (or 'emerging') assistive technologies to meet their access needs?

Survey respondents were first provided with the following **definition of DigAT** that was co-formulated in the Expert by Experience session:

“Any digital technology that processes information to help make your life easier. This can include screen-readers, speech-to-text software, or apps which support daily living such as Grammarly, NaviLens, or Be My Eyes. It does not include non-digital assistive aids like canes, wheelchairs, or magnifying glasses.”

Definition co-formulated with disabled participants (see slide 18)

Day-to-day use of DigAT

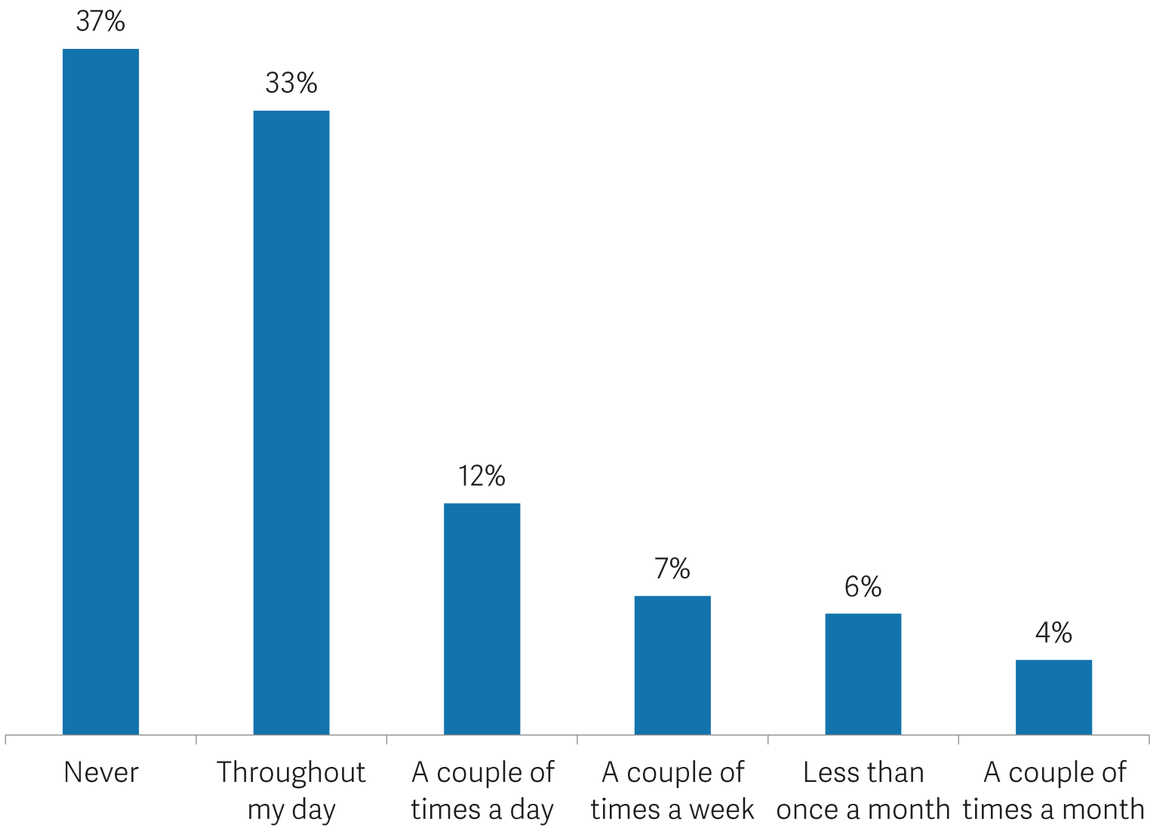
After being provided with a definition of DigAT, survey respondents were then asked how often they use DigAT.

Overall, respondents were most likely to report that they **never** use DigAT (37%) or that they use DigAT **throughout their day** (33%).

- Those with **visual impairments** were most likely to use DigAT throughout their day, with 44% of this group selecting this option.
- **18–39-year-olds** were the most likely age group to use DigAT **throughout their day**, with 42% of this group selecting this option.
- **Older adults were more likely** than younger adults **to report they never use DigAT**. 44% of 60–79-year-olds reported that they never use DigAT. This rose to 55% of over 80-year-olds.
- **Women** were also slightly more likely than men to report they **never use** DigAT, with 41% of women reporting this compared to 31% of men.

Respondents' reasons for not using or rarely using DigAT are explained on slide 49.

How often do you use digital assistive technology? (n=851)



Read about our approach to statistical testing in the appendix

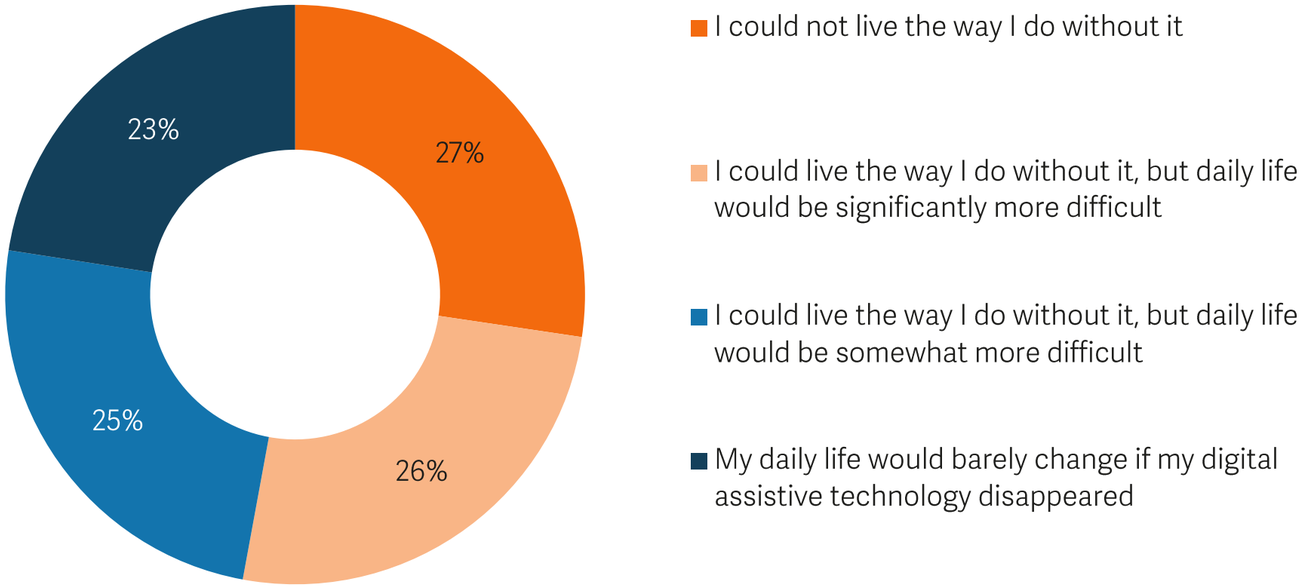
Impact of DigAT on daily life

Survey respondents were asked to score the importance of DigAT in their daily life.

Just over half (53%) of respondents said they either **could not live the way they do without it** or that **their daily life would be significantly more difficult without it.**

- Those with a **visual impairments** were the most likely to report that they **could not live the way they do without it**, with 38% selecting this option.
- Respondents aged **40-59** were more likely to report that their **daily life would be significantly more difficult without it** (33%) than those aged 60-79 (19%).
- Respondents aged **60-79** were most likely to report that their life would **barely change** if their DigAT disappeared (31%) .

How important is digital assistive technology in your life? (n=501)



*Respondents were asked this question later in the survey. The sample size for this question is smaller because respondents who selected 'I don't need to use digital assistive technology for my disability, access need, and/or condition' (see slide 49) were directed to the end of the survey.

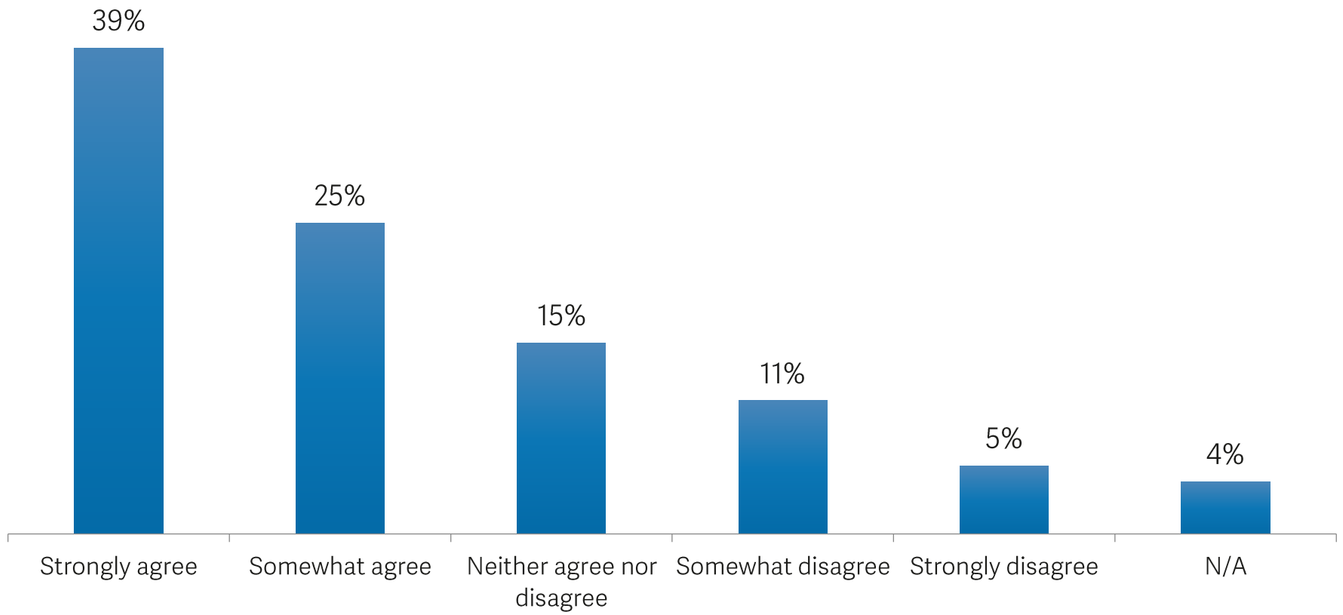
Using DigAT to access critical services

Of respondents who said they use DigAT (n= 475), the **majority** (64%) **strongly or somewhat agreed** that they needed DigAT **to access critical services.**

- Those with **visual impairments** were the most likely to select **strongly agree**, with 45% selecting this option.
- Age or gender did not significantly affect how likely participants were to disagree or agree with this statement.
- Only 16% **strongly or somewhat disagreed** with this statement.

Overall, this **highlights that for disabled people, DigAT is necessary to access critical services.**

To what extent do you agree with the following statement: "I need digital assistive technology to access critical services (such as medical services, online banking, or education)" (n=475)



What technology do disabled people use and consider to be DigAT, and how do they use it day-to-day?

During the rapid evidence review, at the beginning of the project, we noted that there was an absence of widely agreed distinctions between different types of DigAT. It is likely that this is due to the vast range of technology being used and considered by disabled people as DigAT.

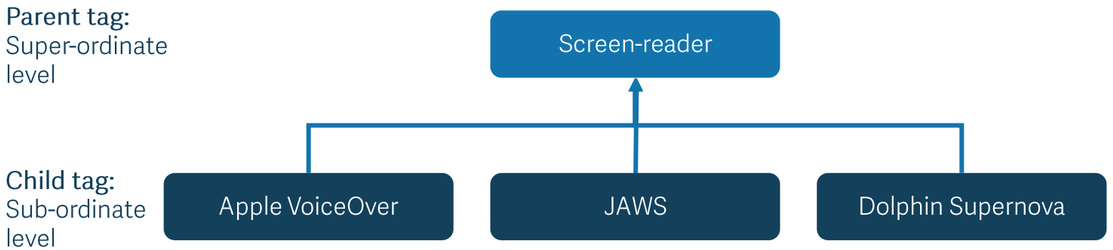
Rather than impose pre-defined distinctions in advance, we decided to ask survey respondents (who said they use DigAT) to list up to 10 DigAT they use and to describe their use in response to two separate open-ended text questions. We employed a bottom-up approach to code and categorise the responses. Under this approach, categories of DigAT emerged organically from the respondents' answers, reflecting how respondents themselves described and characterised their use of DigAT. It is important to note that the data is fluid and some of it is relevant to more than one category.

As part of our approach, in relation to both Q14 ('What DigAT do you use?") and Q16 ("Please describe the tasks you use DigAT for"), we first organised the responses into sub-ordinate levels (i.e. child tags) and then super-ordinate levels (i.e. parent tags). This resulted in:

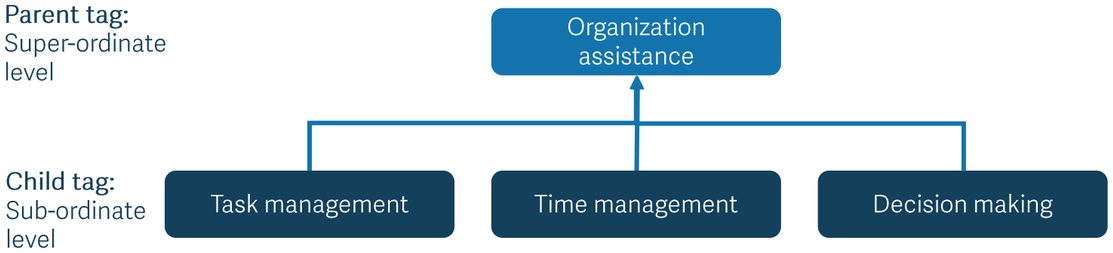
- **Child tags** that were as granular as possible (i.e. listed the exact device type used in Q14, or provided a detailed description of the task the technology was used for in Q16).
- **Parent tags** of the first basic theme tying tags together. For example, Apple VoiceOver, Jaws and Dolphin Supernova are all screen-readers.

For example...

Q14: What DigAT do you use throughout the day?



Q16: Please describe the tasks you use this technology for.

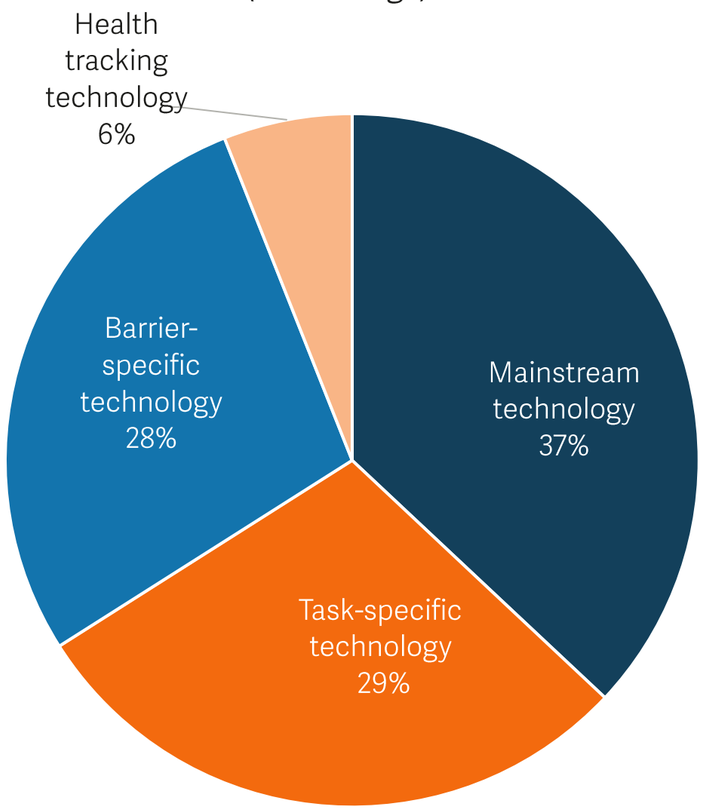


Summary of types of DigAT used

Respondents were asked to list up to 10 types of DigAT they used at any point during the day.

- This question received over 2,000 answers. After cleaning the data, we were left with 1769 valid answers which listed over 460 types of technology respondents considered as DigAT.
- There were low counts for many technology types, meaning it was not possible to cross-tabulate individual types of technology with other variables (such as gender, age, or impairment type). Overall, this suggests that disabled people's use of DigAT is extremely varied, and a lot of technology is not consistently used in one context or to support one impairment type.
- After using a bottom-up coding approach (as described in the previous slides), we concluded that DigAT types could be grouped into four overarching categories: **Mainstream technology; Task-specific technology; Barrier-specific technology;** and **Health tracking technology.**

What digital assistive technology do you use throughout the day? (n= 1769)
Overarching categories (Parent tags)



By **Mainstream technology,** we mean:
Smart phones, laptops, tablets, desktop computers, virtual assistants or communication software or apps.

By **Task-specific technology,** we mean:
Technology aimed at performing specific tasks, such as managing home appliances, travelling, seeking entertainment, managing finances, ordering or preparing food, or online shopping.

By **Barrier-specific technology,** we mean:
Technology aimed at addressing specific barriers in a user's environment, such as support with accessing visual information, text to speech/speech to text conversion, support with organisation, memory, reading, writing, composition, accessing or controlling sound, mobility, or oral communication.

By **Health tracking technology,** we mean:
Apps, software, or devices to track or manage health conditions, energy levels, or physical or mental symptoms.

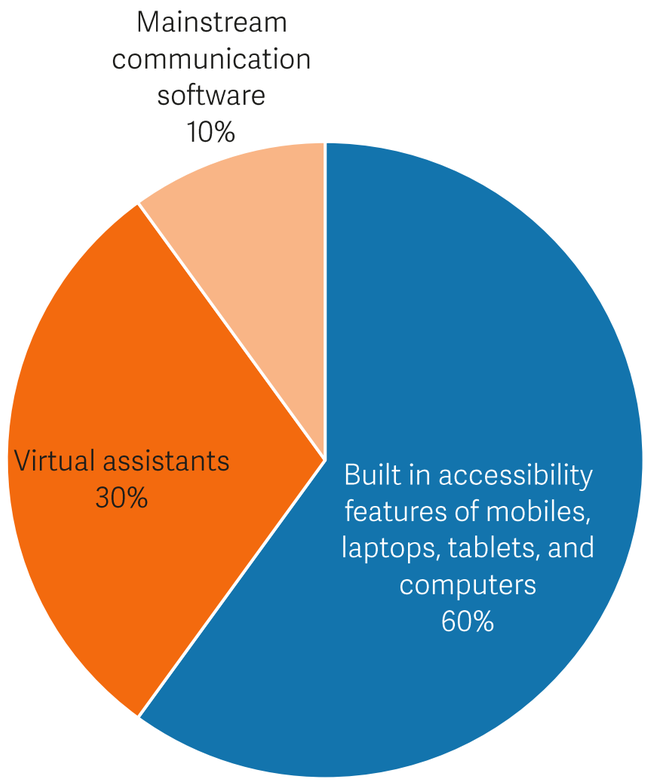
Types of DigAT used: Mainstream technology (37%)

By **Mainstream technology,** we mean:
Smart phones, laptops, tablets, desktop computers, virtual assistants or communication software or apps.

37% of DigAT listed in respondents' answers could be categorised as 'Mainstream technology'. The subcategories of DigAT within this overarching category were as follows:

- **60%** were **standard or in-built accessibility features** provided by smart phones, laptops, tablets, and desktop computers (such as a screen-reader, dark mode, screen magnifier, font or colour adjustments, device-enabled captions)
- **30%** were **voice-controlled assistants** (such as Siri, Google Assistant, Amazon Alexa, and Google Home).
- **10%** were **mainstream communication software or apps** (such as email, messaging, social media, or video calling apps).

Mainstream technology (n= 649)
Subcategories
(Child tags)



Please note that respondents were provided with the following definition of DigAT (which was formulated through the EbE session) at the start of the survey:

By digital assistive technology we mean:

Any digital technology that processes information to help make your life easier.

