Research report:

Are you really listening?

The equipment needs of blind and partially sighted consumers for accessible and usable digital radio

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RNIB supporting blind and partially sighted people

i² mediaresearch

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Foreword

Access to radio is key to the quality of life of blind and partially sighted people. Research shows that listening to the radio is a favoured and valued pastime for many.

Consumer digital radio equipment is able to provide listeners with a range of additional features and functions over analogue radio, including an increased choice of content through more stations, and the possibility of pausing live programmes as well as recording and playing back digital radio broadcasts.

However, anecdotal evidence suggested to us that the needs of blind and partially sighted people were not met by existing digital radio equipment. In this context, the Royal National Institute of Blind People (RNIB) commissioned primary independent research from i2 media research limited to identify the equipment needs of blind and partially sighted consumers for usable and accessible digital radio equipment. In addition, we wanted to compare those needs to those of sighted control groups and people with dexterity problems and dyslexia. The result is a fascinating report that highlights the many similarities between the needs of these different consumer groups and that provides designers of digital radio equipment with a set of very precise design recommendations that should enable them make their products more user-friendly and accessible.

As a second tier to this project, RNIB has also commissioned Ricability to conduct a comparative evaluation of currently available DAB equipment against the design checklist, to fully assess what the precise state of the market is with regards to usability and accessibility and advise consumers on purchase decisions.

This i2 Media research report shows that equipment design can be improved considerably, and that some significant changes are relatively easy to implement for the product chain. RNIB is keen to make the design recommendations from this research happen. This report is therefore an open invitation to manufacturers, retailers, representative UK and European industry bodies, regulators and the UK government to make the digital radio experience of blind and partially sighted people a better one, and we are grateful to those who have already started that journey with us.

Leen Petré
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Executive summary

1. Aims

The research questions addressed in the project were:

1. What are the core functional requirements of blind and partially sighted people from consumer digital radio equipment?

2. What are the design considerations required to make the more advanced functions of current and emerging consumer digital radio equipment accessible to blind and partially sighted people?

3. What are the accessibility and usability priorities for accessible and easy to use consumer digital radio equipment for blind and partially sighted people?

4. To what extent (and how) are accessibility considerations built into manufacturers' product design and development processes of consumer digital radio equipment? Within this context, how feasible is it for manufacturers to develop consumer digital radio equipment that is accessible to blind and partially sighted people?

2. Methods

To address the above research questions, the project involved both consumer and industry research.

The consumer research comprised two activities:

1. Qualitative in-depth research in the homes of 38 Digital Audio Broadcasting (DAB) radio consumers around the UK (24 blind and partially sighted consumers, 3 consumers with dyslexia, 3 with reduced dexterity, and 8 'sighted control' participants). Participants were interviewed and observed using familiar and unfamiliar DAB equipment during these sessions. The goal of this activity was to gain an in-depth understanding of the needs of blind and partially sighted people in terms of maximising the accessibility and usability of consumer digital radio equipment. In addition, the research aimed to assess how the digital radio equipment needs of blind and partially sighted people compared with those of sighted people, people with dyslexia and people with dexterity impairments.

2. A telephone-based survey (Short Preference Survey) involving 325 DAB users (a sample of 100 blind and partially sighted DAB users, and a nationally representative control sample of 225 DAB users). The goal of this activity was to evaluate the extent to which current DAB radios support independent use by blind and partially sighted consumers, compared with sighted consumers, and to highlight any similarities and differences.

The industry research involved the project researchers conducting in-depth interviews with six senior representatives of manufacturers and other entities in the consumer DAB equipment supply chain. The majority of these interviews were conducted face-to-face, though two were conducted via the telephone. The goal of the industry interviews was to find out how participant companies currently research user needs, the extent to which the needs of blind and partially sighted consumers are researched and/or understood by participant companies, and what the industry sees as barriers for addressing the needs of blind and partially sighted consumers.

3. Main findings

3.1 Blind and partially sighted users tend to be more reliant on radio than sighted users

Consistent with much of the background literature reviewed in the project, access to radio was revealed in both the project's qualitative and quantitative research as more important to blind and partially sighted participants than to sighted participants. Blind and partially sighted participants were more likely to refer to listening to the radio as their favoured pastime.

3.2 There are clear benefits for sighted consumers when the equipment needs of people with sight problems are addressed

Many of the usability and accessibility issues which affected blind and partially sighted participants' use of DAB equipment were also observed to reduce usability for sighted participants. Addressing the design considerations should improve the user experience of digital radio equipment for all groups: blind, partially sighted and sighted consumers. The top level design considerations relate to button feedback, button design, physical properties of the text display and interface software design.

3.3 Limited interest in and concerns about advanced functions

Many blind, partially sighted and sighted participants showed no interest in advanced features, either because they felt they had no need for them or they currently used and were comfortable with alternative methods for features such as recording. Many blind and partially sighted participants expressed concern that advanced features were not accessible to them because these features rely heavily on the text display.

3.4 Voice output greatly increases the ability of blind and partially sighted consumers to use digital radio equipment as independently as sighted consumers

A major difference between how blind and partially sighted and sighted consumers use DAB radio is whether or not they can use their equipment independently. The research revealed that blind and partially sighted people can use radios with voice output more independently than they can use radios without voice output. Voice output provides audible (synthetic or recorded) speech feedback to the user in one or both of two ways. First a voice can confirm via speech, the buttons that a user presses or functions that a user alters. Second, a voice can read out the information that appears on the radio's text display (eg station name, time, genre).

Comparing matched samples, relative to sighted DAB users, blind and partially sighted users who do not have voice output on their radio were twice as likely to report needing help from another person to use their DAB radio. At first use, 90 per cent of blind and partially sighted participants who were using a DAB radio without voice output reported needing help from someone else. This contrasted significantly with the much lower figure of 39 per cent of the nationally representative sample reporting needing help. For subsequent use of DAB radio, blind and partially sighted participants using a DAB radio without voice output were again significantly more likely than the nationally representative sample to report needing help (69 per cent versus 17 per cent).

However, a much lower figure, namely 48 per cent of blind and partially sighted participants reporting on radios with voice output needed help from someone else at first use, and 26 per cent needed help for subsequent use. Voice output provided a level playing field, as these figures were not significantly different to those for the nationally representative sample. However, the numbers needing help were significantly higher for those blind and partially sighted participants reporting on use of a DAB radio without voice output.

Comparison of survey responses from blind and partially sighted consumers describing their use of DAB radios with and without voice output clearly demonstrates the high value of voice output for blind and partially sighted consumers. More blind and partially sighted users of digital radio with voice output report being able to use their radios independently than do blind and partially sighted users of digital radio without voice output.

3.5 Barriers to better addressing the needs of blind and partially sighted consumers cited by industry interviewees centred largely on pragmatic and commercial considerations

Industry representatives from the consumer DAB equipment supply chain cited a range of commercial barriers to addressing accessibility issues, including: difficulty evidencing return on investment (and thus building a compelling business case); concerns that building in accessibility may be off-putting to the core (mainstream) market; and that previous attempts at marketing accessible products have rarely been successful.

Potential solutions suggested by interviewees included improved industry consultation with stakeholders, better access to research on user needs (where this report should fill the gap), actionable advice about how to improve accessibility (again a gap filled by this report), consumer education, and technical developments.

4. Key Project Output: prioritised design checklist

Through analysis of the project's in-depth interviews and videos of participants using their own and unfamiliar digital radio equipment, an inventory of design considerations was developed within the project. This was developed into a prioritised checklist (see Chapter 9) as a design resource, and is also being used in a related activity commissioned by RNIB from Ricability, namely an evaluation of a range of DAB equipment on the market against the checklist.

The checklist items were prioritised by considering factors such as the range of tasks that could be affected by addressing the design consideration, the frequency of tasks, and whether they were involved in basic use such as switching on, changing station, and changing volume.

The full checklist is presented in Chapter 9. Highest priority items relate to best practice in:

- the provision of button feedback (including voice output)

- button design (including size, groupings and spacing)

- physical properties of the text display (including contrast and size) to make it more readable, and

- interface software design to minimise user intervention or to maximise simplicity of user interaction and to provide intuitive processes (eg for autotune, rescan, scroll, select, play recording)

The research findings and design considerations were presented to industry at an interim juncture in the project. The project team received feedback that many of the checklist items are easily addressable by manufacturers in the product development process.

5. Next steps to support the availability of more accessible digital radio equipment

It is RNIB's intention that this research report, including the digital radio interface design checklist developed within the project, in conjunction with the comparative evaluation of currently available DAB equipment against the checklist, will support the availability of digital radio equipment that better meets the needs of blind, partially sighted and sighted consumers.

In further pursuit of this goal, RNIB is engaged with manufacturers, others in the supply chain, UK and European industry and statutory bodies.

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1. Radio and blind and partially sighted people – background

This document reports primary independent research conducted by i2 media research limited (i2) and commissioned by RNIB, to identify what makes digital radio equipment accessible and ensures it meets the needs of blind and partially sighted consumers. Whilst the research reported here focuses on DAB radio equipment, it is important to note that basic user actions are broadly similar for other types of stand-alone digital radio receiver equipment. These actions include switching the device on and off, selecting station, and changing volume. Consequently, the equipment needs identified through the current research apply to interface design for other stand-alone equipment that can receive multi-channel digital radio. For example stand-alone internet radios and radios that belong to the wider digital radio standards family (such as DAB+), but excluding PC and digital TV interfaces.

Before starting the primary research, a review was conducted of previous relevant research. Key findings from the review are presented below.

1.1. Radio listening is a valued leisure activity

Previous research has shown that listening to radio is a highly valued pastime of blind and partially sighted people (Douglas, Corcoran and Pavey, 2006; RNIB DAB Development Report, 2000; Bruce, McKennell and Walker, 1991). Douglas et al. (2006) reported that over 90 per cent of blind and partially sighted participants in their Network 1000 research on the opinions and circumstances of visually impaired people in Britain regularly listened to the radio and music. Almost half of these participants mentioned without prompting that they regularly listen to radio, the remainder mentioned radio on prompting. In the same study a high but slightly lower percentage of participants reported regularly watching television (87 per cent). As the Network 1000 research reported, for participants with sight problems the "most popular at-home leisure activity was listening to the radio or to music (91 per cent), followed by listening to/watching television or videos/DVDs (87 per cent), and reading/listening to Talking Books (77 per cent)". This finding was similar across the wide age range sampled in the Network 1000 study, and the popularity of radio was not related to degree of sight loss.

In their study, Bruce, McKennell and Walker (1991) reported that over 80 per cent of blind and partially sighted people own and listen to radio, and that a further 10 per cent own a radio but do not listen to it. In this study, they observed an age trend, in

that older participants (aged 75+) were more likely than younger participants to report not owning or listening to the radio.

1.2. Range of radio content consumed

Though their study was conducted before the advent of digital radio before there was the additional choice offered by digital radio, Bruce et al. (1991) reported that blind and partially sighted people listen to a broad range of content. Participants were asked which one radio station they listened to most out of BBC Radio 1, 2, 3, 4, local radio (BBC and commercial), local radio for blind people, and other. Across all participants, local radio, BBC Radio 2 and BBC Radio 4 were the three most often selected options. Preferences were broadly similar across all age groups, though there was a tendency for local radio to be preferred by younger participants.

1.3. Range of stations listened to

Bruce et al's (1991) study also asked participants which of the radio stations from the above list they ever listened to. Overall, 50 per cent reported sometimes listening to local radio, 43 per cent to BBC Radio 2, 36 per cent to BBC Radio 4, and 15 per cent to both BBC Radio 1 and Radio 3. This pattern of results reflects the older age profile of blind and partially sighted people relative to that of the general UK population. Given that the number of stations available to listeners has increased substantially since their study, particularly with the advent of digital radio broadcasting, the findings of Bruce et al (1991) that blind and partially sighted people tend to listen to more than one radio station is particularly relevant background to the current research.

1.4. Changing station with analogue radio equipment

The study by Bruce et al (1991) explored how blind and partially sighted people reported that they change station to listen to a different radio station, using analogue radio equipment. They reported that 77 per cent of participants aged under 60 years and 62 per cent of those aged 75 years and above, changed station themselves.

1.5. Confidence with technology

For older participants, the extent of residual vision was observed to have an impact on whether they reported being able to change station themselves. The same effect was not observed in relation to younger participants. Whilst Bruce et al. (1991) did not make this explicit, this finding suggests that participants' confidence in using their

analogue radio equipment was an important consideration in understanding their usage behaviours. This is consistent with more recent research the i2 media research team has conducted on consumer use of domestic media technologies, including digital television and computers (Ofcom, March 2006). In any event, the findings from Bruce et al. (1991), and the Network 1000 research (Douglas et al. 2006) demonstrate the importance of considering the ease of use and accessibility to blind and partially sighted people of radio equipment.

1.6. Accessibility is an important consideration

Digital radio provides consumers with a greater choice of radio content than analogue radio. A choice that is appreciated by many, as evidenced by recent data from Ofcom (Ofcom, 2008b) showing a continuous growth in take up of DAB radio equipment by UK consumers. Further take up is likely to be supported by new feature releases in consumer digital radio equipment. New equipment is able to provide listeners with a range of new features and functions, including the possibility of pausing and recording live digital radio broadcasts, iPod docking, and integration with internet radio (via in-home wireless broadband internet, Wi-Fi). Ongoing research by the Digital Radio Development Bureau (2007) indicates interest in various of these functions amongst current and potential digital radio listeners.

The development of interfaces for other digital media equipment, such as digital television receivers, demonstrates that they, relative to their analogue equivalents, have more complex interfaces enabling users to use the increased functions for using digital media services. Examples with digital radio equipment include menus and electronic programme guides presented visually.

1.7. Usability and accessibility issues

Concurrent with this project, Ofcom conducted a research study on the experiences of blind and partially sighted people with a range of communications services (Ofcom, July 2008). With regard to radio, the study reported that there were some usability or accessibility features that were particularly appreciated by blind and partially sighted people. The report noted that blind and partially sighted people have specific strategies to change station such as by memory, or touch or waiting until a station name announcement. The Ofcom research also reported that people with more severe sight loss most appreciated digital radio equipment that reads out the channel name. On the whole, navigation of stations using a remote control (accessing digital radio via digital television set top boxes) was reported by participants as the easiest way of selecting what to listen to. As its scope covered blind and partially sighted people's

experiences of several communications services, the depth of focus the Ofcom study was able to give to radio use was more limited than that afforded by the current project.

1.8. Switchover to digital radio

If a switchover to digital radio takes place at any stage, like the digital television switchover process, digital radio would be the only way to receive the major public service and commercial radio channels. This is a factor accentuating the importance of supporting access for blind and partially sighted people to digital radio equipment.

1.9. Access to digital radio – an RNIB focus

Listening to the radio is important to blind and partially sighted people and so accessibility and usability of consumer digital radio equipment is of high importance (eg Douglas et al., 2006). A concern of RNIB is that a valued existing pastime (listening to the radio) and the benefits of new and emerging features and functions should be as accessible to blind and partially sighted consumers, as they are to sighted consumers.

In this context, the current research was commissioned by RNIB to identify equipment design considerations to support accessibility to digital radio by blind and partially sighted consumers.

The aims and objectives of the current research, and the research questions addressed in it are described in Chapter 2.

The research methods used (in home in depth interviews and telephone interviews with blind, partially sighted and sighted consumers, and semi-structured interviews with representatives from the consumer digital radio equipment supply chain) and the research participants sampled are described in detail in Chapter 3.

Chapters 4 to 10 present the results of both the consumer research activities, and the industry interviews, including the full consumer digital radio equipment design consideration checklist (in Chapter 9).

The report conclusions are presented in Chapter 11, and finally, the Appendices include the questionnaire used for the project's Short Preference Survey, and table format presentations of all charted data.

2. Aims and objectives: scope of work

In January 2008, RNIB commissioned detailed primary user and industry research into DAB digital radio. The project was initiated in recognition that the consumer digital radio equipment market is fast developing and that monitoring the accessibility of digital radio products currently used by blind and partially sighted people might help guide design for easier to use products in the future.

The key objective of the research project was to gain an in-depth understanding of the needs of blind and partially sighted people for consumer digital radio equipment, and to establish how these needs differ from those of sighted radio listeners. An understanding of these needs is a precursor to improving the accessibility and usability of consumer digital radio equipment. A second objective of the research was to understand the extent to which the consumer electronics industry is able and likely to meet these needs.

The scope of this research is limited to considerations relating to table top and portable digital radio equipment. However, it has wider relevance because basic user actions are by definition broadly similar for different types of standalone digital radio receiver equipment. These actions include switching the device on and off, selecting station and changing volume. For this reason, the equipment needs identified through the current research are applicable to interface design for other stand-alone equipment that can receive multi-channel digital radio, such as stand-alone internet radios and radios that belong to the wider digital radio standards family (such as DAB+), but excluding PC and digital TV interfaces for listening to digital radio.

2.1. Research questions

To address the key objective, a series of research questions were established. These were as follows:

1. What are the core functional requirements from consumer digital radio equipment for blind and partially sighted people, and how do these compare with those of the control group?

2. What are the design considerations needed to make the more advanced functions of current and emerging consumer digital radio equipment accessible to blind and partially sighted people? How do these compare with those of the control group?

3. What are the accessibility and usability priorities for accessible and easy to use consumer digital radio equipment for blind and partially sighted people? How do these compare with those of the control group?

And in relation to the DAB equipment supply chain:

4. To what extent and how are accessibility considerations built into the product design and development processes by manufacturers of consumer digital radio equipment?

5. In this industry context, how feasible is it for manufacturers to develop consumer digital radio equipment that is accessible to blind and partially sighted people, and what constraints, if any, are cited that limit feasibility?

The scope of the first research question about the core functional requirements for blind and partially sighted people included: the range of current usage scenarios with digital radio (ie what people generally want to do with digital radio; techniques used to operate consumer digital radio equipment; and how easy to use and accessible these functions are with current equipment). Blind, partially sighted and sighted participants' experiences are compared to understand the extent to which there is any evidence that shows that poor usability of DAB radios can be a barrier.

Areas considered in the scope of research questions 2 and 3 , included: ease of tuning, legibility of any screen menus and information, dependence on screen usage, physical manipulation of controls, visibility of labelling, ease of understanding the logic of controls and settings, and any other areas identified in the primary research conducted with DAB users. Particular design features relevant to tasks that are considered to be core or frequently used 'basic functions', informed a list of prioritised design features.

The scope of research questions 4 and 5 about the industry includes current practices in product development. This includes industry standards for product design, and the extent to which any user testing for accessible or usable design is conducted. Research considerations included the following: technical feasibility; investment costs required (research and development, marketing); potential return on investment including the extent to which solutions could be applied beyond the UK market.

The extent to which good practice in relation to design for accessibility conducted in other industries such as digital TV, fixed and mobile telephony is transferable to the research and development and product development activities of DAB manufacturers was also considered.

In the next chapter, the methods used to address these research questions are described.

3. Methodology

To understand the experiences of, and requirements from DAB radio equipment for blind and partially sighted users', a multi-method, multi-perspective approach was adopted, using both qualitative and quantitative approaches. Industry interviews were conducted to understand perceived incentives, hurdles and barriers to industry addressing these consumer needs.

There were two target samples for the research: DAB consumers and industry. The methods used for these groups were as follows:

For the consumer research:

- In-depth interviews

- Structured Short Preference (telephone) Survey.

For the industry research:

- Semi-structured interviews.

3.1. Consumer research: in-depth interviews

3.1.1. Rationale

Thirty-eight in home, in depth interviews were conducted with DAB radio users to identify any difficulties blind, partially sighted and sighted people experience in operating DAB radio. This method was selected to inform research questions 1-3 (see Section 2.1).

In home, indepth interviews were selected to support the collection of rich data. The rationales for selecting this method were that:

(a) Participants are interviewed in familiar and comfortable contexts, less daunting than more formal contexts, which should put participants at ease with discussing the research topics.

(b) The researcher can easily compare (through careful observation) what participants say they do with their radio with how they demonstrate they use it (catering for any bias in self reporting).

(c) The semi-structured questioning approach allows considerable flexibility in the discussion allowing the researcher to probe further when required and identify areas that may have been overlooked in the discussion guide.

The results of this method informed the development of a prioritised checklist that identifies design considerations for DAB radio to increase its accessibility to blind and partially sighted users (see Chapter 9).

3.1.2. Sample

In-depth interviews were conducted with four groups of participants.

- People who are blind or partially sighted ('BPS': n=24)

- People with dyslexia ('dyslexia': n=3)

- People with manual dexterity problems ('dexterity': n=3)

- People who report none of the above ('sighted controls'; n=8)

The research participants with dyslexia and manual dexterity problems and the sighted controls were recruited to compare their DAB radio experiences with those of the blind and partially sighted participants. The dyslexia and manual dexterity samples were small (n=3) and were not a fully representative sample (eg across age) and conclusions based on this sample size should be treated with caution. Nevertheless they were included to give the research the opportunity to identify major differences or similarities with the blind and partially sighted sample. For instance, aspects of the design (eg scrolling text) may cause similar accessibility issues for people with dyslexia. Similarly, button size, shape, spacing and press mechanism may affect usability for people with manual dexterity problems as well as for blind and partially sighted people. Furthermore, DAB radio design features that may cause accessibility difficulties for blind and partially sighted people might also affect usability in a sighted control sample, limiting their use of DAB radio functions.

To ensure that a variety of DAB radio use experiences were identified a range of blind and partially sighted participants with different levels of sight loss were recruited. These included participants with congenital and with acquired sight loss. All participants from each sub-sample were recruited to meet different age band targets (see Table 3.1).

Table 3.1 DAB radio consumer research sampling

Sub-sample	Age			
	18-30 years	31–64 years	65-74 years	75+ years
Blind/partially sighted: mild	2	2	2	2
Blind/partially sighted: moderate	2	2	2	2
Blind/partially sighted: severe	2	2	2	2
Dyslexia	2	1		
Dexterity			1	2
Sighted controls	2	2	2	2

3.1.2.1. Blind or partially sighted participants

Twenty-four people (13 males, 11 females) who are blind or partially sighted were interviewed. Six were aged 18-30 years (4 males, 2 females), six were aged 31-64 years (3 males, 3 females), six were aged 65-74 years (2 males, 4 females) and six were aged 75 years or older (2 females, 4 males). The sample was intentionally skewed towards older people to be broadly representative of the blind and partially sighted population, consistent with the age profile reported in the Network 1000 report (Douglas, Corcoran, and Pavey, 2006) report (see section 3.2.2). Some of those in the oldest age brackets also reported being affected, to varying degrees, by dexterity and hearing problems.

Sight loss and impact on everyday life
In the blind and partially sighted sample, participants' level of sight loss was categorised as mild, moderate or severe. This categorisation was as used in the Network 1000 research report (Douglas, Corcoran and Pavey, 2006). Prospective participants were asked to self-report how much, if any, vision they had using the same question presented by Douglas, Corcoran and Pavey (2006). The question is included in Appendix A of this report (question 25 of the project's Short Preference Survey). Visual acuity was not tested during the course of this study. Information on their eye condition was provided by some participants – they were not routinely asked for this information, but were prompted to talk about their sight loss and, importantly, the impact on their lives. The participants had a wide range of eye conditions; those that were reported included macular degeneration, retinitis pigmentosa, coloboma,

glaucoma, congenital cataracts, haemorrhage, and optic nerve hyperplasia. Some had no light perception whilst others had partial sight loss, and others had sight in only one eye. Those with some vision used high power magnifiers to aid their poor vision as well as a variety of assistive technologies to render day-to-day activities, technology and media accessible to them.

"My vision is like a painting of Jack Vettriano" [meaning that she can see the general shapes of people, but not the details of their faces - almost like a silhouette.] [blind and partially sighted: mild sight loss, female, 65-74 years]

"I can see your shape, your hair length, the colour of your dress but not the style of it or the details of your face. I use my vision as much as I possibly can." [blind and partially sighted: moderate sight loss, female, 65-74 years]

"I can see the outline of people; I see fuzzy, blur. I can see colours."
[blind and partially sighted: moderate sight loss, male, 75+ years]

"I can see you but I can't see your face. With my magnifier machine I can read, but just some words or the newspaper's headline."
[blind and partially sighted: moderate sight loss, male, 75+ years]

Occupational backgrounds
Consistent with the Network 1000 report (Douglas, Corcoran & Pavey, 2006), the blind and partially sighted participants in the current study came from a wide range of occupational backgrounds. Occupations, both current and pre-retirement included civil servant, radio producer, nurse, recruitment consultant, florist, barman, factory worker, solicitor and judge, and physiotherapist. Some were studying for degrees. Given the recruitment skew towards participants aged between 65 and 74 years, and aged 75 years and older, the current study's qualitative sample was broadly consistent with Network 1000 figures on working status. It reported that 80 per cent of blind and partially sighted people described themselves as retired from paid work. Of the 20 per cent of blind and partially sighted participants who had not yet retired, less than 35 per cent reported their employment status as employed (including those in paid employment, those reporting they were students, and those reporting they were self employed).

Interests
Interests were wide and diverse and included crafts, technology, walking, dancing, cookery, gardening, watching and/or playing sports (eg swimming or football), socialising, games/puzzles (eg crosswords, bridge or chess), music (eg playing piano, church bell ringing or attending concerts), theatre, reading books. Radio was enjoyed by all, as the participants were recruited as DAB radio users. Some participants were

volunteering for their local church or for organisations aimed at supporting people with disabilities. As reported in Chapter 1, radio is generally a favoured pastime for blind and partially sighted people, so the sample's interest in radio is representative.

Living situations and whether help is available
A range of living situations were sampled: some participants were married with children or lived just with their partner; others were living alone or in multi-share accommodation (students, supported housing for older people).

3.1.2.2. Participants with dyslexia
Three people with dyslexia were interviewed to explore any possible overlaps in accessibility/usability issues in DAB radio design. The participants with dyslexia were aged 24, 25 and 56 years.

Dyslexia and impact on everyday life
There was little evidence of a sense of exclusion due to dyslexia, particularly for the younger participants who felt that people were generally better informed about it today. The main impacts that they cited of dyslexia on their lives were in their schooling and in learning how to use new technologies.

"..[dyslexia] is annoying and frustrating sometimes especially in terms of writing. […] I don't feel really excluded from things in society. Maybe I'd just like people to know more about dyslexia." [Dyslexia, male, 18-30 years]

"It was hard in school. Now it is better but sometimes I still find it difficult using the computer or reading or writing quickly. I don't feel limited. People probably know about dyslexia more now than when I was 14." [Dyslexia, male, 18-30 years]

"I can't read quickly; I need to read every word well - I can't skim. I have to learn the shape of the words. I can't understand grammar. I think my sense of exclusion is often linked to technology. It is difficult for me learning to use something without having someone to show me what to do. I need to visualise and experience." [Dyslexia, female, 31-64 years]

Occupational backgrounds
Their occupations were dancer, health care assistant and a civil servant working in education.

Interests
Interests included walking, attending galleries, socialising, technology, gardening, music (playing an instrument and listening to), watching films, reading and listening to radio.

Living situations and whether help is available
One lived at home with his parents, another was a single parent, and the other lived in a shared household.

