Realising the
potential of
people & places

CITIES UNLOCKED

This report looks at the possibilities for technology-enabled
navigation and mobility for people with sight loss in the UK

Cities **Unlocked**

When the Cities Unlocked core partners first came together we had high hopes and bold ambitions for the project. Three diverse organisations with one common aim: to make cities more accessible for people with sight loss.

The diversity of our expertise was our greatest strength. It drove us all to embrace new ways of working, and to generate ambitious solutions to the daily challenges facing people with sight loss.

Everyone involved in the project takes from it a deep understanding of the vital role that collaboration and partnership have played in moving us from delivering just the ordinary to the extraordinary. It is clear that, from here on, creating agile and novel partnerships will be essential to achieving our aims, both within the Cities Unlocked project and as individual organisations.

We are very proud and excited by what has been achieved over the last three years – but we hope that this is only the beginning. We hope that what we have achieved to date will be a catalyst for national, and global, transformation in the way we think and design our cities: for people with sight loss, for those with other impairments, for everyone.

We hope you will join us in working to make the world a better place for all of us to move around in.

November 2014
Peter Madden, CEO Future Cities Catapult
Richard Leaman, CEO Guide Dogs
Nick Corrigan, Head of Microsoft Services UK

Cities **Unlocked**

CATAPULT Future Cities

GUIDE DOGS

Microsoft

With special thanks to...

Cities Unlocked would not exist without the extraordinary support of a select group of individuals, each with a different type of sight loss, who have contributed countless hours of their time to the project, walking the route around Reading, giving invaluable feedback and bringing so much crucial guidance to the project. Our heartfelt thanks go to all of the 24 participants who were so generous with their time especially John, Jennifer, Terry, Edward, Tim, Kirstie Grice, Lisa, Gerald, Jenny, Don and John.

Particular thanks also to our Group Partners for their patience and cooperation over the last year. They have allowed us to let loose a host of technical experts, people with sight loss, guide dogs, mobility instructors and camera crews across their premises and have always responded with good humour to our many and varied requests: Barclays Bank, First Great Western, Network Rail, Reading Buses, Reading Borough Council and Tesco.

Our research partners have, likewise, been with us every step of the way, providing the insights and evidence that has made our work so robust: Arup, CASA UCL, Helen Hamlyn Centre, University of Nottingham University (EPSRC EP/M000877/1 IMPETUS Transport Systems Catapult University Partnership EPSRC EP/G065802/1) and Superflux Studio.

Other organisations that have helped us on the journey include Afershockz, EE, MIBeacons/Mubaloo and Olswang. And special thanks to Imogen, Louise and Tom of Martineau & Co for their hard work and support.

BARCLAYS

First Great Western

NetworkRail

Readingbuses

Reading Borough Council
Working better with you

TESCO

3

FOREWORD

The Lord Holmes of Richmond

I am no stranger to a challenge. Losing my sight suddenly and unexpectedly at the age of fourteen had a devastating impact upon my life, especially in the early weeks and months.

Learning to come to terms with my sight loss wasn't easy, but over time I discovered the joy and liberation that came from focusing on my dreams instead of my disability – I found myself realising ambitions that at first seemed impossible. Whether with my Paralympic swimming, university achievements, working as a City lawyer or my work with the Equality and Human Rights Commission, the one lesson I've learned time and again is that all obstacles, however great, can be overcome.

The Cities Unlocked project has the potential to enable greater personal freedom for hundreds of thousands of visually impaired people, so they can overcome their own barriers in life; and this is the reason why I am so excited about this unique collaboration. The technology will not just enable blind people to move around with confidence, it will also give them the freedom to celebrate their human spirit, by allowing everyday decisions to be made spontaneously. This might sound like a small thing, but it represents a tremendous step forward in getting to the heart of the challenges people with sight loss face every day.