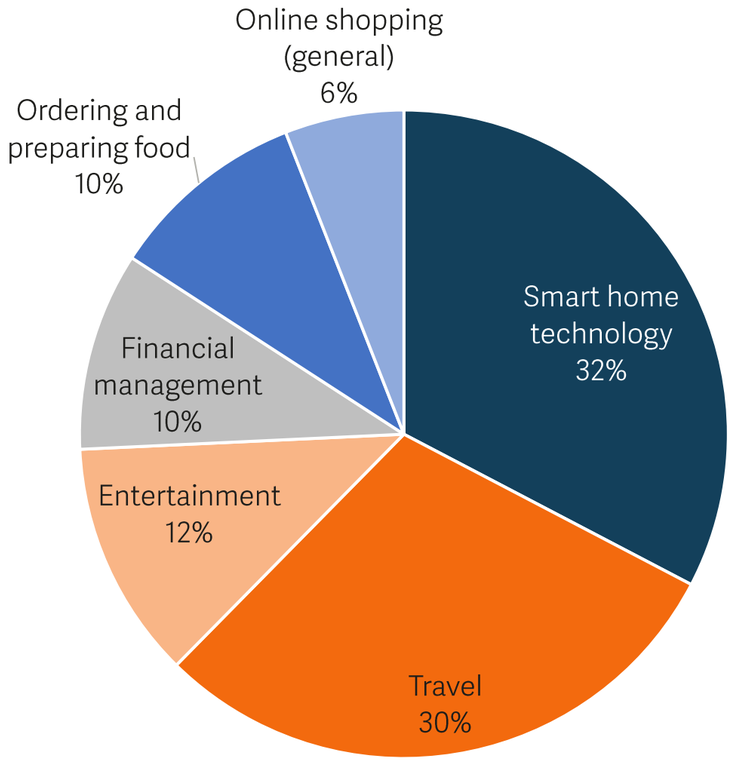
Types of DigAT used: Task-specific technology (29%)

By **Task-specific technology,** we mean:
Technology aimed at performing specific tasks, such as managing home appliances, travelling, seeking entertainment, managing finances, ordering or preparing food, or online shopping.

29% of DigAT listed in respondents' answers could be grouped as 'Task-specific technology'. The subcategories of DigAT within this overarching category were as follows:

- **33%** were **smart home technology** (such as app controlled smart heating, lighting, plugs, switches, or doorbells).
- **30%** were **travel-related or wayfinding apps** (such as Google Maps or Maps, or Microsoft Soundscape).
- **12%** were **entertainment-related devices or apps devices** (such as electronic readers, gaming software, or accessibility features on TV or streaming services).
- **10%** were **finance-related apps** (such as online banking) and **online services to order or prepare food** (such a supermarket or takeaway apps).

Task-specific technology (n= 504)
Subcategories
(Child tags)



Please note that respondents were provided with the following definition of DigAT (which was formulated through the EbE session) at the start of the survey:

By digital assistive technology we mean:

Any digital technology that processes information to help make your life easier.

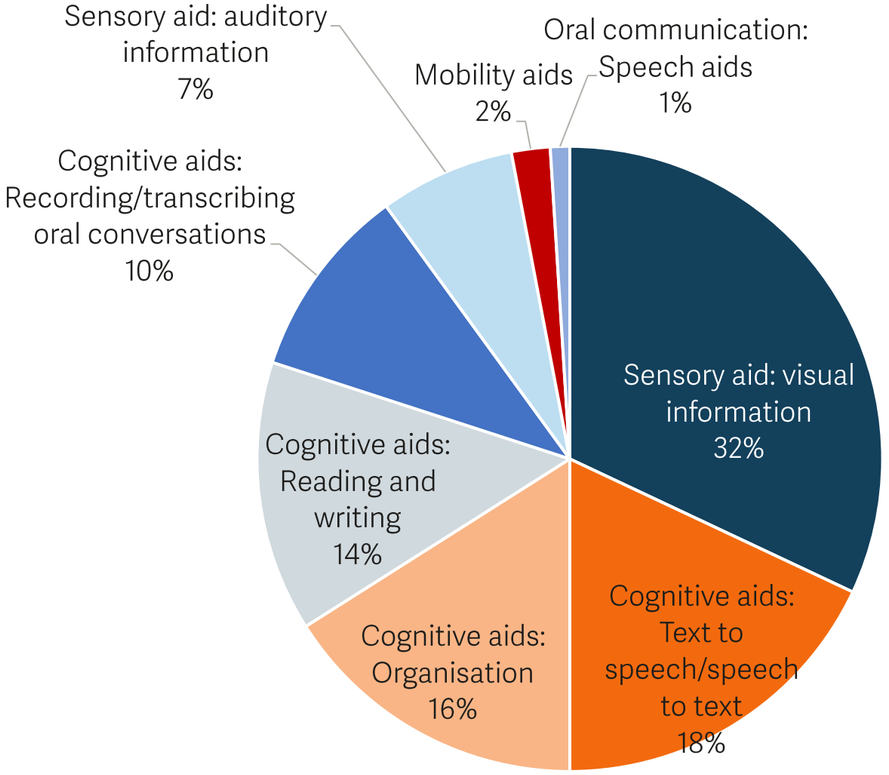
Types of DigAT: Barrier-specific technology (28%)

By **Barrier-specific technology,** we mean:
Technology aimed at addressing specific barriers in a user's environment, such as support with accessing visual information, text to speech/speech to text conversion, support with organisation, memory, reading, writing, composition, accessing or controlling sound, mobility or oral communication.

28% of DigAT listed in respondents' answers could be categorised as 'Barrier-specific technology'. The subcategories of DigAT within this overarching category were as follows:

- **32%** were **an aid to access visual information** such as a screen-reader, or sight assistance apps (e.g. Be My Eyes, Aira, Navi Lens, or Seeing AI).
- **18%** were **text-to-speech/speech-to-text software** (such Natural Reader, Dragon).
- **16%** were **apps to support organisation** (such as calendar or task management apps).
- **14%** were **devices or apps to support with reading, writing or composition** (such as Grammarly).
- **10%** were **apps or devices to record or transcribe oral conversations.**

Barrier-specific technology (n= 502)
Subcategories
(Child tags)



Please note that respondents were provided with the following definition of DigAT (which was formulated through the EbE session) at the start of the survey:

By digital assistive technology we mean:

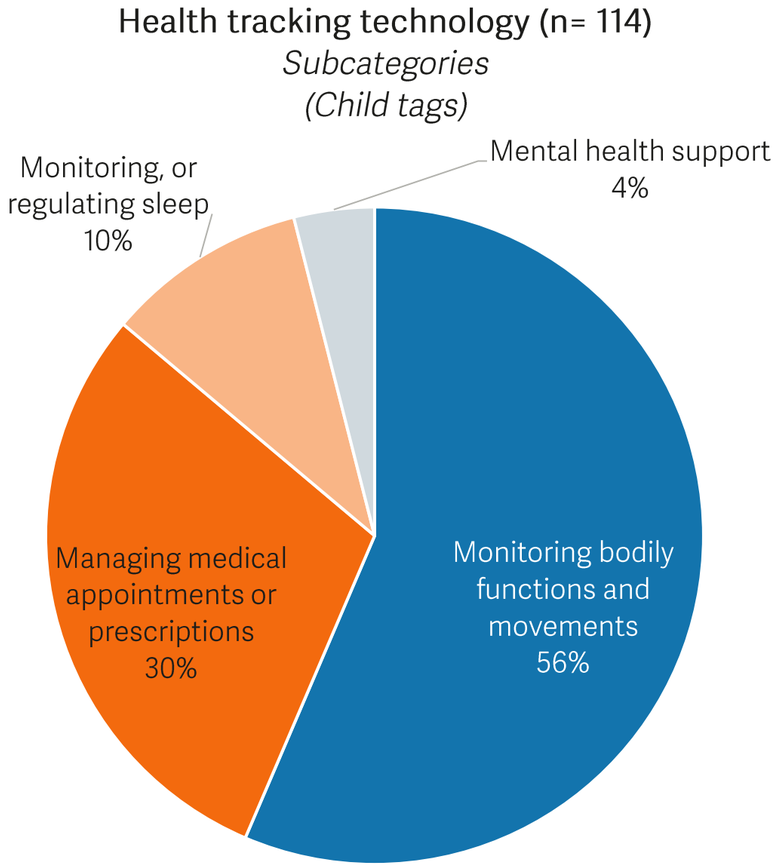
Any digital technology that processes information to help make your life easier.

Types of DigAT used: Health tracking technology (6%)

By **Health tracking technology,** we mean:
Apps, software, or devices to track or manage health conditions, energy levels, or physical or mental symptoms.

6% of DigAT listed in respondents' answers could be categorised as 'Health tracking technology'. The subcategories of DigAT within this overarching category were as follows:

- **57%** were apps or devices specifically designed to **monitor bodily functions and movements.**
- **30%** were software or apps to **manage medical appointments or prescriptions.**
- **10%** were devices and apps specifically designed to **monitor, regulate, or improve their sleep.**
- **4%** were apps to support **mental health.**



Please note that respondents were provided with the following definition of DigAT (which was formulated through the EbE session) at the start of the survey:

By digital assistive technology we mean:

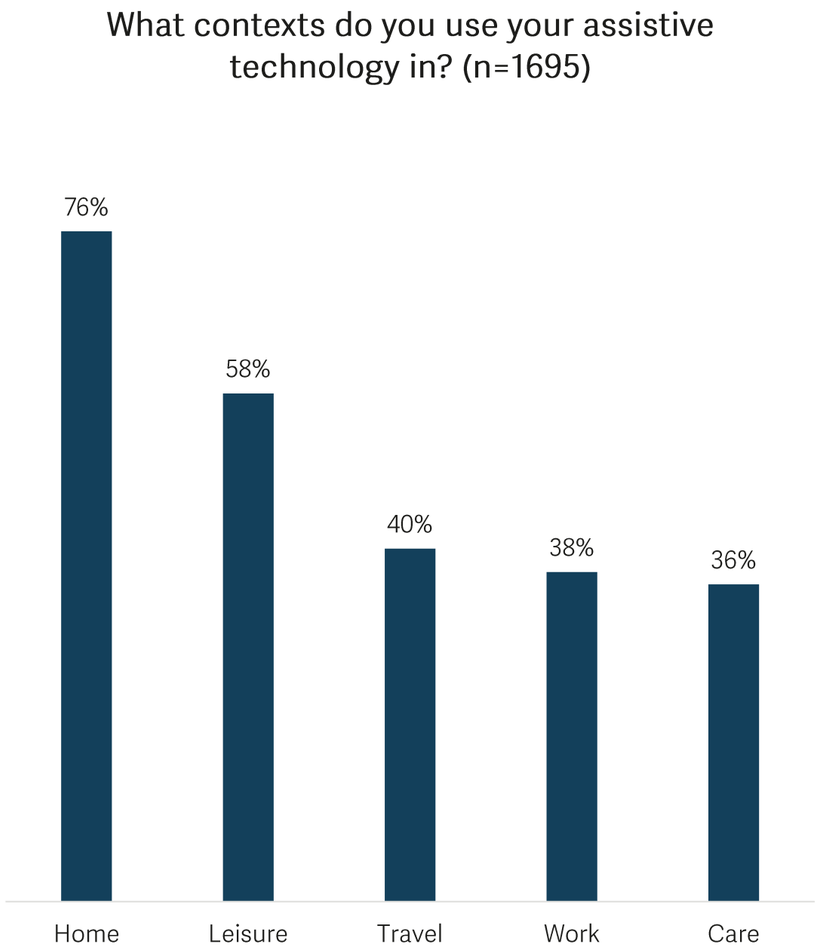
Any digital technology that processes information to help make your life easier.

Contexts in which DigAT is used

Respondents were then asked to select the dominant contexts in which they used their DigAT.

- **Home was the context in which DigAT was most used**, with over 3 in 4 respondents selecting this.
- **Leisure** was the second context in which DigAT was most used, with just under 3 in 5 respondents selecting this
- Around 2 in 5 respondents used DigAT in **Travel** and **Work** contexts, with slightly less using it in a **Care** context.

This question aimed to provide a high-level overview of the contexts in which DigAT is used. A further demographic breakdown of respondents' answers was not provided for in the research. However, there might be value in conducting future research on the factors influencing disabled people's usage in different contexts (such as employment status).



Definitions of each context, as provided in the survey

By:

Home, we mean activities to manage domestic tasks such as cooking, cleaning, or online food shopping.

Leisure, we mean leisure activities such as seeing friends and family, or taking part in hobbies.

Travel, we mean using public or private transport.

Work, we mean activities you do for employment, education, or volunteering.

Care, we mean activities to take care of yourself or others in your household, such as managing your hygiene, sleep, mental health, or symptoms of medical conditions.

Summary of uses for DigAT

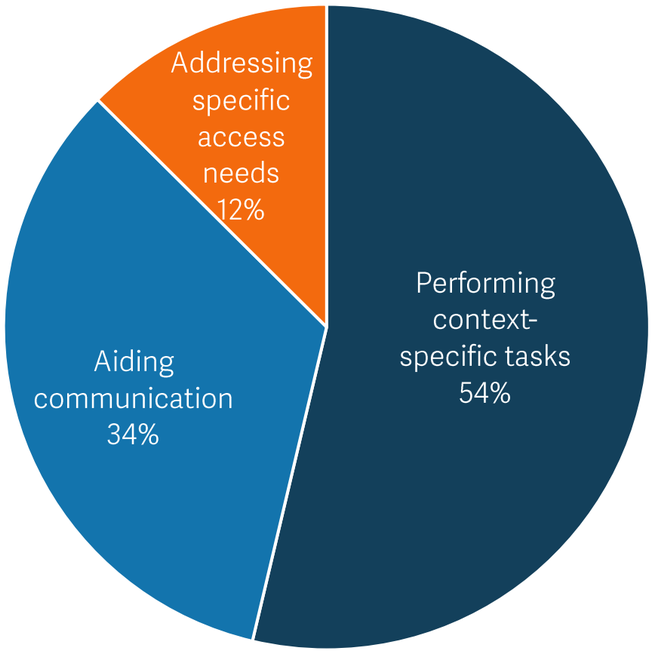
Respondents were then asked to describe the tasks or actions they used their DigAT for.

- This question also received over 2,000 answers. After cleaning the data, we were left with 1490 valid answers that listed over 150 different uses.
- As before, after using a bottom-up coding approach, we concluded that uses for DigAT could be grouped into three overarching functions: **Performing context-specific tasks; Aiding communication;** and **Addressing specific access needs.**

An overarching finding was that DigAT enabled users to meet their specific needs and fulfil a wide range of tasks that would otherwise be difficult or impossible to complete independently.

In the following slides, we provide a more detailed breakdown of these findings.

Please describe the tasks you use this technology for (n= 1490)
Overarching functions
(Parent tags)



By **Performing context-specific tasks,** we mean:

Tasks which participants described as relating to specific contexts, such as work, home, leisure, care or travel and not to their disability or access needs.

By **Aiding communication,** we mean:

Specific communication challenges participants spoke of overcoming with the use of DigAT, without referring to specific contexts or a disability or access need.

By **Addressing specific access needs** we mean:

Actions or activities which participants mentioned without specifying a specific context, but which helped assist them with a cognitive, visual, hearing, dexterity or mobility impairment.

Uses for DigAT: Performing context-specific tasks (54%)

54% of respondents' answers described using DigAT to perform context-specific tasks. Of these:

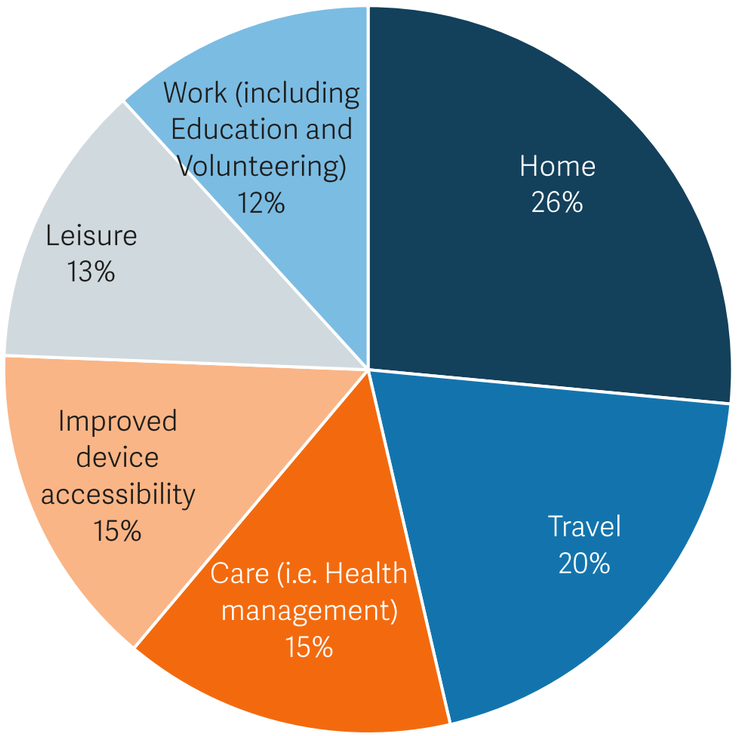
- **26% reported using DigAT to perform tasks around the home,** such as controlling household appliances (including heating, lighting, or other appliances), managing finances, buying or cooking food, shopping, cleaning, or remotely answering the door.
- **20% described using DigAT to assist with travel,** such as navigation (including planning or completing journeys), using public transport, arranging holidays, or driving.
- **15% described using DigAT for personal care or health management,** such as managing medication or carers, tracking or managing symptoms, communicating with medical professionals, life critical care or contacting emergency services, and daily self-care including managing personal hygiene and getting dressed.
- **15% reported improving their devices' accessibility** (i.e. by using in-built accessibility features on their smart phone, laptop/desktop computer, or iPad to make them easier to use) to help them perform tasks in multiple contexts.
- **13% described using DigAT to assist with leisure activities,** such as learning new skills, accessing entertainment media (i.e TV, music, news, radio, or videos), gaming, exercising, or arts and crafts.
- **12% reported using DigAT to perform tasks at work,** including in the workplace, or when volunteering or in education.

By **Performing context-specific tasks,** we mean:

Tasks which participants described as relating to specific contexts, such as work, home, leisure, care or travel and not to their disability or access needs.

Context-specific tasks (n=800)

Contexts reported (Child tags)



Qualitative insights: Performing context-specific tasks

Selected quotes from the survey and focus groups

Home

"The fact I have mobility issues, the Hue means I don't have to get up and turn the lights on or turn something on like a light switch, I can do it from my bed and control how bright or dark the room is if my eyes are bothering me from my phone....so for me, and especially the council, it means I don't have to give as many carer hours, it gives me a greater deal of independence."

Focus group participant with a cognitive and physical impairment (smart home devices)

"While of general use being able to control my Hive central heating controller via Alexa is a major advantage. I can ask what is the temperature and turn heating on or off by voice command."

Survey respondent with a visual, hearing and mobility impairment (smart home devices, voice-controlled assistant)

Travel

"Finding and planning journeys on step-free routes

Survey respondent with a mobility, dexterity, and hearing impairment (Google maps, Moovit)

"Journey planning, accessing real-time information - this is crucial as I cannot see or read live departure boards and so I rely on this app for live platform information."

Survey respondent with a visual and mobility impairment (Train time apps)

Care and health management

"I recently started using a new app that comes with another piece of technology. I wear it on my wrist and it's an app called Visible....to track chronic conditions, like long Covid...it manages your heart rate throughout the day, you can use it to track activities and when your energy levels spike. I can pace myself."

Focus group participant with a cognitive and physical impairment (wearable device and health monitoring app)

Focus group insights

Focus group participants provided some examples of how they use DigAT to perform context-specific tasks in their day-to-day lives.

Performing daily household tasks

Many participants spoke of the value of using smart home devices (such as voice-controlled assistants, or smart thermostats, lights, plugs, or doorbells) to operate household gadgets or systems without manual intervention. This type of DigAT was particularly important for those with visual impairments or restricted mobility or dexterity. By allowing them to control their devices using voice input, or via an app (with or without the help of accessibility features on their devices such as a screen-reader or magnification), it allowed them to achieve a greater degree of safe autonomy in their home life.