3.1.2.3. Participants with manual dexterity impairment

Three people with manual dexterity impairment were interviewed to explore any possible overlaps in accessibility/usability issues in DAB radio design. All three people suffered with arthritis and were aged between 65 and 83 years.

Manual dexterity and impact on everyday life
These participants had arthritis that was not just limited to the hands. This resulted in additional impairment in other areas of their life such as general mobility. Pain was commonly experienced and they had 'good' and 'bad' days with this. None felt excluded from society because of their impairment. Impacts were mostly noted in handling/grabbing heavy objects (eg cooking pans) and opening bottles and jars. Some people used specially designed products, such as jar openers.

"During the last 6 years I have had to change part of my lifestyle. I don't cook anymore because it's difficult to grab things for me. The pain is not the same every day; sometimes it is better than others." [Dexterity, female, 75+ years]

"I have suffered from arthritis for many years but now it is getting worse. I have it in my hands, back and legs. I can do most of my day-to-day work. Opening bottles or jars is difficult but I have tools that help me. I also broke my shoulder a few years ago. I don't consider myself disabled." [Dexterity, female, 75+ years]

"I don't go out as much as I used to. I have had arthritis for six to seven years. Sometimes it's really painful, other times it's fine. I consider myself disabled and I am registered disabled as well. I don't feel excluded at all." [Dexterity, female, 60–74 years]

Occupational backgrounds
All three were over 65 and retired.

Interests
Interests included listening to the radio, cooking, socialising, watching TV, watching bowls and travelling.

Living situations and whether help is available
Two of the three participants were living alone, although one of these had relatives living close by who provided assistance when needed. The third participant with manual dexterity impairment was living with her partner.

Participants with no reported sight loss, dyslexia, or manual dexterity impairment ('sighted controls').

3.1.2.4. Participants with no reported sight loss, dyslexia or manual dexterity impairment (sighted controls)

Occupational backgrounds
The eight controls came from a range of backgrounds. Occupations included IT worker, teacher, receptionist, administrator and counsellor. Two were retired, and one was unemployed. One retired woman did voluntary work.

Interests
Interests included gardening, decorating, socialising, family activities, technology (eg computer/internet), keeping fit, cinema and film, TV, listening to the radio, shopping, writing stories, cooking, crafts (eg painting), and games (eg board and computer).

Living situations and whether help is available
A range of living situations was sampled (living alone, living with parents, and living with partner. Some had children who had left home.

3.1.3. Procedure

Participants were recruited across the UK by a range of methods including adverts in RNIB publications and press releases, other charities for blind people, partially sighted and older people, snowballing via existing participants, and through recruitment agencies. The interviewees lived in central and Greater London, Berkshire, Hertfordshire, Greater Manchester, Merseyside, East and West Midlands and Surrey. Each interviewee gave informed consent to take part and to be audio and video recorded for transcription purposes. The interview lasted between 45 minutes and 150 minutes depending on how engaged participants were with the topic. The majority lasted approximately 90 minutes.

The interview followed a semi-structured discussion guide that focused on the following areas:

- life situation

- hobbies, things interviewees like doing

- value of radio (ie frequency of use, preferences)

- radio equipment in household

- perceptions and expectations of DAB radio

- overview of uses of their own DAB radio

- adopting and using their own DAB radio

- demonstration of how interviewees use their DAB radios

- trying an unfamiliar DAB radio and expressing their thoughts (eg likes, dislikes, what's easy and intuitive and what's not) whilst using it.

They used either:

- low-cost DAB radio (around £25)

- DAB radio with voice output (around £100)

- DAB radio with advanced functions (around £200).

At the end of the interview, participants were fully debriefed about the research objectives and each person was paid £30 for their time.

The DAB radio consumer in-depth interview data (interview transcriptions and observations of DAB radio use noted by the interviewers) were used to generate a checklist for recommended features of DAB radio equipment. They also informed the development of a second phase in the consumer research - the Short Preference Survey (see below).

3.2. Consumer research: Short Preference Survey

3.2.1. Rationale

In addition to revealing key usability and accessibility considerations for digital radio equipment design, the in-depth interviews identified the typical range of radio functions that participants used and understood, and those which were not used or understood. These insights informed the development of a 27-item telephone survey (the 'Short Preference Survey'). Whilst the in-depth interviews provided rich contextual information about digital radio use, the aim of the Short Preference Survey was to collect quantitative data. A key focus was to understand the proportions of sighted and blind and partially sighted samples who could use their radios independently.

3.2.2. Sample for the Short Preference Survey

The target was to have a nationally representative sample of DAB radio users and a sample of 100 blind and partially sighted people, matched as closely as possible to the age profile of the nationally representative sample of DAB radio users.

Data from the nationally representative sample was collected via the market research agency GfK NOP's Telephone Omnibus. The Omnibus is a nationally representative telephone survey, conducted weekly with a target of 1,000 people per week to which additional sections or questions can be added to explore specific topics. The survey was conducted over the weekend of 9-11 May 2008. A total of 225 people from the national survey had DAB radio and were therefore asked the Short Preference Survey questions. Fifty-four per cent of the 225 DAB owners was male.

As can be seen in Figure 3.1 (also see Results table [AB3.1] in Appendix B), and consistent with recent Digital Radio Development Bureau data (2007), DAB owners tend to be over-represented in the middle age groups (31-64 years old), and under-represented in older age groups.

Table 3.1 Comparison of the age distribution of the research sub-samples with the Network 1000 nationally representative data for the blind and partially sighted population
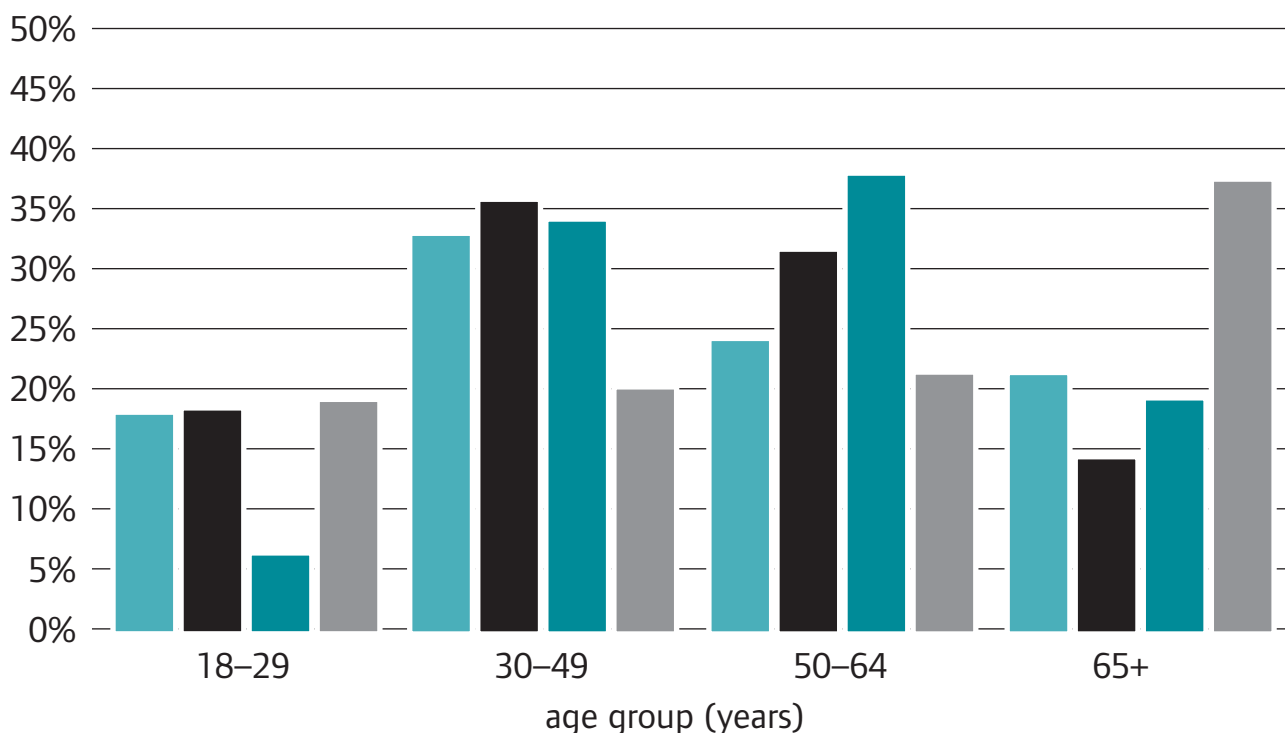
- nationally representative (all) (n=999)
- nationally representative DAB (n=225)
- blind and partially sighted DAB (n=100)
- Network 1000 (comparison: n=100)

Data collection for the Short Preference Survey with the blind and partially sighted sample took place between 13 June and 7 August 2008. In contrast to the nationally representative sample which was recruited with cold calling, all participants for the blind and partially sighted sample had volunteered to participate in response to adverts and via word of mouth. The adverts specified that only people using DAB radios should respond. Efforts were made in recruitment of the DAB sample to broadly match the nationally representative DAB sample in terms of age. However, as shown by the Network 1000 data (Douglas et al. (2006)) shown in Figure 3.1 above (also see Results table [AB3.1] in Appendix B), the age profile of blind and partially sighted people in the UK is very heavily skewed towards older age. To make sure the survey captured meaningful data about the experiences of DAB from blind and partially sighted people, efforts were also made to recruit a slightly older sample of blind and partially sighted DAB users. It is important to note that whilst older blind and partially sighted people are therefore somewhat under-represented in the survey, this is likely to be a fairly accurate estimate of the age profile of blind and partially sighted DAB listeners - showing the same tail off in DAB ownership for older participants as is apparent in the sighted nationally representative sample.

Respondents in the blind and partially sighted sample were recruited via similar methods as participants for the in depth interviews. Sixty-nine per cent of the blind and partially sighted sample were male. Whilst this skew differs from the general population profile of blind and partially sighted people, it is consistent with the male skew in DAB ownership in the nationally representative sample. It is also possible that male DAB owners were more likely than female DAB owners to volunteer to participate in a survey on DAB. Reasons for this may include: that more males were invited to participate (eg recruitment methods targeted more men than women), or that males are more confident than females in talking about media technology.

The age profile of the two samples is shown in Table 3.2 right.

Table 3.2. Short Preference Survey: age profile of the samples of DAB owners (unweighted)

Age band	Nationally representative sample (n=225)	Blind and partially sighted sample (n=100)
18-24 years	12%	2%
25-34 years	14.2%	10%
35-44 years	18.2%	18%
45-54 years	21.8%	25%
55-64 years	19.6%	24%
65-74 years	9.8%	11%
75-84 years	4.0%	5%
85+ years	0.4%	5%
TOTAL	100%	100%

3.2.3. Procedure

The Short Preference Survey asked respondents to focus on one DAB radio that they used the most, and probed their first experiences of having used that DAB radio and then their subsequent day to day across a range of different functions (See Appendix A for the full survey).

They were asked if they needed any advice, help or support from any other person with a range of potential actions/functions that they have explored using their radio. For ease of analysis, there were three response options:

1. yes, needed help from someone

2. no, could do independently

3. don't know/not applicable - didn't use/radio doesn't offer that function.

3. Methodology

There were 19 tasks specified, for which respondents were asked to report on their experience of first-time use of the DAB radio they used the most:

a. getting the radio out of its packaging

b. using the operating instructions that came with it

c. plugging the radio in

d. inserting batteries

e. switching the radio on/off

f. tuning the radio in (scanning for channels)

g. setting/storing presets

h. accessing information on the text display

i. knowing which station they were listening to

j. changing station

k. tuning to a specific station (eg BBC Radio 4)

l. changing volume

m. using a remote control to control your digital radio

n. finding out what programmes were going to be on later that evening or that week, using the radio to do this

o. finding out what the time was using the radio

p. pausing live radio

q. forwarding and/or rewinding back to live radio

r. recording a radio programme

s. playing back a recorded programme

There were 18 tasks for which the respondents were asked to report on their experience of subsequent use of this same digital radio, which were very similar to the tasks specified above with some changes:

a. using the operating instructions

b. plugging the radio in

c. changing batteries

d. switching the radio on/off

e. retuning the radio (re-scanning to find new stations)

f. updating/re-setting/re-storing presets

g. accessing information on the text displays

h. knowing which station they are listening to

i. changing station

j. tuning to a specific station (eg BBC Radio 4)

k. changing volume

l. using a remote control to control your digital radio

m. finding out what programmes were going to be on later that evening or that week, using the radio to do this

n. finding out what the time was using the radio

o. pausing live radio

p. forwarding and/or rewinding back to live radio

q. recording a radio programme

r. playing back a recorded programme

The survey also probed what features participants thought their radio supported and asked participants to nominate up to five features that they thought were most useful to have on a DAB radio. They were asked about any difficulties they experienced using their DAB radio, how they remedied problems and to what extent they felt the DAB radio they were assessing for the survey was easy to use.

Other more general questions asked participants about their DAB radio listening patterns and favourite station genres and stations. Finally, participants were asked a series of demographic questions, and the blind and partially sighted respondents were asked about their level of vision.

The survey took 15 - 45 minutes to complete with each person. Most surveys took 20.–25 minutes. There was no financial incentive to take part.

3.2.4. Methodology for assessing impact of voice output

A subset of the items relating to 'basic use' are explored separately to full, complete use (all items). Items 1. to 12. from the 'first time use' list were considered related to basic, core use. Items 1 to 11 from the 'subsequent use' list were considered related to basic, core use.

The data were explored in different ways:

- Proportion of sample reporting 'yes, needed help' for any of the 'basic' tasks (a crude index of basic tasks relate to items 1 to 12 for first time use, and 20 to 38 for subsequent use).

- Proportion of sample reporting 'yes, needed help' to any of the 'first use' tasks (12 items.

- Proportion of sample reporting 'yes, needed help' to any of the 'subsequent use' tasks (11 items)

- Proportion of sample reporting 'yes, needed help' for any of the tasks

- Proportion of sample reporting 'yes, needed help' to any of the 'first time use' tasks (19 items)

- Proportion of sample reporting 'yes, needed help' to any of the 'subsequent use' tasks (18 items)

- Average number of tasks/items for which the samples needed help from someone else (for all tasks and basic tasks as defined above)

3.3. Industry research: semi-structured interviews

3.3.1. Rationale

The industry research was conducted to address research questions 4 and 5, about how and whether accessibility features in product design and what barriers industry cites for developing accessible digital radio equipment.

3.3.2. Sample

Six semi-structured interviews were conducted with senior staff members (eg Chief Executives, Chief Operating Officers, Directors/Senior Management) across different parts of the consumer digital radio equipment supply chain. Five manufacturers and one component supplier participated. Some retailers were also invited to participate,

though none accepted the invitation. The interviews were conducted face-to-face where possible (n=4), or via telephone (n=2) as requested by participants.

3.3.3. Procedure

Industry participants were recruited via personalised email requests, with assistance from Intellect [The UK representative trade body for the consumer electronics industry; see http://www.intellectuk.org]. An outline of the discussion guide was sent to all industry participants prior to their formal participation. Where possible, and where permission was granted to do so, industry interviews were recorded for transcription purposes.

Six semi-structured interviews were conducted with these volunteers from the DAB industry supply chain. The interviews lasted between 50 minutes and 120 minutes with an average interview time of approximately 75 minutes. The following scope areas were covered during the discussions:

- company background and culture

- company understanding of its customers

- what data capture or research is conducted within the company

- what processes exist for product development, and where accessibility considerations fit in (if at all)

- organisational structure, and whether there is any user testing conducted within the organisation

- company understanding of usability and accessibility of DAB radio for blind and partially sighted consumers

- perceived hurdles, barriers, solutions, incentives to better addressing the needs of blind and partially sighted consumers.

All participants were assured that their participation and responses would be treated completely confidentially and anonymously unless they requested otherwise. Hence, this report does not mention company names nor does it provide any other information that might indirectly disclose the identities of these participants or their companies.

4. Structure of results chapters

The results from all of the methods deployed in this research project are split over six chapters. These are structured by the research questions outlined in Chapter 2, the Aims and Objectives, with an additional chapter on voice output DAB radio. Chapters that present background and contextual findings precede the results addressing the more focused research questions:

Setting the scene (see Chapter 5)

This chapter is divided into sections that contextualise the research findings. First, to summarise the breadth of DAB radio experiences observed across the samples, a series of five personas are presented. Each persona represents an amalgamation of insights obtained across the samples and illustrates broadly different types of radio user. Next, to provide further context to the results with particular regard to the key user group – blind and partially sighted DAB radio users - findings relating to blind and partially sighted participants' views on independence, disability, and sense of exclusion are presented. This is followed by background results across all samples on value and ownership of radio and participants' views on what radio means to them.

Core functional requirements (see Chapter 6)

This chapter addresses results to the first research question as posed in the title to Chapter 6. It includes sections on how blind and partially sighted participants used their radio and what they did with it and what they expected from it. Also the reported or observed techniques they have for using DAB radios more effectively – how they operate the radios (eg strategies they have developed to capitalise on all the cues and prompts provided by DAB radio itself). The aim was to establish the core functional requirements based on participants' actual DAB radio use experiences. For both sections, the results for the additional samples - people with dyslexia, manual dexterity impairment and sighted controls - are compared to those of the blind and partially sighted participants. In the concluding section to this chapter, the equipment considerations for making the core functionality of DAB radios easy to use and accessible for blind and partially sighted consumers are addressed. This includes a discussion on design features which help and hinder use of DAB radio.

Advanced functions (see Chapter 7)

Demand for advanced functions is assessed by exploring the blind and partially sighted research participants' perceptions and expectations of these features. How these perceptions and expectations of advanced functions differ from those of people with dyslexia, manual dexterity impairment and the sighted control samples is described. Finally, this chapter outlines relevant equipment considerations that the research suggests might increase accessibility and usability of those advanced features.

Consumer reaction to voice output (see Chapter 8)

Whilst the question of the impact of voice output on DAB radio use was not a research question in itself, the overwhelmingly positive responses given by blind and partially sighted participants' to DAB radios with voice output was felt to warrant a separate chapter. The impact of voice output on independent use and other benefits to blind and partially sighted participants are described. Any benefits to participants with dyslexia, manual dexterity impairment and to the 'sighted control' group are discussed. Finally, this chapter details the impact of DAB radios with voice output on perceptions of the ease of use of DAB radio.

Priorities for accessible and usable DAB radios for blind and partially sighted people (see Chapter 9)

Following the preceding discussions on the research findings relating to how blind and partially sighted participants use DAB radio (what they do with it, what cues and design features assist accessibility and usability), a checklist of design considerations is presented in a prioritised form.

Insights from industry interviews (see Chapter 10)

This chapter explores the extent to which and how accessibility considerations are built into the product design and development processes by manufacturers of consumer digital radio equipment. It also reports the constraints and solutions cited by industry interviewees relating to the feasibility of developing consumer digital radio equipment that is accessible to blind and partially sighted people.

5. Setting the scene

5.1. Personas

As noted in the Methods chapter (Chapter 3), a total of 38 people were interviewed. The majority (n=24) were blind or partially sighted, and there were three additional samples: people with dyslexia (n=3), people with manual dexterity impairment (n=3) and a control sample of sighted participants who reported that they were not affected by dyslexia or manual dexterity impairment (n=8). In addition, 100 blind or partially sighted people were respondents for the Short Preference Survey, and many chose to describe their DAB radio experiences beyond the information collected by this structured Survey.

A broad range of life situations and experiences with DAB were described to us. To bring our research participants to life for the reader, we present five 'personas'. None of the personas were real participants in the research, but their characteristics and features are based on research observations gained in this project. The key thing to note from the personas is that blind and partially sighted and sighted digital radio users have many overlapping needs and requirements.

Persona 1: Susie, age 27 years, student

- Very confident with a range of technologies, cost sensitive (bought 2nd hand on eBay, wanted portable access):

  - iPod, PC, mobile; enjoys the range of stations that DAB offers, and improved reception

- Uses DAB independently:

  - Presets, re-scanning, alarm clock, volume, station surfing

- Blind since birth, Susie's DAB use differs from a sighted person:

  - No access to extra information on the DAB screen

  - Initially had to be shown how to use, and still sometimes relies on friends for trouble shooting; wishes her DAB gave some (tactile or audible) feedback to help her work out where the various settings are at

  - Takes her longer to find a station (by memorising the order in which radio stations are listed, listening to hear what station is on) than her flatmates

"The main advantage of analogue is that you know what you're doing just twirling the dial."

Persona 2: Margaret, age 73 years, retired

- Average confidence with technology

  - Bought her first DAB radio for herself as a replacement radio 3 years ago, and since bought another two different models for other rooms (white one for the kitchen, long lasting battery life for bathroom); retailers have shown her how to set each one up

- Values radio, in a mix of media use, and likes getting out

  - Listens 2-4 hours a day; prefers to listen to her DAB radios, because she knows she can get so many different stations; remembers how at first she avoided changing station until she worked out how to do it; has noticed different ways of changing station on her different DABs

  - Sometimes records radio to cassette, and would be interested in recording directly using one of her DABs, if it could do it and it was easy for her

- Margaret is sighted

  - Put off exploring newer DAB features, because she finds it hard to read the screen – needing to bend down and put on her glasses, contrast that makes it hard to read in bright light

"I used to record a lot. I'm not really that confident with the digital…. I haven't explored if I can access that function [recording] on my radio…"

Persona 3: Graham, age 47 years, insurance sales

- Confident with technology, work PC use

  - Bought DAB with voice output himself because loves radio, and heard about voice output - lives alone, very independent - the voice output makes his radio use more independent than previously

- Values radio

  - Listens 1-3 hours a day ranging from stations offering intelligent 'talk'/debate (particularly in the mornings) to more 'talk' and classical music in the evening

- Set his DAB up himself with help from a friend, used audio CD instruction manual

  - Once he had checked with help from a sighted friend how to set presets, he now sets them himself- CD manual helpful, but does not remember it detailing every action; changes station mainly using presets as his radio does not provide any feedback using the scroll and select method of changing station

  - Has asked a friend to re-scan to find new stations, and had to ask a friend to set the alarm clock

- Graham has been blind since birth

"Digital radio [with voice output] is so easy; I don't change station in any of the other radios I have"

Persona 4: Henry, age 54 years, retired bus driver

- Low confidence with technology, no work PC use, received DAB as gift from daughter

- Values radio highly

  - Listens 6-10 hours a day usually to a 'talk'/easy listening station whether on analogue or DAB; used to listen to the cricket commentary on one of his DAB presets but can't remember how to find that station; would like local radio to be on DAB too

- DAB set up by his daughter but she's not been to visit for a few months

  - No re-scan carried out to check for new stations (lost preset because of new channel numbering)

- Henry retired early - partial sight loss affected job (bus driver)

  - Can't read the small text on the low contrast DAB screen

  - Doesn't explore functionality (menus, other stations) in case he 'breaks' it, when he has tried he sometimes doesn't know if he's pressed a button or not, or where dials are at/pointing

"I am not interested in functions like the station guide [EPG] or recording. I don't think I would use them… It does what I want, but it wasn't worth £99."

Persona 5: James, age 32 years, civil servant

- Loves new technology and gadgets

  - Will spend a premium for highly featured products, likes to get new technology products first

- Values radio highly

  - Listens to DAB at home, would like to listen to DAB whilst travelling to and from work (in car), and listens to radio over internet through headphones at work; over 4 hours a day - usually music stations, or sport

- Set up his DAB himself

  - Knows how to re-scan and set pre-sets

- James is sighted and there are things he would like

  - A bigger screen to display all text (station name, presenter, content information…), rather than scrolling through text options using 'info' button

  - Voice output for the text display information in car DAB radio, like his SatNav

"I think I've explored all the functions. Yes, I've looked at the instruction manual, but just to see if there was something I didn't find by myself."

5.2. Independence, disability, and a sense of exclusion (blind and partially sighted sample)

The interviews conducted as part of this research project collected rich data not only on radio use, but also on the lives of the blind and partially sighted people we spoke to. To put the role and value of DAB radio in the context of the lives of the blind and partially sighted interviewees, participants' self-reflections on being blind or partially sighted are considered here. Illustrative quotations from the interviewees are provided where relevant.

All participants in the blind and partially sighted sample were asked to what extent, if at all, they considered themselves disabled, and to comment on any area(s) in their lives they felt their independence had been compromised by being blind or partially sighted.

The majority of blind and partially sighted participants showed they had adapted to new and changing sight loss and reported maintaining a rich and varied social and work life. Nevertheless, there is little doubt that sight loss and no sight have significant impact on people's lives. Where independence is lost, feelings of frustration, vulnerability and depression emerged. Many participants felt wary of venturing out of the house alone and entering new, unfamiliar contexts which could increase the sense of social isolation. In some contexts participants felt a burden to others, resulting in giving up previously enjoyed activities.

Many participants felt that the label of 'disability' was more relevant to pockets of their lives rather than to themselves as people. Many preferred to acknowledge the limitations in being able to live in a sighted world. Independence appears to be a constant goal, and challenge.

Some participants gave up their independence in some areas of their lives willingly, whilst others reported going to great lengths to adapt to maintain a level of independence whether via learning new strategies (eg counting steps), accepting huge time expenditure on learning (eg a mental map of a process) or investing in sometimes costly assistive technology.

"I think that you must adapt to the situation; once you manage it, the problem is limited." [blind and partially sighted: severe sight loss, male, 31-64 years]

"My life is my memory now. I try to make up with my mind what I have lost with my eyes." [blind and partially sighted: moderate sight loss, male, 75+ years]

The extent to which problems with everyday activities hindered behaviour was largely dependent on whether or not participants perceived their difficulties as hurdles that

could be overcome. Confidence with technology and awareness of assistive devices and technologies are important in increasing independence. A few participants felt entirely excluded from particular activities and did not consider that technology could offer assistance to them. For many of these people, confidence with technology or having the know-how (eg word-of-mouth through close social networks of people with similar sight problems) was lacking.

Participants' views on how industry can and could support their needs varied, often related to their sense of dependency. For instance, for some partially sighted participants, technical solutions involving colours and contrast were key; whilst some of those who were blind expected that they would require more substantial product modifications.

Some participants were sympathetic to the hurdles faced by industry in implementing accessible and usable product design, commonly citing small markets as a possible hurdle for industry. Others felt they were increasingly being left behind in a world dominated by new digital technologies in which their existing learned product-use strategies are no longer effective or relevant (eg touch-screen devices).

"I think in an ideal world, companies should build things designed for blind people but I know the audience is limited. For me [it] is difficult to find and buy something suitable because I am not totally blind; I need devices with extra features rather than talking substitutes. Things like changeable colours are really useful for me." [blind and partially sighted: mild sight loss, male, 18-30 years]

"It is important to have disabled people [involved] in the products design process." [blind and partially sighted: severe sight loss, male, 75+ years]

5.3. Value of radio (all samples)

Radio valued by all samples

Radio was valued by all participants who were interviewed irrespective of the sample from which they were drawn. This may partly reflect a sampling bias - all were recruited because they were DAB radio users and willing to give time to talk about their DAB radio experiences. Similar sampling bias could be present in any similar type of research, where participants voluntarily agree to take part. Across the participants who were sighted, there was no evidence to suggest any difference in the value placed on DAB radio between people with dyslexia, those with dexterity impairment and the sighted controls. The only differences related to the amount of time people had to listen to DAB radio - for instance older people who were retired (eg dexterity sample)

had more opportunity to listen without interruption to DAB radio at their leisure than did those who were younger and were working or studying (eg the dyslexia sample).

Blind and partially sighted participants relied more on radio for entertainment, information and company than did the sighted participants

Radio was relied on more highly by the blind and partially sighted interviewees compared to the sighted controls for entertainment, information and company. The importance of radio access and usability to the blind and partially sighted sample in this context are paramount. In contrast, the sighted participants more often reported satisfying their needs for entertainment, information and company with use of television as well as radio.

"I listen to a lot of radio because I find many entertaining and interesting programmes on it; also because I need to compensate for my lack of visual stimulation." [blind and partially sighted: severe sight loss, male, 65-74 years]

"All the information radio gives is suitable for me; this is the key reason why I listen to it." [blind and partially sighted: moderate sight loss, female, 65-74 years]

"Radio is very important for blind people because it is a form of communication and information. I don't watch TV, as I must be very close to it." [blind and partially sighted: moderate sight loss, female, 65-74 years]

"In the morning I mainly listen to the radio, then I walk the dog, look after him and watch television." [Control, male, 65-74 years]

Blind and partially sighted participants were likely to use the radio as their main information and entertainment medium. They listened for many hours over the day (including overnight), and were more likely than any of the sighted samples to 'sit and listen' as well as use it for background and company.

"When I listen to radio it is quite often dedicated; I pretty much [just] listen." [blind and partially sighted: mild sight loss, female, 18-30 years]

"I have two radios, both DAB digital radio. I listen to them constantly, every day. [...] Radio has a valuable role for blind people." [blind and partially sighted: mild sight loss, male, 31-64 years]

"I love radio. I switch it on every morning and sometimes during the night if I can't sleep." [blind and partially sighted: mild sight loss, female, 65-74 years]

5.4. Ownership of radio (all samples)

Blind and partially sighted interviewees and respondents to the Short Preference Survey tended to own more radios (analogue or digital) than did any of the sighted samples

Most blind and partially sighted participants across the interviews owned more than one radio and some owned many more, indicating potentially larger market sizes than might be assumed solely on the basis of prevalence data for sight loss. This observation was supported by data from the Short Preference Survey: 87 per cent of the blind and partially sighted sample owned three or more radios (DAB or analogue) compared with 48 per cent of the nationally representative sample (see Figure 5.1/Results table [AB5.1] in Appendix B). Where specified by respondents to the Short Preference Survey, blind and partially sighted respondents owning more than five radios reported owning 7 (n=1), 9 (n=2), 10 (n=1), 12 (n=1), 15 (n=1), more than 20 (n=1), and more than 30 (n=1).

Figure 5.1 How many radios (analogue or digital do you have?)

Percentage of sample

Number of radios

■ nationally representative sample (n=225)

■ blind and partially sighted sample (n=100)
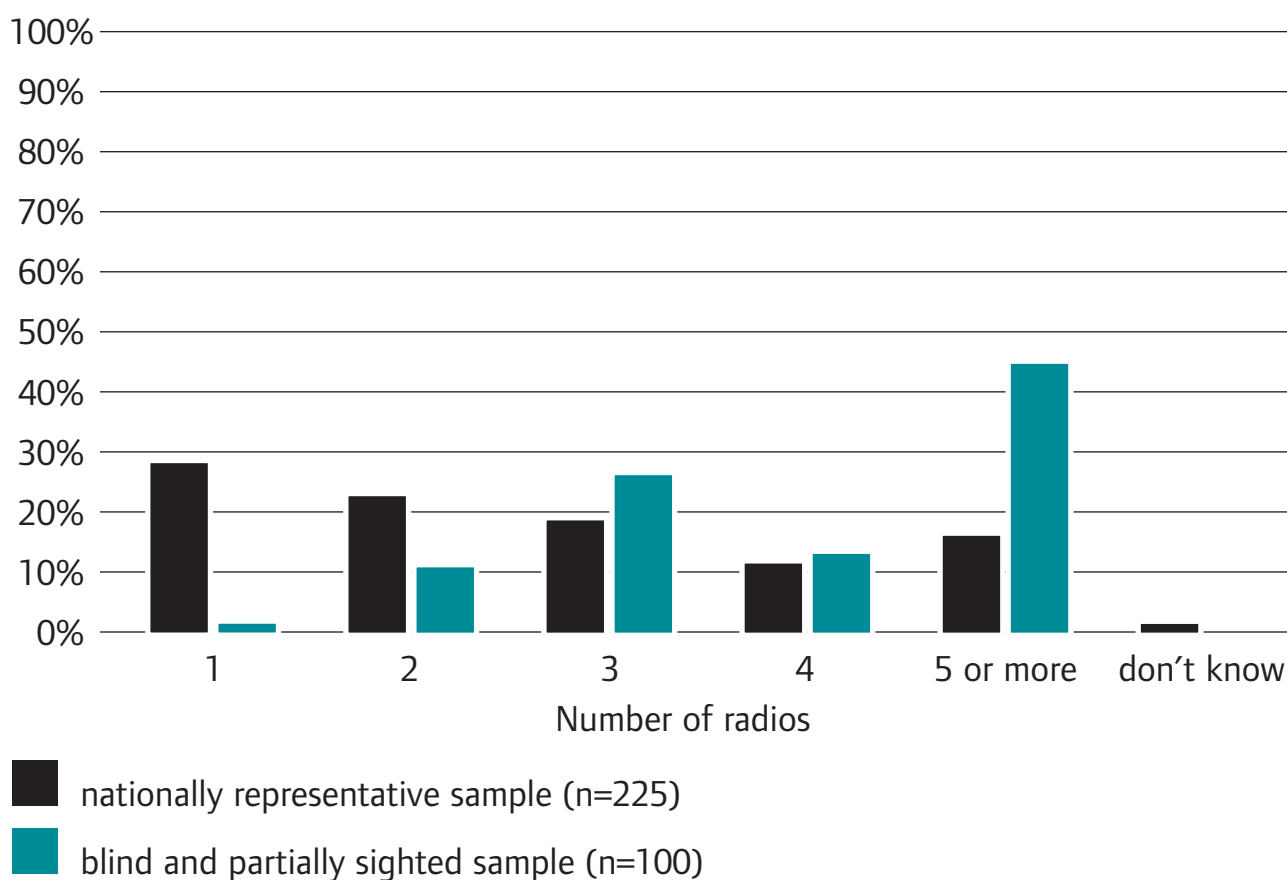
The interviewees also revealed that many of their radios were never moved from a particular room and radios were often matched to room décor.

"I have a radio in the living room, one in the kitchen, one in the bedroom, in the bathroom, at the door and a portable one. Radios are usually fixed in the rooms." [blind and partially sighted: severe sight loss, male, 31-64 years]

Blind and partially sighted respondents were more likely than their sighted counterparts to own more DAB radios

The Short Preference Survey revealed that in addition to owning more radios, in general, blind and partially sighted respondents owned more DAB radios (40 per cent owned three or more) than did respondents from the nationally representative sample (11 per cent owned three or more) (see Figure 5.2/Results table [AB5.2] in Appendix B). Only one respondent reporting "five or more" DAB radios specified a precise number of DAB radios and claimed to own more than 20.

Figure 5.2 On how many of your radios can you listen to digital (DAB) radio?

Percentage of sample

Number of radios

■ nationally representative sample (n=225)

■ blind and partially sighted sample (n=100)
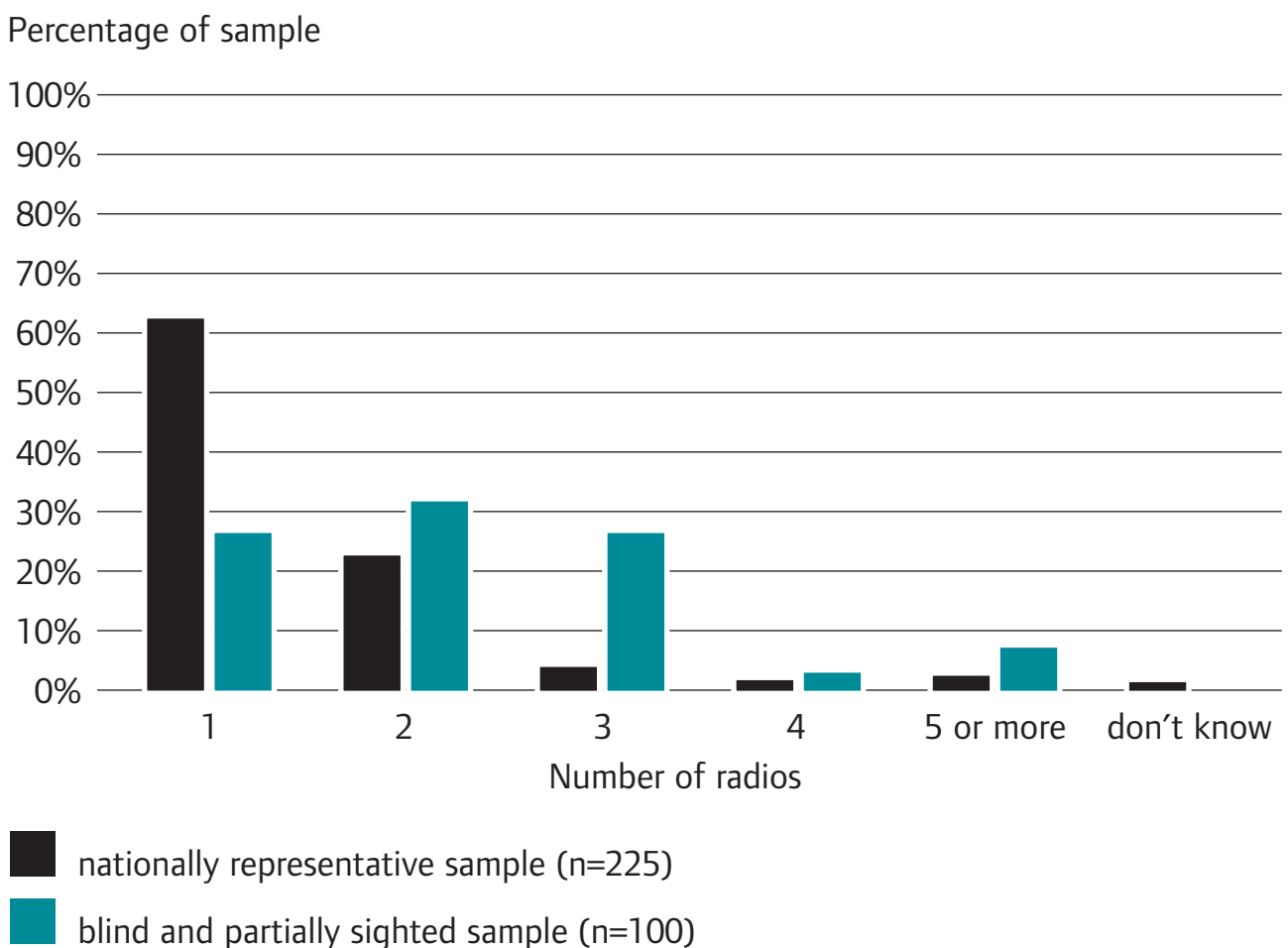
Nearly half of the blind and partially sighted sample from the Short Preference Survey reported owning a radio with voice output.

In the Short Preference Survey all respondents were asked to report on their DAB radio. Respondents that owned more than one DAB radio were asked to report on the one they used the most. Forty-two percent of the blind and partially sighted respondents chose to report on their DAB radio that had voice output. For this reason, throughout the remaining results chapters, relevant results are reported by three samples: nationally representative (n=225); blind and partially sighted reporting on DAB radio with no voice output (no VO: n=58); and blind and partially sighted reporting on DAB radio with voice output (VO: n=42).

The blind and partially sighted sub-sample with voice output was more likely to be female (relative to the sample as a whole) and whilst age distributions were similar between those reporting on a voice output DAB radio and those reporting on a DAB radio without voice output, there was a disproportionate number of voice output DAB radio ownership between the ages of 75-84 years (see Table 5.1).

Table 5.1 Age distribution across the blind and partially sighted sample reporting on DAB radios with and without voice output (Short Preference Survey)

Age range	DAB without voice output (n=58)	DAB with voice output (n=42)
18-24 years	1.7%	2.4%
25-34 years	8.6%	11.9%
35-44 years	17.2%	19%
45-54 years	25.9%	23.8%
55-64 years	24.1%	23.8%
65-74 years	13.8%	7.1%
75-84 years	1.7%	9.5%
85+ years	6.9%	2.4%
TOTAL	100%	100%

5.5. The meaning of 'digital radio' (all samples)

Irrespective of the sample from which they were drawn, the perceptions and expections of 'digital radio' of most participants' in the in-depth interviews were associated with increased station choice (including novel stations not available through analogue broadcasts), better quality reception and ease-of-use (particularly with regard to tuning).

"Digital radio means to me ease of use, good sound and availability." [blind and partially sighted: mild sight loss, male, 18-30 years]

"Digital for me means a bigger range of stations and ease of use." [Dyslexia, male, 18-30 years]

"The digital is very easy, a lot easier than the analogue I have, even from the first time I got it. Reception and tone are really good. I would recommend it." [Dexterity, female, 75+ years]

Some participants were unsure of the meaning of 'digital radio'; some questioned whether analogue radios with digital displays offered 'digital radio'. These occasionally noted perceptions and beliefs were not associated with any particular sample or age group. Our in-home observations verified that all participants for the in-depth interviews were using DAB radios.

"I don't have a clue what makes a radio digital. I thought it was because you press different digits for different stations." [blind and partially sighted: moderate sight loss, male, 75+ years]

"Digital for me means more money for no difference. I like the fact I can listen to it again from the computer but I don't know if it's because of the digital. I don't know what digital means." [Control, female, 18-30 years]

Increased functionality was generally not cited by respondents as being associated with digital radio. This is consistent with results presented in the next two Chapters which describe the arguably limited expectations and use of DAB radio across the majority of participants, irrespective of their sample.

6. Core functional requirements

6.1. Summary

- Partial sight and blindness appear to account for more differences in DAB radio use than dyslexia or dexterity impairment. Interviewees with dyslexia and dexterity impairment used radio more like the 'sighted control' group than they did the blind and partially sighted sample. This was in terms of ways of controlling the equipment and listening patterns.

- Core functional requirements relate to basic listening (switching on, tuning in). The most common and important use of digital radio was simply listening to content. Blind and partially sighted interviewees tended to listen to a lot more radio than the sighted samples, who did not appear to differ in their digital radio consumption.

- Interviewees across all samples evidenced a range of media that they used for providing information (eg radio, television, newspapers, internet). Overall, participants with dyslexia, dexterity impairment, and 'sighted controls' reported more reliance on television for their information needs than did the blind and partially sighted sample who placed more emphasis on radio to fulfil this need.

- All interviewees, irrespective of their sample, listened to a small range of radio stations and primarily expected good quality programming, easier to use and aesthetically pleasing products from digital radio.

- Blind and partially sighted respondents to the Short Preference Survey were more likely to report having some difficulty related to getting lost in a menu or having difficulty with the settings compared to the nationally representative sample.

- Blind and partially sighted respondents to the Short Preference Survey dealt with difficulties differently to the nationally representative sample. Blind and partially sighted respondents were more likely to switch the product off and on again and only one in five reported consulting the manual (likely because of poor accessibility) whilst the nationally representative sample were more likely to carry on pressing buttons or to consult the manual.

- Strategies observed and reported on by the blind and partially sighted interviewees including memorising button press sequences (eg for setting presets) after having been shown by a sighted person (shop assistant, partner, friend), 'feeling around' for button cues (eg large size button to indicate 'on', button positioning) and sticking

'raised dots' on products as reference points, trial and error, and maintaining very simple, predictable use (ie not changing anything).

- In contrast the sighted interviewees (including those with and without dexterity problems or dyslexia) used their vision to work out how to use digital radio. This included understanding button labels and symbols as well as button positions and size as cues. The location and the tilt of the visual display were considered important for ease of use. Sighted and partially sighted participants valued displays positions and tilts that supported easy viewing. And as with the blind and partially sighted sample, maintaining simple use was common.

- Based on these research findings, key considerations for easy to use equipment include: easy connections, button feedback and physical characteristics of buttons, clear connections and easy to manoeuvre aerials, better interaction design for simply listening to radio (eg tuning, rescan, scroll and select), and characteristics of the text display to make the information more readable.

6.2. Blind and partially sighted people: general use of DAB radios

6.2.1 Time spent listening to radio

As noted in the previous section, blind and partially sighted people listen to a lot of radio and used more radios compared with the other samples. This is partly because those at home listen more and loss of sight is in many cases age-related. People at home are generally but not exclusively retired. Whilst 50 per cent of both the blind and partially sighted sample and the sighted samples taken together ('sighted controls', samples with dyslexia and dexterity impairment) were aged over 65 years and hence of retirement age, blind and partially sighted participants were more likely than sighted participants to spend more time at home. In some cases, this was because they spent less hours per day in employment, and for others, they chose to spend more time at home. For some participants this related their sense of independence (see section 5.2).

Blind and partially sighted participants were more likely to use the radio (rather than TV), for more hours over the day (including overnight), for more content genres, and were more likely to 'sit and listen' as well as use it for background and company.

6.2.2. Reliance on radio for news

Whilst many blind and partially sighted participants reported using a range of media for their world/national/local information needs (including accessible internet for many mostly young participants), radio was most often cited as the main medium for this genre.

"**Radio is massively important in my life; it is my newspaper; I know what's going on by means of it.**" [blind and partially sighted: moderate sight loss, female, 31-64 years]

"**I use radio for news, especially from the World Service.**" [blind and partially sighted: moderate sight loss, male, 75+ years]

6.2.3. Range of radio stations listened to

Consistent with the research cited in Chapter 1 (from the Digital Radio Development Bureau (2007), and from Bruce et al.' (1991)), there was no strong evidence from any of the samples that participants regularly listened to the full range of digital radio stations available to them. Usually this was through choice (they only liked a few stations), though at other times it was because of usability issues. Presets were relied on heavily and it was common for participants to set up to just five presets (or have them set up for them), sometimes losing some of them over time. Participants stuck with whatever presets they had that worked.

"**I listen to BBC London that is set on the only preset I have. On Sunday I tend to listen to Kerrang Radio, occasionally BBC5Live for sport.**" [blind and partially sighted: moderate sight loss, male, 18-30 years]

"**I think I can receive a lot of channels but I just listen to my five presets. […] I tend not to move the radio around because I would be scared, and because I think I would lose all the presets**" [blind and partially sighted: mild sight loss, female, 65-74 years]

"**I find it difficult to use this one because of the display; I can't read it so I don't know which station I am listening to. I know I could have 10 presets but I have just three of them.**" [blind and partially sighted: moderate sight loss, male, 75+ years]

6.2.4. Expectations of DAB

For all interviewees, DAB radio expectations centred largely on content (more stations, stations only available via DAB), usability (often the assessment being based on word-of-mouth) and aesthetics (matching radios to rooms).

"I expect good sound quality, ease of use and simplicity even if I am quite a 'techie' person." [blind and partially sighted: mild sight loss, male, 18-30 years]

"I bought my radio for the sound and for more channels. I also don't want to be left behind with technology." [blind and partially sighted: moderate sight loss, female, 65-74 years]

6.2.5. Exploration of unfamiliar stations

Blind and partially sighted participants were mostly happy with the smaller range of stations they listened to and when none of their selected stations offered interesting programming, participants tended to switch off rather than explore other non-preset stations. Once again, for some participants this was through choice, but for others, usability issues and confidence with technology affected their behaviour.

"I can access three channels now. Generally for the everyday use of my radio I am happy. Sometimes I'd like to listen to something else when I find those channels not interesting, but it doesn't bother me a lot. I can find something else to do."

[blind and partially sighted: moderate sight loss, female, 65-74 years]

"I have realised that if there is something I don't like on TV I tend to change channel, whilst if it happens with radio I tend to turn it off. This is because radio is more complicated. You have to look for another station, to select, to control the aerial. [...] I don't think digital radio is any better than analogue. I don't think it is such a big improvement. It didn't meet my expectations." [blind and partially sighted: mild sight loss, male, 65-74 years]

6.3. Sighted controls and participants with dyslexia and manual dexterity impairment: general use of DAB radio

6.3.1. Time spent listening to radio

All sighted participants - 'sighted controls' and participants with dyslexia and manual dexterity impairment - were generally less heavy radio listeners than were blind and

partially sighted participants. Whilst sighted participants in the dexterity, dyslexia and control samples used and valued radio highly, TV also played an important role.

"I switch the radio on at about 7 in the morning until 12. I like it for the company. I watch TV in the afternoon." [Dexterity, female, 75+ years]

"When I listen to it I usually do something else like painting, having a shower, driving." [Control, male, 18-30 years]

6.3.2. Reliance on radio for news

For sighted participants, TV was reported to play a large role in providing news.

"We listen to news quite a lot from the radio, but we also get them from the newspaper and TV. For me TV is probably the main source of information." [Control, female, 75+ years]

6.3.3. Range of radio stations listened to

Similar to the blind and partially sighted participants, all sighted participants (controls, and participants with dyslexia and dexterity impairment) listened to only a few stations.

"I listen to Radio 2. I never change channel because otherwise I can't go back." [Dexterity, female, 75+ years]

"Extra stations are not a benefit for me. I just listen to TalkSport and two other radios [stations]. If I want something else, I probably go on the internet. I am sure most of the people listen to their favourite channels and that's all they listen to." [Control, male, 18-30 years]

"[My grandson] set the presets on my radios: Radio 4 and Magic in the one in the kitchen, just Radio 4 on the [brand A] one [...] I just switch the radio on, off, press the preset where Radio 4 is set, nothing else. I have not explored my radio. I don't know how many channels I can receive." [Control, female, 65-74 years]

6.3.4. Expectations of DAB

Across all samples, expectations of DAB radio centred on content (stations and programming), usability and aesthetics.

"A radio has to be aesthetically pleasing [...] I don't like the shape of the [brand C]; it's too masculine [...] When I buy something like this I look for quality and good looking." [Dyslexia, female, 31-64 years]

"I was expecting more stations and easier way to use. I was looking for something
  small and neat, that's why I bought it." [Control, female, 31–64 years]

6.3.5. Exploration of unfamiliar stations

Similar to the blind and partially sighted participants, there was a tendency for sighted
participants (controls, and participants with dyslexia and dexterity impairment) to
switch off if none of the programming on their preferred radio stations were of
interest. There was no strong evidence to suggest that any of the sighted samples were
different to the blind and partially sighted sample in their behaviours with regard to
exploring new radio programming. Note, however, radio was more likely to be listened
to passively (background) in these groups. A consideration in encouraging new
audiences to radio stations is how easy it is for users to explore the range of stations
available on their receivers.

"If there is something I don't like on TV or on the radio I watch a DVD." [Dexterity,
  female, 75+ years]

6.4. Blind and partially sighted people: operating DAB radios

6.4.1. More difficulties in operating equipment

Overall, respondents from the blind and partially sighted sample to the Short
Preference Survey (whether their own DAB radio supported voice output or not) were
more likely (88.6 per cent) than their sighted counterparts (47 per cent) to report
experiencing some difficulty in the everyday use of their DAB radio. A Pearson Chi-
Squared test revealed that this difference was significant (Chi Squared = 50.6 (df =1),
p < 0.01). Having a radio with voice output reduced difficulty experienced with DAB
radio (voice output: 85.7 per cent versus no voice output: 91.4 per cent) though not
to the same level as for sighted respondents (see Figure 6.1/Results table [AB6.1] in
Appendix B). This difference was not statistically significant (Chi squared = 0.8 (df =
1), ns).

Figure 6.1 Experienced some difficulty with DAB radio

Percentage of sample

nationally representative sample (n=225)

blind and partially sighted sample: no voice output (n=58)

blind and partially sighted sample: voice output (n=42)
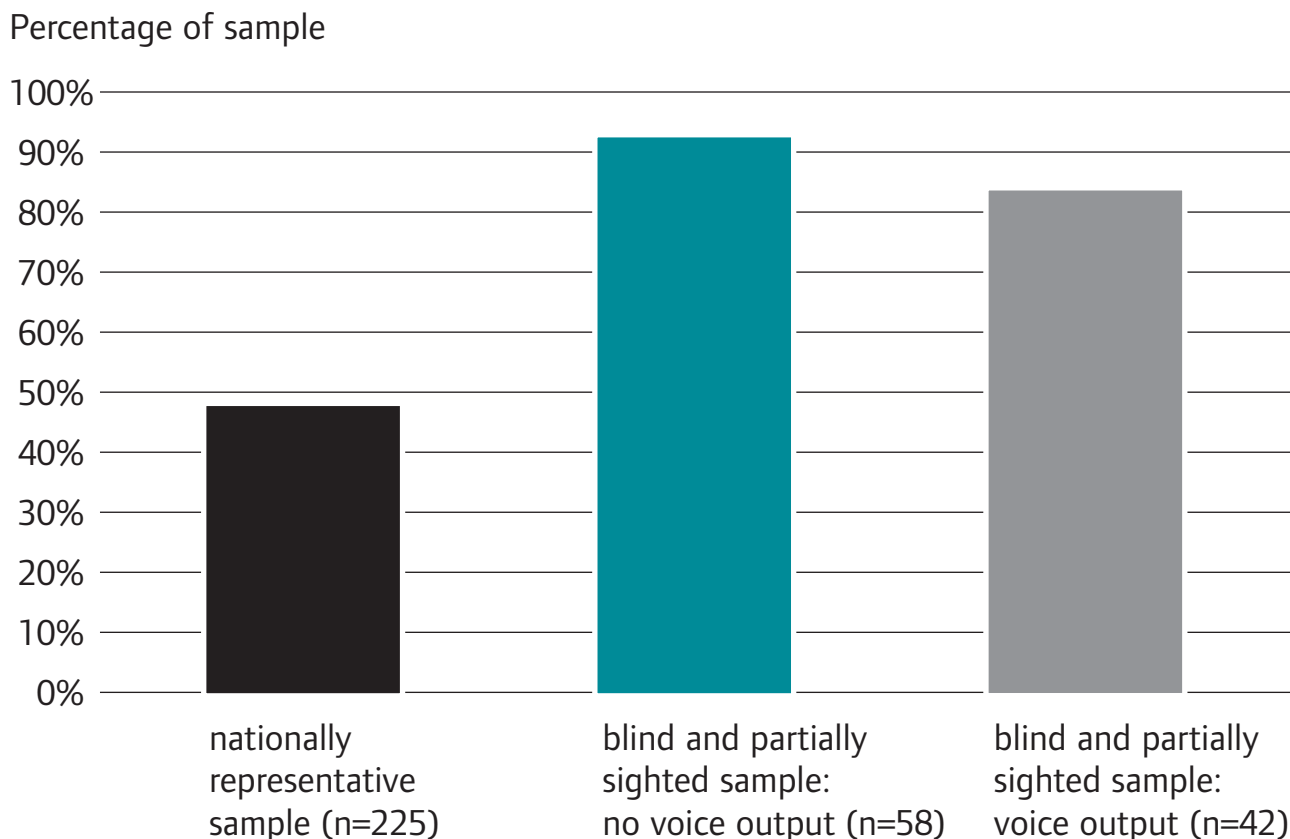
Blind and partially sighted respondents were over twice as likely than the nationally representative sample to report getting lost in a menu (blind and partially sighted sample: 48 per cent versus 19 per cent). They are nearly twice as likely to report accidentally changing a setting (eg station, volume, or power) without expecting to (61 per cent versus 33 per cent) and also nearly twice as likely to report finding that a setting had changed without them or anyone else apparently pressing any buttons (27 per cent versus 14 per cent). Indeed one respondent to the Short Preference Survey summarised his digital radio experience: "The radio is in charge; I'm not in charge".