Personal care and health management

Some participants spoke of using wearable devices and health apps to monitor and manage their health conditions, symptoms or energy levels when performing activities or tasks in different contexts.

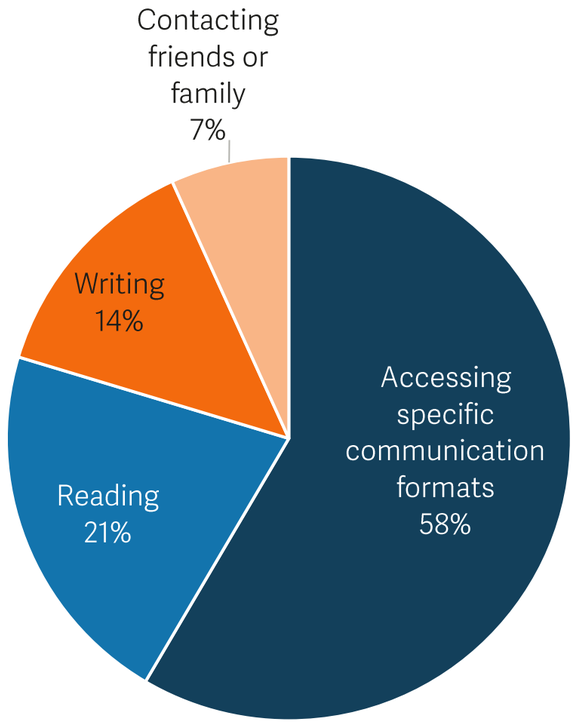
Uses for DigAT: Aiding communication (34%)

By **Aiding communication,** we mean:
Specific communication challenges participants spoke of overcoming with the use of DigAT, without referring to specific contexts or a disability or access need.

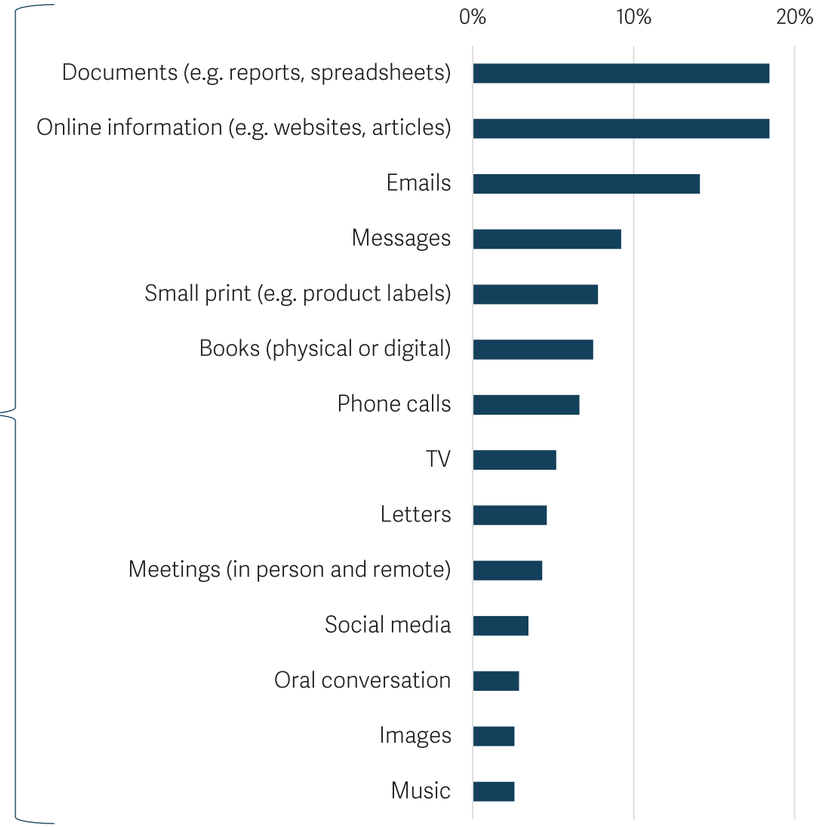
34% of respondents' answers described using DigAT to aid with communication. Of these:

- **58% reported using DigAT to access specific communication formats.** 30 format types were reported. Respondents mostly used DigAT to access digital documents (such as reports or spreadsheets), websites, articles and other online information; and emails.
- **21%** described using DigAT to help with **reading** (communication formats were unspecified).
- **14%** reported using DigAT to help with **writing**, including providing an accessible alternative to holding a pen or typing, or support with spelling or grammar.
- **7%** reported using DigAT to support them with contacting friends or family.

Aiding Communication (n= 503)
Tasks reported
(Child tags)



Communication formats respondents used DigAT to access (58%, n=347)



Other formats reported by 2% or less of respondents include: Recipes, Articles, Podcasts, Newspapers, Videos, Audiobooks, Lectures, Menus, News, Radio, Films, Poetry, Stories, Webinars

Qualitative insights: Aiding communication

Selected quotes from the survey and focus groups

Accessing specific communication formats and reading

"I use JAWS to access and read emails, documents, spreadsheets, web browsing and digital system interaction – literally everything"

Survey respondent with a visual and mobility impairment (screenreader)

"My [Document Reader] helps me access content in documents."

Survey respondent with a cognitive, dexterity, and mobility impairment (document reader)

"I can use the Kindle to read books because I can't pick up the weight of it, hold the book and physically open it to read it and also read the small print…I can put it on a tripod in front of me and read hands free and adjust the screen."

Focus group participant with a cognitive, dexterity, and mobility impairment (electronic reader)

Writing

"The reasons I use Dragon is more for dyslexia reasons and writing…because I also get shoulder impingement syndrome, it can get quite painful so the less typing and clicking I do the better."

Participant with a cognitive and mobility impairment (Dragon)

"Grammar and spelling as I'm dyslexic."

Survey respondent with a cognitive, hearing, dexterity, and mobility impairment (Grammarly)

Focus group insights

Focus group participants provided some examples of how they use DigAT to **aid with communication** in their day-to-day lives.

Viewing and reading digital content

Participants described using DigAT to view digital text and content. Relevant DigAT was not only useful for those with sight loss or sight-related conditions (such as colour blindness or photophobia) but also those with understanding or learning difficulties or neurodevelopmental conditions (such as dyslexia) or dexterity issues (who may struggle to hold or turn pages of a book). Relevant DigAT mentioned by participants included in-built accessibility features or external software (such as screen or text readers, magnification software, text or colour adjustments) and electronic readers (such as an electronic reader).

Spoken communication

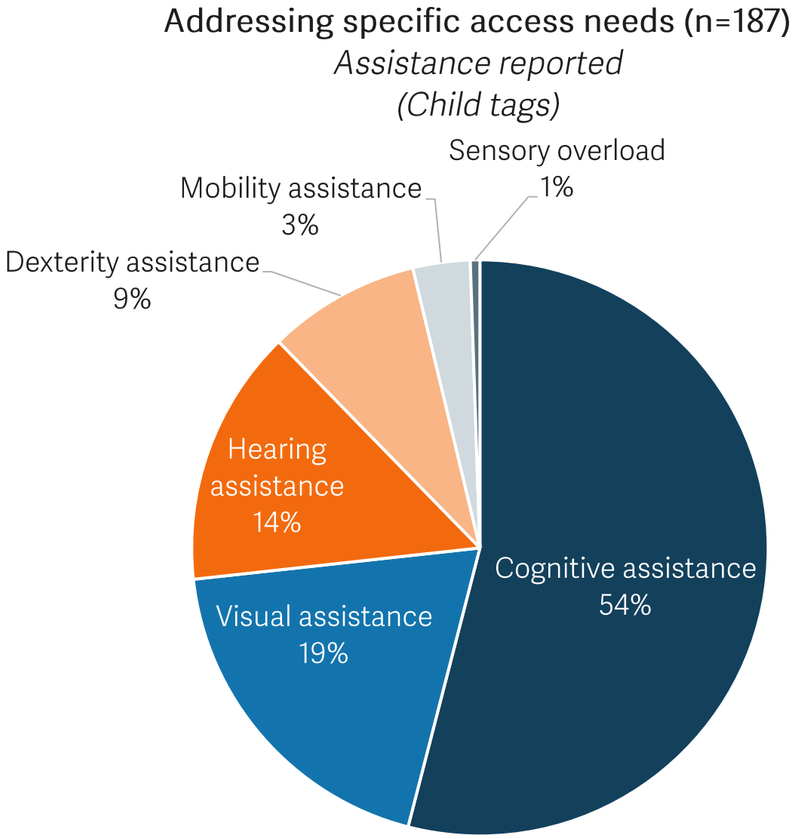
One participant with speech difficulties spoke of using a speech-generating app (Google's speech recognition system) to enable them to orally communicate with others.

Uses for DigAT: Addressing specific access needs (12%)

By **Addressing specific access needs,** we mean: Actions or activities which participants mentioned without specifying a specific context, but which helped assist them with a cognitive, visual, hearing, dexterity or mobility impairment.

12% of respondents' answers described using DigAT to help address or assist with specific access needs. Of these:

- **Over half (54%) reported using DigAT to assist with a cognitive function,** such as remembering or managing tasks, time management, decision making, or note taking.
- **19% reported using DigAT to assist with understanding visual information,** such as identifying objects, magnification, or describing physical spaces.
- **14% reported using DigAT to assist with hearing,** such as hearing and understanding audio information (including conversations).
- **9% reported using DigAT to assist with dexterity,** and under **4%** to assist with **mobility** or **sensory overload.**



Qualitative insights: Addressing specific access needs

Selected quotes from the survey and focus groups

Cognitive assistance

"[I use alarms on my phone] to remind me to take my medication 10 times a day, put the bin out, phone someone…anything I need to do as my memory is very poor."

Survey respondent with a cognitive, communication, dexterity and mobility impairment (alarms on devices)

"Make notes about my feelings…make notes about for work"

Survey respondent with a cognitive, communication, dexterity and mobility impairment (Google Keep, Remarkable)

"I also use the notes app on my phone. It's like a second brain almost where it's great for making lists and organising things, copying things down and organising my life and studies as well."

Participant with a visual and cognitive impairment (note taking app)

Visual assistance

"I use Seeing AI and Be my Eyes frequently to identify items and access printed content."

Survey respondent with a visual impairment (Seeing AI, Be My Eyes)

"I've got Aira which [like 'Be My Eyes'] gives you a live person and you can show them what the instructions are…or if I drop something on the floor they will pick up where it is and then I can pick it up."

Focus group participant with a visual impairment (Aira)

Hearing assistance

"Heard that is an app that helps me hear conversations in loud spaces – a problem for those who cannot lip read. It cuts out background noise and focuses on what is being said to me and around me."

Survey respondent with a hearing impairment (Heard That)

"My biggest one is automatic captions…I use those everywhere…online meetings or for videos, voicemail messages. I sometimes pair it with my Roger microphone to improve the accuracy of the captions."

Focus group participant with a hearing impairment (closed-captions)

Focus group insights

Focus group participants provided some examples of how they use DigAT to address specific access needs in their day-to-day lives.

Memory and organisation

Participants with cognitive conditions and memory loss indicated that they benefited from using DigAT to record and organise important information (such as reminders for tasks or appointments or medication) and manage day-to-day tasks.

Understanding visual information

Aside from DigAT that focuses on digital content, there was DigAT visually impaired participants used to help visually scan and interpret their surrounding environment, enabling them to better interact with it – either with artificial intelligence or remote human assistance. Such DigAT included downloadable apps such as Soundscape, SeeingAI, Google Lens, Be My Eyes, Aira, allowing users to identify their physical surroundings or objects or text in their vicinity, find their location, or obtain instructions or directions from others by providing remote camera access.

Assistance with hearing

Participants with hearing loss benefited from a range of DigAT that enhanced their ability to hear (such as Bluetooth hearing aids, or Roger microphones), device-enabled closed-captioning and a means of access to BSL translation.

Confidence using and adopting new DigAT

Respondents who use DigAT (57%) were asked how confident they felt using current as well as 'emerging' or new DigAT when they become available.

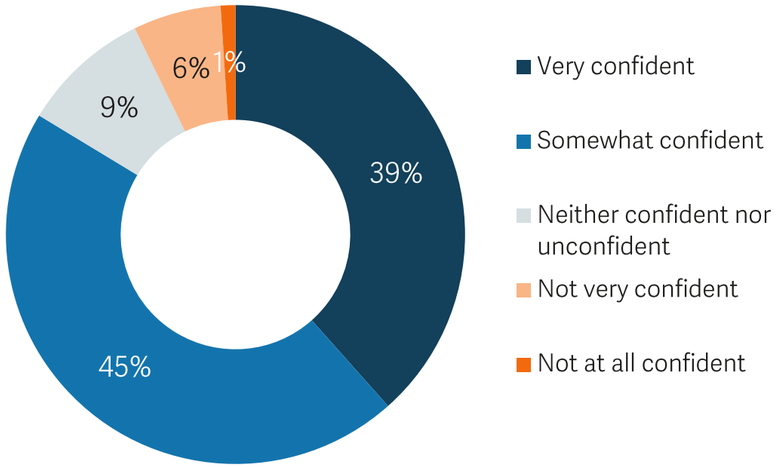
Over 8 in 10 respondents (84%) felt very or somewhat confident using their current DigAT while only 7% felt not very or not at all confident.

- 18–59-year-olds felt a lot more confident using their current DigAT than older respondents. Men also felt more confident using DigAT than women.

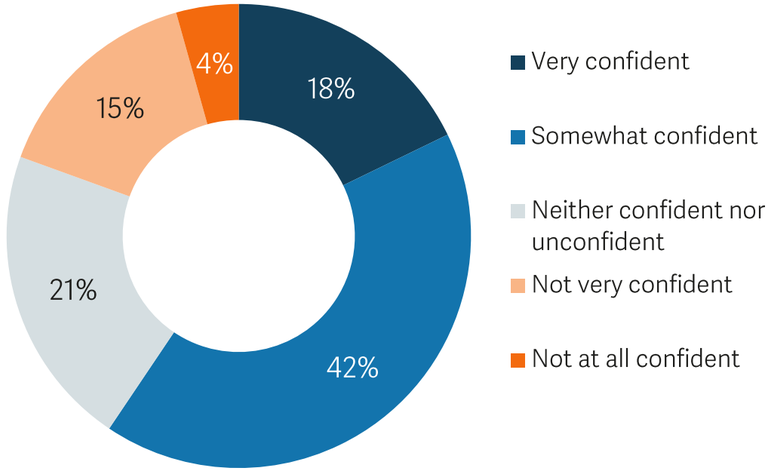
In contrast, **respondents felt less confident adopting new DigAT**, with 6 in 10 respondents feeling **very or somewhat confident.**

- Men felt significantly **more confident** than women, while 60–79-year-olds felt significantly **less** confident than younger respondents adopting new DigAT.

How confident do you feel about using your current digital assistive technology? (n= 484)

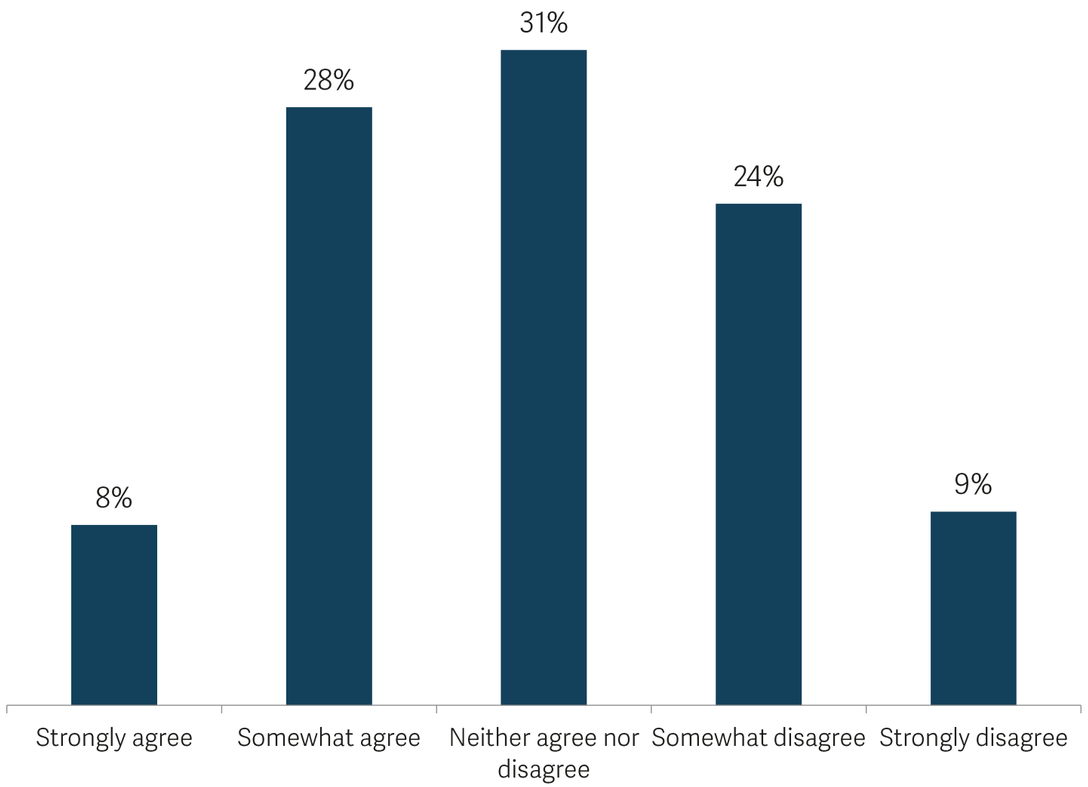


How confident do you feel adopting new digital assistive technologies when they become available? (n= 483)



Using the latest innovations

To what extent do you agree with the following statement? "I use the latest innovations in assistive technology as soon as they become available" (n= 484)



Respondents who use DigAT were asked the extent to which they agreed that they **use the latest innovations in DigAT** as soon as they become available.

36% **strongly** or **somewhat agreed** with this statement, while 33% either **strongly** or **somewhat** disagreed.

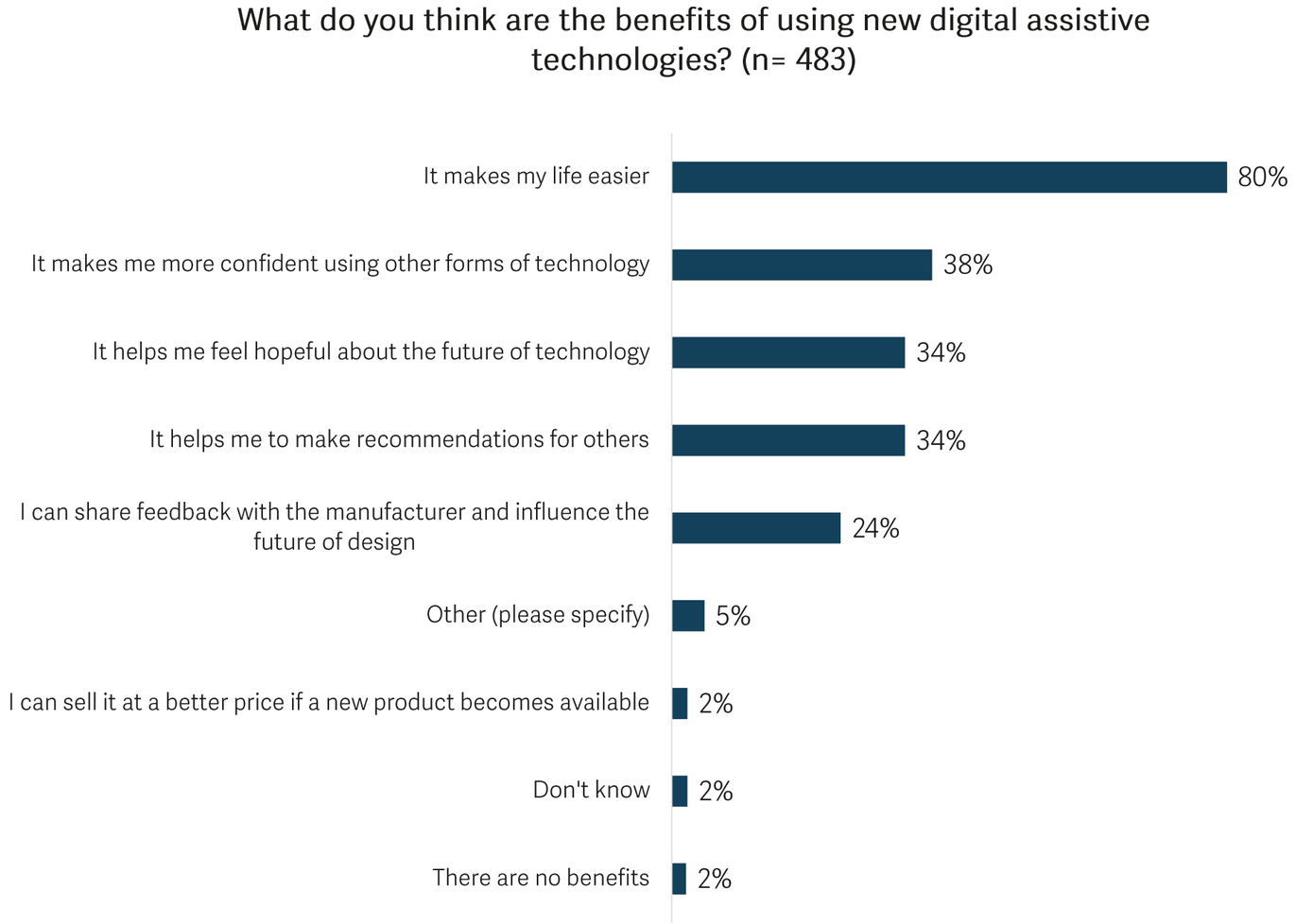
- **Men were significantly more likely to agree** with this statement than women, with 44% of men expressing agreement compared to 30% of women.
- Those with **sight loss were more likely to agree** with this statement, with 43% expressing agreement.
- **18 to 39-year-olds were significantly more likely to disagree** with this statement compared to other age groups.

Perceived benefits of using new DigAT

Respondents who used DigAT were asked what they felt were the benefits of using new DigAT.

8 in 10 respondents felt the benefit was that **it made their lives easier**.

- Nearly 4 in 10 respondents felt that it made them more confident using other forms of technology.
- 50% of 18- to 39-year-olds felt a benefit was **making recommendations to others** compared to 27% of 60-79 year olds.
- Only **2%** felt a benefit was being able to **sell their DigAT at a better price** if a new product became available, suggesting that this is not an important benefit for disabled people.
- Only **2%** felt there were no benefits of using new DigAT.



How do disabled people discover DigAT, and what prevents people from using them?

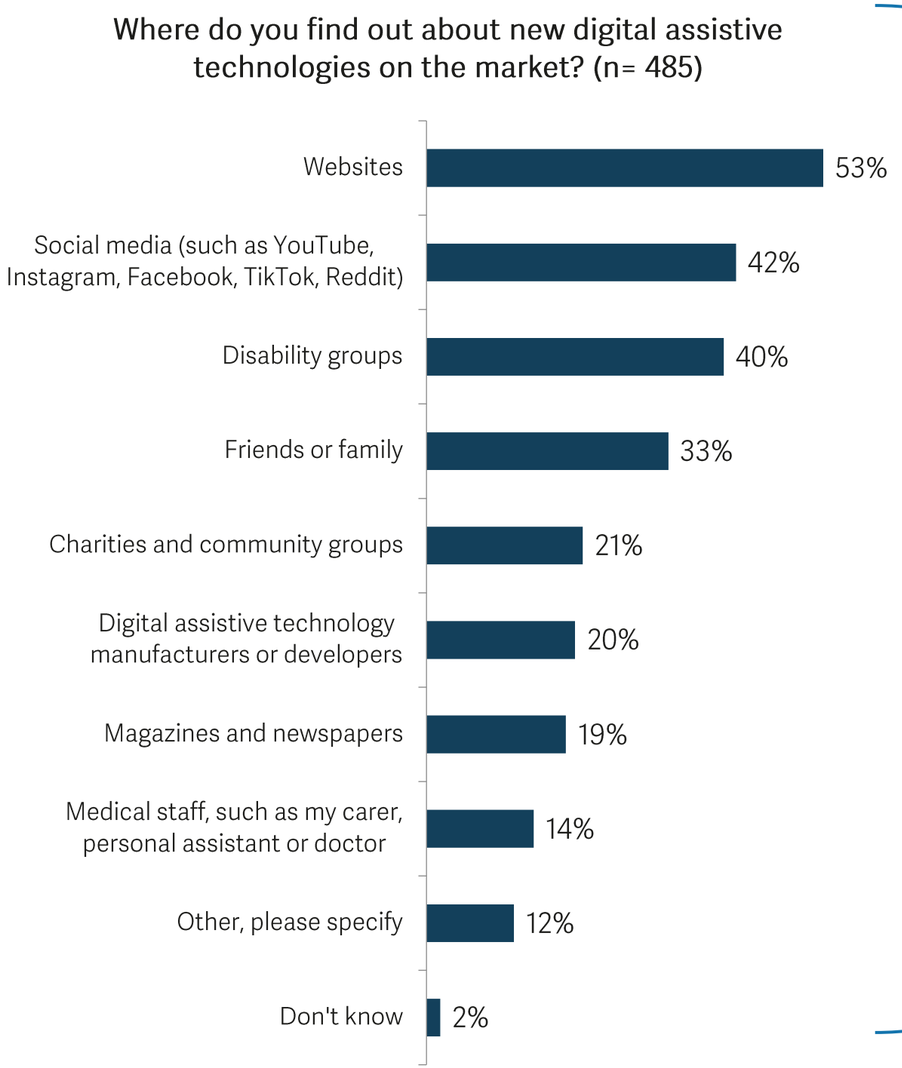
Image credit: Trusted Reviews: Ray-Ban Meta Glasses vs Echo Frames: Who does smart specs best?

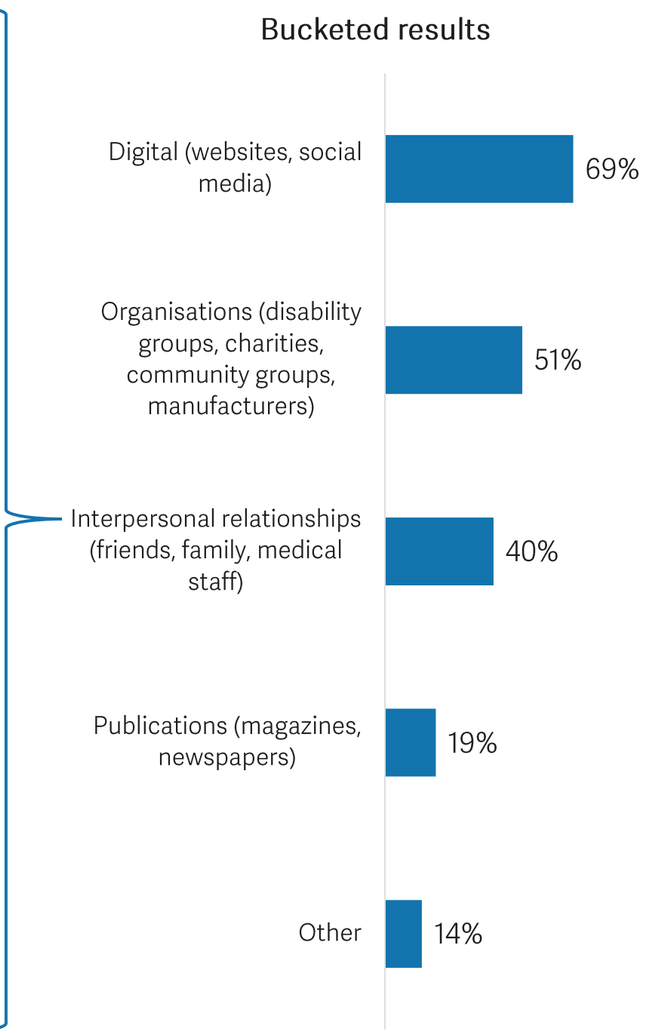
Discovering new DigAT

Respondents who use DigAT were asked **where they discovered new technologies** on the market.

The most popular method of discovering new DigAT was **online (i.e. via websites or social media)**, with 69% selecting this option.

- Being informed by organisations (i.e. disability groups, charities, community groups, and manufacturers) was the next highest at 51%, with disability groups being the most popular within this subset.
- 40% of respondents reported discovering new DigAT through interpersonal relationships (i.e. friends, family, or medical staff), although twice as many respondents learned about technology from friends and family (33%) than from medical staff (14%).





Discovering new DigAT

The knowledge required and process involved

Focus group participants stressed that **the internet was a crucial means of discovering new DigAT** and of acquiring precise knowledge about the types of support it can provide as well as practical information about how to use it. Participants highlighted, however, that it was important to 'know the space' i.e., have a prior knowledge of where to look in order to find out about what is available. Participants also stressed the time and effort needed to determine whether a piece of DigAT can fulfill their individual needs and expectations and realise its potential in practice.

> "Thanks to the digital age, we do have access to more online resources such as manuals, video and audio guides so I guess it has helped, especially if you know where to look in terms of the tech space. I would say that I am quite informed, I follow quite a lot of creators who discuss technology and a few podcasts and I tune into different keynote presentations of companies…I guess being a young person, I'm just naturally informed…it's just becoming a bit familiar with the space and knowing what technology can help you with your disability."
>
> Participant with a sensory and cognitive impairment

> "I do spend a lot of time searching on the internet what's available and how it works and whether it would be suitable for me…sometimes it's a case of doing course online just to figure out how it works."
>
> Participant with a cognitive and physical impairment

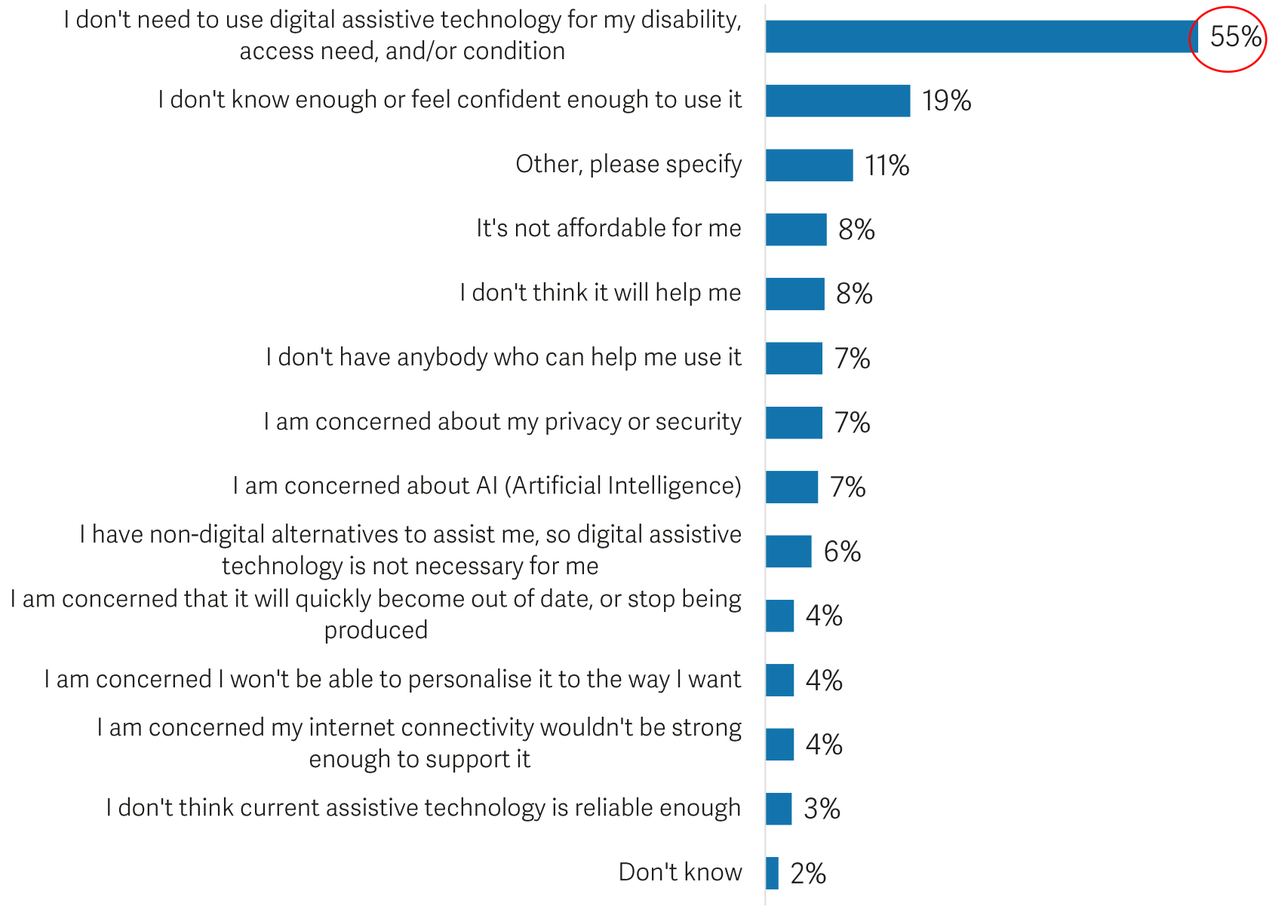
Reasons for not using DigAT

We asked respondents who said they **never use** DigAT or **use it less than once a month** (43%) what their reasons were for never or rarely using it.

Over half of those respondents (55%) said they **did not need to use DigAT for their disability, access need, and/or health condition***.

- 19% felt they **did not know enough or feel confident enough to use it.**
- 8% said it was **not affordable** or that they **did not think it would help them.**
- 7% said they did not have anybody who could help them use it, or had concerns about their privacy, security or AI (Artificial Intelligence).
- Respondents aged over 80 were significantly more likely to report that they had concerns about AI.

You said you rarely or never use digital assistive technology. Why is this? (n= 356)



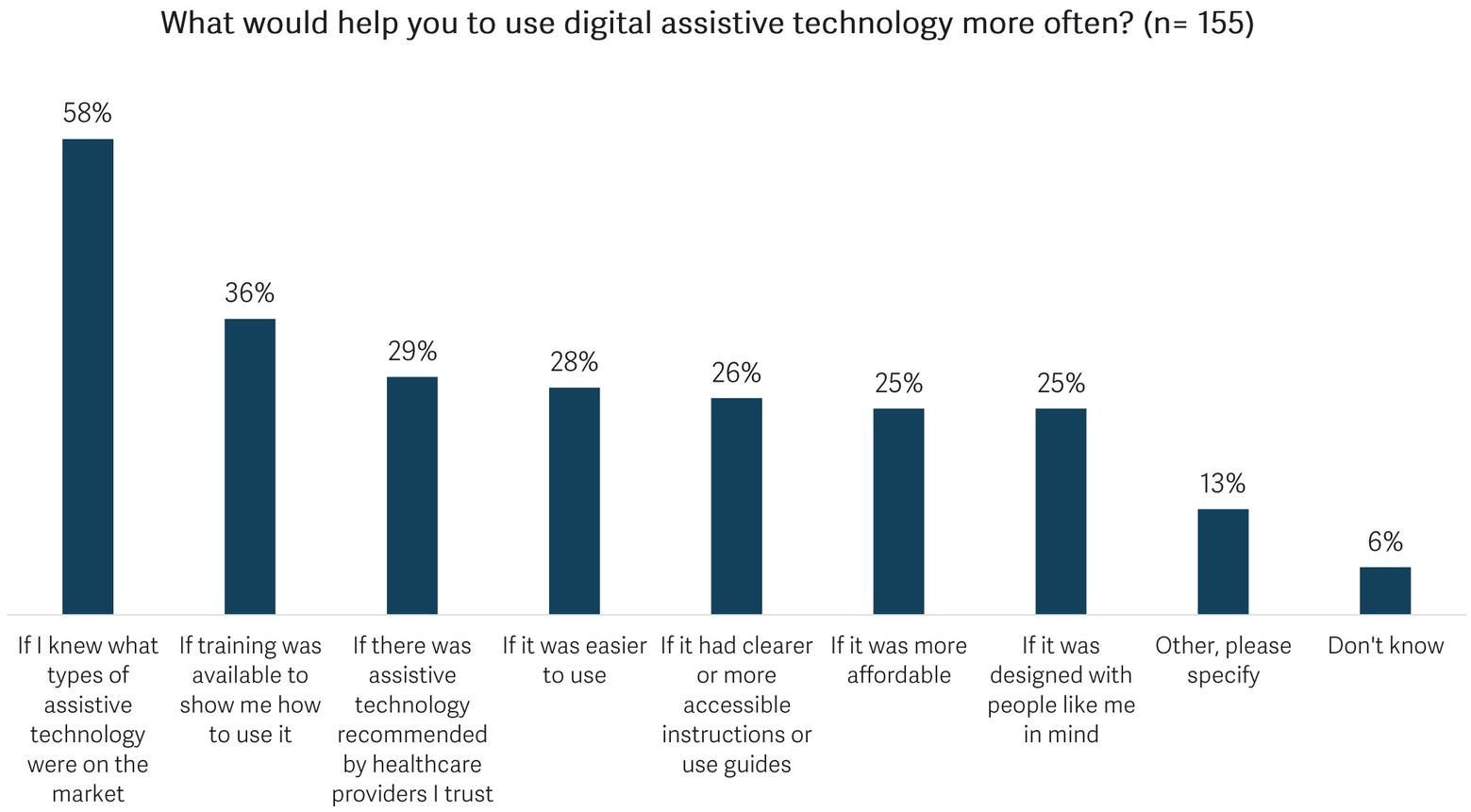
*Please note that respondents who selected 'I don't need to use digital assistive technology for my disability, access need, and/or condition' were directed to the end of the survey after answering this question.

Factors that would encourage adoption amongst non-users

We asked respondents who suggested that they did need DigAT for their disability, access need or condition (45%) what would help them use it more often.

- Nearly 6 in 10 respondents said they would use it more **if they knew what types of DigAT were on the market** (58%). Women were significantly more likely than men to select this option – 64% compared to 46%.
- 36% of respondents said they would use it more **if training was available.**
- Just under 3 in 10 respondents said they would use it more **if there was DigAT recommended by healthcare providers they trusted** (29%) and **if it was easier to use** (28%).
- Impairment type and age did not significantly affect participants' answers.