6.4.2. Troubleshooting

Of those reporting some difficulty with using their digital radio, the blind and partially sighted sample (n=89) showed different patterns of trouble shooting compared with their sighted counterparts (n=106). Sighted participants were most likely to either continue pressing buttons hoping to get back to where they were (55 per cent), or they referred to the user/instruction manual (55 per cent). Over half of them also tried switching their radios off and on (52 per cent). Almost a third (31 per cent) reported asking for someone's help. In contrast, the blind and partially sighted sample as a

whole was most likely to try switching their radio off and on (72 per cent) or they carried on pressing buttons (51 per cent) or asked for local help from a friend, family member or housemate (46 per cent). They were less inclined to refer to the user/instruction manual (20 per cent), probably because it is often not accessible to them. Whilst calling a telephone helpline was only reported by a low proportion of blind and partially participants who had experienced difficulties, it is possible that more accessible user manuals could reduce call centre costs.

6.4.3. Ease-of-use

Since many of the blind and partially sighted interview sample owned more than one DAB radio, participants were more able to judge comparative usability, particularly across different DAB brands and models or by comparing to analogue radio. It was difficult for participants to make broad judgements about the usability of DAB radio in this context; each DAB radio was often judged on its own merit and relative to others that they owned.

"The sound is clearer on my DAB and I can get more channels, but it's not as easy-to-use." [blind and partially sighted: moderate sight loss, male, 75+ years]

6.4.4. Confidence with technology

When confronted with an opportunity to use an unfamiliar digital radio in the in-depth interviews, participants who were more comfortable with technology quickly and eagerly explored the product by feeling around for clues, using trial and error to get the radio switched on and tuned in. Thinking aloud whilst they explored, they were more likely to verbalise the design features that helped them (eg expectations of button position for particular functions, button size as an indication of button importance, drawing on their mental map of existing digital radio interfaces). Those who were less comfortable with technology, explored more slowly and cautiously, waiting for prompts from the interviewer. They needed more prompting to describe their thoughts as they explored (eg what do you think that is and why?).

6.4.5. Variation in interface design for DAB radios

Interaction interfaces across DAB radios are generally not as consistent as those across analogue ones. The older transistor radios were more predictable generally consisting of 2 dials: on/volume and tuning dial.

Where participants owned multiple radios, some participants in the in-depth interviews kept each different radio tuned to a particular station which was rarely, if ever, changed, or they set up radios in different rooms for different functions (ie to listen to

different stations). Re-tuning or scroll and selecting different stations was reported or observed to be difficult for some users.

"What I don't like on digital radio is that I forget how to tune, but I think it's a problem due to the fact that new devices are all different from one another." [blind and partially sighted: severe sight loss, male, 75+ years]

"I tend to leave the radio on the same channel on one radio, and another channel on another radio. Setting presets is too difficult for me. That's why I would like a talking radio [radio with voice output for button presses and voice output for information presented on the screen]. I also have a talking kitchen [products in the kitchen that provide voice output] and a talking clock." [blind and partially sighted: moderate sight loss, female, 65-74 years]

"I have two radios next door tuned on Radio 4 long wave for the cricket. Another in the bedroom on Radio 4; then I have two radios in the living room. I use the first when I want to record something on cassette; the other is a DAB radio." [blind and partially sighted: moderate sight loss, male, 75+ years]

For partially sighted interviewees, characteristics of the text display were important to its accessibility. High contrast text to background and large text size were important to accessing the displayed information for partially sighted participants.

6.4.6. Strategies for learning to use DAB radios

To use their own radio and when using an unfamiliar radio for the first time, blind and partially sighted participants who were interviewed reported or were observed using a number of strategies. Participants commonly reported being shown how to access and use certain functions (eg setting presets) usually by a sighted helper (eg a shop assistant, a family member, partner or friend) and if they were sufficiently confident with technology they would memorise button press sequences and button locations to perform the same action(s) independently. Others avoided having to learn by never altering settings, maintaining only very basic use (switch on/off).

6.4.7. Simple strategies for everyday use of DAB radios

Some blind and partially sighted participants reported never using the scroll and select function and used alternative methods to know which station they were listening to. Many respondents only ever used presets for a small number of channels which they had memorised, and others relied on the broadcast station identifications (on the hour/half hour). Some counted through the alphabetised channel order, and others

were so familiar with their favourite stations that they could recognise a station after only a few seconds of hearing it (presenter's voice, predictable content).

6.4.8. Good feedback valued

Feedback (auditory or tactile) from the product was hugely beneficial to blind and partially sighted users exploring their radios. Observations of participants using an unfamiliar radio indicated that absence of an immediate response from the product to a button press (eg with the scroll and select function) was confusing, and delays in response (eg delay before tuning in) often led to more, unnecessary, button pressing. For example, some participants found it difficult to tune in to a station until they were encouraged (by the interviewer) to wait a few seconds after pressing the select button.

To help orientate themselves, some participants reported counting the number of clicks to find a station that they wished to listen to (where the stations were ordered alphabetically).

Others had added tactile 'dots' to their products to give themselves reference points.

"The strategy I have to use for some devices is usually putting a dot on them, to have a datum point." [blind and partially sighted: severe sight loss, male, 65-74 years]

"I think it's useful to have a starting point for the volume. The buttons are too close and rounded so you can't stick a dot or a label to recognise them." [blind and partially sighted: moderate sight loss, female, 65-74 years]

6.5. Sighted people: operating DAB radios

6.5.1. Limited impact of dyslexia or dexterity impairment

Interviewees with dyslexia, dexterity impairment and the 'sighted controls' showed no notable differences in how they used digital radio: being sighted had more impact on the way they operated their radio as a group compared with the blind and partially sighted sample. Typically, all sighted interviewees irrespective of whether they were a 'sighted control' or had dyslexia or dexterity problems, primarily relied on their vision to work out what to do with their radios. This was most evident when exploring an unfamiliar radio for the first time.

6.5.2. Confidence with technology

Similar to the blind and partially sighted interviewees, the extent to which participants from the sighted samples felt confident with technology affected their exploration of digital radio both of their own familiar radio, and of a new unfamiliar one. Simple use (ie listening to only one station always at the same volume, user only switched radio on and off) was common.

"I do enjoy radio but my use of it is restricted to what I am able to do. My husband usually changes channel for me." [Control, female, 75+ years]

6.5.3. Feedback and buttons

Issues for the sighted groups centred on clear text displays and meaningful button labelling (eg a brand label to activate voice output was meaningless to participants, and the labels 'standby' and the symbol to represent standby were sometimes unclear to sighted users). A minority of participants, though not always those with dexterity impairment, commented that it was more difficult to manipulate buttons with minimal elevation from the surface. Some commented on buttons that stood out because they were presented in a different colour. There was some evidence of mistaking a light (LED) for a button.

Some participants reported that the angle of the display on many digital radios was unhelpful, requiring the user to bend down to see the display. When comparing their own radio to a new one presented to them during the course of the interview, the sighted participants acknowledged differences between text displays and indicated preferences for those that were easier to read (higher contrast, larger text size) than others.

6.5.4. Context based similarities in blind, partially sighted and sighted users' needs

When the interviewees from the sighted samples were using or reported on using their own radios, they sometimes operated it without looking (eg because it was positioned in a kitchen on a work top lower than the user's line of sight, or at night when the room is dark). Under these conditions, participants used physical characteristics of the buttons to help them navigate the interface (eg memorised button positions, recognised larger buttons).

6.6. Core functions of DAB radio use

The interviews and comments collected during the Short Preference Survey elicited information about which features and functions of digital radio were most valued and used. All sub-samples were similar in their general radio use and exploration; the majority of participants and respondents regularly carried out basic tasks and advanced functions, where they were available, were less often explored Listening to reports from research participants and observing their DAB radio use, indicated that radio functions were generally prioritised in the following order:

- listening to the radio

- station selection

- changing volume

- setting presets.

Few participants explored beyond these basic functions. A few participants did report using their radios for some advanced functions, the most common being:

- accessing additional text display information

- alarm clock and 'Sleep' (where available).

Far lower (observed or reported) functional priorities were:

- pausing

- recording

- Electronic Programme Guide (where available).

Participants' reactions to these advanced features are discussed in the next chapter (Chapter 7).

6.7. Equipment considerations that make core functionality accessible to blind and partially sighted consumers

6.7.1. Feedback from equipment

For blind and partially sighted participants, tactile and/or audible feedback provided for button presses or dials was observed to be invaluable for strategies helping DAB radio users to orient themselves (eg counting the number of clicks to find a station the

user wishes to listen to). Dial controls that use tactile markers to indicate highest, lowest and current position of dial and/or tactile or auditory clicks were reported to be helpful to blind and partially sighted interviewees.

"I think the interface of this radio is wrong for people that can't see. The dial doesn't click…" [blind and partially sighted: mild sight loss, female, 18-30 years]

"I know exactly what to do but if I press or turn a button three times, instead of two, I can't see what I did." [blind and partially sighted: moderate sight loss, male, 31-64 years]

"I know how to set a station on the preset now, but I think that this is more difficult than with the old ones I have. The dial turns around without a starting point, and it is difficult to know where you are and which station you are listening to. The only way is by recognising the voices." [blind and partially sighted: moderate sight loss, male, 75+ years]

"I prefer dials to buttons, but they should have an end point." [blind and partially sighted: moderate sight loss, male, 75+ years]

Some respondents to the Short Preference Survey also reported difficulties when any audio feedback in general was absent: comments indicated that confusion arises when the radio goes quiet. This may have resulted from: the radio crashing; station losses and changes; low volume when switched on; and the radio switching itself off. Absence of useful feedback was also noted by Short Preference Survey respondents with respect to a variety of contexts. For instance, some respondents reported confusion over whether they were listening in DAB or FM mode; and several respondents reported that their portable DAB radios sometimes unexpectedly ran out of battery power and suggested that an auditory low battery indicator might have prevented this.

6.7.2. Physical characteristics of buttons

6.7.2.1. Button size and groupings/layout
As noted above (see Section 6.3.1), all participants were observed to benefit from variation in button size and groupings/layout. Participants expected buttons for commonly used functions to be more distinctive than those for less frequently used functions. This can be achieved, for instance, by using variation in button shape, size, markings and spacing across functional groups.

"Things that could help blind and partially sighted people are: raised buttons, dot on the '5', audio feedback, big buttons, different shapes for different functions. We need to have very recognisable basic things, not many multifunctional

buttons." [blind and partially sighted: mild sight loss, female, 75+ years]

"I think the buttons' structure, their distribution, separation, pronunciation and ease to press are elements that could really help people with visual impairment." [blind and partially sighted: severe sight loss, male, 65-74 years]

"It is also useful when buttons have a groove, when they have tactile distinctions." [blind and partially sighted: severe sight loss, male, 65-74 years]

Blind and partially sighted respondents to the Short Preference Survey also noted confusion in identifying the correct button to press if buttons were too small, close together or had a similar feel.

Expectations of button position were important to interviewees in their radio exploration. Participants typically expected the 'on' button to be at the top in a corner. Comments relating to confusion over button position were also elicited from the respondents to the Short Preference Survey.

"I expect the on button to be on the top left." [blind and partially sighted: moderate sight loss, female, 65-74 years]

"I know the on/off button is top left." [blind and partially sighted: moderate sight loss, male, 31-64 years]

"I would like to have the basics on the front and everything else on the side of the radio." [blind and partially sighted: mild sight loss, female, 75+ years]

6.7.2.2. Button prominence/elevation, button resistance and stability of equipment during button presses

Prominence/elevation of buttons from the product surface can also provide cues to button function. When exploring the low cost unfamiliar radio, a number of interviewees were observed having to support or steady the radio as they pressed the buttons because the hardware was too lightweight to support the button press.

"I don't have very good dexterity in my hands and the equipment I have at the moment is quite fiddly" [blind and partially sighted: moderate sight loss, female, 31-64 years]

Conversely, very touch sensitive buttons can also be problematic. One participant in the Short Preference Survey noted that some radios have buttons that are too easy to press by accident that change functions. It was suggested that a 'lock' function (as used with mobile phones) might be useful.

6.7.2.3. Button spacing

Some participants reported finding the spacing between buttons too small making it difficult to avoid pressing buttons simultaneously. Providing adequate spacing between buttons, particularly for smaller buttons, should be considered.

6.7.2.4. Button colour

As colour was redundant for the participants who were totally blind, using colour as the sole distinction is best avoided when considering radio design that would work for blind and partially sighted people. Strong colour contrast of buttons against the background was notably helpful for partially sighted participants.

"I think they should change the colour of the buttons because it is the same as the background, grey on grey. […] Good buttons is my priority. I mean buttons that are big enough to see, that give you feedback and that are positioned in a way you can recognise and remember them. What I need is the basic buttons to stand out. Even if they are not big, it is important they stand out, possibly with a strong backlit. […] It's difficult to say how big labels should be because if they're too big the radio becomes too bulky. Maybe bold 14." [blind and partially sighted: moderate sight loss, male, 18–30 years]

"… red often reminds me of the record button." [blind and partially sighted: moderate sight loss, male, 18–30 years]

6.7.2.5. Button shapes

Blind and partially sighted interviewees reported that any cues to help identify buttons can be helpful, including variation in button shapes. For instance, navigation type keys could be shaped consistently with their function.

"Things on digital radios that could help people with visual impairment are… distinguishable buttons and dials of different shapes and sizes that avoid confusing you." [blind and partially sighted: severe sight loss, male 75+ years]

"… buttons have the same shape and ordered like in a keypad. A shape of an arrow could be easier for people with sight problems." [blind and partially sighted: mild sight loss, female, 18–30 years]

"Things like the 'play' button to be a triangle or the 'stop' to be a square could really help so you can associate the shape to the function." [blind and partially sighted: moderate sight loss, male, 18–30 years]

6.7.2.6. Button labels

Considerations for button labels include contrast, position and meaning. Button labels with poor contrast to the background are more difficult to read for partially sighted consumers as well as sighted consumers. Readability is also affected by the text style: consistent with other research on accessible labelling (Ofcom, 2006), button labels are easier to see when presented in lower case text and a sans serif font, such as Arial or Tiresias. The label's position relative to its corresponding button should be clear and unambiguous, and the label itself should be intuitive and unambiguous.

6.7.2.7. Toggle buttons

Toggle buttons were not always clear to participants. This was most clearly evidenced in difficulties that several participants experienced (across samples) with understanding which mode - FM or DAB - they were listening to, particularly when exploring the unfamiliar low cost DAB radio that the interviewer presented to some participants. One participant from the blind and partially sighted sample who was using a DAB radio thought he was listening to digital but observation revealed he was actually listening to FM broadcasts. This illustrates both poor understanding of what to expect from DAB radio and that confusion can arise with products that support both FM and DAB formats using a toggle button. Furthermore, comments from a number of blind and partially sighted participants indicated that having dedicated buttons, rather than toggle buttons, for different functions was easier to follow in the absence of adequate (eg visual) feedback.

"Things like big buttons and dedicated functions… make a radio easier" [blind and partially sighted: severe sight loss, male, 31-64 years]

"I would like a radio with nine big buttons: four for the preset, two for the volume - up and down - two for changing channel - left and right - and a select in the middle. […] Buttons are not distinguishable […] Navigation buttons should be separate to the others or raised." [blind and partially sighted: mild sight loss, male, 18-30 years]

6.7.3. Physical properties of the text display

6.7.3.1. Contrast

"Labels and text on the screen with a high contrast could make radio more accessible for people with visual impairment. For me, the best is white on black background…" [blind and partially sighted: mild sight loss, female, 31-64 years]

Whilst the visual output of the text display is largely not usable by blind users, good contrast helps partially sighted users and sighted participants to see the text.

6.7.3.2. Text size and style

Getting the size of the text to be readable can be a difficult task, particularly when there is a lot of information to be read from the screen. People with sight loss do not always benefit from increased text size, as different medical conditions can affect sight in different ways (eg for some people, smaller text can be more easily readable). In terms of text style one participant below notes that 'squared' text is less readable, and flashing and moving text were also reported to be difficult to follow. Text is easier to see when presented in lower case and a sans serif font, such as Arial or Tiresias.

"I think the display should be bigger and the text clearer, maybe 16, 18 font size [compared to print size]. I would prefer having the text not to be squared because it is confusing sometimes." [blind and partially sighted: mild sight loss, female, 18-30 years]

"I can't read when the text is flashing." [blind and partially sighted: moderate sight loss, male, 18-30 years]

6.7.3.3. Screen size

To accommodate larger text, larger (though more expensive) displays may be a solution and would be welcomed by sighted as well as blind and partially sighted participants.

"With this radio I would finally be able to change channel thanks to the visible numbers on the preset and to the bigger screen. I would like a radio like this." [Dexterity, female, 75+ years]

6.7.3.4. Backlit text (and buttons)

In addition to contrast and text size, another method to make text stand out is by providing backlit text. Backlit text was also mentioned by some blind and partially sighted respondents to the Short Preference Survey.

"I think it would be difficult to use even for sighted people, especially the display. If the buttons were backlit, you wouldn't have the problem of the shadow of the dials on the buttons below them." [blind and partially sighted: mild sight loss, male 18-30 years]

6.7.3.5. Movable text display

Some users noted a preference for a display with adjustable position.

"…and the display to be angled and preferably movable. The reason is because when it's angled it catches better the light." [blind and partially sighted: mild sight loss, male 18-30 years]

6.7.4. Default software processes

6.7.4.1 DAB/FM mode switching

Knowing which mode participants were listening to was frequently noted as an issue by the interviewees (or observed) across the blind, partially sighted and sighted samples. Having the default set to DAB mode would ensure that users at least start off listening to digital (consistent with expectations), and some feedback to indicate that the mode has switched would be helpful.

"It's difficult to understand whether I'm on DAB rather than FM." [blind and partially sighted: moderate sight loss, male, 18-30 years]

6.7.4.2. Auto-tune

Difficulties with DAB radios emerged when participants were presented with unnecessary user demands (eg tuning at first use). Some respondents to the Short Preference Survey commented that independent use for tuning in was only possible with extreme patience. One noted that the process was "extremely inconvenient and took loads of time; there was no one about to help but I would have asked if there was". Indeed many respondents to the Short Preference Survey reported that they never re-tuned either because they were satisfied with their presets or they didn't know how to re-tune. Auto-tuning in this regard is helpful.

6.7.4.3. Default to last-use settings when power reconnected

Some participants expressed frustration or confusion at losing their settings (eg presets, alarms) when the power supply was disconnected. Conversely, however, as indicated in Chapter 3 (Section 3.2), Short Preference Survey respondents commonly reported switching their radio off and on again when they were having difficulty (eg lost in a menu) to re-orientate themselves. As a general rule, however, participants expected the radio to return to the last used state when they switch the product off and on again.

"I always know the channel I am listening to when I switch the radio on because the radio automatically tunes on the last channel I was listening to the previous time." [blind and partially sighted: severe sight loss, male, 18-30 years]

6.7.4.4. Updating stations

The software management of station alterations (station name changes, or position changes) was noted by respondents to the Short Preference Survey. For users of the voice output model, numerous respondents complained that re-scanning identified new stations for which there was no pre-recorded voice identifier. The software for the voice output did not update as station orders changed so many were left without

station name identifiers; others thought their radio sometimes gave incorrect station names. The default voice tag was 'station unknown'. This was reported by respondents to have an impact on their strategies of learning how to find stations.

Voice output software should manage changes in station names and positions in a way that minimises confusion for the user.

6.7.5. Instruction manuals

6.7.5.1. Accessible instruction manuals

Whilst some interviewees reported that they rarely used a manual, or that they relied exclusively on others to help them, others striving for independent use valued the provision of an accessible instruction manual.

Some blind and partially sighted respondents to the Short Preference Survey also noted that a trial-and-error approach was their only option when their user manual was inaccessible and there was no one around to ask for help. Some of these respondents vented frustration at the amount of time taken to work out the user manual. Approaches used included using magnifiers, downloading accessible versions, and having custom transcriptions to Daisy CD of their radio's user manual.

Based on the research, considerations include the provision of at least one alternative accessible format of instructions provided in the packaging. Different participants specified different format preferences: audio, large print, and braille. Whilst braille is only used by a minority of blind and partially sighted people, and large print is not accessible to people with very poor vision or who are blind, audio instructions are accessible to both groups. In the Short Preference Survey two participants were slightly confused however, by provision of a CD-based manual: one believed the CD was to update the software, and the other was unsure of the purpose of the CD. Some participants specified a preference for accessible electronic files of user instructions (eg word, text, html and accessible pdf files) available online.

6.7.5.2. Full use Instruction manuals

Some interviewees noted that not all steps in a process were documented (or presented in a logical order) in the manual which had led to usability difficulties. This was supported by some comments from blind and partially sighted respondents to the Short Preference Survey. For instance, instructions on how long to hold down a button to set a function was missing and had to be worked out through trial-and-error instead.

"The DAB radio manual was better than most, because it was an audio [with voice output] one… The information should be high level. For example, the CD told me I have to turn the dial to change the station, but it didn't tell me to push in after selecting a channel. I needed these basic instructions…" [blind and partially sighted: moderate sight loss, female, 31-64 years]

6.7.5.3. Pictures and words
Some interviewees from the blind and partially sighted sample reported that diagrammatic instructions were not accessible with their print readers (scan and read out text). Instructions provided in both words and pictures should meet different user needs.

6.7.5.4. Relevant Instruction manuals
Some participants vented frustration at having to wade through pages of irrelevant material, particularly when they relied on scanning the pages to access the information. Material considered as surplus to their requirements included instructions written for a different radio model to their own, and multiple languages. Instructions presented in English, with an easy way of finding the English version (if multiple languages are catered for) were cited as helpful and minimised extra effort involved for blind and partially sighted users who relied on scanning their manuals for access. Therefore, instruction manuals relevant to the radios they accompany should be provided in the language of the user.

"I think the manuals nowadays are complicated because they don't refer to a specific model." [blind and partially sighted: severe sight loss, female, 31-64 years]

"I try not to use the instruction manual. It's usually a big book, in 15 languages, but if I need something I scan or download it." [blind and partially sighted: severe sight loss, male, 18-30 years]

"I don't always get help from someone to do stuff like this. I can use my reading machine to read the instructions but unfortunately in this case it was a bit difficult because I have the big machine upstairs and the hi-fi downstairs. The machine is as big as a television so I can't move it. I had to read the instructions upstairs, then come back downstairs, and start again - very complicated." [blind and partially sighted: moderate sight loss, male, 31-64 years]

"I would try to scan the instructions manual but it probably comes in different languages so it is quite complicated." [blind and partially sighted: severe sight loss, male, 31-64 years]

Instructions that allow the user to identify function and location of various buttons would be helpful (eg using audio instructions on CD).

6.7.6. Packaging, hardware and basic connections for set up

6.7.6.1. Product packaging
In the user trials with blind and partially sighted participants, the interviewers observed several instance of participants failing to extract all the contents. In a real life context it is possible that they might accidentally miss important product-related information or parts. Keeping all loose parts and accessories together in one compartment or bag could reduce loss of important components.

6.7.6.2. Redundant 'holes' in hardware
Some, but not all, interviewees from all samples struggled with making the basic connections for set-up of an unfamiliar radio. Where multiple sockets were available and hardware contained superfluous holes, users sometimes tried to connect to any apparent socket. Product design could consider covering redundant holes and making it more clear which socket is correct for the cable.

"…sockets more recognisable: the shape of the jack should be the same as the one of the socket." [blind and partially sighted: moderate sight loss, male, 18–30 years]

"I think there are too many holes on the back of the radio; I can't see where to plug in." [blind and partially sighted: mild sight loss, female, 75+ years]

6.7.6.3. Pliability of hardware
Other issues observed included fiddly and tricky release and extension of the aerial; difficulty in identifying the battery panel and the correct orientation of batteries to be inserted. Tactile cues would help in some of these instances.

6.7.6.4. Hardware material
A few blind and partially sighted respondents commented on the hardware material from which their radio product or the unfamiliar radio that they trialled was made, both for aesthetic and usability reasons. Some commented that the material from which the lowest cost DAB radio that some were asked to trial felt 'cheap'. Others commented that the combination of the finish and the material from which the radio hardware is made can impact on usability if it produces glare, affecting users' ability to clearly see the buttons and screen (eg shiny, metallic).

6.7.7. Interaction design

6.7.7.1. Selecting stations

Interviewees (across samples) trialling scroll and push methods of selecting stations indicated that for products where the label 'push' was stuck onto the dial, participants did not always consider that the dial might need to be twisted first. Conversely some participants twisted without following the prompt to push the button to select.

"I've learned where the stations are by using the radio […] The first time it was quite difficult; I needed time to remember all the stations. I also didn't realise that I had to press 'select' after turning, so the first time I went wrong with it. I discovered it just exploring; it took me about 10 minutes." [blind and partially sighted: mild sight loss, male, 31-64 years]

6.7.7.2. Setting presets

Presets were valued and once set up, many interviewees used them exclusively. When stations were withdrawn or the station order changed, some lost access to valued stations because of difficulties in setting presets.

"I think it would be useful to have someone at the shop that presets the stations I want." [blind and partially sighted: moderate sight loss, female, 18-30 years]

Some respondents to the Short Preference Survey also noted unexpected loss of presets after retuning.

6.7.7.3. Unexpected changes to radio settings

Survey about their confusion and annoyance at unexpected setting (time/alarm) changes or that their alarm/sleep settings did not functioning predictably. Indeed, one respondent reported that their DAB radio auto-reset under certain weather conditions.

6.7.7.4. Personalised settings

Depending on the degree of sight loss, different personal preferences for settings were evident. For instance, whilst the majority of blind and partially sighted participants interviewed indicated a preference for light on-screen text on dark background, others preferred the opposite. Allowing users to invert the colour scheme on the electronic text display would be helpful.

6.7.7.5. Trouble shooting

Getting lost in menus or lack of feedback during system delays to understand what the DAB radio was doing were difficulties observed in the in-depth interviews, and reported by respondents in the Short Preference Survey. Providing an easy exit for

when lost in menus, and feedback during system delays would help to remedy these difficulties. Another common problem amongst participants using DAB radio with voice output is the failure in updating voice output software so that it accurately provides station identifier information. Software should be designed to manage station changes (name changes, additions, deletions).

"Drawbacks of DAB for people with visual impairment are the display, not particularly visible, and the fact that it doesn't recognise new stations, with the [DAB with voice output] in particular." [blind and partially sighted: severe sight loss, female, 31-64 years]

6.7.8. Remote control interfaces

Only a small proportion of respondents had DAB radios accompanied by a remote control. The few comments that were made about remote controls were polarised. Some were very positive and felt that they offered an easy, more intuitive and familiar (logical layout) interaction interface, whilst others were very negative about them (having to locate the remote control, small fiddly buttons).

"…buttons in a remote control have to be separate, so you are sure you are pressing just one button; risen from the surface; they should have good feedback to confirm the action you did." [blind and partially sighted: severe sight loss, male, 65-74 years]

Where remote controls are provided with DAB radios, they should conform to best practice identified in previous research (eg Ofcom, March 2006).

6.8. Applicability of design considerations for use by people with sight

Here we consider sighted controls, participants with dyslexia and participants with dexterity impairments.

6.8.1. Feedback

Sighted participants reported contexts where their ability to rely on vision whilst using their DAB radios was compromised (eg night time listening, radios positioned below eye height, in car use). Audio feedback for button presses would be useful for all users.

6.8.2. Physical characteristics of buttons

Irrespective of the more challenging contexts that sighted users referred to in using their digital radios where they were unable to see the product clearly, good practice in the design of physical characteristics of buttons was generally reported to make a product easier to use.

6.8.2.1. Button size and groupings/layout
Bigger buttons with adequate spacing between buttons, layouts that are predictable with expectations (eg consistent with the radios they already owned) would improve usability.

"I think the buttons are too small and probably not recognisable enough, especially if you need to use the radio during the night - you easily get confused." [Control, female, 75+ years]

6.8.2.2. Button prominence/elevation, button resistance and stability of equipment during button presses
Buttons that were prominent and easy to press were reported or observed to improve usability.

"The radio is also too light, if I press a button the radio moves back." [Control, male, 31-64 years]

6.8.2.3. Button spacing
Well spaced buttons, particularly when the button size is small, was reported or observed to improve usability.

"It's really difficult for me, this radio. The buttons are too small for me [...] Buttons are really difficult to press; they are too close. When my hands start to shake I can't press the button I want." [Dexterity, female, 65+ years]

6.8.2.4. Button labels
Good contrast between button/label against background, and intuitive button/dial labels, were reported or observed to be helpful to usability. Some participants trialling either the unfamiliar voice output digital radio or the unfamiliar highest cost radio were observed to accidentally press the incorrect number button because the label was positioned equidistant between two buttons.

"I know the re-tune button but I can't read the label very well. I have to take the radio closer to me." [Control, male, 65-74 years]

6.8.2.5. Toggle buttons

Fewer toggle buttons, were all reported or observed to be helpful to usability. There was evidence across all samples that toggling between DAB and FM could be confusing.

"The only thing that wasn't immediately clear was to understand when the radio was on DAB or FM. It would be better having two distinct buttons for them." [Dyslexia, male, 18-30 years]

6.8.3. Physical properties of the text display

Similar to partially sighted participants, participants from the dyslexia, dexterity impairment and sighted control samples were also observed to benefit from clarity of the text display. Whilst many of these participants would 'make do' with whatever type of text display they already had (note that many did not even use it at all) they clearly acknowledged some features that rendered the display more readable. Features noted included text size, screen size, backlit displays, and movable displays.

6.8.3.1. Text size and style

Whilst text style was not reported or observed to be of particular benefit to participants in any of the sighted samples, participants commented that larger text sizes were helpful to usability.

"I can read the display. [The text is] about a centimetre big." [Dexterity, female, 65-74 years]

6.8.3.2. Screen size

Some sighted participants reported a preference for bigger screen sizes, which in turn, enables larger text sizes.

"If I had to design a radio for me I would put a bigger screen so I don't have to struggle in the morning when I don't have my [contact] lenses on […] I probably would keep this radio adding a bigger screen and bigger speaker." [Control, male, 18-30 years]

6.8.3.3. Backlit text

In addition to text and screen size, backlit text was also reported to improve usability.

"The light is helpful; it doesn't stay on all the time - after a while it switches off." [Dexterity, female, 65-74 years]

6.8.3.4. Movable text display

Consistent with reports from participants in the blind and partially sighted sample, some sighted participants commented that the text display should be positioned so that it is easy to see.

"I would prefer having the display oblique on the top so I can see it better."
  [Control, female, 31-64 years]

6.8.4. Default software processes

6.8.4.1. DAB/FM mode switching

As noted in physical characteristics of buttons above, sighted participants were as likely as blind and partially sighted participants to struggle with the concept of toggling between DAB and FM modes.

6.8.4.2. Auto-tune

Evidence obtained throughout the research (interviews and Short Preference Survey respondents) consistently indicated that tuning and setting presets needed to be easier for people as many relied on others to help them set up their radios.

6.8.5. Instruction manuals

Many sighted respondents reported never having used their instruction manual - instead, someone else would set up their radio. They used it only for very basic use, or if their ability to see the product provided key cues to use.

6.8.5.1. Pictures and words

In contrast to the bias towards text based instructions in the blind and partially sighted sample, one person with dyslexia expressed a preference for picture based instructions over text. Instructions provided in both words and pictures should meet different user needs.

"For my dyslexia, I think that manual instructions with diagrams would be better."
  [Dyslexia, female, 31-64 years]

6.8.6. Packaging, hardware and basic connections for set up

6.8.6.1. Product packaging

There was no evidence from any of the sighted samples of accidental loss of components or accessories from loose packaging.

6.8.6.2. Redundant 'holes' in hardware

When provided with an unfamiliar radio to try, some sighted users who were less comfortable with technology showed similar errors to those of blind and partially sighted participants where they attempted to connect the cable to redundant holes.

6.8.7. Interaction design

6.8.7.1. Selecting stations

Similar to the blind and partially sighted sample, some sighted participants also struggled with the 'twist and push' method to scroll through and select radio stations. This may be difficult to understand possibly because it uses a different procedure to the familiar twist-only method used with traditional analogue radios.

"A problem of the [brand name] was to understand to press 'select' after choosing the stations you want to listen to." [Dyslexia, male, 18-30 years]

"The main problem is finding the way to change channel. The dial to do that has a label that says 'push'; it's quite confusing." [Control, male, 65-74 years]

6.8.7.2. Setting presets

As emphasised throughout this report, a basic use of radio was the norm. Whilst sighted interviewees were not particularly concerned or did not express great difficulty in setting presets and other settings, in practice some reported that they never set up the radio themselves anyway. Some of the participants who could see the station being shown when scrolling through stations reported no need for presets. Being able to independently set up one's own radio for basic use should be made as easy as possible.

"I don't think this radio needs preset buttons because you can already order your favourite stations on the tuning dial." [Dyslexia, male, 18-30 years]

6.8.7.3. Trouble shooting

During the interviews, when participants were given an unfamiliar radio to explore, many participants were reluctant to try more advanced features that relied on prompts from the text display, mainly because they were unfamiliar with these functions and would never choose to do them themselves. A few participants who explored beyond basic use became stuck in menus that were difficult to exit from. This highlights the importance of having a button that allows the user to exit the menu and return to radio listening, akin to a 'back' button.

6.8.8. Remote control interfaces

As with the blind and partially sighted sample, most participants did not report using a remote control with their radio and there was no general enthusiasm for having one.

However, where discussions took place during the interview about the potential for a remote control interface, some thought a remote control could make a radio easier to use. Reasons given were because they are so familiar and almost formulaic in their design nowadays (eg on/off button, channel/station up/down, volume up/down and navigation pad) that it may be easier to use across different types of radio. Indeed as noted earlier, inconsistent interface design across different radios appears to make it more difficult to learn how to use a new radio. Characteristics of remote controls that were noted by participants are incorporated in the report section on button design.

7. Advanced functions

7.1. Summary

- There were no notable differences between participants in the different samples with regard to their interest in advanced features (principally, electronic programme guide, record/playback, pause) - reactions to them were mixed across all the samples.

- Many participants showed no interest in advanced features either because they felt they had no need for them or they currently used and were comfortable with alternative methods. Whilst participants from the blind and partially sighted sample were more likely to use more traditional alternatives to the advanced functions offered by some DAB radios (eg tape recorders, Radio Times listings) sighted participants were more likely to report using the internet and podcasting.

- Others (across samples) were keen to learn more about advanced features or had already made use of them, particularly extra information presented on the text display.

- When asked to nominate the most useful features of a DAB radio, blind and partially sighted respondents were more likely to prioritise features that increased accessibility whilst sighted respondents focused less on access and more on new functions - although they showed no clear preference for any particular feature.

- Many blind and partially sighted participants expressed concern that advanced features were not accessible to them because of heavy reliance on the text display, and a few wondered how information like electronic programme guide information would ever be fully accessible whilst being easy to use.

7.2. Blind and partially sighted people's interest in advanced functions of DAB radio

7.2.1. Advanced features were not spontaneously associated with DAB radio

The majority of participants from the blind and partially sighted sample did not spontaneously cite advanced features (such as recording, pausing and EPG) as being associated with 'digital radio' without the interviewer first suggesting them. In most

cases, participants were unaware that DAB radio afforded these extra features. When participants were asked about their perceptions and expectations of what digital radio means, they typically cited extra stations, better quality reception, novel stations not available on analogue, and ease of use (no fiddly tuning).

7.2.2. Mixed reaction to advanced features of DAB radio

For many people radio is radio - unprompted, their needs from DAB radio were equivalent to what they have learned to expect from analogue radio: to listen to high quality, interesting and entertaining programming. When advanced features were described to participants, reactions varied.

"I am not interested in functions like 'EPG' or recording. I don't think I would use them. If I want to listen to something on radio I would listen directly from it. I understand the recording facility for TV but not very much for radio. Pausing or rewinding are not features I would use." [blind and partially sighted: mild sight loss, male, 65-74 years]

7.2.2.1. Low interest
Whilst some DAB radios can offer advanced functionality that could benefit some of the participants who already had alternative means to achieve the same function, many preferred to stick with their existing methods. These included recording onto audio cassette tape or other formats, downloading missed programmes from the internet, using an accessible Radio Times, or 'just knowing' when their favourite programmes were on.

"I'm not interested in recording programmes and I've never been a fan of recording even when I could see. It's not my vision that stops me recording. As regards finding out what is on radio, I already know that TalkSport is on every day and The Arrow as well for music so there is no need for me to know anything else. But it would be good sometimes to know if there is some episode of Bill Bailey or something like that. The only way I know what's on is by the Radio Times." [blind and partially sighted: moderate sight loss, male, 31-64 years]

"Yes I like recording programmes, I do it with an old [recording] machine. I know from the commercials that I could record with the digital as well. […] I can't see the screen so maybe a programme guide wouldn't be very useful for me." [blind and partially sighted: mild sight loss, male, 31-64 years]

"I would like to rewind and pause, but maybe recording directly into my radio would be too complicated for me. I am used to my cassettes." [blind and partially sighted: moderate sight loss, male, 75+ years]

7.2.2.2. Recognition of potential benefits

Some participants were keen to learn about advanced features, wondering if their DAB radio might indeed support them. Whether or not blind and partially sighted participants would actually be able to access them is unknown. The extent to which older users would use these features is questionable, given their generally restricted DAB use and their reported reliance on others for using technology.

"Recording on my radio would be brilliant. I would probably use it even if I don't understand this kind of thing. I used to be quite comfortable with technology. I would like to pause." [blind and partially sighted: mild sight loss, female, 65-74 years]

"Things like pausing or rewinding are a bonus and a nice having it but I already have problems in presetting my radio. I think that when technology moves on, visually impaired people are often in trouble with it." [blind and partially sighted: moderate sight loss, female, 65-74 years]

"I think that my radio has the record function but I've never tried it. When I will have more time I think I will do it." [blind and partially sighted: severe sight loss, male, 18-30 years].

7.2.2.3. Limited usage amongst those motivated to use advanced features

Only a few people thought they had explored all the functions supported by their DAB radio. In some instances, taking part in the interview indeed spurred them on to check what their DAB radios could actually offer. A few participants commented spontaneously on the extra information provided on the text display (eg title/artist of current track, DJ). Some valued this added feature, citing it as a light-hearted way of resolving debate in the home over the artist of any particular song. For partially sighted users the display characteristics were key to their accessibility.

"I like the pause function even if I don't use it a lot [...] I think I have explored everything on my digital radio: the pause, record function, tuning, preset, volume, tone, on/off." [blind and partially sighted: mild sight loss, male, 18-30 years]

"The [brand name] has more functions like the recording or rewind ones; it also has a flashcard where you can save the recording. It could be really useful but I don't use it because it's frustrating." [blind and partially sighted: severe sight loss, male, 18-30 years]

One respondent to the Short Preference Survey reported difficulty in understanding how to delete the right programme from their memory card and had to return to the shop for assistance.

7.3. Sighted people's interest in advanced functions of DAB radio

7.3.1. Mixed reaction to advanced features of DAB radio

Similar to the blind and partially sighted sample, there was mixed reaction by sighted interviewees to advanced features of DAB radio: many considered advanced features to be superfluous to DAB use.

"I used to record in the past but not any more [...] I wouldn't be interested in the pause function. I don't look at the screen I have on the radio. I am quite happy with what I have. I could also use my radio with my eyes shut. [...] I have never had any problem with my radio; it's very easy to use. I just use the dial and the on button. I know what I want and how to get it." [Dexterity, female, 75+ years]

"I am convinced that people want really simple pieces of equipment; they don't want extra functionality. They don't want to pay more for something they will probably never use. [...] I believe radio is a media for the masses, and masses most of the time don't have the technical knowledge or simply they don't want something complex. [...] I don't tend to look at the display. I am usually the kind of person that explores the technology it has, but not with the radio. I just use the on button, volume dial and tuning buttons, that's it." [Control, male, 18-30 years]

"I don't look at the screen. I don't need my radio to be interactive." [Control, female, 18-30 years]

"We don't use the EPG [Electronic Programme Guide]. I already know what to listen to. [...] I think one of the reasons why I don't record now is because I think in the past it was easier. You had a standard cassette for every device. Now the memory cards are all different. Moreover, the few times we recorded something from the TV we didn't watch it. I am not interested in pausing either." [Control, male, 65-74 years]

"I am happy with what I have, I don't think I need more. I like the idea of pausing but I don't feel the necessity of it." [Control, female, 65-74 years]

"I don't think I would be interested in an EPG because I buy a radio schedule anyway. I don't think I would record into my radio even if I could." [Control, male, 31-64 years]

"Most of the days I check the radio guide in the newspaper, but I know when some of the programmes I like come on. The idea of an EPG is good but you have to have the radio on to know what is going on, so I prefer to look in the newspaper." [Control, female, 65-74 years]

"Memory card on radio is a good idea, maybe I could use it. I like the idea of pausing, I use it on [TV on] Sky+ but I am not sure I would use it on radio. I have managed without it so far. I don't want to make my life complicated." [Dexterity, female, 65-74 years]

7.3.2. Use of digital audio alternatives to advanced DAB functions

For sighted participants, the internet and podcasting were more frequently mentioned alternatives to using advanced DAB functionality. Whilst participants from the blind and partially sighted sample reported using more traditional media (eg audio cassette) to achieve the same functions offered by DAB radios with advanced features, sighted participants more often sighted the internet and podcasting.

"I don't record from radio, the podcast is easier to use. I listen to radio from the internet sometimes." [Dyslexia, male, 18-30 years]

"I think I have never recorded. I go for the podcast instead, it's easier. I remember a day when I really wanted a record facility or a pause for a show I wanted to listen to and I couldn't, but in the end I found an alternative way to listen to it." [Control, male, 18-30 years]

7.4. Survey respondents' prioritisation of advanced DAB features

Respondents to the Short Preference Survey were presented with nine DAB radio features (accessible user manual; voice output for button presses/functions altered; voice output for text display information; clock; pause live radio; record and playback; easy way to store presets, electronic were provided where necessary. Respondents were asked to nominate up to five features that they would find most useful to have with a DAB radio.

Perhaps unsurprisingly, large proportions of blind and partially sighted participants nominated features that can directly affect their access to DAB radio: voice output for button presses (92 per cent); user manual in alternative formats (81 per cent); and voice output for the information on the screen (72 per cent). It is important to note that both voice output options were very frequently nominated. Voice output for

button presses was more frequently nominated than was voice output for the information on the screen, possibly because blind and partially sighted people are used to not having access to on-screen information, but have to be able to press the right buttons to control a radio. Of the more advanced functions (EPG, record/playback, pause), the record/playback feature was most popular amongst the blind and partially sighted sample, endorsed by almost half of them (49 per cent) (see Figure 7.1).

In contrast, for the nationally representative sample, when the features were rank ordered by popularity, the voice output features and accessible user manual were less frequently selected. In fact, the accessible user manual (32 per cent), voice output for button presses/function (24 per cent) and voice output for text display information (27 per cent) were ranked in the bottom three of the list. Sighted consumers gave more variable reports of their desired functionalities - there was no clear 'winning' feature - indicated by a more even spread of percentage responses to the different features. For this sample, 'clock' was endorsed most often (47 per cent), jointly followed by 'pause' (44 per cent) and 'easy presets' (44 per cent) and then closely followed by 'EPG' (43 per cent) and 'record and playback' (42 per cent) (see Figure 7.1/Results table [AB7.1] in Appendix B).

Figure 7.1 Which five of the following nine features are most useful?

Percentage of sample
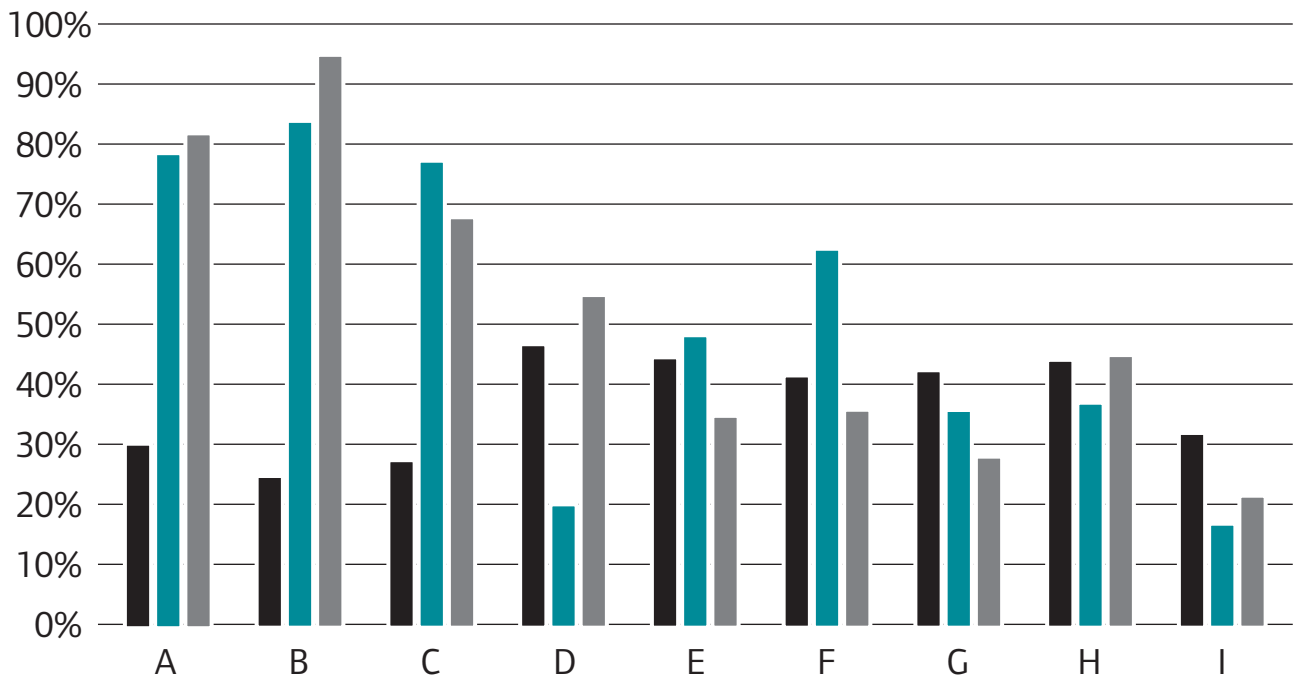
nationally representative sample (n=225)

blind and partially sighted sample: no voice output (n=58)

blind and partially sighted sample: voice ouput (n=42)

Features
A – Accessible user manual
B – Voice output: button presses/functions
C – Voice output: text display info
D – Clock
E – Pause
F – Record/playback
G – Easy presets
H – EPG
I – Sleep

7.5. Equipment considerations to make advanced functionality accessible to blind and partially sighted consumers

7.5.1. Features specified in relation to core functionality are important for making advanced functions accessible

To improve accessibility to the advanced functions, many equipment considerations relating to the various core equipment considerations specified in the last chapter need to be implemented (Chapter 6).

In addition, as advanced features are still relatively new to the DAB radio market, many participants (across all the samples) were happy to continue to use alternative methods (eg Radio Times or internet instead of the EPG function), or they were unsure if their radios actually supported the new features. Those that had used them did not use them regularly. This could be due to participants' expectations of radio – most expected to simply listen to it – or related to usability – for instance, labelling may not be sufficiently clear or the process of accessing them may be too complex.

7.5.2. Characteristics of the text display and voice output

Access to many advanced features of digital radio equipment tends to rely heavily on menus, and the text display. These features are therefore currently impossible for most blind people to access even though some reported wanting them. For partially sighted people, characteristics of the text display that improve readability are key to accessibility. Many blind and partially sighted participants from the interviews and Short Preference Survey felt that voice output for information on the screen was the principle means of enabling access to those features. As there were no radios on the market at the time of data collection that have both advanced features and voice output, this could not be tested in this study.

"Anyway, even if you have different shaped buttons, you have to remember them, so the speech [voice output] is better." [blind and partially sighted: severe sight loss, female, 65-74 years]

A discussion on the impact of voice output on independent use of DAB radio and its other benefits is presented in full in the next chapter (Chapter 8). The remaining discussion in this chapter will relate to issues raised by participants in the research about how to best design voice output to access advanced features.

7.5.3. Concerns about voice output for advanced features

Some blind and partially sighted respondents queried whether voice output would be appropriate for advanced features. Indeed, extra comments made by blind and partially sighted respondents during the Short Preference Survey indicated that whilst voice output for the information on the screen would be helpful, and for some, essential, some respondents noted that a continual stream of this type of voice output would interrupt the broadcast programme.

Some were concerned that adding voice output would push up the price of the DAB radio.

7.5.4. Customisation of voice output for advanced features

Adjustable voice output speeds, detail and styles might accommodate different user needs and appeal to a wider market. Some participants expressed a preference for voice output facilities to be adjustable in the level of verbosity. There was evidence from the blind and partially sighted sample of using voice output computers with adjustable voice speeds. One young blind user was listening to his PC voice output at a speed that was incomprehensible to the interviewer but perfectly acceptable to the user with his faster auditory processing skills.

Customisable voice output settings such as customisable voice style option (eg voice used, recording own voice tags, downloadable voices) were noted as potentially 'nice to have'.

7.5.5. Voice output as default

Voice output used to communicate information carried on the electronic text display was valued by many blind and partially sighted users with this feature on their DAB radios. Blind and partially sighted users would benefit where the default setting is for voice output to be active, and it could then be switched off by those not interested in it.

7.5.6. Natural sounding voice output

Comments from participants indicated that spelling out words was annoying; voice output should use full words, sound like a real person's voice, and be adjustable (with different levels of speech verbosity available for selection by the user).

7.6. Equipment considerations for usability of advanced functionality for sighted consumers

Participants with dyslexia, manual dexterity impairment and the sighted controls reported, or were observed to, benefit from easier to see text displays and easier to understand processes to access and use advanced features.

There was low awareness and use of advanced features across the sighted samples and no notable differences emerged to suggest different equipment considerations for the different sighted user groups.

Raising awareness and usability of the advanced features would support the needs of sighted users. Considerations that impact on usability relate to features of the text display, button labelling and more intuitive processes. For instance, some sighted interviewees who were presented with the most advanced radio to trial, found direct recording relatively straightforward and intuitive (press the red 'record' button) but all participants struggled with accessing the programme they had recorded. One interviewee became 'stuck' in a menu and was unable to exit back to listening to the radio.

8. Consumer reaction to voice output

8.1. Summary

- Blind and partially sighted interviewees and Short Preference Survey respondents were impressed with voice output for digital radios and felt that it made radio more accessible and usable to them.

- Sighted interviewees (irrespective of their sub-sample) could appreciate the value of voice output to people who are blind and partially sighted and some reported interest in having this feature themselves.

- For blind and partially sighted users, compared with digital radios without voice output, having voice output increased independent use of digital radio and reduced the likelihood of having difficulty with using the radio and of asking for someone's help when faced with use difficulties. However, they still slightly e more likely to call a telephone helpline for advice, but this remained a low proportion of the sample.

- Other benefits to blind and partially sighted consumers noted in this research were that having voice output increased awareness of the functionalities their DAB radios offered, and increased positive opinion about the usability of DAB radio in general.

8.2. Overwhelmingly positive feedback

Participants from the interviews and Short Preference Survey were extremely positive about their digital radios with voice output. Many felt that this was the only way for them to access some of the features.

"DAB is really easy, but without the voice [output] facility I would just be able to use the presets." [blind and partially sighted: moderate sight loss, female, 31-64 years]

"I think the [DAB with voice output] is a great product. I have never heard a single complaint about it. I think it's a product that everybody can use. It is not just good for blind or partially sighted but for elderly or kids as well. It probably just needed to be more advertised." [blind and partially sighted: moderate sight loss, male, 18-30 years]

"In a list of priorities for blind people, I would put in first place audio instructions; the second is a good voice facility. [...] In designing technologies for people with visual impairment, it is necessary to consider all the levels of impairment because

the range is really big and every level needs attention." [blind and partially sighted: severe sight loss, male, 65-74 years]

And in at least one instance, voice output was reported to override other design considerations.

"The same size of the buttons is not a problem with the [DAB with voice output] because you have the speech. Anyway, even if you have different shape buttons you have to remember them, so the speech is better in any case." [blind and partially sighted: severe sight loss, female, 65-74 years]

8.3. Interest in adoption of DAB radios with voice output

Blind and partially sighted participants who did not have DAB radios with voice output were interested in getting one.

"I can't use the text display at all. A voice [output] facility would be really useful." [blind and partially sighted: moderate sight loss, female, 18-30 years]

Some sighted participants could see personal benefits to DAB radios with voice output in some circumstances. It was interesting to observe sighted participants' reactions to a voice output DAB radio. Most did not explicitly notice the voice output at first; clearly it felt a quite natural experience. During discussions some sighted participants could identify examples from their lives where voice output would be a useful feature to have. Whether or not this opinion would translate into purchase behaviour is difficult to ascertain, particularly as the sighted sample were generally more cost sensitive.