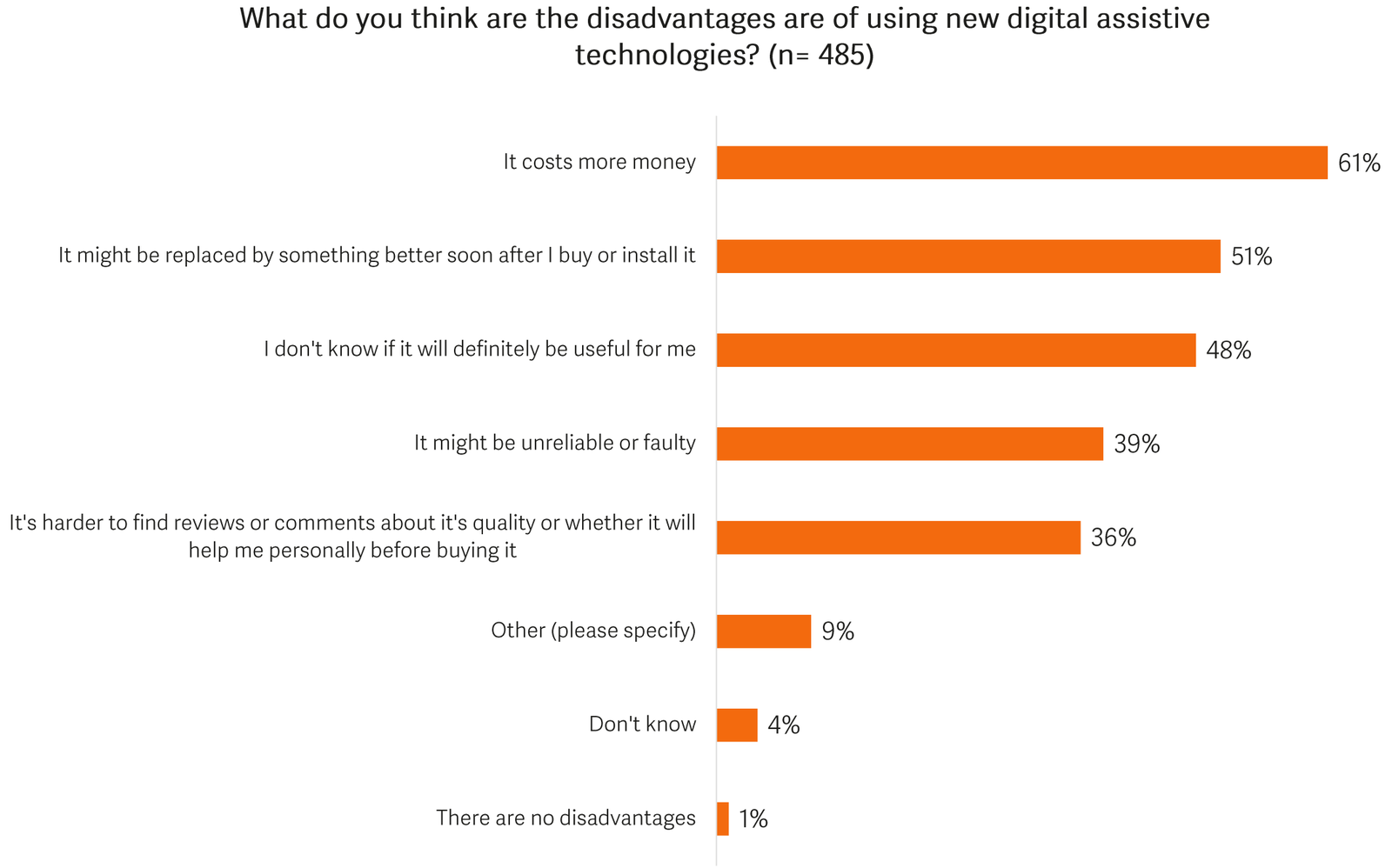
Overall, this suggests that **a lack of awareness of available DigAT** and its benefits as well as **training are key barriers to adoption** for non-users.



Perceived disadvantages of using new DigAT

Respondents who use DigAT (57%) were asked what they felt were **the disadvantages of using new DigAT.**

- 6 out of 10 said that a disadvantage of using new DigAT was that it would **cost more money** (61%).
- The cost of new DigAT was **considered a bigger disadvantage for 18-39 year olds** (71%) than 60-79 year olds (53%).
- **Obsolescence** was another key concern with just over half (51%) of respondents saying they were concerned their DigAT might be replaced by something better soon after buying or installing it.
- Nearly half of respondents (48%) questioned **whether it would be useful for them.**
- Only 1% felt there were no disadvantages of using new DigAT.



Factors to consider when adopting DigAT

As already described, the initial stage of adopting DigAT involves a potential user discovering its existence and gaining an understanding of how it can be of practical help. The focus group findings showed that several factors came into play in determining whether a potential user would adopt or continue to use a specific piece of DigAT.

Cost and affordability

Participants raised that unaffordable cost was a significant barrier to adoption of DigAT that would otherwise be considered particularly beneficial to the user.

> "I would like them to be less expensive so not exclusive, niche, and specialist that only a few lucky people can afford to get them. And just more choice for lots of disabilities, more new technologies in the market I guess."
>
> Participant with a cognitive and physical impairment

Many participants referred to subsidised provision of DigAT either in an educational context (i.e. Disabled Student Allowance) or through the workplace (i.e. Access to Work). While such financial support could overcome this cost barrier, there were sometimes obstacles to obtaining this support.

> "No one really helps with that. I was trying to get some help through the university, but they won't do anything without a disability student allowance and I'm currently in dispute to student financing about whether I'm allowed or not."
>
> Participant with a cognitive impairment

Obsolescence

In a context of continuous changes of and updates to certain technologies, participants also expressed anxiety about the risk of investing in DigAT that could be rapidly superseded by new or emerging DigAT.

> "It's a sector that is growing really fast and changing really fast and there are a lot of companies trying to get in on the game and there are a lot of things that haven't really been tested."
>
> Participant with a cognitive impairment

Compatibility with other devices

The value of DigAT may depend on its compatibility with other technologies. Lack of compatibility was a source of frustration for some participants and could result in their use of the DigAT being abandoned.

> "The compatibility with other devices is a massive issue…If I had a magic wand, I think I'd like to change in terms of the products that are available, the compatibility. I'd develop some kind of chip or widget that makes everything work [with it]."
>
> Participant with a cognitive and physical impairment

Availability of support

Participants also indicated that, when considering possible adoption of DigAT, they might be deterred by concerns related to the subsequent availability of necessary technical support.

> "It is too dear and then my problem is who do I go to after if there are issues? That's what has stopped me purchasing."
>
> Participant with a cognitive impairment

What access needs are not being met by DigAT?

Perceived need for solutions through initial co-design

There was a strong perception amongst participants across focus groups (including the UX focus group) that **a failure to involve disabled users in the design phase and testing of DigAT** would result in their access needs not being met.

Many felt that participatory or co-design methodologies for developing DigAT were more likely to yield better results and build consumer good will towards the product and its producer. Many participants singled out Apple products as pioneering in their inclusion of accessible features from the outset.

> "I'd like to see assistive technology sort of designed and made for disabled people because they know what they want. It makes sense to get them to co-produce or be consulted at the very early stage."
>
> **Participant with a cognitive and physical impairment**

> "My main concern would be the fact that this technology isn't really tested with its target audience but on top of that, the support is frequently not tested as well with other daily technology like a smartphone screenreader, change in text size etc..."
>
> **Participant with a cognitive impairment**

> "In my experience, a lot of companies will start with something in a partially working state, and then they'll retrofit accessibility which sometimes doesn't work as well as it could have. My argument is to get people involved earlier...if they involve people from the outset....whether they've got diabetes, blindness, the product could be made usable from the start...iPhone for example, had VoiceOver from day one...A lot of companies could learn from what Apple did."
>
> **Participant with a visual impairment [UX focus group]**

> "The big thing for me, is it should be accessible at the design stage because retrofitting creates so many barriers...it costs a lot more to retrofit...I don't want to sound like an Apple fanboy but that's why I'm in the Apple ecosystem...they seem to be trying to address virtually every aspect of disability and it's that commitment that makes me carry on supporting them. I know that Microsoft and Android are catching up nicely with visually impaired stuff."
>
> **Participant with a visual impairment [UX focus group]**

Lack of accessible support

Inaccessible DigAT instructions or a failure to provide a customer service were also cited by focus group participants as another reason for their access needs not being met by DigAT.

Participants raised that inaccessibility could also arise from a failure to provide support in preferred or necessary communication formats. Difficulties accessing support also related to the use of automated systems such as chat bots which could fail to respond to specific issues and requirements. For this reason, participants valued human support, which they saw as being more likely to deliver the responses sought.

> "Often we're given this tech and it's like you're on your own. Dragon are appalling…all their stuff is done over email and if I have to write an email, I have to employ somebody to help me, I'd rather speak to somebody on the phone….and even with Amazon, when I had a problem with my Alexa, they weren't interested in solving the problem, they just wanted to give me 15% off a new one…often it's the technical support that is lacking"
>
> **Participant with a cognitive and physical impairment**

> "The problem with online chatbots is they are glorified frequently asked questions pages – that's all they are. Technology doesn't really understand how to give an appropriate answer, what it gives is a sequence of words that are most commonly given in that context…it's just replacing customer service with a worse customer service, it's taking away jobs people could be doing."
>
> **Participant with a cognitive and physical impairment**

> "I'd also like more instructions with these things because often they come without. Like with Dragon, it was just a code I got given then I had to go to the website, download the programme, then that's it. You get no instructions or nothing. I'd like different formats of instruction as well like audio, easy read, large font…what about aftercare?"
>
> **Participant with a cognitive and physical impairment**

> "I need to speak to a person because I know that your automated system cannot deal with this."
>
> **Participant with a cognitive and physical impairment**

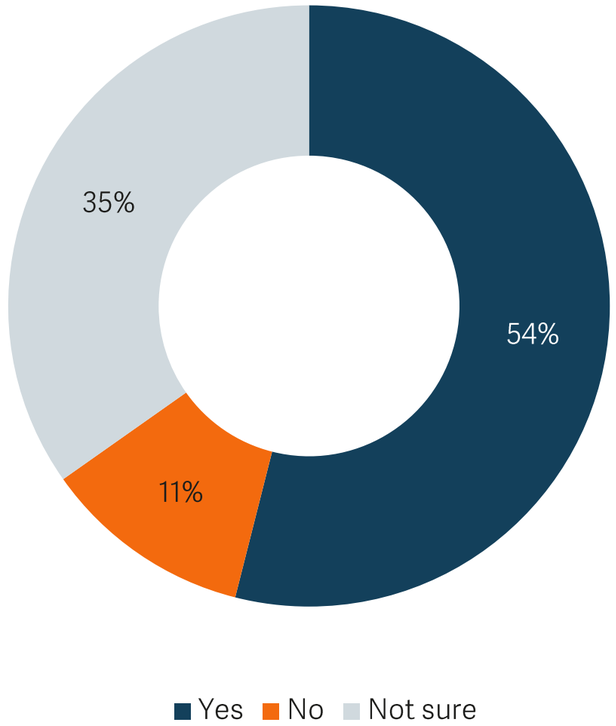
Perceived potential of Artificial Intelligence

Respondents were asked **whether they believed that Artificial Intelligence (AI) had the potential to improve the lives of disabled people.**

Over half of respondents (54%) believed that AI had the potential to improve the lives of disabled people.

- 18–39-year-olds were more likely to hold this belief (65%) than older age groups.
- Men were also more likely than women to hold this belief, with 60% expressing agreement compared to 49% of women.
- Respondents' beliefs did not differ across impairment groups.

Do you believe AI has the potential to improve the lives of disabled people? (n= 532)

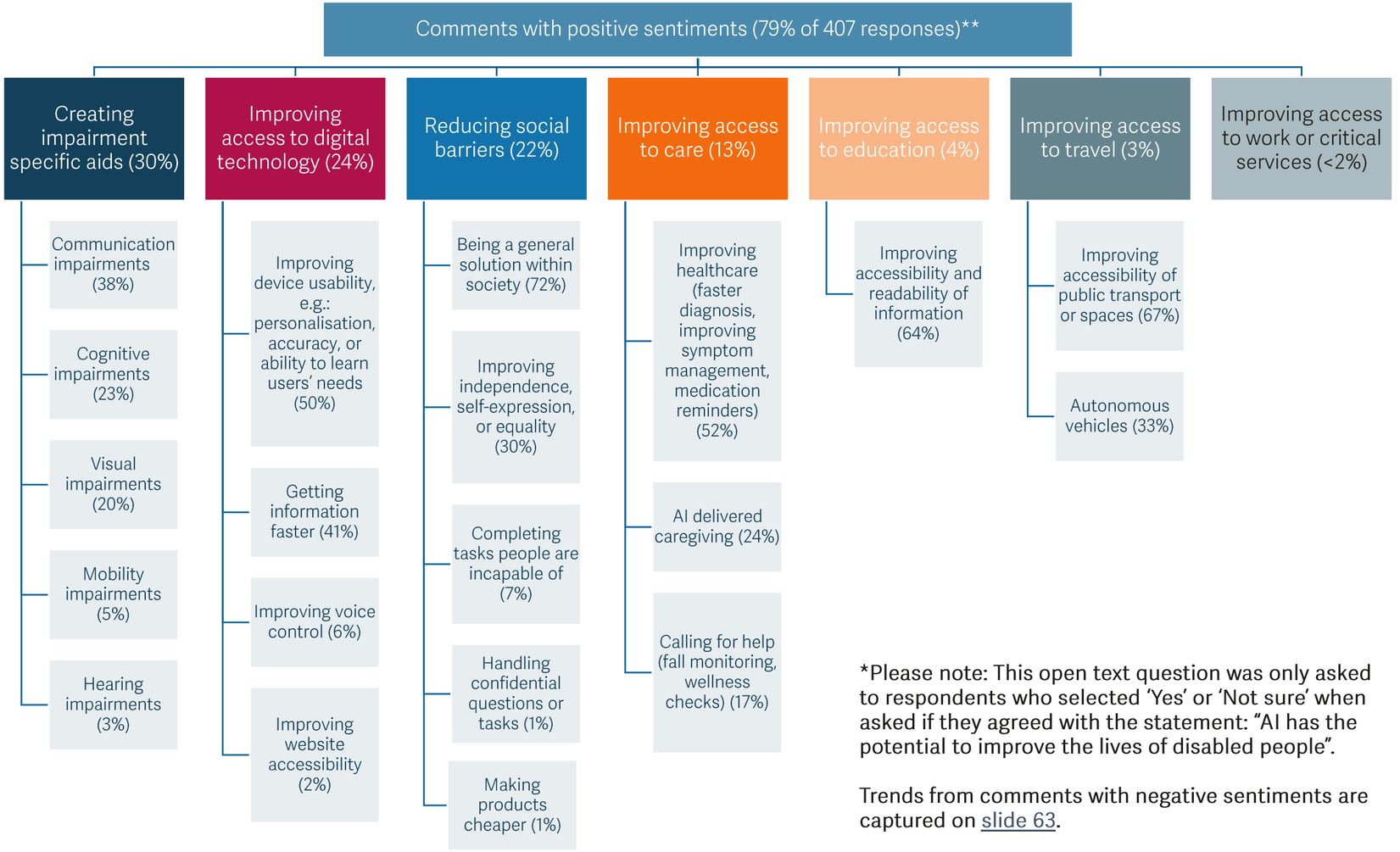


Unmet access needs that could be met with AI-powered DigAT

We asked respondents who said they believed or were unsure that AI had the potential to improve the lives of disabled people to explain their thoughts. 79% of all responses (n=407) described **positive changes that would solve currently unmet access needs.**

- The three biggest areas that respondents felt AI could improve were:
  1. **Creating impairment specific aids** (30%) – aids to support communication difficulties were suggested above any other impairment aids
  2. **Improving access to digital technology** (24%) – this involved improving device usability and ease of accessing information
  3. **Reducing social barriers** (22%) – both by using AI to improve society overall, but also to achieve greater independence, self-expression and equality experienced by disabled people
- **Improving access to care** was mentioned three times more frequently than improving access to education, travel, work, or critical services.

Please explain how you think AI has the potential to improve the lives of disabled people*.



*Please note: This open text question was only asked to respondents who selected 'Yes' or 'Not sure' when asked if they agreed with the statement: "AI has the potential to improve the lives of disabled people".

Trends from comments with negative sentiments are captured on slide 63.

Participant ideas for transformative DigAT

We asked focus group participants if they could wave a magic and create a new piece of DigAT, what it would be and explain how it could improve their day-to-day lives.

Participants with different access needs came up with ideas for transformative DigAT consisting of **a capacity to interpret their experience of the world** or **complete tasks that might be otherwise difficult** or **impossible for them to complete independently.** The concepts that participants presented could be grouped as follows and are detailed on the following two slides:

- **Enhanced AI powered tools for interpreting their environment** to overcome barriers to perceiving or understanding the surroundings in which users would find themselves in or assist with communication, health or personal care needs.
- **Greater connectivity between devices and systems** (e.g. through integration of the Internet of Things) to overcome structural or societal barriers or assist with care needs.

Participant ideas for transformative DigAT: Enhanced AI-powered tools

Participants described the following DigAT ideas to help them overcome barriers created by inaccessible environments or to assist them with their communication, health or personal care needs.

These were often a response to participants' specific or personal circumstances, but their ideas could have wider relevance for those in similar circumstances or who face similar barriers in their day-to-day lives.

Body language interpretation glasses

"Body language is such an important part of language and quite often I don't understand from looking at someone if they are angry or joking and some kind of body translator for people with autism would be incredibly helpful…some kind of smart glasses."

Participant with a cognitive impairment

Texting support tool

"if you're sending a text to someone, it can be so easily misconstrued. It's so easy to want to put something into writing and the other person at the other end takes it the wrong way…if there was something to interfere and say you put so and so which could be misconstrued – that would be a very good help ."

Participant with a cognitive, mobility and dexterity impairment

BSL and closed-captions hologram

"My dream would be to have a sort of hologram both in BSL interpreters and captions that was 100% accurate and it would just be available everywhere at any time of day. It would change my life."

Participant with a sensory impairment

Automated cars/transport

"Automated cars and transport. It's not just a case of driving itself. For me, 'd like to see it be more interactive…telling you where it's going and what it's doing or what it can because it's scary. If it's driving and you can't see at all."

Participant with a sensory impairment

Robot assistant

"My dream would be to have a personal assistant robot that can help me navigate busy areas…or if I were in a store and needed to locate milk, it can work out the stock in store and access the online data base, help with colour identification, small print."

Participant with a sensory and cognitive impairment

"For me it would have to be a robot that could do all of my personal care….I just wish there was a robot I could say….help me go to the loo or help me to get in the shower – that's all I'd like to see."

Participant with a mobility and cognitive impairment

Participant ideas for transformative DigAT: Improved connectivity or accessibility of devices or systems

Some participants, however, said they would prefer to adapt or improve existing DigAT or systems rather than create new technologies – either through increased connectivity or improved accessibility.

Improved connectivity between devices and systems

"I have multiple carers each day, somebody different and when you've got anxiety and you're quite vulnerable anyway, having this constant stream of strangers coming into your house that you don't know…it ends up being more stressful than helpful so having that permanent fixture in your house that could do all of those things and connect to all your devices, call for assistance if needed."

Participant with a cognitive and physical impairment

Device to make all technology compatible

"The bit I'd want to change in terms of the products that are available is the compatibility. I'd want, I'd develop some kind of chip or widget that just makes everything work…my husband, when he does his gaming uses something called Triton…you can get the controller from any games console and just put this thing in between them, and it just works so you can use the Playstation controller to control the Xbox and so on. So, a Triton for everything would be great."

Participant with a visual, mobility, and cognitive impairment

Accessible payment systems

"A fully accessible digital payment system which as we're moving towards a more digitalised society, I would design a system whereby when you pay with your card or whatever replaces cards, it tells you what your remaining balance is or what your remaining budget is straight away."

Participant with a cognitive impairment

Accessible healthcare tracking

"We're currently looking at a software and a device that can make life easy for people who are dyslexic that have diabetes. Because that is one big thing that people who have diabetes struggle with…monitoring their blood sugar levels."

Participant with a cognitive and mobility impairment

Incorporating information about accessibility into wayfinding apps

"For the Google Street view to expand…if there was a little robot that would go into the entrance of every single business you go to on the high street that would take 360 degree images of the ramps, access, what it's like inside…you can view the accessibility whenever you are planning a trip."

Participant with a cognitive, hearing,, visual and mobility impairment

This prompted many participants to argue in favour of disabled people having an active role in creating innovative DigAT.

> **“We actually ask blind people for invention ideas…I think a lot of the barriers that people experience are to do with the fact that they can’t bring the product to the market, you know, blind people have fantastic ideas.”**

Participant with a sensory impairment [UX focus group]

For some participants, waving a magic wand was not about creating a specific new DigAT or enhancing existing DigAT but about creating the right conditions for the optimal development and take-up of DigAT more generally.

This included co-design, affordability, training and support, and raising the public's awareness of disability.

> **"It should be cheaper and easier because this is a very fundamentalist thing for some of us who use these kinds of aids to live day to day life. It should not be that expensive. We are living in social countries where we can all have them, we should raise this concern...to make these things heard."**

Participant with a mobility impairment

What are disabled people's primary concerns when using DigAT?

Concerns about DigAT

To explore their concerns, we asked respondents (n= 530) whether they agreed with the following statements about DigAT.