"I would have the speech on my car radio." [Control, male, 18-30 years]

"I like the fact that it speaks, I find it very informative." [Control, female, 31-64 years]

"...[with the DAB radio] I need my glasses to change channel." [Dexterity, female, 65-74 years]

8.4. Voice output and blind and partially sighted respondents' independent use of DAB radio

8.4.1. Sighted respondents more likely to report independent DAB radio use

As a baseline from which to compare the impact of voice output on independent use, the blind and partially sighted DAB sample were less able than the nationally representative, sighted, sample to use their radios completely independently.

Data from the Short Preference Survey were explored in different ways (see Section 3.2.4). Overall, irrespective of whether their radio had voice output or not, the blind and partially sighted sample were more likely to have needed someone's help to complete any of a range of tasks with their DAB radio both for the first time they used it (69 per cent needed help at least once), or any subsequent time (48 per cent). In contrast 39 per cent of the nationally representative sample needed someone's help with at least one task for first time use, then 17 per cent for subsequent use.

In terms of basic tasks (items a–l for first time use, and a–k for subsequent use, see section 3.2.3.), 69 per cent of the blind and partially sighted sample as a whole needed someone's help for the first time they used it, and 48 per cent needed help for subsequent basic use. Note. these figures are identical to those for the full range of tasks. These compare with 32 per cent of the nationally representative sample needing help with basic tasks for first time use, and 14 per cent for subsequent use (see Table 8.1).

Table 8.1 Proportion of samples requiring assistance with at least one DAB radio task

	First time use		Subsequent use	
	Any task (19 items)	**Any basic task (12 items)**	**Any task (18 items)**	**Any basic task (11 items)**
Nationally representative sample	39%	32%	17%	14%
Blind and partially sighted sample	69%	69%	48%	48%

8.4.2. Voice output increases extent of independent use for blind and partially sighted respondents

Blind and partially sighted respondents using DAB radios with voice output used radio much more independently than those without voice output DAB radios. As indicated in Figure 8.1 (and Results table [AB8.1] in Appendix B), blind and partially sighted respondents without voice output DAB radios were more than twice as likely than their counterparts with voice output DAB radios to report needing help with either any task, or any basic tasks, both for first time use, and subsequently. In fact the figures for independent use amongst the blind and partially sighted sample with voice output were more similar to the nationally representative sample than they were to the blind and partially sighted sample who had a radio without voice output.

Figure 8.1 Proportion of samples requiring any help for first time use and subsequent use, with any task and any basic task

Percentage of sample

Legend:
- nationally representative sample (n=225)
- blind and partially sighted sample: no voice output (n=58)
- blind and partially sighted sample: voice output (n=42)
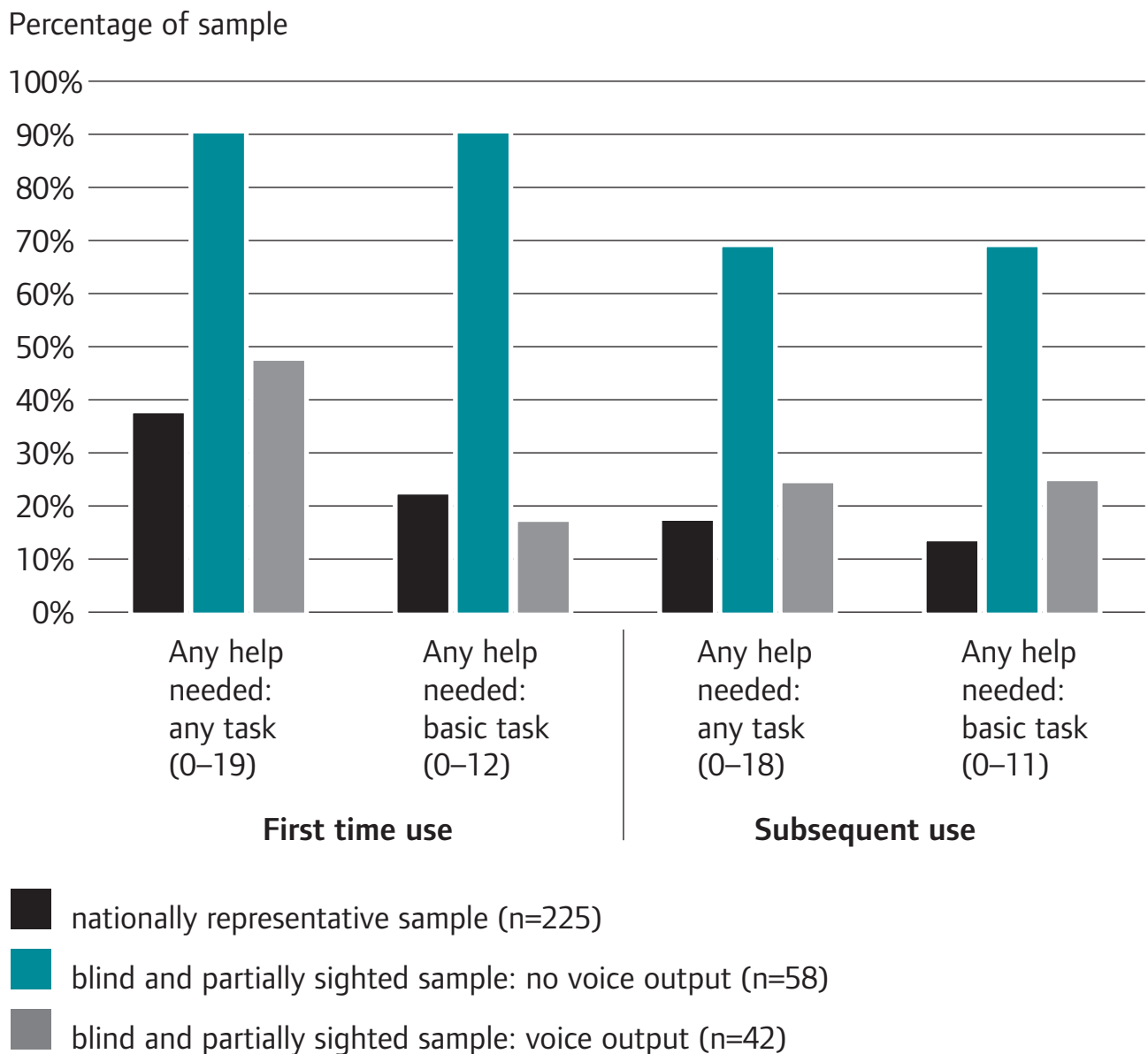
Statistical analyses using Pearson chi squared tests indicated that the nationally representative sample were significantly less likely to report needing any help from another person than the blind and partially sighted sample reporting on a DAB radio without voice output. This difference was significant for first and subsequent use, across basic and any task (First use, basic tasks: Chi squared = 62.3 (df = 1), p<0.001; any task: Chi squared = 47.1 (df = 1), p<0.001; Subsequent use, basic tasks: Chi squared = 72.9 (df = 1), p<0.001; any task: Chi squared = 61.1 (df = 1), p<0.001).

Similarly, the blind and partially sighted sample reporting on a DAB radio with voice output were significantly less likely to report needing any help from another person than the blind and partially sighted sample reporting on a DAB radio without voice output. Again, this difference was significant for first and subsequent use, across basic and any task (First use, basic tasks: Chi squared = 21.4 (df = 1), p<0.001; any task: Chi squared = 21.4 (df = 1), p<0.001; Subsequent use, basic tasks: Chi squared = 17.8 (df = 1), p<0.001; any task: Chi squared = 17.8 (df = 1), p<0.001).

Importantly, there were no significant differences between the nationally representative sample and the blind and partially sighted sample reporting on a DAB radio with voice output (First use, basic tasks: Chi squared = 3.82 (df = 1), ns; any task: Chi squared = 1.1 (df =1), ns; Subsequent use, basic tasks: Chi squared = 3.8 (df = 1), ns; any task: Chi squared = 1.8 (df = 1), ns).

8.4.3. Voice output reduced extent of help needed by blind and partially sighted respondents

Blind and partially sighted users with voice output DAB radios needed help from someone else for fewer tasks than did those without voice output DAB radios. The blind and partially sighted respondents reporting on a DAB radio without voice output reported needing help with two to three times as many tasks as those reporting on a DAB radio with voice output. In turn, blind and partially sighted participants reporting on a DAB radio with voice output needed help from someone else with, on average, 2 tasks for first time use, and even less (<1) for subsequent use. These figures are comparable to those obtained from the nationally representative sample. (see Figure 8.2/Results table [AB8.2] in Appendix B).

Figure 8.2 average number of tasks for which help from someone else was needed by each sample

Number of tasks

nationally representative sample (n=225)

blind and partially sighted sample: no voice output (n=58)

blind and partially sighted sample: voice output (n=42)
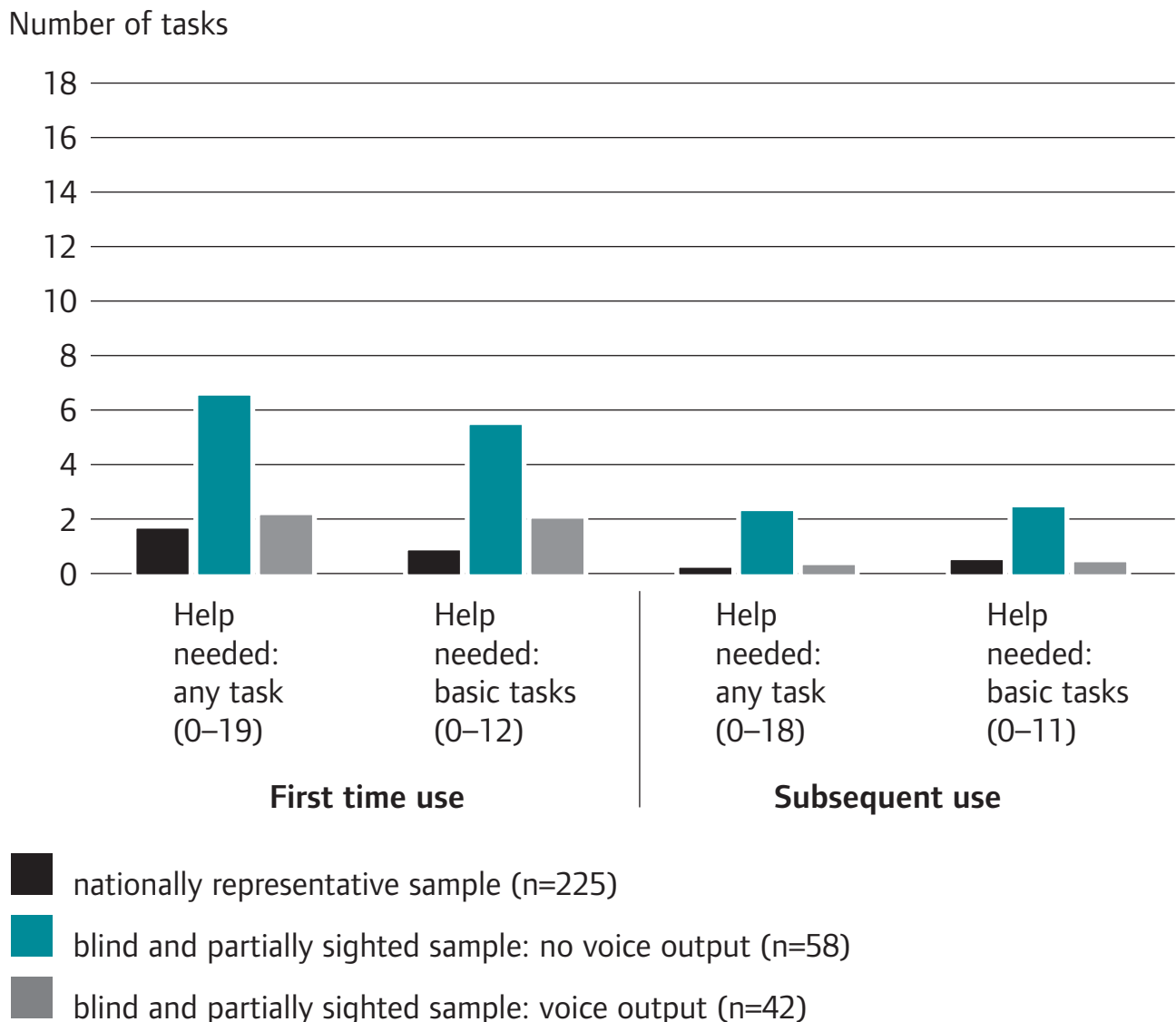
8.4.4 Voice output reduced reports of difficulties

Having a DAB radio with voice output reduced the likelihood of experiencing complications such as getting lost in a menu. Of all blind and partially sighted participants, those reporting on DAB radios with voice output (VO) were significantly less likely than those without voice output (noVO) to either:

(a) get lost in a menu (noVO: 60 per cent versus VO: 36 per cent: Chi squared = 5.9 (df = 1), $p < 0.05$) or

(b) accidentally change setting without expecting to (noVO: 74 per cent versus VO: 48 per cent: Chi squared = 7.3 (df = 1), $p < 0.001$).

However of all blind and partially sighted participants, those reporting on DAB radios with voice output were more likely (though not significantly) than those without voice output to report finding that a setting had changed when neither they nor anyone else had appeared to press any buttons (noVO: 22 per cent versus VO: 31 per cent: Chi squared = 0.9 (df = 1), ns). This is likely to be a model specific issue, as there was only one DAB radio model with voice output at the time of data gathering. Equivalent proportions of blind and partially sighted sub-samples with and without voice output DAB radios reported 'other' difficulties, not otherwise specified (both 38 per cent).

In comparison, the nationally representative sample was least likely of all groups to report experiencing any of these difficulties. The most frequently endorsed difficulty for this sample was to accidentally change a setting (33 per cent) and nearly one in five (19 per cent) reporting getting lost in a menu even though they had no reported sight problems (see Figure 8.3/Results table [AB8.3] in Appendix B).

The nationally representative sample were significantly less likely than both blind and partially sighted sub-samples to report getting lost in a menu (without VO: Chi squared = 39.3 (df = 1), p<0.001; with VO: Chi squared = 5.7 (df = 1), p<0.05) and 'other difficulty' (without VO: Chi squared = 32.4 (df = 1), p<0.001; with VO: Chi squared = 27.3 (df = 1), p<0.001). The nationally representative sample were also significantly less likely to report accidentally changing a setting than the blind and partially sighted sample reporting on a DAB radio without voice output (Chi squared = 32.4 (df = 1), p<0.001) and were significantly less likely than the blind and partially sighted sample reporting on a DAB radio with voice output (Chi squared = 7.1 (df = 1), p<0.001) but not those without voice output (Chi squared = 2.3 (df = 1), ns) to report that a setting had changed without touching. As noted above, this latter finding appears to be a model specific issue.

Figure 8.3 Thinking of when you have used your digital radio, please indicate which, if any, of the following have happened

Percentage of sample

nationally representative sample (n=225)

blind and partially sighted sample: no voice output (n=58)

blind and partially sighted sample: voice output (n=42)
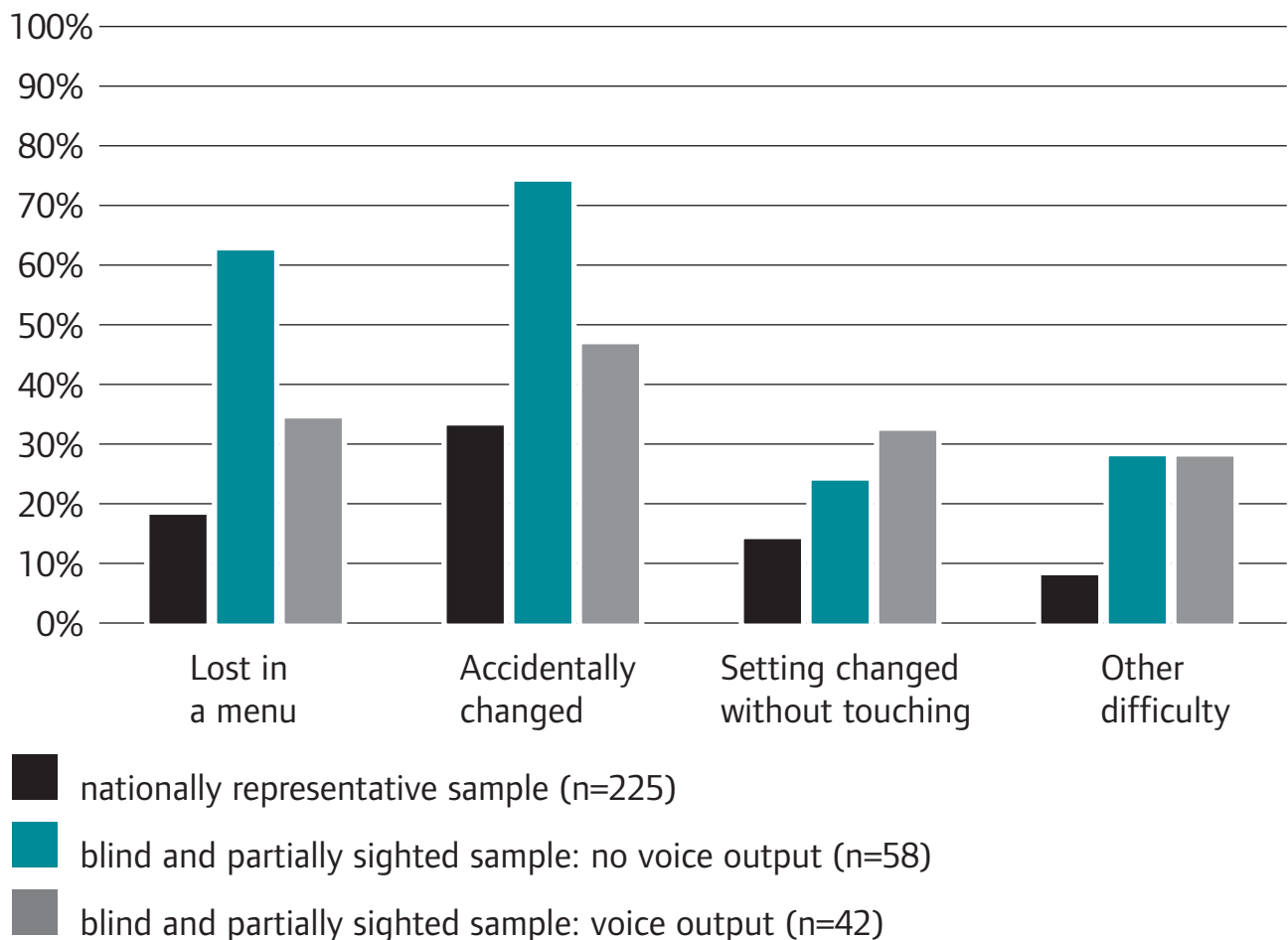
8.4.5. Voice output reduced reliance on others to help with difficulties

For the blind and partially sighted sample, having a DAB radio with voice output hugely reduces reliance on others for help. As indicated in Figure 8.4 (and Results table [AB8.4] in Appendix B), having a DAB radio with voice output increases independent use of radio in terms of typical troubleshooting.

Most strikingly, of respondents reporting some difficulty, blind and partially sighted respondents with voice output DAB radios were more than three times less likely to ask for help from a friend, family member or housemate than were respondents with DAB radios without voice output. In fact those with voice output DAB radios were even less likely than the nationally representative sample to ask for someone else's help. Those with voice output DAB radios were also less likely than those without voice output DAB radios and the nationally representative sample to rely on hopeful button pressing.

Compared to blind and partially users reporting on DAB radios without voice output DAB, those with voice output were less likely to refer to the instructions manual, or to switch the radio off and on again. Relative to those without voice output, blind and partially sighted respondents with voice output DAB radios were more likely to report calling a telephone helpline for advice - though it is important to note that this remained a low proportion of the sample, and may have reflected specific issues relating to the one model of DAB radio with voice output that participants were reporting on.

Figure 8.4 When any of the above (difficulties) have happened, which of the following steps have you taken to try and fix the problem?

Percentage of sample
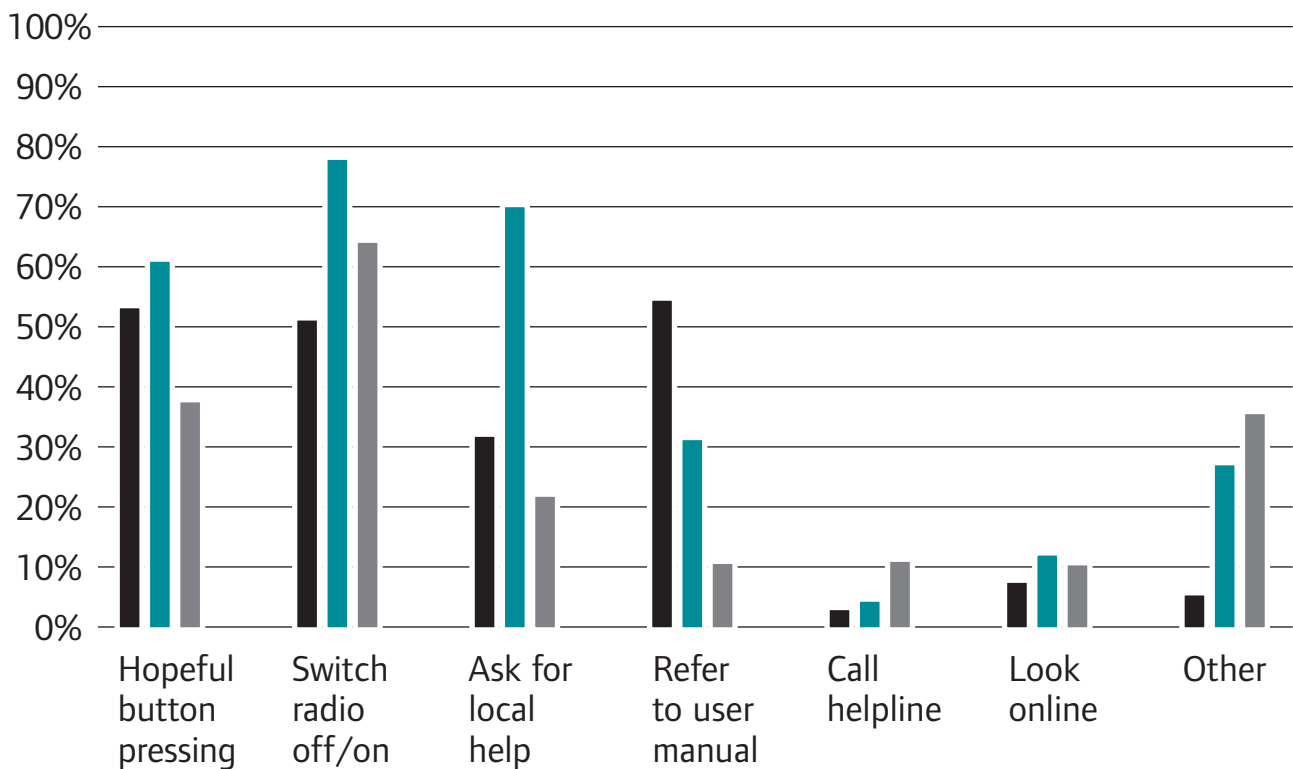
■ nationally representative sample (n=106)

■ blind and partially sighted sample: no voice ouput (n=53

■ blind and partially sighted sample: voice output (n=36)

8.4.6. Voice output increased blind and partially sighted respondents awareness of their radio's functionality

Blind and partially sighted respondents reporting on voice output DAB radios were aware of more features on their DAB radio than were blind and partially sighted respondents without voice output. Respondents to the Short Preference Survey were asked to indicate which of a series of nine additional features they thought their radio supported:

- operating instructions in alternative formats

- voice output for all button presses/functions

- voice output for the text display

- clock

- pause live radio

- record function

- easy way to store presets

- electronic programme guide

- sleep function.

Whilst this question could elicit from respondents the features actually offered by their DAB radio, it was designed to elicit respondents' familiarity with the product they use. This is particularly the case in the light of the discussions presented in earlier chapters showing that participants' use of any advanced functions through their radios is very limited. Respondents using more accessible and usable equipment were expected to be more aware of which features their equipment supports, even if they choose not to use the features. The total number of additional features that each respondent reported was calculated.

The nationally representative sample reported an average of four features. For the blind and partially sighted sample, those with voice output on their DAB radio reported having significantly more features than those without voice output (average of 5.5 vs. 1.7 features; $t(93.2)=-17.0$, $p < 0.01$). The difference in means is more than 2 (which would account for endorsing the two voice output related items) thus those with DAB radios with voice output were still more likely to report more DAB radio features. A second analysis which removed the two voice output options from the total number of DAB radio features revealed that even when voice output options are excluded, the blind and partially sighted sample reporting on DAB radios with voice output still

reported significantly more features than those without voice output on their DAB radios (average of 3.8 vs. 1.7 features; t(82.8)=-10.0, p. < 0.01). This possibly reflects a relationship between accessibility and awareness; it is more difficult to know what features your radio supports if you cannot easily access those features.

8.4.7. Perceived limitations of voice output

A proportion of blind and partially sighted respondents with voice output DAB radios did not consider that their radios supported voice output for all information on the text display. The DAB radio with voice output on the market at the time of the project's fieldwork offered voice output for button pressing, menu navigation, and information on the screen. However, some blind and partially sighted participants reporting on this DAB radio failed to report that their radio offered voice output for all the information on the text display. There were several reasons identified. Whilst all participants acknowledged that there was some voice output for the text display, some reported being unable to verify the accuracy and completeness of the voice output representation of the text. They claimed that as they couldn't see the screen, they couldn't check whether there was voice output for all information on the text display. Others had checked this with a sighted companion and reported knowing that the voice output did not provide a comprehensive report on the text display output. A third group of people reported that because of the tendency for the radio to spell out words at times, they did not consider this to be a fully functioning voice output facility.

8.5. Voice output and perceived ease of use

8.5.1. Voice output is a major benefit to blind and partially sighted participants

The voice output facility hugely facilitated ease-of-use for our sample of blind and partially sighted people. Not everyone agreed that voice output was important, however. Those that viewed it as less important appeared to either have close support from a sighted person (eg partner) or were happier to rely on other people and used their radio for only very basic use. Participants who strived for independence valued voice output more. Some commented that for this feature to be useful there should be a means of adjusting the level of output. And one participant reported that having voice output slowed down the process of changing channel.

"I have two DAB radios. One is the [voice output DAB] and I bought it for its accessibility [...] I use DAB more now with the [voice output] because before it

was difficult to remember where I had preset the stations." [blind and partially sighted: severe sight loss, male, 18-30 years]

"Comparing the [voice output model] with the [Brand A] and the old analogue, I would say it [voice output model] is the easiest to use. You just need to press a button and you know what you pressed, where you are, etcetera. The [voice output model] is slower than the [Brand A] in changing channel because of the speech." [blind and partially sighted: severe sight loss, female, 65-74 years]

"I have a talking kitchen [devices in the kitchen that offer voice output], but I don't think I need a talking radio. I already know what and when to listen to the different programmes. Furthermore, the radio already tells me what's going on and I also have [my wife] who helps me when I need." [blind and partially sighted: moderate sight loss, male, 75+ years]

"I bought the [model with voice output] because I realised that I was missing many things." [blind and partially sighted: severe sight loss, male, 75+ years]

8.5.2. Voice output DAB radios are easy to use

All blind and partially sighted users with voice output DAB radios agreed that these radios were easy to use. The nationally representative sample reported positively on their radio's usability; 48 per cent agreed and 36 per cent strongly agreed (total of 84 per cent) that their DAB radio was easy to use. In comparison, far fewer of the blind and partially sighted sample without voice output DAB radios agreed or strongly agreed that their radio was easy to use (only 59 per cent). However, one hundred per cent of the blind and partially sighted sample using DAB radios with voice output agreed (17 per cent) or strongly agreed (83 per cent) that their voice output DAB radio was easy to use - demonstrating that voice output improves blind and partially sighted people's perceptions of the ease of use of DAB radios (see Figure 8.5/Results table [AB8.5] in Appendix B).