Respondents' top three concerns were:

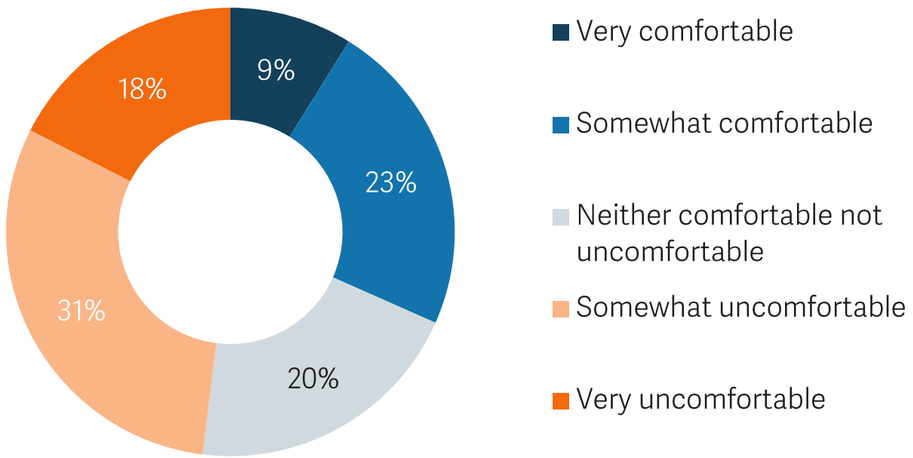
1. **DigAT companies replacing their human support teams with chat bots or AI** meaning they would not be able to obtain the support they needed, with 55% selecting this.
2. **DigAT not being tested with real disabled people resulting in inaccessible features,** with 49% selecting this.
3. **That a lack of awareness about the latest DigAT would mean that nobody else would help them access it**, with 46% selecting this.

The above concerns were consistent across different age, gender, and impairment groups.

Statements	Agreed
If digital assistive technology companies replace their human support teams with chat bots or AI, I won't be able to get help with any issues I have	55%
Digital assistive technology is often not tested with real disabled people, meaning it can have inaccessible features	49%
If I don't know about the latest digital assistive technology, nobody else is going to help me access it	46%
I have concerns about digital assistive technology using AI (Artificial Intelligence)	44%
I am worried about how much of my data companies are gathering when I use their digital assistive technology	43%
I am worried about how my personal data will be used by digital assistive technology	43%
Learning how to use new digital assistive technology takes me a lot of time and effort	42%
It is expensive to get exactly what I need from digital assistive technology	40%
I am worried that advancements in technology will make the digital assistive technology I use on my devices outdated, even though it meets my needs	40%
Accessing publicly funded digital assistive technology is not easy	38%
Solving problems that arise with my digital assistive technology takes a lot of personal effort	36%
I am worried that my digital assistive technology will suddenly become out of date or no longer produced, which would put my safety at risk	31%
Digital assistive technology is not always compatible with the technology I already own	31%
A lot of new digital assistive technology is experimental and launched to the public before all the problems are ironed out	30%
Digital assistive technology is not reliable enough to completely trust it to deliver the support it is designed to give	28%
I can only afford lower quality digital assistive technology that does not fully meet my needs	23%
Digital assistive technology is not accurate enough and I don't fully trust the information it gives me	21%
I don't agree with any of the above statements	22%

Thoughts about Artificial Intelligence

How comfortable are you with the increasing use of Artificial Intelligence (AI) in everyday life? (n= 531)



While over half of respondents believed that Artificial Intelligence (AI) had the potential to improve the lives of disabled people, just over **4 in 10 said they had concerns about DigAT using Artificial Intelligence (AI)** (see slide 64).

Respondents were later asked how comfortable they felt with **the increasing use of Artificial Intelligence (AI).**

The majority (49%) felt **somewhat** or **very uncomfortable**, while 32% felt **somewhat** or **very comfortable.**

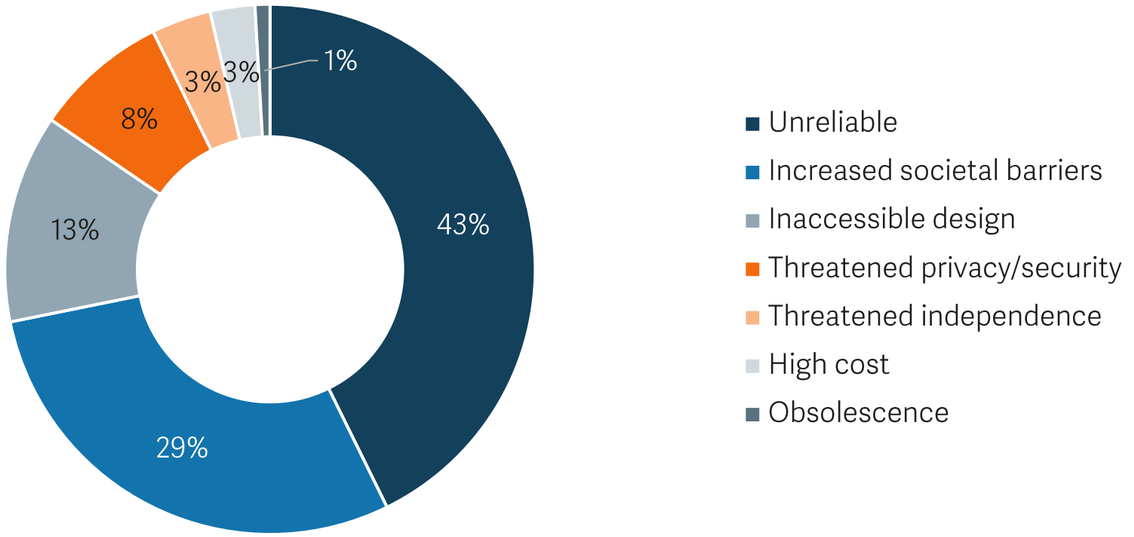
- 60- to 79-year-olds were the **most likely** age group to report that the felt **very uncomfortable** with the increasing use of AI, while 18- to 39-year-olds felt the most comfortable.
- Men were more likely than women to report that they felt **very** or **somewhat comfortable** with the increasing use of AI, with 39% expressing comfort compared to 26% of women.
- Those with **sight loss** felt the most comfortable with the increasing use of AI, with 35% reporting that they felt **somewhat** or **very comfortable.**

Concerns about AI

When asked to explain how AI could improve the lives of disabled people, 18% of respondents' comments mentioned **concerns.**

- Over **2 in 5** respondents (43%) raised concerns about AI being **unreliable,** including it being inaccurate, ineffective, or incapable
- **Nearly 3 in 10** respondents (29%) raised concerns about AI causing **increased societal barriers**, such as reduced human interaction, increased opportunity for discrimination, increased isolation, and reduced self-efficacy or job security.
- **13%** were concerned about the design of AI being inaccessible or not user-friendly – for example, it not being designed with disabled people's needs in mind, or AI-powered technology being difficult to learn.
- **8%** reported concerns about **privacy and security**, such as AI being intrusive or causing their privacy to be compromised.
- Between 1% to 5% raised concerns about AI threatening their autonomy or independence, being too costly, or becoming obsolete or replaceable.

Please explain how you think AI has the potential to improve the lives of disabled people. Comments with negative sentiments (n= 98)



"I believe that AI needs safeguards dependent upon the severity of the situation and user. The user should never give any AI system full autonomy, it is a tool and not the operator."

Respondent with a dexterity and mobility impairment

"AI scares me!"

Respondent with a hearing, cognitive, mobility and dexterity impairment

Data and privacy

Just **over 4 in 10 respondents** (43%) were concerned about how much data is gathered from them and how this data is used when using their DigAT (see slide 64).

This concern was also expressed by focus group participants – particularly in relation to AI powered DigAT.

Their concerns related to the extent to which the DigAT would depend on and generate more data about its users'. Participants were worried about the possibility of data breaches and the consequences being more serious because of the extent and connectedness of the data concerned but also because of the specific vulnerabilities of disabled users.

Additionally, some expressed concern that the privacy of third parties could be compromised by the gathering and interpretation of data in the user's environment.

Personal privacy

"My main concern is the fact that everything is all joined up and obviously that is hackable. All the data is the amount of times I get notifications saying 'oh this thing was hacked and your data has been breached."

Participant with a cognitive and physical impairment

"My only concern and worry of AI is the privacy issue...you did not give them authorisation or permission to access your personal data. It's completely wrong and so with this you will have fear, panic, and worry – what if my information gets leaked? I'm being tracked or monitored."

Participant with a sensory impairment

Privacy of others'

"The only concern I have is the confidentiality. If I was to use my [speech recognition] app now, it would pick up all of you and maybe Google is listening."

Participant with a communication impairment [UX focus group]

"Something like those special glasses with the camera in it, it helps guide you and do things but obviously you could be catching other people and it will hear some of the stuff others are doing...yes, it might open and give you some accessibility but there is also the privacy of and how it might be affecting other members of the public."

Participant with a sensory impairment

“I do see there is a big improvement in protecting people’s data but there is definitely further to go with encouraging that kind of policy-making is in effect…it’s just not fast enough in my opinion for the rate that technology is improving.”

Participant with cognitive and physical impairment

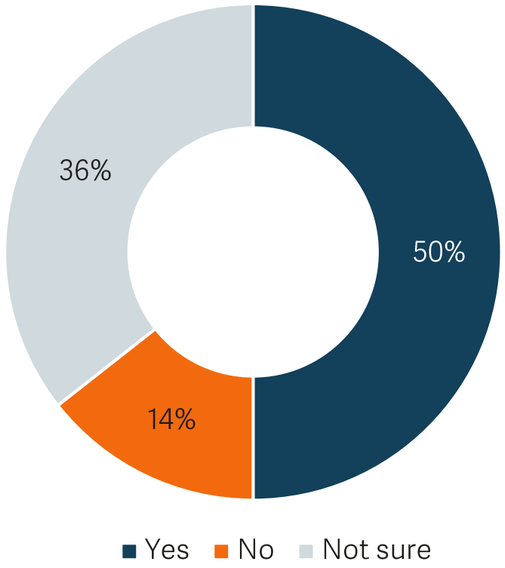
AI: Potential for discrimination

AI systems are often built upon data that is shaped by human decisions or judgements. Because of this, there is a risk that human biases, stereotypes, and prejudices could become embedded in AI powered DigAT which in turn could lead to discrimination.

Respondents were asked if they had **any concerns about AI being used in a way that could discriminate against disabled people**.

- Half of respondents said **'Yes'**, while 36% were **'Not sure'**.
- **18- to 39-year-olds** were significantly more likely than older age groups to indicate that they had concerns.

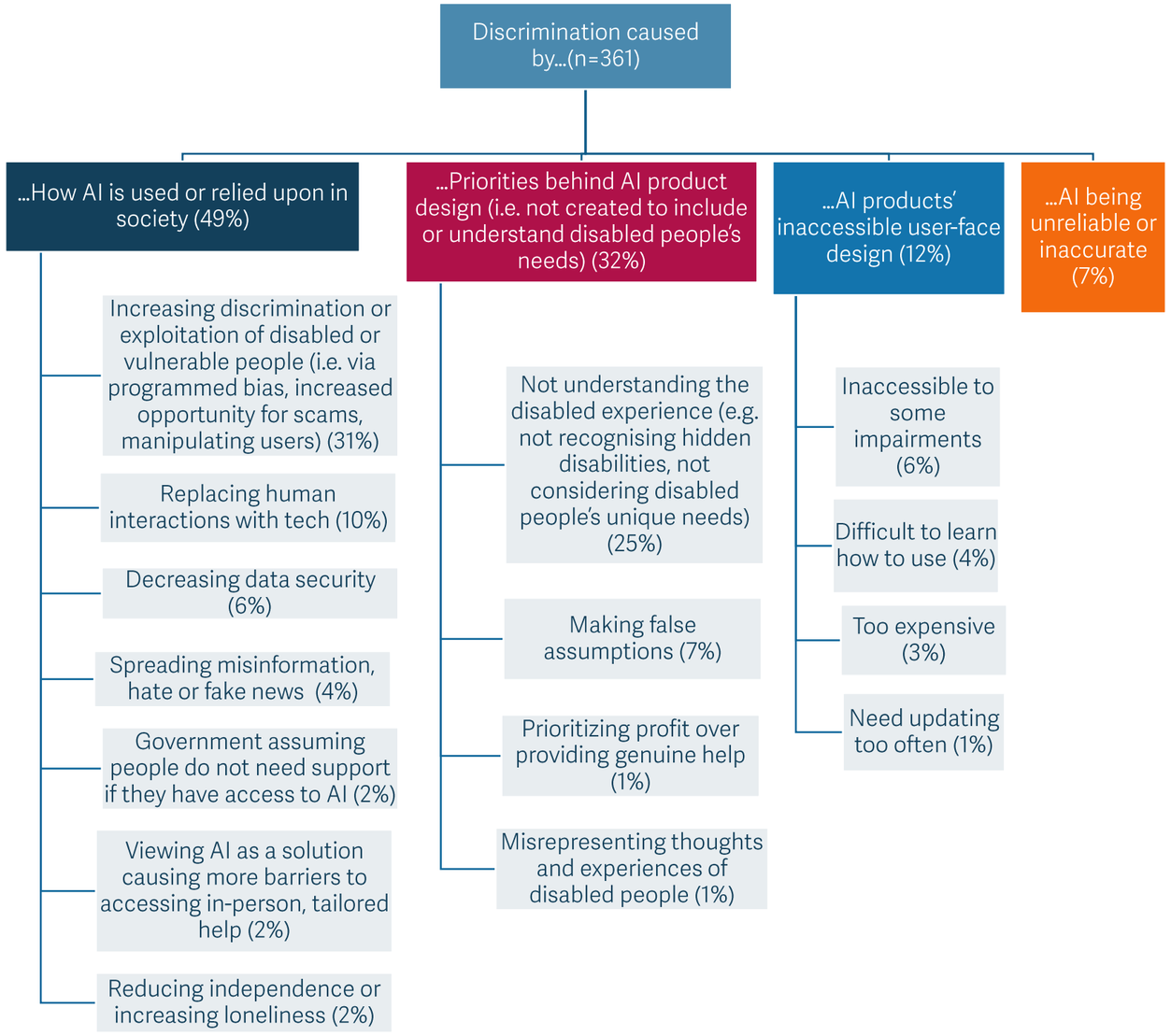
Do you have any concerns about AI being used in a way that could discriminate against disabled people? (n= 528)



AI - Potential for discrimination against disabled people

Respondents were asked **to explain their concerns** about AI being used in a way that could discriminate against disabled people.

- **Almost half (49%)** of respondents were concerned that discrimination could arise from **how AI is used or relied upon by society.** For example, 1 in 3 respondents felt that AI generally created more opportunity for discrimination and exploitation, so increased reliance was likely to result in greater discrimination. 1 in 5 felt that relying more heavily on AI could result **in inaccessible changes to services**, such as replacing staff with technology, decreasing data security, or result in increased access barriers in society due to reduced efforts to remove structural barriers.
- **A third (32%)** of respondents felt that discrimination could be caused by the **priorities behind AI products.** For example, 1 in 4 felt that AI is not designed to understand the disabled experience.
- 12% felt that discrimination could arise from AI products' user interface being inaccessible, difficult to learn, too expensive or becoming obsolete.
- 7% felt that discrimination could arise from AI being unreliable or inaccurate.



“AI could help overcome accessibility problems, like verifying identity, if the bot is genuinely like a human and if those designing it had the foresight, creativity and consultancy with disabled people. But that’s a lot of “ifs”, and if the designers were in touch with these accessibility problems, they wouldn't have designed inaccessible identity verification services in the first place. Improvement can only happen if the full spectrum of human experience is considered, and it’s recognized that things aren’t accessible now. Without that, AI may further engrain the problems, inaccessibility, and discrimination which already exists.”

Respondent with a visual and mobility impairment

Perceived risks of AI

Participants across all focus groups (including the UX focus group) further voiced concerns about the unknown risks of incorporating AI into DigAT.

Inaccuracies and inappropriate support

Participants expressed concerns about the potential of AI to generate inaccurate or inappropriate information or support which could in some cases, compromise the safety, wellbeing or perceptions of vulnerable users. Participants felt that an over reliance on AI could magnify this risk.

> "The other thing I would want to add is the accuracy. I think when it gets things wrong and you know about it – that's ok but sometimes it gets things wrong and you don't know about it. I think that's quite risky, especially if you're thinking about some kind of important communication in my case."

Participant with a sensory impairment

> "I have a small concern about companies like Be My Eyes and Aira who currently use real people to help blind people in the environment they are in or with reading things, or road crossing. They are already talking about incorporating AI into feedback systems. I'm fairly confident that these professional organisations will manage these risks because I know AI has hallucinations, errors, basically in perception….but there may be other companies that won't consider this, and that could introduce risks."

Participant with a sensory impairment [UX focus group]

Over dependency

Participants highlighted their concern about a creeping dominance of AI in society. Fears related to the replacement of human interaction with automated support which might prove to have disadvantages that are difficult to counteract (owing to an absence of human involvement). This indicated a possible conflict with the social model of disability which says people are disabled by structural barriers in their environment, not by their impairment or difference. Participants were concerned that AI could be viewed as a 'fix-all' solution that only tries to compensate for their impairment and that an over-reliance would result in reduced efforts to minimise these societal barriers, reducing disabled users' capacity for autonomy or independence.

> "There are a lot of unknowns. You know we are watching a dystopian sort of series about AI and it's scary and it is probably over dramatized…but we just don't know whether it's a dangerous regime that is going to take over the country in the future and use it against us.."

Participant with a cognitive and physical impairment

> "I kind of think I want us to go backwards in a way because I'm worried that if we go too digital, the human element will be lost and we've been talking about humans being replaced by chatbots which are rubbish…I'm worried that if we lose humans it will be really disadvantageous to disabled people."

Participant with a cognitive and physical impairment

Overall, these findings suggest a need for a framework of safeguards aimed at maximising the potential benefits of AI powered DigAT for disabled people while at the same time minimising the risks. Such safeguards might include involving disabled people in the design stage, ensuring that data generated and shared does not undermine users' privacy and autonomy, protecting disabled users from exposure to inaccurate information, discrimination and bias, and maintaining a minimum guarantee of human involvement.

Where do disabled people go for access to, and help with DigAT?

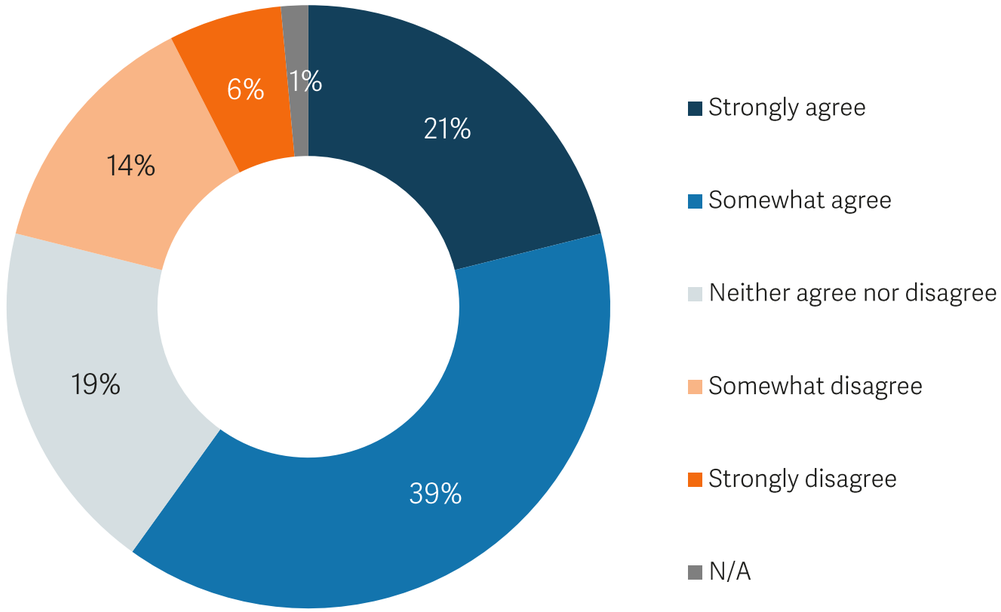
Solving problems with DigAT

The findings from our EbE session indicated that a key digital skill required to use DigAT independently was **the ability to research and find suitable solutions to problems with DigAT online.**

We asked respondents who use DigAT to what extent they agreed that they were able to do this.

- 6 in 10 respondents **strongly or somewhat agreed** that they were able to do this while 2 in 10 disagreed.
- 18- to 39-year-olds were significantly more likely to **strongly agree** that they were able to do this compared to older respondents, with 31% selecting this option. This was followed by 40-59-year-olds, with 24% selecting this option.
- 60 to 79-year-olds were significantly more likely to **strongly disagree** with this statement (9%).
- Respondents with **cognitive** and **dexterity impairments** were more likely to **strongly** or **somewhat disagree** with this statement – 26% and 24% respectively.
- Women were significantly more likely to **somewhat** or **strongly disagree** with this statement (26%) compared to men (12%).

To what extent do you agree with the following statement: "I am able to independently research and find suitable solutions to problems with my digital assistive technology online." (n= 479)

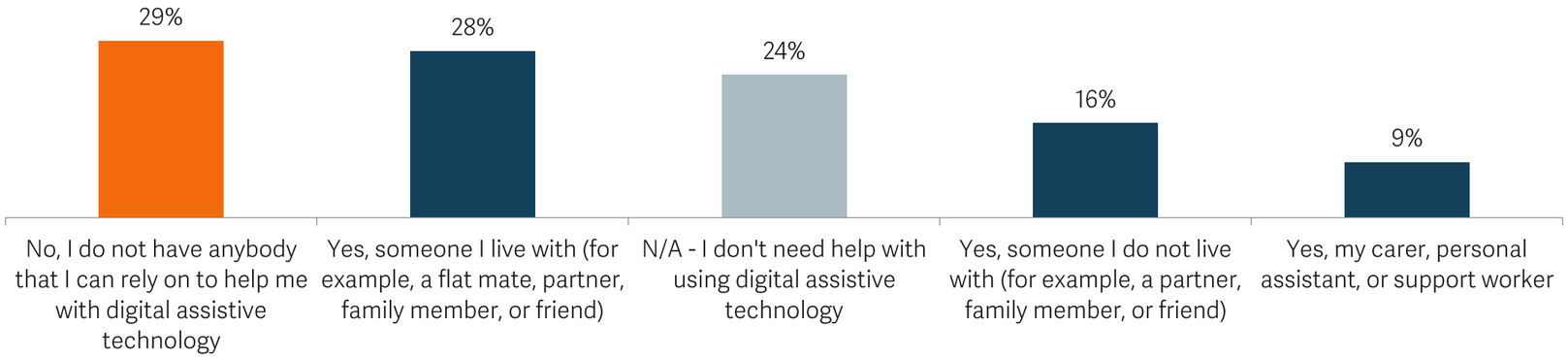


Seeking help

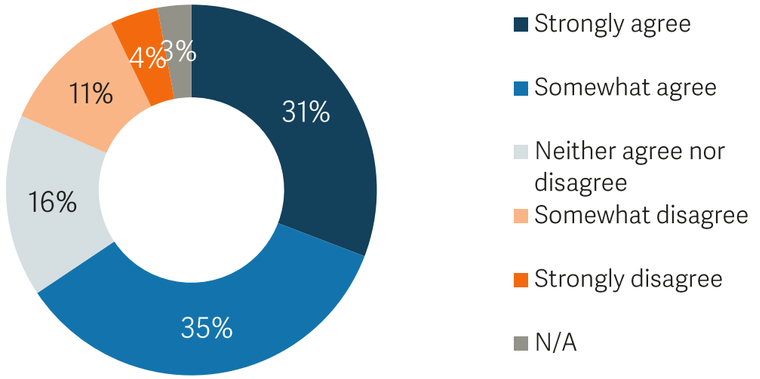
We asked respondents who use DigAT whether they had **anybody they could rely on to help them with using it** and **how comfortable** they felt asking for help.

- Just under 3 in 10 respondents (29%) **did not have anybody they could rely on for help.**
- 28% of respondents **lived with someone they could rely on for support.** 18- to 59-year-olds were more likely to report this than older age groups.
- Nearly 1 in 4 respondents (24%) **did not need help** with using their DigAT. Men (29%) were significantly more likely than women (19%) to report this. Similarly, 18- to 39-year-olds were more likely report this (36%).
- 66% of respondents **strongly** or **somewhat agreed** that they felt comfortable asking for help with their DigAT.
- Women were more likely to **strongly disagree** that they felt comfortable asking for help (6%) than men (2%).

Do you have anybody that you can rely on to help you with using your digital assistive technology? (n= 479)



To what extent do you agree with the following statement: "I am comfortable asking for help with my digital assistive technology." (n= 477)



Seeking support

Focus group participants were asked **where they went for help** and **how they resolved problems** with their DigAT.

Participants described the typical journey they would take when seeking support with their DigAT.

Capacity to problem solve independently

Some participants spoke of approaching potential problems with their DigAT with a 'can do' attitude and a determination to resolve issues independently in so far as is possible.

> "I'm very much a person who won't take no for an answer. If anything is possible, where there is a will, there's a way, I'll find out. Sometimes I figure out myself through playing around with the app or the piece of software until it works."
>
> Participant with a cognitive and physical impairment

Googling the issue

Participants said they used Google to search for solutions. However, they noted that this could be time-consuming and did not always yield the results sought.

> "A lot of googling, like everyone has said, researching on the internet, but sometimes you do put a lot of time and effort into it and you don't quite resolve it so sometimes I would abandon it and try something else."
>
> Participant with a sensory impairment

Friends and family

Some participants looked to their family or friends if they needed help. However, others expressed a hesitancy in doing so, because they either did not want to impose or because their family or friends did not have the knowledge required to help them.

> "My partner is really good at technology so they show me how to do things…because of my autism, using new digital interfaces I get really overwhelmed so I want someone to show me what to press or click…when I had Access to Work and the DSA they paid for training on how to use the program."
>
> Participant with a cognitive impairment

Role of disability networks, organisations and charities

Many participants spoke about the value of using forums, and communities of their peers (either online through social media or offline) to share knowledge and experiences.

> "I'm in a lot of Facebook groups and forums and things, they are quite good places for finding out information… people using them give good advice."
>
> Participant with a sensory impairment
>
> "Asking visually impaired people is always handy so there's like a local peer support group where I live so we've got a Whatsapp group so people can post in there so that can be useful."
>
> Participant with a sensory impairment

Some participants praised charities for providing support with the set-up of their DigAT as well as training.

“There are some charities that can be really good, there are more and more specific organisations being set up specifically to help people with digital assistive technology…my husband and me, we both really like gaming but we struggle with the physical aspect of that so we were referred to a charity called Special Effects who are absolutely fantastic and they came and they assessed and set us up with a complex system of controls where when my husband plays games, he can only move his head and fingers and toes yet he can beat me on every computer game with a different button attached to different places!”

Participant with cognitive and physical impairment

Seeking support

Reaching out to the DigAT's customer service

The extent to which participants relied on manufacturers varied. Some indicated that they would approach them as a last resort or after trying other solutions, while others indicated that they would resort to contacting the manufacturers more immediately and directly. Participants highlighted the importance of having accessible contact details to use.

> "...Sometimes I google it or look online for other people who might have said something about it....If I can't find the answer myself, my husband is my next port of call...If we can't work it out between us...it's a case of ringing up the manufacturer."
>
> Participant with a cognitive and physical impairment

> "As far as solving is concerned, I'll be honest, I'll go the easy way because with the Apple phone, I have a phone number to phone them directly...they don't mind spending the time with me going through everything."
>
> Participant with a sensory impairment

Barriers to accessing customer support

Focus group participants described some of the issues they faced when trying to obtain customer support from the manufacturer of their DigAT. The main issues raised concerned:

- **Lack of timely or satisfactory responses.** Participants spoke of delays in getting a response or the support they needed. They also spoke of receiving responses which failed to respond to their needs, resolve the problem or of sometimes being directed to purchasing new DigAT which was not always feasible for cost reasons.
- **Lack of human support as a fallback.** Participants spoke of being frustrated by chat bots and automated systems and of either not being able to obtain human support or human support being inadequately available.

Lack of timely or satisfactory support

"You can put a lot of time and effort into it and you can't resolve it so you just abandon it and just try something else or I've been told to get an additional piece of technology and you think that's more time and cost."

Participant with a sensory impairment

"Also the support in terms of software support, like I've had so many issues with Mind View and Note Talker and I've really struggled to get a proper resolution as there are so many functionalities within the software that are not adaptable to what you need and you want to get some advice on how to work on it and find out what you need."

Participant with a cognitive impairment

Lack of human support as a fallback

"I struggle trying to find a human person you can speak to, other than an automated system…it's just time-consuming…I struggle with written stuff online and I need it to be audible…you can't get people on the phone and even when you are on the phone, they are literally rushing you."

Participant with a cognitive impairment

"I think chat bots have got so much better but sometimes I think a useful intermediate is to have a useful chat bot but actually after a couple of attempts, it's not working that you get to speak to a human so then you're reducing the number of humans you are having to employ but they are still there."

Participant with a cognitive and physical impairment

What are disabled people's experiences of participating in user (UX) testing of DigAT?

Getting involved

A separate (UX) focus group was conducted with six panel members who had previously been involved in testing or designing new DigAT to explore their experiences.

Participants described how they found out about testing opportunities and what motivated them to get involved.

Finding out about testing opportunities

Participants found out about testing opportunities through word of mouth, local support groups, online channels (such as mailing lists or social media), or by being directly approached because of feedback they have provided on the product or past involvement in testing.

> "I am a member of quite a few mailing lists online and I also follow a few different things on social media…others have reached out to me as I've actually given feedback in the past on websites so it's a combination between direct contact versus information on various mailing lists."
>
> Participant with a sensory impairment

> "My first attempt to get involved was through a mailing list I was on for the British Heart Foundation; they came out saying they were looking for PPI volunteers. From there, I just signed up to Diabetes UK's PPI mailing list for volunteers as well and had quite a few students contact me through that….and also word of mouth as well, where one student will pass my name onto another student."
>
> Participant with a cognitive and physical impairment

Motivations for involvement

Participants' motives for getting involved in in testing or designing new DigAT were mainly altruistic. Many wanted to share their knowledge, lived experience or overcome the inaccessibility of DigAT in order to make a difference for others. Another strong motivation included the positive social and mental health benefits of being engaged in research (off-setting feelings of isolation, lack of purpose or self-determination).

> "Lived experience and seeing the lack of knowledge out there and knowing that I have skills to make a difference."
>
> Participant with a physical impairment

> "My motivation as a blind person has always been to try and make a difference…having sight loss, I did get depressed in my teens, really wondering what prospects were out there for VI people…I was actually told in school I would never be able to make anything of myself in technology…I got the determination to carry on so my mum encouraged me to pass on my knowledge onto other people. I'm amassing all this knowledge from a technical standpoint."
>
> Participant with a sensory impairment

Other motivations for involvement included discovering or gaining access to new or innovative DigAT.

> "Sometimes you get nice little incentives, depending on how projects are funded but often it's quite good that you get left with the app afterwards, in particular some of the diabetes ones and some of the ones for blood pressure monitoring are quite good once they make tweaks and roll them out, you get to keep them so it's quite handy but I also see the benefit for people coming through the system in future years as technology improves so I'm trying to see the bigger picture"
>
> Participant with a cognitive and physical impairment

Barriers to getting involved

Participants highlighted that **inaccessible recruitment processes or materials**, **poor compensation**, or **time-consuming testing processes** either prevented them from taking part or negatively impacted their involvement in UX testing. For example, some participants mentioned being sometimes misled about the work and time commitments involved.

Inaccessible recruitment processes or materials

"Actually the contract I had to sign, the non-disclosure agreement was sent to me on a digital contractual piece of software that wasn't accessible at all, as it was pdf and was not set up for people with assistive technology...When I've taken on work since, I've actually written in my contract what my reasonable adjustments are and if people don't take on those reasonable adjustments, I just don't take the work."

Participant with a physical impairment

"I recently got a survey request from the RNIB and I had to abandon the survey halfway through because I could not check the boxes or hit the slider or read the table in a sensible way and that was from the RNIB."

Participant with a sensory impairment

Poor compensation

"I really do think that payment should be discussed. A lot of people volunteer a huge amount of their time...a lot of organisations who can afford to pay disabled people choose not to...It's a hard needle to thread because we want to do things but that can be taken advantage of."

Participant with a cognitive and physical impairment

Time-consuming processes

"...they had completely misled me about how much work it was...they hadn't done any of the initial work and it ended up being four or five times the amount of work in a relatively short period of time and because it was something I believed in and wanted to do, I actually made myself quite poorly...Longer term things are fine as long as expectations are established and there is decent communication."

Participant with a cognitive and physical impairment

Testing environment

Participants had tested DigAT in various settings, including at home, in labs or other locations.

Testing outside of the home

Participants mentioned obstacles to take part in testing DigAT outside of the home due to access constraints or the cost of travel.

> "Everything I've done has been digitally because of mobility and because I'm quite away from where the main centres of the universities are...the cost of travel to these centres isn't usually covered."
>
> Participant with a cognitive and physical impairment

> "A lot of these companies don't actually offer to come out to you anyway, you have to go to them which in itself is a bit of a barrier....and transport can be quite costly really and some companies don't cover your expenses, like the university."
>
> Participant with a sensory impairment.

However, some participants mentioned the social and mental health benefits of getting out of the house, and meeting others.

> "It would be a lot easier to do it at home but I actually enjoyed getting out there and it gave me reason to get out of the house and that was part of my mental recovery....I have done the odd thing at home like testing game apps for the blind....which is fine, but it wasn't as good an experience of actually meeting people and having that interaction."
>
> Participant with a cognitive and physical impairment

Testing at home

Participants referred to the convenience of testing DigAT at home, but did refer to the potential for frustration to arise when confronted with difficulties and not having immediately available support.

> "....When it goes wrong, especially when it was in its early stages of development....you get stumped too quickly and you get frustrated because you don't know whether that's me being stupid or whether it's actually a problem with the design. Not having someone to contact immediately...you don'.t get that immediate feedback and for whatever reason you lose interest or motivation."
>
> Participant with a sensory impairment

However, other participants considered that the experience of frustration in itself was useful to identify DigAT design issues as well as workarounds discovered through personal effort.

> "Sometimes I think that's actually quite an important part of the process where you can – instead of asking someone immediately, what's wrong? You spend a bit of time trying to see what the workarounds are and that's useful feedback for them and those frustrations are important for them to know and understand."
>
> Participant with a cognitive and physical impairment

Many participants expressed the value of in-person or remote moderated testing (i.e. while in the presence of developers, designers or other testers). They felt that this made it a lot easier to get their feedback across.

> **"I find that unless they can watch you and see what the barriers are, they don't even know it exists so explaining something via a survey or email, you can't always get your point across whereas if I'm actually there in person and say 'look I'm trying to get to this', they have a real-life example...I think more companies should take that approach."**

Participant with a sensory impairment

Impact of testing

Participants observed that the impact of the insights they provided could vary depending on factors such as **the level of commitment of individual product designers**, **the attitude of companies and others commissioning the research** and **the extent of accompanying advocacy**. Some mentioned that their involvement led to immediate changes but noted that changes could also come later. Some participants referred to the positive role of charities in advocating for changes during the product development process.

A number of negative aspects of testing included perceptions that it was just a 'tick box exercise' without any positive influence on actual outcomes: the failure of researchers and product designers to make clear what the real objectives of the testing are, and a failure to inform participants of what the practical results of the research are.

"Big companies…have budgets to put towards this…smaller companies, start-ups – they go in with the best intentions, but they don't necessarily have the infrastructure or the ability to take on all of the comments, pieces of feedback, everything just kind of peters out…and you're like 'wait I just put a lot of time and effort into this'."

Participant with a cognitive and physical impairment

"A lot of companies have been very proactive in my experience, sometimes you have to follow up with them, but they have implemented suggestions, some companies take longer than others…sometimes you have to chase things up yourself…when organisations are campaigning like the RNIB, we need to get there before the items are released to the market."

Participant with a sensory impairment

"I think the negatives are when things are like a tick box exercise and you're not listened to at all, you feel that your time has been wasted."

Participant with a cognitive and physical impairment

"The negative for me is that most of the work I've done has been for research students' so I have no idea A. who I've been working for or what the specific goals were….and B. I rarely get any feedback or not had any feedback…I've not had anything to say, 'well what you told me on that day helped us write that function."

Participant with sensory impairment

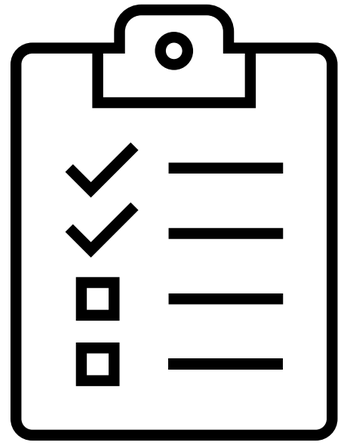
What societal changes regarding DigAT do disabled people want?

Desired policy changes

At the end of the Expert by Experience session, participants were asked **what policy changes** they would like to see occur after this research.

Their suggestions were to:

- Bring about a cultural shift to increase pride in creating products that are accessible (similar to Apple's professed ethos) and reduce the stigma that can exist around DigAT
- Increase the public's and policy makers' awareness of the current DigAT market
- Ensure companies offer more support for DigAT
- Ensure more companies do user-testing with disabled people
- Make policy changes that remove disadvantages disabled people face with DigAT



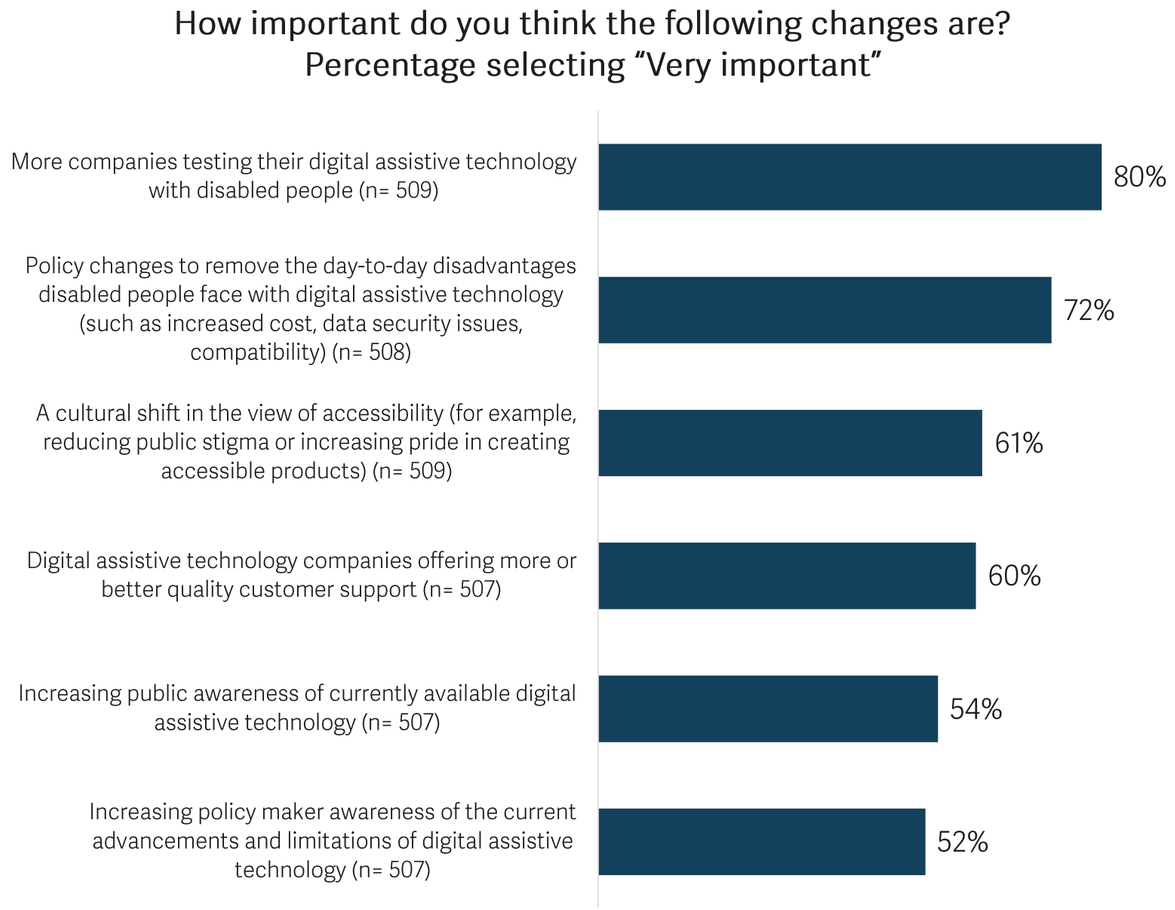
These five suggestions were used to inform our survey, in particular, with a view to identifying what societal changes respondents considered to be most important for them in the future.