Figure 8.5 To what extent do you agree or disagree that the DAB digital radio you are answering this survey about is easy to use?

Percentage of sample

nationally representative sample (n=225)

blind and partially sighted sample: no voice output (n=58)

blind and partially sighted sample: voice ouput (n=42)
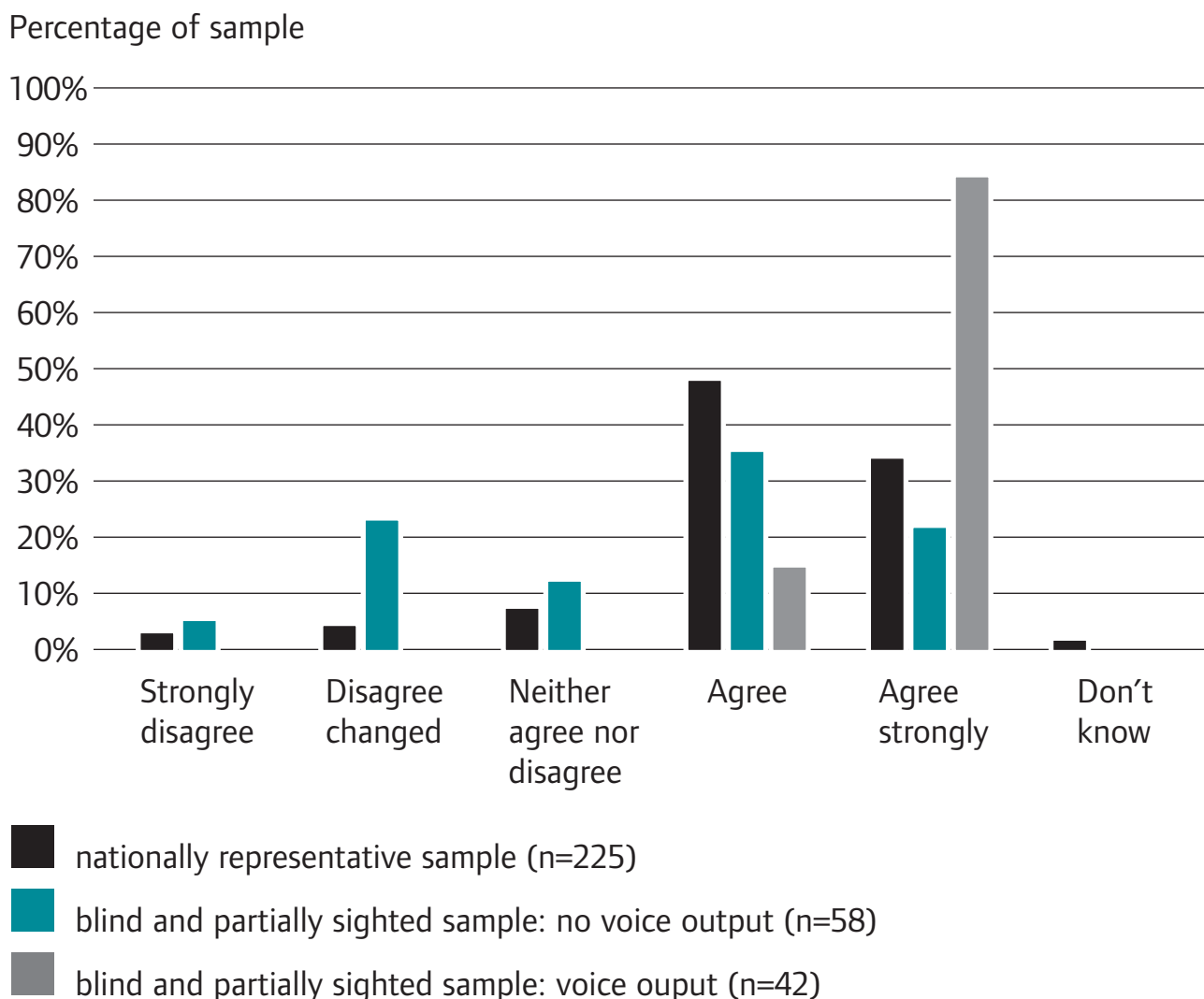
8.5.3. Voice output DAB radio owners are more likely to agree DAB is easier to use than analogue radio

Of the blind and partially sighted sample, those reporting on DAB radios with voice output were more likely than those without voice output to rate DAB radios in general as easier to use than analogue ones. Overall, sighted respondents were more likely than the blind and partially sighted respondents to agree that DAB radios are easier to use than analogue ones (59 per cent of sighted controls agree/strongly agree versus 38 per cent of blind and partially sighted respondents as a whole).

However, blind and partially sighted respondents who had reported on a radio with voice output were more likely to show a more positive bias towards the usability of DAB radios in general (45 per cent agree DAB radios are easier to use than analogue

ones) compared with blind and partially sighted respondents reporting on a DAB radio without voice output (31 per cent).

Indeed across all respondents, a positive experience with the DAB radio that respondents reported on was significantly associated with a positive report of DAB radio compared with analogue radios (r=0.41, p<0.01, n=325) This highlights the importance of personal experience in affecting general perceptions of the product group as a whole.

It is also noteworthy that many blind and partially sighted participants who reported on a DAB radio with voice output reported finding this question difficult to answer. This is reflected in the much higher number of responses from this sample in the 'neither agree nor disagree' response option (33 per cent) where many participants with voice output DAB radios commented that it depends on the type of radio (see Figure 8.6/Results table [AB8.6] in Appendix B).

Figure 8.6 To what extent do you agree or disagree that the DAB digital radios are easier to use than analogue ones?

Percentage of sample

nationally representative sample (n=225)

blind and partially sighted sample: no voice output (n=58)

blind and partially sighted sample: voice output (n=42)
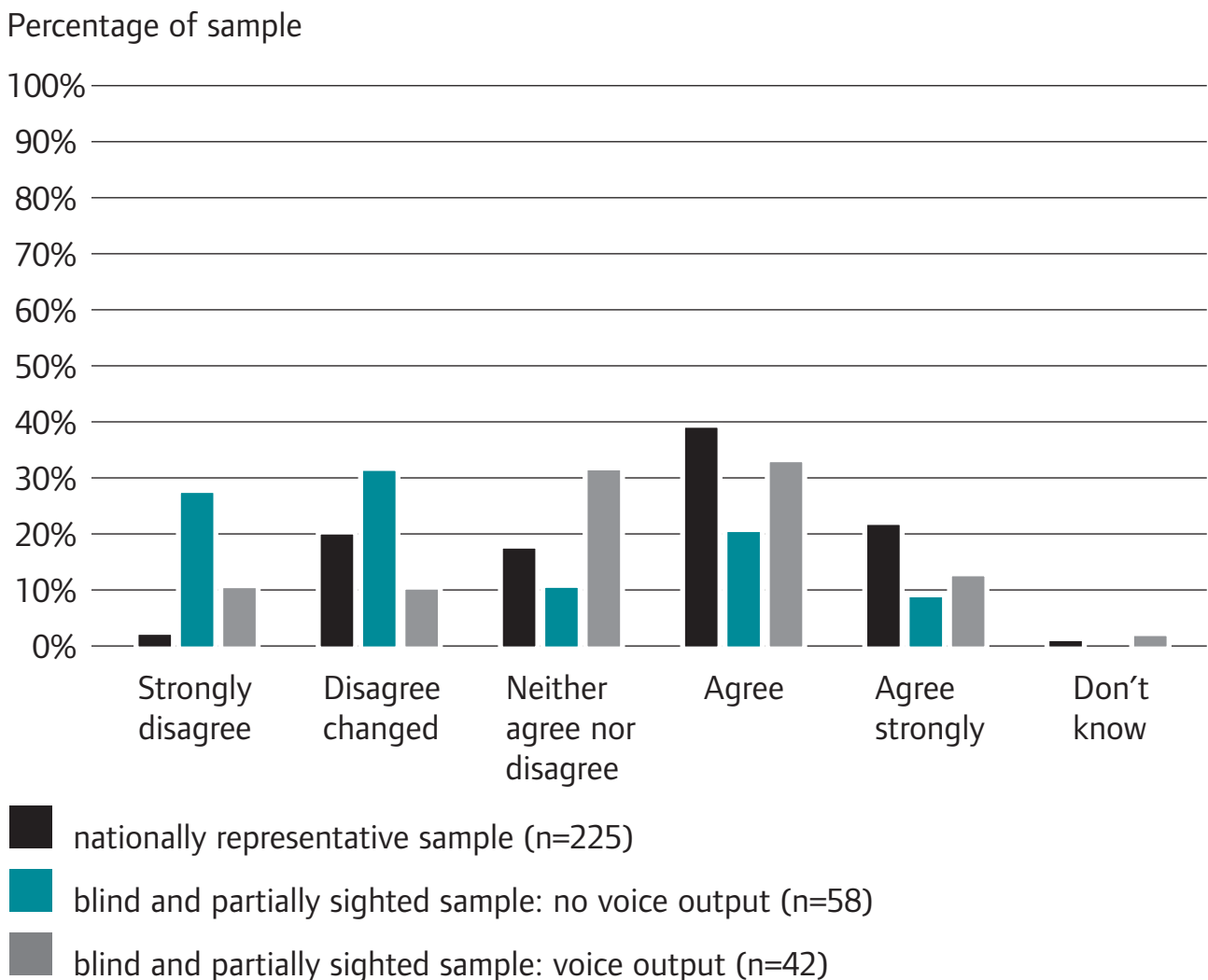
9. Priorities for accessible and usable DAB radios for blind and partially sighted people

9.1. Summary

- The consumer research approaches (in-depth interviews and Short Preference Survey) defined and refined a set of design considerations. These are presented in full in the form of a checklist below.

- Insights from consumers' experiences - their behaviour with their existing and a different DAB radio that the researchers asked them to use, along with their comments (positive and negative) - have informed the checklist and have been described throughout this report in context.

- Analysis of the in-depth interviews identified a range of equipment needs (product design considerations) that would improve access to DAB radio equipment for blind and partially sighted consumers, and usability for sighted consumers.

- The design considerations are presented in a prioritised form (high, medium and low) to support the comparative evaluation of digital radio equipment and to inform the development of more usable products (for both sighted and blind and partially sighted consumers). In the checklist, items labelled as "1" are top priority, "2" medium priority and "3" lowest priority respectively.

- Requirements were given a higher priority if they facilitated access to and use of basic functions, and if those tasks were typical of day-to-day use.

- The priority ratings were agreed between the two interviewers on the project, after each had independently rated each checklist item based on their experience of the fieldwork.

- The methods used to define the checklist items, and to assign their priority levels, is the same that i2 media research has used in previous research for Ofcom and DTI (BERR).

9.2. The checklist and priority levels

1 is high, 2 is medium, 3 is low

A	Installation	
A1	All package contents besides the radio itself (eg A/C cable, paper and other documents that accompany the product such as guarantees, instructions, CDs) are contained within a plastic wallet with the main product.	3
	Instructions	
A2	Electronic alternative formats of paper-based instructions (eg audio, url link) are available online.	2
A3	User is informed that at least one alternative format other than paper-based instructions is included within packaging (eg large print, CD, braille, audio tape formats) and others are available on request.	2
A4	At least one form of an instructions manual in plain English is present (ideally clear print paper copy, tape cassette, CD).	2
A5	Installation instructions are presented in words and pictures. Standard paper-based installation instructions that use both text and picture format can benefit partially sighted people and those with dyslexia who may need to use them	2
A6	Installation instructions are only for the specific model which they accompany.	2
A7	Installation instructions are in users' local language.	2
A8	Installation steps follow a logical order.	2
A9	Regardless of the format they are presented in, instructions are provided that enable the user to identify the functions of various buttons on the hardware (and remote control, where present).	2

	Basic connections/physical set-up	
A10	All redundant holes on product are covered, limiting the number of ports which might be thought of as connection ports to those required for full use of the product.	**2**
A11	It is not possible to insert incorrect cables/connectors into any sockets on the hardware. Notes: In interview trials with unfamiliar radio equipment, we observed participants attempting to connect the A/C cable to any feasible hole on the product via trial and error.	**2**
A12	The aerial can be released from its resting position and extended with ease.	**2**
A13	If a battery panel is present, a tactile means is provided for users to locate the battery panel guides.	**2**
A14	If a battery panel is present, a tactile means is provided for users to identify correct orientation for inserting batteries.	**2**

B	**General characteristics and use**	
	General	
B1	The combination of the finish and the material from which the radio hardware is made of does not produce glare in the range of normal lighting conditions (eg shiny, metallic).	**2**
B2	The radio hardware designed so that when a user presses any button(s) on the radio's front, the radio does not fall over.	**1**

	Button characteristics	
B3	All buttons elicit a clear haptic (touch) click when pressed.	**1**
B4	All buttons elicit an audible click when pressed.	
B5	No buttons are overly sensitive to the extent that they are accidentally pressed when a user is exploring the equipment by touch.	**1**
B6	Any navigation type keys (arrows up/down/left and right) are shaped consistent with their function (eg triangular points).	**3**
B7	Any toggle button switches between only two states (e.g, voice output on, voice output off).	**2**
B8	Buttons to operate the most frequently used (basic) operations [power on/off/standby, volume up/down, station up/down] are more distinctive (using larger size, unique shape and/or texture) than those that operate less frequently used (advanced) operations.	**1**
B9	Dial controls that operate any function use tactile markers to indicate lowest and highest position, and current position of the dial, and/or use haptic or auditory clicks as they scroll through positions.	**2**
B10	Buttons/controls are rear lit (illuminated from behind) to ease identification.	**2**
	Button grouping and spacing	
B11	No two buttons are so close in proximity that pressing one button results in the simultaneous pressing of another.	**1**
B12	No button relies solely on colour to make it distinctive.	**1**
B13	There is variation in size and shape of buttons across functional groups.	**1**
B14	Spaces within and between functional groupings enable users to identify and navigate functional groupings by touch.	**1**

	Button labels	
B15	Button labels contrast strongly against the background colour.	**1**
B16	Button labels use lower case text.	**2**
B17	Button labels use sans serif fonts (ie those without details at the extremities of characters).	**2**
B18	Button labels are positioned unambiguously in relation to their respective button (either on the button or closer to their target button than to any other button).	**1**
B19	All button labels are intuitive and unambiguous	**1**
B20	The function of all buttons is made clear from the user manual.	**1**
	Electronic text display	
B21	The electronic text display uses strongly contrasting light text against dark background.	**1**
B22	User is able to reverse the colour scheme on the electronic text display.	**2**
B23	The electronic text display minimises the use of scrolling/flashing text of which the movement can not be controlled by the user. Notes: It is likely that less text movement will be required when the electronic text display is larger.	**2**
B24	The electronic text display uses sans serif text of as large a size as feasible given display constraints.	**1**
	Voice output	
B25	Voice output is included as a feedback option.	**1**
B26	A voice output interface is used to communicate information carried on the electronic text display.	**2**
B27	Where voice output is provided, the default setting is for the voice output to be active.	**2**
B28	Voice output uses full words rather than spelling out words.	**2**
B29	Voice output sounds like a real person's voice.	**2**

B30	Voice output can be toggled on or off.	2
B31	Different levels of voice output can be selected by the user.(eg voice output can be set to basic output only, through to full menu output via voice, and additionally detailed usage instructions via voice can be selected when wanted by the user.)	2
B32	The speed of voice output can be adjusted.	3
B33	The voice used by the voice output can be selected by the user from a variety of voice options.	3
B34	The voice used by the voice output can be customised by the user (ie the user can record their own voice tags).	3

C	**Basic tasks**	
	Basic tasks: Switching on	
C1	The 'power on/standby' button is distinguishable from the other buttons because it is either larger and/or positioned in a predictable location (top, bottom, corners), and/or is positioned noticeably farther away from any other buttons or clusters of buttons.	2
C2	The 'power on/standby' button is labelled 'on' 'on/off' and/or uses the internationally recognised standby symbol.	2
C3	The button label is closer to its respective button than any other button; the label is not equidistant between buttons.	2
C4	The receiver returns to its last used state when turned on (after first use)	1
C5	The receiver includes a 'home' button to immediately return the user to listening to the last listened to radio station if the user gets lost in menus.	2

	Basic tasks: First time tuning	
C6	Radio default (factory setting) is to DAB at first use (if FM is also available).	**1**
C7	C2b A method of switching between DAB and any analogue states is used that does not rely on a toggle.	**2**
C8	When a user switches between DAB and any analogue states, appropriate feedback is provided (eg voice output, beeps…, suggestions from short preference survey).	**2**
C9	Radio default (factory setting) is to auto-tune at first use.	**1**
	Basic tasks: Changing radio station	
C10	If numeric keys 1–9 are used, they should be positioned in 3 rows of numbers, with '1' at the top left and '9' at the bottom right. The '0' (zero) key should be on an additional row beneath these three rows, underneath the '8' button.	**1**
C11	A number '5' button should have a raised nib as an identifier, consistent with the European Telecommunications Standards Institute (ETSI) standard for tactile identifiers ES 201 381.	**1**
C12	Design feature(s) is (are) incorporated to keep users informed during delays in feedback (eg instant audio feedback when user has activated a station switch, especially to a station on a different multiplex, to fill the delay gap; examples may include beeps, white noise, voice message indicating station change in progress).	**2**
C13	Design feature(s) is (are) incorporated to provide feedback when a user has pressed a button that will result in a station change; this type of feedback being unique to this function.	**2**
C14	User manual/instructions (and voice output, where present) must specify whether a user needs to press a button/depress a knob to select a channel whose position has been navigated to.	**2**
	Basic tasks: Changing volume	
C15	If two buttons are used to change volume, the volume increase button should be positioned above or to the right of the volume decrease button.	**1**

C16	The volume increase/decrease buttons should be labelled 'volume', 'vol' or 'v', with '+' or 'up' and '–' or 'down' to indicate direction.	1
C17	The volume increase/decrease buttons have tactile markings or tactile labels (not braille as this is only understood by a minority).	2

D	**Advanced tasks**	
	Advanced tasks: setting presets	
D1	Equipment has a function that automatically sets presets.Possibly via a simple process for storing presets on a 'store as preset' or 'do not store as preset' basis for available stations.	2
	Advanced tasks: pausing	
D2	The equipment supports voice output of its pausing functions and menus.	3
	Advanced tasks: recording	
D3	The equipment supports voice output of its recording functions and menus. No other specific suggestions at present, beyond standard buttons identification and manipulation, and voice output elements (above).	3
	Advanced tasks: using EPG	
D4	The equipment supports voice output of Electronic Programme Guide content. No other specific suggestions at present, beyond standard buttons identification and manipulation, and voice output elements (above).	3
	Advanced tasks: other (eg navigating menus)	
D5	The equipment supports voice output of its menus. No other specific suggestions at present, beyond standard buttons identification and manipulation, and voice output elements (above).	2

10. Insights from DAB industry interviews

10.1. Research questions

As outlined in the methods section to this report (see Chapter 3), the project included industry research to understand (a) the extent to which accessibility considerations for blind and partially sighted people are built into the product design and development processes for consumer digital radio equipment; (b) any industry standards used in these processes; (c) the barriers cited by industry interviewees to developing consumer digital radio equipment that is accessible to blind and partially sighted people, and (d) any solutions.

10.2. Motivation for the industry interviews

Given that the current project was designed to identify a broad range of equipment needs from accessible digital radio equipment for blind and partially sighted consumers, a valuable extension of the project scope was to take the findings to industry with the goal of understanding the barriers they cite to addressing the needs.

When commissioning this project, RNIB was also aware of Ofcom's 2007 publication of a commissioned audit of research on ease of use issues with domestic electronic communications equipment carried out by independent consultants (George and Lennard, 2007). One of the audit's conclusions was that there was little research available in the public domain to establish how internal corporate policies support or hinder companies in addressing usability and accessibility, and that this constituted a research gap. The industry interviews in the current project stood to gain insight on this question in relation to the needs of blind and partially sighted people. i2 media research has recently completed a related research project for Ofcom's Advisory Committee on Older and Disabled people, focused more broadly across different media (radio and television broadcasting, fixed and mobile telecommunications, and online). The findings of both research activities are supportive of each other, and the interested reader is referred to the i2 report to be published by Ofcom's ACOD in Q4 2008.

10.3. Main themes observed

10.3.1. Partnerships with representative groups and charities

Two of the six companies who took part in the interviews had actively engaged in activities designed to address the needs of blind and partially sighted consumers,

specifically in the development of products designed to meet the needs of blind and partially sighted consumers.

10.3.2. Representative groups – a useful source of insight

The two companies referred to in 10.3.1 as having engaged in activities designed to address the needs of blind and partially sighted consumers had both partnered with groups representing blind and partially sighted people. Both manufacturers had interfaced closely with the groups representing blind and partially sighted people to capture equipment requirements.

10.3.3. No direct research on needs of blind and partially sighted people from digital radio

Interestingly, some of the interviewees reported that prior to being invited to take part in the interview for the RNIB project they had not thought about whether their products were particularly inaccessible to blind and partially sighted people. This finding was supported by an observation that none of the project interviewees' companies had conducted their own research on the needs from digital radio equipment of blind and partially sighted consumers. Indeed, for the majority of participants' companies insight on their customers was derived mainly from returns of completed product registration cards. The insight provided by such mechanisms tends to be limited.

It is important to note that this low reporting by participant companies that they conduct user research was observed both in relation to the mainstream (non-disabled) market and to the older and disabled market generally; it was not only in relation to blind and partially sighted consumers.

10.3.4. Concerns about return on investment

Consistent with the findings from interviews with a wider cross-section of industry conducted and reported for Ofcom's ACOD (to be published in Q4, 2008), commercial considerations were those most often raised by industry interviewees. Interviewees from the digital radio industry all raised concerns that orienting their organisations to address the needs of blind and partially sighted people in their product ranges would constitute costs with little promise or evidence of any return on their investments.

Whilst the project's industry interviewees were well able to appreciate the difficulties faced by blind and partially sighted consumers in using digital radio equipment independently, all commented that any attempts to address the difficulties had to be

commercially viable. The majority of interviewees repeatedly reported that they were from companies of a scale that cannot support engagement in unprofitable activities.

10.3.4.1. Perception of a limited market for accessible digital radio equipment

The fundamental barrier raised repeatedly by interviewees was that there is only a small market for equipment specifically accessible to blind and partially sighted consumers. Another commercial barrier cited by interviewees in the current project included concerns that building in accessibility may be off-putting to companies' core (mainstream) markets. As described in section 8.2 however, this project's consumer research showed that accessible features in themselves need not be off-putting to mainstream consumers. Another commercial barrier cited by interviewees was that previous attempts at marketing accessible products have rarely been successful. One reason cited for this, from more than one interviewee, was that some retailers have not supported the marketing of accessible digital radio products, by not assigning sufficient shelf space in competitive retail environments. Others in the supply chain questioned whether consumers would be prepared to pay more for more accessible digital radio equipment.

10.3.4.2. No consumer demand for accessible equipment

A related observation, rarely raised without prompting by interviewees, is that if consumers were made more aware of the availability of accessible and easy to use digital radio equipment and choose to purchase it over less accessible and more difficult to use equipment, there would be a natural market pressure on the supply chain to provide accessible and easy to use products. None of the interviewees reported any awareness of significant consumer demand for digital radio products with voice output, or for products otherwise designed to be specifically accessible to blind and partially sighted people.

10.4. Solutions discussed by industry interviewees

10.4.1. Better interfaces with representative groups and charities

Interfacing with representative groups and charities as a minimum provides access to insight on the needs of blind and partially sighted consumers, and the potential for support in marketing of digital radio products to target consumers. Some of the interviewees indicated a willingness to interface with organisations representing the interests of blind and partially sighted people. RNIB was included as such an organisation.

10.4.2. Current limited interest in research on the needs of blind and partially sighted people

Consistent with the previous finding, all the interviewees expressed interest in being given access to the final results of the current study on the needs of blind and partially sighted consumers from digital radio equipment. Interviewees made clear that of key importance in supporting any improvement was actionable advice about how to improve the accessibility of their products to blind and partially sighted people. Examples cited included written down guidelines, and better availability of shared user research data.

10.4.3. Improved confidence that a market exists

Interviewees' concerns that there is only a small market for digital radio equipment specifically accessible to blind and partially sighted consumers were probed by the project interviewers. Specifically, interviewees were asked whether their concerns could be allayed by demonstrations that addressing many of the equipment needs of blind and partially sighted consumers could improve the ease with which sighted consumers could use the equipment. Broadly positive feedback was obtained in this regard. Similarly positive feedback was obtained at presentations of the results at industry meetings in London (July 2008, hosted by Intellect) and Brussels (August 2008, hosted by EICTA).

10.4.4. Consumer education and information

A theme referred to tangentially several times in the interviews was that consumers are not, in large numbers in any case, demanding digital radio equipment that is accessible to blind and partially sighted people. One solution discussed was the need for provision of comparative information on how easy to use and accessible are different models and brands of digital radio equipment. As is reported in relation to other products (eg Ricability's digital television product evaluations see www.ricability-digitaltv.org.uk), the products most accessible to blind and partially sighted people could then be badged, labelled or promoted as such.

Another solution discussed was that if a broad range of consumers experienced that digital radio equipment designed to be accessible to blind and partially sighted people was easier for them, then this could support the marketing of such equipment. Another suggested solution, not received as warmly by all, was to encourage consumers to complain about any difficulties they experience when using digital radio equipment.

10.4.5. Technical developments over time cited as most probable solutions

The majority of the industry interviewees suggested that technical improvements over time will make accessibility features, such as voice output of button presses, more feasible (easier and cheaper) to include in consumer electronics products. The key development likely to support this, is that the evolution of digital radio modules is in any case towards more powerful processors and more memory. Once standard modules have sufficient processing power and memory to support voice output, including voice output would necessitate a smaller price increase relative to a product that does not support voice output than does implementing voice output today. Eventually the only price uplift should be in relation to interface design and software development.

10.4.6. Levers to speed up change: international standards and procurement

To speed up technical developments, levers discussed included accessibility considerations featuring in tender documentation for public procurement, and international standards supporting accessibility features. Whilst these topics were referred to briefly in the interviews, none of the interviewees had detailed suggestions about either.

10.4.7. Lukewarm reactions to any new legislation or regulation

No interviewees welcomed the prospect of any new legislation or regulation to force them to better address the needs of older and disabled people. This point was stressed repeatedly in the international context of the digital radio equipment market, where difference in requirements between countries is seen as a hindrance by industry.

11. Conclusions

11.1. Blind and partially sighted users are more reliant on radio than are sighted users

Consistent with much of the background literature reviewed in the project, access to radio was revealed in both the project's qualitative and quantitative research as more important to blind and partially sighted than to sighted participants. Blind and partially sighted participants were more likely to refer to listening to the radio as their favoured pastime.

11.2. Simple design considerations could improve access

Through analysis of the project's in-depth interviews, and videos of participants using their own and new digital radio equipment, an inventory of design considerations was developed within the project. This was developed into a checklist (see Chapter 9). If implemented, these design considerations could improve access to digital radio for blind and partially sighted people, and usability for sighted people. The most important design considerations identified relate to button feedback, button design, physical properties of the text display and interface software design.

11.3. Current limited interest in, and concerns about, advanced functions

Many blind, partially sighted and sighted participants showed no interest in advanced features either because they felt they had no need for them or they currently used and were comfortable with alternative methods for features such as recording. Many blind and partially sighted participants expressed concern that advanced features were not accessible to them because these features rely heavy reliance on the text display.

11.4. Industry is engaging with evidence-based prioritisation of design considerations

Design considerations included in the checklist were prioritised based on the judgement of two experts (taking into account the range of tasks that could be affected by addressing the design consideration, the frequency of tasks, and whether they were involved in basic use: switching on, changing station, changing volume). The

DAB equipment industry has shown initial signs of engaging positively with the recommendations included in the checklist following interim presentations of the project results.

11.5. Many of the design considerations are relatively easily addressable

Having shared the design considerations with industry at an interim juncture in the project, the project team received feedback that many of the checklist items are addressable by manufacturers in the product development process.

Interaction is ongoing between the project team, RNIB and the consumer digital radio equipment industry to support the implementation of many of the research recommendations.

11.6. Addressing the needs of people with sight problems has benefits for sighted consumers

Many of the usability and accessibility issues which affected blind and partially sighted participants' use of DAB radios were also observed to affect sighted participants' DAB experiences. These have been summarised in the report. Addressing the design considerations included in the checklist therefore has the capacity to impact positively on the user experience of digital radio equipment for both blind and partially sighted and sighted consumers.

11.7. Voice output enables blind and partially sighted consumers to use digital radio equipment almost as independently as sighted consumers

The biggest difference in how blind and partially sighted and sighted consumers use DAB radio is whether or not they can use their equipment independently. Comparing matched samples, relative to sighted DAB users, blind and partially sighted users are twice as likely to report needing help from another person to use their DAB radio.

Comparison of survey responses from blind and partially sighted consumers describing their use of DAB radios with and without voice output clearly demonstrated the high value of voice output for blind and partially sighted consumers. A similar proportion of blind and partially sighted users of digital radio with voice output report that they are able to use their radios independently as the proportion of sighted users of digital radio that can use their radio independently.

11.8. Industry cites pragmatic and commercial barriers

Industry representatives from the consumer DAB equipment supply chain cited a range of commercial barriers, including: difficulty evidencing return on investment (and thus building a compelling business case); concerns that building in accessibility may be off-putting to the core (mainstream) market; and that previous attempts at marketing accessible products have rarely been successful.

However, as has been shown in this report, many features that would improve accessibility and usability of a product to blind and partially sighted people would also improve usability for sighted people. Furthermore the project's consumer research showed that accessible features in themselves need not be off-putting to mainstream consumers; voice output received a neutral or positive response from sighted participants. A product marketed as an inclusive, usable design for a mass market – that is additionally usable by blind and partially sighted people – is likely to have a better market impact than a product marketed as primarily for blind people.

11.9. Industry would benefit from better availability of research insight, interaction with stakeholders and consumer awareness

Potential solutions suggested by interviewees included improved industry engagement and consultation with stakeholders, better access to research on user needs, actionable advice about how to improve accessibility, consumer education, and technical developments. This research report responds to the need for better research and the need for actionable advice.

11.10. RNIB is supporting better consumer information

The design checklist (Chapter 9) with this report is being used in a related research activity commissioned by RNIB from Ricability, who are using the checklist to evaluate a range of DAB radio equipment on the market. It is hoped that the results of this activity will influence consumers' future purchasing decisions for digital radio equipment.

11.11. RNIB is supporting the availability of more accessible digital radio equipment, in this and future work

Through the publication of this report, including the digital radio interface design consideration checklist (Chapter 9), and the ongoing comparative evaluation of currently available DAB radios against the checklist by Ricability, RNIB is supporting the availability of digital radio equipment that better meets the needs of blind and partially sighted, and sighted, consumers. In further support of this goal, RNIB is engaged with manufacturers, others in the supply chain, representative industry bodies and the UK Government's Digital Radio Working Group.

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14. Glossary of terms

Audio Description
Like a narrator telling a story, audio description is an additional commentary on television and video describing body language, expressions and movements

BPS
Blind and partially sighted people

DAB
Digital audio broadcasting

EPG
Electronic programme guide

LED
Light emitting diode

Voice output
A radio with voice output provides audible (synthetic or recorded) speech feedback to the user in one or both of two ways: first a voice can confirm via speech the buttons a user presses or functions a user alters, and second a voice can read out the information that appears on the radio's text display (eg station name, time, genre)

WiFi
The name of a popular wireless networking technology that uses radio waves to provide wireless high-speed Internet and network connections

Appendix A – Short Preference Survey on DAB use

Hello! We are conducting research for the Royal National Institute of Blind People to understand if and how DAB digital radio could be made more easy to use for blind and partially sighted people.

DAB stands for Digital Audio Broadcasting. Compared with the older analogue radio signal, digital radio can offer more choice of channels and improved sound quality. The more robust digital signal is less susceptible to the effects of different types of interference, for instance, bad weather conditions. New digital radios can provide extra information about the radio station and the current programme, usually on a small screen, like a radio programme guide. With some digital radios the user can record, pause and rewind live radio.

1. Do you have DAB digital radio equipment that you use at home?
   [SINGLE CODE]
   Yes . . . .[1] go to Q2
   No . . . .[2] END
   Don't know . . . .[3] END

Thinking of the DAB digital radio you use the most …
2. How long have you had this radio?
   [SINGLE CODE]
   Over a year . . . .[1]
   Between 6 months and a year . . . . . .[2]
   Over 3 months and up to 6 months .[3]
   Over 1 month and up to 3 months . .[4]
   Up to 1 month . . . .[5]
   Don't know . . . .[6]

3. Thinking back to when you first got this digital radio and when you first started to use it, did you need any advice, help or support from any other person (not from audio or other manuals) with…:
   a. getting the radio out of its packaging, for the first time?
      [SINGLE CODE]
      Yes . . . .[1]
      No . . . .[2]

Don't know/not applicable . . . . . .[3]

b. using the operating instructions/user manual that came with it (note: whatever the format: CD, internet, paper, large print), for the first time?
[SINGLE CODE]
Yes . . . .[1]
No . . . .[2]
Don't know/not applicable . . . . . .[3]

c. plugging the radio in, for the first time?
[SINGLE CODE]
Yes . . . .[1]
No . . . .[2]
Don't know/not applicable . . . . . .[3]

d. inserting batteries, for the first time?
[SINGLE CODE]
Yes . . . .[1]
No . . . .[2]
Don't know/not applicable . . . . . .[3]

e. switching the radio on/off, for the first time?
[SINGLE CODE]
Yes . . . .[1]
No . . . .[2]
Don't know/not applicable . . . . . .[3]

f. tuning the radio in for the first time (scanning for channels)?
[SINGLE CODE]
Yes . . . .[1]
No . . . .[2]
Don't know/not applicable . . . . . .[3]

g. setting/storing presets, for the first time?
[SINGLE CODE]

[SINGLE CODE]
Yes . . . .[1]
No . . . .[2]
Don't know/not applicable . . . . . .[3]

h. accessing information on the text displays on the radio, for the first time?
[SINGLE CODE]
Yes . . . .[1]
No . . . .[2]
Don't know/not applicable . . . . . .[3]

i. knowing which station you are listening to, for the first time?
[SINGLE CODE]
Yes . . . .[1]
No . . . .[2]
Don't know/not applicable . . . . . .[3]

j. changing station, for the first time?
[SINGLE CODE]
Yes . . . .[1]
No . . . .[2]
Don't know/not applicable . . . . . .[3]

k. tuning to a specific station (eg BBC Radio 4), for the first time?
[SINGLE CODE]
Yes . . . .[1]
No . . . .[2]
Don't know/not applicable . . . . . .[3]

l. changing volume, for the first time?
[SINGLE CODE]
Yes . . . .[1]
No . . . .[2]
Don't know/not applicable . . . . . .[3]

m.using a remote control to control your digital radio, for the first time?
[SINGLE CODE]
Yes . . . .[1]
No . . . .[2]
Don't know/not applicable . . . . . .[3]

n. finding out what programmes were going to be on that evening or later that week that may have interested you, using your radio, for the first time?
[SINGLE CODE]
Yes . . . .[1]
No . . . .[2]
Don't know/not applicable . . . . . .[3]

o. finding out what the time was, for the first time?
   [SINGLE CODE]
   Yes . . . .[1]
   No . . . .[2]
   Don't know/not applicable . . . . . .[3]

p. pausing live radio, for the first time?
   [SINGLE CODE]
   Yes . . . .[1]
   No . . . .[2]
   Don't know/not applicable . . . . . .[3]

q. forwarding and/or rewinding, back to live radio, for the first time?
   [SINGLE CODE]
   Yes . . . .[1]
   No . . . .[2]
   Don't know/not applicable . . . . . .[3]

r. recording a radio programme, for the first time?
   [SINGLE CODE]
   Yes . . . .[1]
   No . . . .[2]
   Don't know/not applicable . . . . . .[3]

s. playing back a recorded radio programme, for the first time?
   [SINGLE CODE]
   Yes . . . .[1]
   No . . . .[2]
   Don't know/not applicable . . . . . .[3]

4. Nowadays, do you ever feel you need any advice, help or support from any other person with:
   a. using the operating instructions/user manual that came with it (note: whatever the format: CD, internet, paper, large print)?
   [SINGLE CODE]
   Yes . . . .[1]
   No . . . .[2]
   Don't know/not applicable . . . . . .[3]

b. plugging the radio in?
[SINGLE CODE]
Yes . . . .[1]
No . . . .[2]
Don't know/not applicable . . . . . .[3]

c. changing batteries?
[SINGLE CODE]
Yes . . . .[1]
No . . . .[2]
Don't know/not applicable . . . . . .[3]

d. switching the radio on/off?
[SINGLE CODE]
Yes . . . .[1]
No . . . .[2]
Don't know/not applicable . . . . . .[3]

e. retuning the radio (rescanning to find new channels)?
[SINGLE CODE]
Yes . . . .[1]
No . . . .[2]
Don't know/not applicable . . . . . .[3]

f. updating/setting/storing presets?
[SINGLE CODE]
Yes . . . .[1]
No . . . .[2]
Don't know/not applicable . . . . . .[3]

g. accessing information on the text displays on the radio?
[SINGLE CODE]
Yes . . . .[1]
No . . . .[2]
Don't know/not applicable . . . . . .[3]

h. knowing which station you are listening to?
[SINGLE CODE]
Yes . . . .[1]
No . . . .[2]
Don't know/not applicable . . . . . .[3]

i. changing station?
   [SINGLE CODE]
   Yes . . . .[1]
   No . . . .[2]
   Don't know/not applicable . . . . . .[3]

j. tuning to a specific station (eg BBC Radio 4)?
   [SINGLE CODE]
   Yes . . . .[1]
   No . . . .[2]
   Don't know/not applicable . . . . . .[3]

k. changing volume?
   [SINGLE CODE]
   Yes . . . .[1]
   No . . . .[2]
   Don't know/not applicable . . . . . .[3]

l. using a remote control to control your digital radio?
   [SINGLE CODE]
   Yes . . . .[1]
   No . . . .[2]
   Don't know/not applicable . . . . . .[3]

m. finding out, using your radio, what programmes are going to be on tonight or later this week that may interest you?
   [SINGLE CODE]
   Yes . . . .[1]
   No . . . .[2]
   Don't know/not applicable . . . . . .[3]

n. finding out what time it is?
   [SINGLE CODE]
   Yes . . . .[1]
   No . . . .[2]
   Don't know/not applicable . . . . . .[3]

o. pausing live radio?
   [SINGLE CODE]
   Yes . . . .[1]
   No . . . .[2]
   Don't know/not applicable . . . . . .[3]

   p. forwarding and/or rewinding, back to live radio?
     [SINGLE CODE]
     Yes ....[1]
     No ....[2]
     Don't know/not applicable ......[3]

   q. recording a radio programme?
     [SINGLE CODE]
     Yes ....[1]
     No ....[2]
     Don't know/not applicable ......[3]

   r. playing back a recorded radio programme?
     [SINGLE CODE]
     Yes ....[1]
     No ....[2]
     Don't know/not applicable ......[3]

5. Which, if any, of the following additional features do you think your radio has?
   Select all that apply [MULTICODE]
   a. operating instructions in alternative formats (audio/CD, large print, braille) .[1]
   b. voice output for all functions (where a voice confirms the buttons you
     press/functions you alter) ....[2]
   c. voice output for the information on the screen (where a voice reads out
     information that appears on the text display eg station name, time, genre) .[3]
   d. clock ....[4]
   e. pause live radio function ....[5]
   f. record function ....[6]
   g. easy way to store presets ....[7]
   h. electronic programme guide (on-screen programme guide which provides
     information about what programmes are going to be on later on the current and
     other stations, usually on the radio's - small screen) ....[8]
   i. sleep function ....[9]
   j. none of the above ....[10]

6. Which, if any, of the following additional features do you think are the most useful to have with a radio? Pick up to five from the list below - some will be functions you have on your current radio, some you may have heard of before, and some you may hear about for the first time in this list?
Select up to five [MULTICODE]

a. user manual (operating instructions) in alternative formats (audio/CD, large print, Braille) . . . .[1]
b. voice output for all functions (where a voice confirms the buttons you press/functions you alter) . . . .[2]
c. voice output for the information on the screen (where a voice reads out information that appears on the text display eg station name, time, genre) .[3]
d. clock . . . .[4]
e. pause live radio function . . . .[5]
f. record and playback function (where you record a programme onto the radio's memory disk/card) . . . .[6]
g. easier way to store presets . . . .[7]
h. electronic programme guide (on-screen programme guide which provides information about what programmes are going to be on later on the current and other stations, usually on the radio's - small - screen) . . . .[8]
i. sleep function . . . .[9]
j. none of the above . . . .[10]

7. Thinking of when you have used your digital radio, please indicate which, if any, of the following have happened
Select all that apply [MULTICODE]

a. I have got lost in a menu . . . .[1]
b. I have accidentally changed a setting (eg station, volume, power) without expecting to . . . .[2]
c. A setting (eg station, volume, power) has changed without me or anyone else pressing any button(s) . . . .[3]
d. Other (please specify) . . . .[4]
   Please specify: _____
e. None of the above . . . .[5]

8. When any of the above have happened, which of the following steps have you taken to try and fix the problem
    Select all that apply [MULTICODE]

    a. Carried on pressing buttons on the radio hoping to get back to where I was [1]
    b. Switched the radio off and on again . . . .[2]
    c. Asked someone else to help me (eg a friend, family member or housemate) [3]
    d. Referred to the instruction manual that came with the radio (note: whatever the format: CD, internet, paper, large print) . . . .[4]
    e. Called a telephone helpline for advice . . . .[5]
    f. Looked online for advice . . . .[6]
    g. None of the above . . . .[7]
    h. Other (please specify) . . . .[8]
    Please specify: _____
    9. What make and model is the radio you have answered this survey about?
    please specify make:_____
    model:_____

10. To what extent do you agree or disagree that the DAB digital radio you are answering this survey about is easy to use?
    Please select one [SINGLE CODE]
    a. Strongly disagree . . . .[1]
    b. Disagree . . . .[2]
    c. Neither agree or disagree . . . .[3]
    d. Agree . . . .[4]
    e. Strongly agree . . . .[5]
    f. Don't know . . . .[6]

11. Which three radio stations do you most enjoy?
    Specify THREE that apply [FREE TEXT]
    a. Favourite [1] . . . .[1]
    Please specify: _____
    b. Favourite [2] . . . .[2]
    Please specify: _____
    c. Favourite [3] . . . .[3]
    Please specify: _____

12. How many radios (analogue or digital) do you have at home that you use in total?
    [by radios we mean devices whose primary function is as a radio]
    Please select one [SINGLE CODE]
    a. 1 . . . .[1]
    b. 2 . . . .[2]
    c. 3 . . . .[3]
    d. 4 . . . .[4]
    e. 5 or more . . . .[5]

13. On how many of these can you listen to digital (DAB) radio?
    Please select one [SINGLE CODE]
    a. 1 . . . .[1]
    b. 2 . . . .[2]
    c. 3 . . . .[3]
    d. 4 . . . .[4]
    e. 5 or more . . . .[5]
    f. Don't know . . . .[6]

14. To what extent do you agree or disagree that the DAB digital radios are easier to
    use than analogue radios?
    Please select one [SINGLE CODE]
    a. Strongly disagree . . . .[1]
    b. Disagree . . . .[2]
    c. Neither agree or disagree . . . .[3]
    d. Agree . . . .[4]
    e. Strongly agree . . . .[5]
    f. Don't know . . . .[6]

15. What different devices or formats do you use to listen to digital radio broadcasts?
    Please select all that apply [MULTICODE]
    a. DAB digital radio . . . .[1]
    b. Digital TV . . . .[2]
    c. Internet . . . .[3]
    d. Mobile phone . . . .[4]
    e. (Podcasts via) MP3 . . . .[5]
    f. Other (please specify) . . . .[6]
    Please specify: _____

16. On average, how many hours a day do you listen to radio?
    Please select one [SINGLE CODE]
    a. Less than 1 hour . . . .[1]
    b. 1-2 hours . . . .[2]
    c. 2-4 hours . . . .[3]
    d. 4-6 hours . . . .[4]
    e. 6-10 hours a day . . . .[5]
    f. 10-14 hours a day . . . .[6]
    g. 14 hours a day or more . . . .[7]

17. What type(s) of programme(s) do you listen to?
    Please select all that apply [MULTICODE]
    a. Music . . . .[1]
    b. News/weather . . . .[2]
    c. Sports . . . .[3]
    d. Drama . . . .[4]
    e. Entertainment . . . .[5]
    f. Current Affairs . . . .[6]
    g. Other . . . .[7]
    Please specify: _____

18. What times of the day do you tend to listen to the radio on WEEKDAYS (Monday-Friday)?
    Please select all that apply [MULTICODE]
    a. Breakfast peak (0600-1000) . . . .[1]
    b. Mid-morning (1000-1300) . . . .[2]
    c. Afternoon (1300-1600) . . . .[3]
    d. PM/'Drive' (1600-1900) . . . .[4]
    e. Evening (1900-midnight) . . . .[5]
    f. Overnight (midnight-0600) . . . .[6]

19. What times of the day do you tend to listen to the radio on WEEKENDS (Saturday-Sunday)?
    Please select all that apply [MULTICODE]
    a. Breakfast peak (0600-1000) . . . .[1]
    b. Mid-morning (1000-1300) . . . .[2]
    c. Afternoon (1300-1600) . . . .[3]
    d. PM/'Drive' (1600-1900) . . . .[4]
    e. Evening (1900-midnight) . . . .[5]
    f. Overnight (midnight-0600) . . . .[6]

Background information

20. What sex are you?
    [SINGLE CODE]
    a. Male . . . .[1]
    b. Female . . . .[2]

21. Which of the following age bands are you in:
    [SINGLE CODE]
    a. 18 - 24 . . . .[1]
    b. 25 - 34 . . . .[2]
    c. 35 - 44 . . . .[3]
    d. 45 - 54 . . . .[4]
    e. 55 - 64 . . . .[5]
    f. 65-74 . . . .[6]
    g. 75-84 . . . .[7]
    h. 85+ . . . .[8]

22. Which of the following best describes your ownership of the property you live in?
    [SINGLE CODE]
    a. Living in a property that you/your family own outright/ with a mortgage . .[1]
    b. Living in property rented privately . . . .[2]
    c. Living in property rented from the council/housing association . . . .[3]
    d. Other living arrangement . . . .[4]

23. Do you live…?
    [MULTICODE]
    a. Alone . . . .[1]
    b. With your partner/husband/wife . . . .[2]
    c. As a family with your parent(s) . . . .[3]
    d. As a family with your child(ren) . . . .[4]
    e. In a shared household (eg with friends, colleagues, siblings) . . . .[5]
    f. Other . . . .[6]
    Please specify: _____

24. Do you have any long term illness, health problem or disability with any of these areas of your life?
    Please select all that apply [MULTICODE]
    a. Prefer not to say/none . . . .[1] go to Q27
    b. Mobility (moving about) . . . .[2] go to c
    c. Lifting, carrying or moving objects . . . .[3] go to d
    d. Manual dexterity (using your hands to carry out
       everyday tasks) . . . .[4] go to e
    e. Memory or ability to concentrate, learn or
       understand . . . .[5] go to f
    f. Speaking problems . . . .[6] go to g
    g. Hearing problems . . . .[7] go to h
    h. Vision problems, not corrected with spectacles or
       contact lenses . . . .[8] if yes go to Q25
    else Q28

25. Which of the following describe what you are able to see?
    [MULTICODE, sequential]
    a. Prefer not to say . . . .[7] go to Q26
    b. In a room during daytime, you can tell by
       the light where the windows are . . . .[1] if no, then go to Q26, else b
    c. You can see the shapes of the furniture
       in a room . . . .[2] if no, then go to Q26, else c
    d. You can see well enough to recognise a friend
       if you get close to his or her face . . . .[3] if no, then go to Q26, else d
    e. You can you see well enough to recognise a
       friend who is at arm's length away . . . .[4] if no, then go to Q26, else e
    f. You can see well enough to recognise a
       friend across the room . . . .[5] if no, then go to Q26, else f
    g. You can see well enough to recognise a
       friend across the road . . . .[6] go to Q26

26. Are you registered blind or registered partially sighted?
    Please select one [SINGLE CODE]
    a. Registered blind . . . .[1]
    b. Registered partially sighted . . . .[2]
    c. Neither . . . .[3]
    d. Don't know . . . .[4]

27. What is your preferred reading format?
    Please select one [SINGLE CODE]
    a. Large print . . . .[1]
    b. Braille . . . .[2]
    c. Audio   . . . .[3]
    d. Electronic (email/internet/disk) . . . .[4]
    e. Other . . . .[5]
    Please specify: _____

28. We are planning a small number of follow up interviews with people who have
    completed this short survey. Each person selected will be paid £30 for taking part
    in a 60-90 minute interview.

    If you would be willing to take part in a more detailed interview about your
    experiences of DAB digital radio equipment, please provide your name and contact
    number to the interviewer.
    Name: _____
    Phone number: _____

Appendix B – Data tables

Table AB3.1 Comparison of the age distribution of the research sub-samples with the Network 1000 nationally representative data for the blind and partially sighted population

	18-29 years	30-49 years	50-64 years	65+ years
nationally representative sample (all)	19%	34%	25%	22%
nationally representative sample (DAB: n=225)	19%	36%	30%	14%
blind and partially sighted sample (DAB: n=100)	7%	36%	38%	20%
blind and partially sighted sample (network 1000: n=1007)	20%	21%	22%	37%

Table AB5.1 How many radios (analogue or digital) do you have in total?

	1	2	3	4	5 or more	don't know
nationally representative sample (n=225)	28%	24%	19%	12%	16%	1%
blind and partially sighted sample (n=100)	2%	11%	27%	14%	46%	0%

Table AB5.2 On how many of these can you listen to digital (DAB) radio?

	1	2	3	4	5 or more	don't know
nationally representative sample (n=225)	64%	24%	6%	2%	3%	1%
blind and partially sighted sample (n=100)	27%	33%	27%	4%	9%	0%

Table AB6.1 Experienced some difficulty with DAB radio

	Experienced some difficulty	Never experienced difficulty
National Representative Sample (n=225)	47%	53%
BPS – no voice output (n=58)	91%	9%
BPS – voice output (n=42)	86%	14%

Table AB7.1 Which five of the following nine (DAB radio) features are most useful?

	Accessible user manual	VO: button presses/ function	VO: text display	Clock	Pause	Record/ playback	Easy presets	EPG	Sleep
National Rep' Sample (n=225)	32%	24%	27%	47%	44%	42%	44%	43%	32%
BPS – no voice output (n=58)	79%	86%	77%	19%	47%	63%	35%	33%	16%
BPS – voice output (n=42)	83%	98%	67%	57%	33%	36%	26%	45%	24%

Table AB8.1 Proportion of samples requiring any help for first time use and subsequent use, with any task and any basic task

	First time use		Subsequent use	
	Any help needed; any task (19 items)	Any help needed; basic tasks (12 items)	Any help needed; any task (18 items)	Any help needed; basic tasks (11 items)
National Representative Sample (n=225)	39%	32%	17%	14%
BPS – no voice output (n=58)	90%	90%	69%	69%
BPS – voice output (n=42)	48%	48%	26%	26%

Table AB8.2 Average number of tasks for which help from someone else was needed by each sample

	First time use		Subsequent use	
	Any help needed; any task (0-19)	Any help needed; basic tasks (0-12)	Any help needed; any task (0-18)	Any help needed; basic tasks (0-11)
National Representative Sample (n=225)	1.8	1.1	0.3	0.6
BPS - no voice output (n=58)	6.2	5.7	2.2	2.4
BPS - voice output (n=42)	2.2	2.1	0.5	0.5

Table AB8.3 Thinking of when you have used your digital radio, please indicate which, if any, of the following have happened (base: respondents reporting at least some difficulty in using DAB radio)

	Lost in a menu	Accidentally changed setting	Setting changed without touching	Other difficulty
National Representative Sample (n=225)	19%	33%	14%	8%
BPS - no voice output (n=58)	60%	74%	22%	38%
BPS - voice output (n=42)	36%	48%	31%	38%

Table AB8.4 When any of the above (difficulties) have happened, which of the following steps have you taken to try and fix the problem? (base: respondents reporting at least some difficulty in using DAB radio)

	Hopeful button pressing	Switch DAB off/on	Ask for local help	Refer to user manual	Call helpline	Look online	Other
National Representative Sample (n=106)	55%	52%	31%	55%	5%	8%	7%
BPS - no voice output (n=53)	62%	79%	70%	31%	6%	13%	28%
BPS - voice output (n=36)	39%	64%	22%	9%	11%	11%	36%

Table AB8.5 To what extent do you agree or disagree that the DAB digital radio you are answering this survey about is easy to use?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
National Representative Sample (n=225)	3%	4%	8%	48%	36%	1%
BPS - no voice output (n=58)	5%	22%	14%	36%	22%	0%
BPS - voice output (n=42)	0%	0%	0%	17%	83%	0%

Table AB8.6 To what extent do you agree or disagree that the DAB digital radios are easier to use than analogue ones?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know
National Representative Sample (n=225)	3%	20%	17%	37%	21%	1%
BPS – no voice output (n=58)	28%	31%	10%	22%	9%	0%
BPS – voice output (n=42)	10%	10%	33%	33%	12%	2%