Towards a better future

Survey respondents were asked to rate **how important those societal changes regarding DigAT were to them.**

Over half of respondents rated all of these societal changes as 'very important'. However, the three changes that respondents considered most important were:

- **More companies testing their digital assistive technology with disabled people**, with 80% selecting this as 'very important'.
- **Policy changes to remove the day-to-day disadvantages disabled people face with DigAT** (such as increased cost, data security issues, compatibility), with 72% selecting this as 'very important'.
- **A cultural shift in the view of accessibility** (for example, reducing public stigma or increasing pride in creating accessible products), with 61% selecting this as 'very important'.



Section 7

Suggestions for policy-making

Suggestions for policy-making

The following suggestions for policy-making and possible future research are based on our reflections on the findings presented in this report.

Improve definitions of DigAT and related terms

1. Avoid tight definitions of DigAT. Instead, follow an approach that allows disabled people themselves to define whether their technology is assistive

Our research found that a vast range of technology was being used as DigAT, often without the intention of the technology's manufacturer. Factors explaining this are likely to include the rapid evolution of technology, the absence of a set of centralised DigAT requirements, variations in the needs of disabled people and in their level of digital access and financial resources.

Our research suggested that policy which only covers technology labelled as DigAT by manufacturers, or attempts to group DigAT into categories, is likely to exclude a significant percentage of disabled people and may become outdated as technology develops.

A policy that allows disabled people to identify technology as DigAT themselves may be better able to adapt to future developments. The definition that RiDC used during the project, which was co-formulated with disabled panel members during the initial stage of the research was "any digital technology that processes information to make your life easier". For comparison, it may be useful to also refer to the UK Government's definition of disability: "You're disabled under the Equality Act 2010 if you have a physical or mental impairment that has a 'substantial' and 'long-term' negative effect on your ability to do normal activities."

2. Define 'assistive' and 'life-critical' in a broad way

Avoid tight definitions of what 'assistive' and 'life-critical' are. Our research showed that the uses for DigAT are as varied as people's access needs. People with specific access needs may consider that they have a life-critical reliance on a range of DigAT- facilitated activities. It is important that policy recognises that all disabled people may have a personally perceived life-critical reliance on technology. Furthermore, our research suggested that policies which use restrictive definitions of 'assistive' or 'life-critical' may become outdated as technology develops.

Discovering DigAT and means of obtaining it

3. Make DigAT easier to discover, including for those without digital skills, disability-friendly support networks, or with limited financial resources or DigAT-awareness.

Our research suggested that discovering or accessing DigAT is often an individualised process in which disabled people are required to have prior knowledge of where to look in order to find what is available. 46% of our survey respondents agreed that, if they did not

Suggestions for policy-making

know about the latest DigAT, nobody else would help them access it. Participants also referred to the time and effort required to determine whether a piece of DigAT could fulfil their needs and to learn how to use it. Overall, this suggests that those without these skills or resources will be less likely to access DigAT. Any policy aimed at increasing awareness of and uptake of DigAT must consider these factors. Other related factors include affordability, and a knowledge of an eligibility for forms of financial support (e.g. the Disabled Student's Allowance or Access to Work); an ability to easily avail of technical support or training; compatibility of different DigAT devices (some are not always compatible with other devices); and the obsolescence of DigAT (which may impose a cost pressure on disabled users over time).

Ensuring access needs are met

4. Ensure that access needs are met through co-design

There was a strong perception amongst our research participants that involving disabled people in the design phase and testing of DigAT would help ensure that their access needs are met by the product under development. With regard to policy-making, survey respondents considered the testing by companies of DigAT with disabled people as most important. A related point was that participants considered that disabled people should be actively involved in conceptualising innovative DigAT. Based on this, a policy-making objective might therefore be to include disabled people in the most upstream stages of DigAT development. Internalising advocacy for accessibility and inclusive design should make a cultural shift towards optimal DigAT more likely.

5. Ensure DigAT support is fit-for-purpose

DigAT companies and others should ensure that their support systems fully respond to the access and communication needs of disabled users. Our research showed that, for disabled users, support systems can be flawed due to automated systems being insufficiently able to respond to specific issues or support being unavailable in alternative accessible communication formats. Policy-making should aim at avoiding such problems.

Addressing concerns about DigAT

5. Ensure that privacy policies specifically take account of disabled people

Over 40% of survey respondents were concerned about how much data is gathered from them when they are using their DigAT and how that data is used by the companies involved. Any privacy policy, particularly in relation to AI, should aim to ensure that disabled people's data is protected and that disabled users understand how their data is being used and by whom. There is a need to ensure that the privacy policies of technology companies, particularly those who do not view their technology as DigAT, are accessible

Suggestions for policy-making

and comprehensible for disabled people, including those with low digital skills. Means of providing informed consent also need to be sensitive to the needs of disabled people and provide them with meaningful choices. Furthermore, our research showed that disabled people raised specific data concerns, not only in relation to themselves, but also in relation to those they interact with (e.g. people in their vicinity).

6. Ensure that Artificial Intelligence (AI) powered DigAT is regulated

While over half of survey respondents believed that AI had the potential to improve the lives of disabled people, just over 40% reported being concerned about DigAT that depends on AI, due to fears of it being unreliable, inaccurate, or used to replace human support or minimise efforts to reduce structural barriers in society. In terms of policy-making, it would be appropriate to ensure that the development and roll-out of AI-powered DigAT focuses on minimising the risks for disabled people by involving them in design stage; ensuring that data generated and shared is not at the expense of users' privacy; protecting users from exposure to inaccurate information or bias; and maintaining a minimum guarantee of human support and oversight.

Financial and other support frameworks for DigAT

7. Carry out research on the effectiveness of initiatives and support frameworks aimed at increasing access to DigAT

40% of our survey respondents reported that it was expensive to get what they needed from DigAT, while 38% agreed that accessing publicly funded DigAT was not easy. Exploring the factors that contribute to these sentiments could help inform future policies aimed at increasing awareness of and improving access to DigAT.

For example, research could examine the effectiveness of public or private initiatives to raise awareness of and provide access to DigAT (e.g. through Access to Work, healthcare providers, or charities). This research might focus on how disabled people perceive these initiatives or support frameworks and any outstanding barriers they experience.

Understanding the impact of intersectionality on access to and use of DigAT

8. Undertake further targeted research on intersectional factors that might impact the update of DigAT

As our research was broad, we were unable to explore the extent to which other personal circumstances might impact disabled people's access to and use of DigAT. Before writing any policy, it might be useful to further explore how a range of other factors or personal circumstances might impact the uptake of DigAT, such as employment status, financial circumstances, or whether English is a first language.

Section 7

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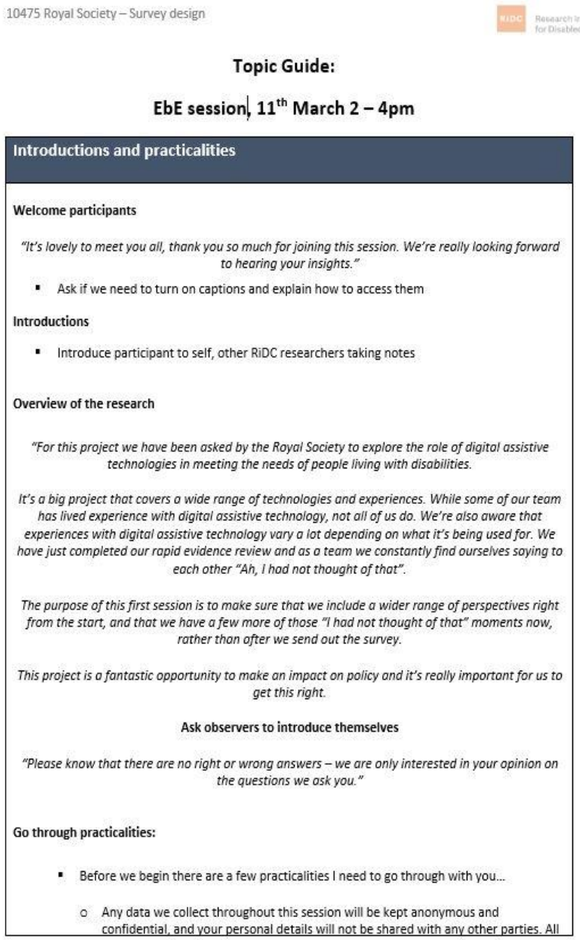
Research materials

View the Expert by Experience session discussion guide.

View the survey script.

View the UX focus group discussion guide.

View the Non-UX focus group discussion guide.



10475 Royal Society – Survey design

Topic Guide:

EbE session, 11th March 2 – 4pm

Introductions and practicalities

Welcome participants

"It's lovely to meet you all, thank you so much for joining this session. We're really looking forward to hearing your insights."

- Ask if we need to turn on captions and explain how to access them

Introductions

- Introduce participant to self, other RiDC researchers taking notes

Overview of the research

"For this project we have been asked by the Royal Society to explore the role of digital assistive technologies in meeting the needs of people living with disabilities.

It's a big project that covers a wide range of technologies and experiences. While some of our team has lived experience with digital assistive technology, not all of us do. We're also aware that experiences with digital assistive technology vary a lot depending on what it's being used for. We have just completed our rapid evidence review and as a team we constantly find ourselves saying to each other "Ah, I had not thought of that".

The purpose of this first session is to make sure that we include a wider range of perspectives right from the start, and that we have a few more of those "I had not thought of that" moments now, rather than after we send out the survey.

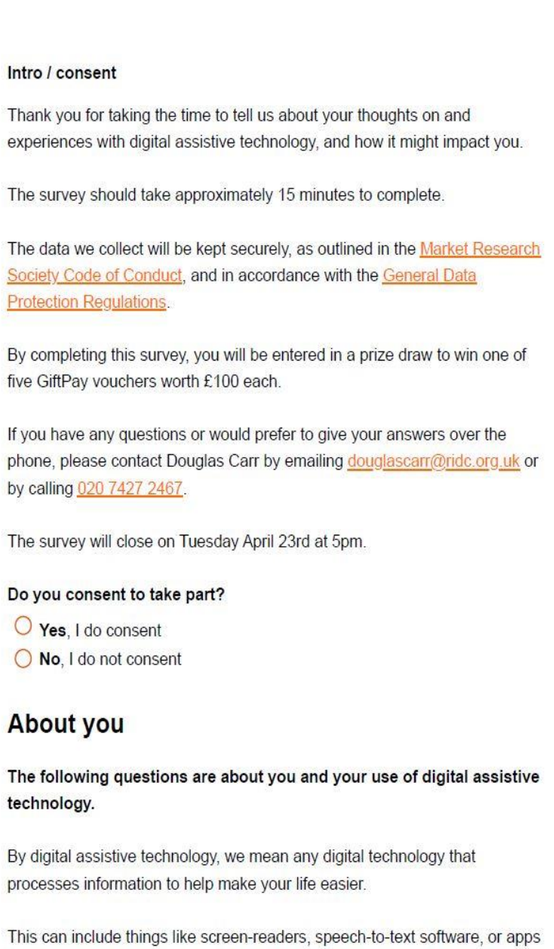
This project is a fantastic opportunity to make an impact on policy and it's really important for us to get this right.

Ask observers to introduce themselves

"Please know that there are no right or wrong answers – we are only interested in your opinion on the questions we ask you."

Go through practicalities:

- Before we begin there are a few practicalities I need to go through with you…
  - Any data we collect throughout this session will be kept anonymous and confidential, and your personal details will not be shared with any other parties. All



Intro / consent

Thank you for taking the time to tell us about your thoughts on and experiences with digital assistive technology, and how it might impact you.

The survey should take approximately 15 minutes to complete.

The data we collect will be kept securely, as outlined in the Market Research Society Code of Conduct, and in accordance with the General Data Protection Regulations.

By completing this survey, you will be entered in a prize draw to win one of five GiftPay vouchers worth £100 each.

If you have any questions or would prefer to give your answers over the phone, please contact Douglas Carr by emailing douglascarr@ridc.org.uk or by calling 020 7427 2467.

The survey will close on Tuesday April 23rd at 5pm.

Do you consent to take part?

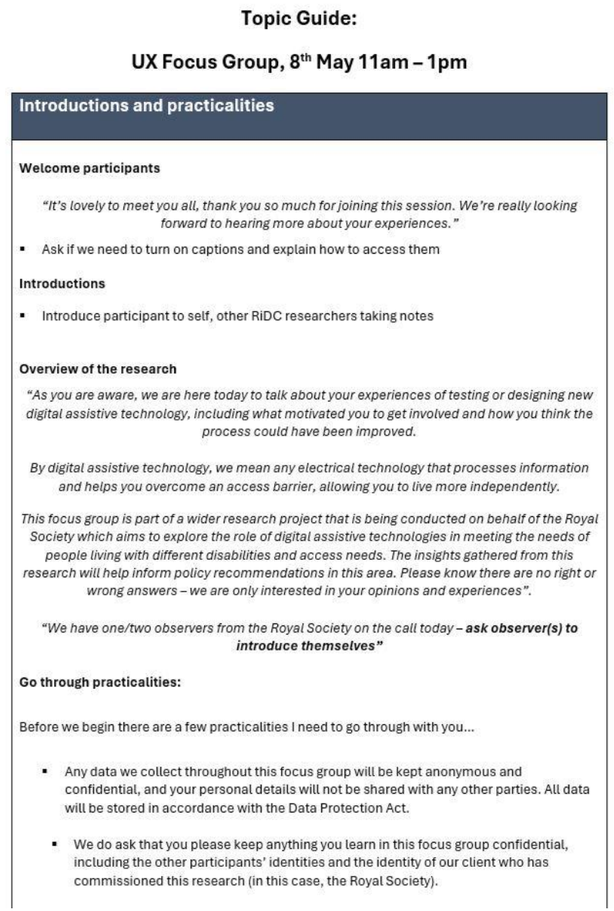
- ○ **Yes**, I do consent
- ○ **No**, I do not consent

About you

The following questions are about you and your use of digital assistive technology.

By digital assistive technology, we mean any digital technology that processes information to help make your life easier.

This can include things like screen-readers, speech-to-text software, or apps



Topic Guide:

UX Focus Group, 8th May 11am – 1pm

Introductions and practicalities

Welcome participants

"It's lovely to meet you all, thank you so much for joining this session. We're really looking forward to hearing more about your experiences."

- Ask if we need to turn on captions and explain how to access them

Introductions

- Introduce participant to self, other RiDC researchers taking notes

Overview of the research

"As you are aware, we are here today to talk about your experiences of testing or designing new digital assistive technology, including what motivated you to get involved and how you think the process could have been improved.

By digital assistive technology, we mean any electrical technology that processes information and helps you overcome an access barrier, allowing you to live more independently.

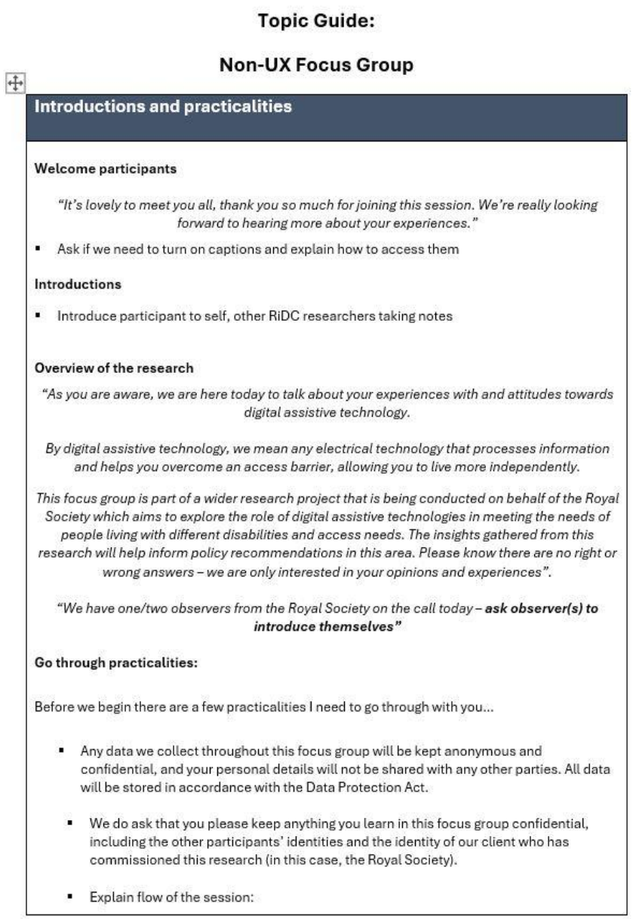
This focus group is part of a wider research project that is being conducted on behalf of the Royal Society which aims to explore the role of digital assistive technologies in meeting the needs of people living with different disabilities and access needs. The insights gathered from this research will help inform policy recommendations in this area. Please know there are no right or wrong answers – we are only interested in your opinions and experiences".

*"We have one/two observers from the Royal Society on the call today – **ask observer(s) to introduce themselves"***

Go through practicalities:

Before we begin there are a few practicalities I need to go through with you…

- Any data we collect throughout this focus group will be kept anonymous and confidential, and your personal details will not be shared with any other parties. All data will be stored in accordance with the Data Protection Act.
- We do ask that you please keep anything you learn in this focus group confidential, including the other participants' identities and the identity of our client who has commissioned this research (in this case, the Royal Society).



Topic Guide:

Non-UX Focus Group

Introductions and practicalities

Welcome participants

"It's lovely to meet you all, thank you so much for joining this session. We're really looking forward to hearing more about your experiences."

- Ask if we need to turn on captions and explain how to access them

Introductions

- Introduce participant to self, other RiDC researchers taking notes

Overview of the research

"As you are aware, we are here today to talk about your experiences with and attitudes towards digital assistive technology.

By digital assistive technology, we mean any electrical technology that processes information and helps you overcome an access barrier, allowing you to live more independently.

This focus group is part of a wider research project that is being conducted on behalf of the Royal Society which aims to explore the role of digital assistive technologies in meeting the needs of people living with different disabilities and access needs. The insights gathered from this research will help inform policy recommendations in this area. Please know there are no right or wrong answers – we are only interested in your opinions and experiences".

*"We have one/two observers from the Royal Society on the call today – **ask observer(s) to introduce themselves"***

Go through practicalities:

Before we begin there are a few practicalities I need to go through with you…

- Any data we collect throughout this focus group will be kept anonymous and confidential, and your personal details will not be shared with any other parties. All data will be stored in accordance with the Data Protection Act.
- We do ask that you please keep anything you learn in this focus group confidential, including the other participants' identities and the identity of our client who has commissioned this research (in this case, the Royal Society).
- Explain flow of the session:

Approach to Statistical Testing

Statistical testing was conducted on the survey data using Qualtrics. Testing was calculated using the total number of responses to the question.

The following tests were used:

Pairwise Z-Test: The Pairwise Z-Test is a statistical test used to determine if 2 paired groups are significantly different from each other on your variable of interest. For example, it highlights if those in an older age group have significantly different answers to those in a younger age group. Significance was set at p=0.05

Chi-squared Test: The Chi-Square test is a statistical test used to examine the association or independence between two categorical variables. We used the Chi-Square test when we wanted to determine if there was a relationship between two variables, such as ethnicity and confidence when using DigAT. Significance was set at p=0.05

False Positives

In the report we have not included the significance level when we have reported differences between groups. This is because when multiple statistical tests are conducted the risk of reporting a false positive is increased. Instead, we have used the statistical tests as a guide to indicate to us where there are differences between groups and reported on these without providing the significance level.

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