The research shown here represents a turning point in the way society thinks about people with sight loss and the expectations people with sight loss can have of society. I hope businesses, public service providers, city planners and others will rise to the challenge set out in this paper, and find inspiration in the work done to date, to transform the landscape in our cities forever.
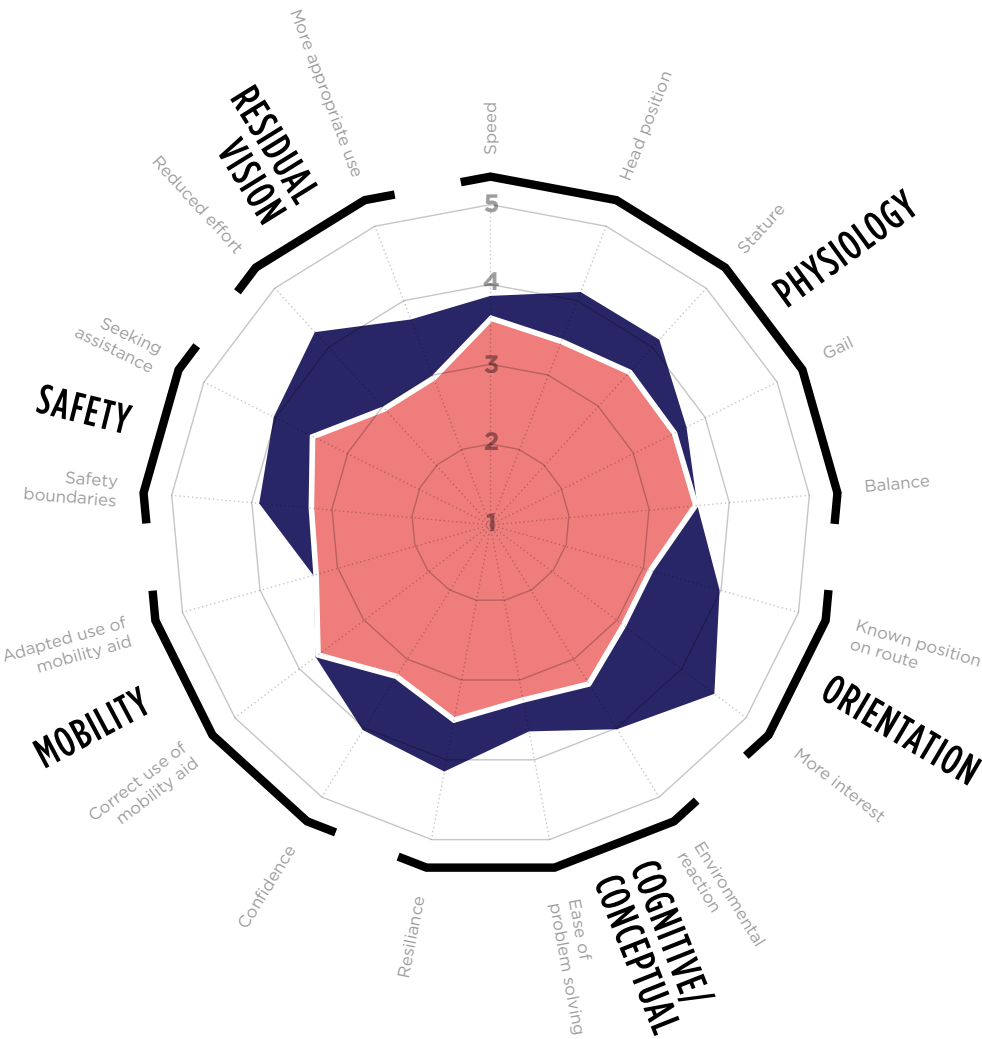
Likewise, I hope the work that the Cities Unlocked project has started will enable people with sight loss to experience a sense of empowerment and independence – freeing within them the potential to achieve their own hopes and dreams in the years ahead.

Chris Holmes

The Lord Holmes of Richmond

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

RESIDUAL VISION
- More appropriate use
- Reduced effort

SAFETY
- Seeking assistance
- Safety boundaries

MOBILITY
- Adapted use of mobility aid
- Correct use of mobility aid
- Confidence
- Resilience

PHYSIOLOGY
- Speed
- Head position
- Stature
- Gail
- Balance

ORIENTATION
- Known position on route
- More interest

COGNITIVE/ CONCEPTUAL
- Environmental reaction
- Ease of problem solving

Research instruments designed by Guide Dogs and administered by its professional Mobility Instructors were used to assess participants wellbeing. This graph shows the wellbeing measures of individuals before using the technology in pink and then after in blue. You can clearly see which measures the technology has enabled significant improvement on.

■ Before technology

■ With technology

Getting around cities is a nerve-wracking experience for too many people, especially those living with sight loss. Too often it feels like public spaces and services – from parks to transport systems – are designed with insufficient consideration for the people they serve.

Cities Unlocked was created to help fix this. Guide Dogs and Microsoft joined forces in 2011 to improve mobility and navigation for people with sight loss, and Future Cities Catapult followed in 2013. Over the last year, we have been working towards realising one ambition: to make cities more accessible for people with sight loss.

We've taken a holistic approach to identifying the challenges that urban environments pose for the visually impaired, and developed a demonstrator device in response. The result is a new headset that allows a smartphone app to provide the wearer with 3D-soundscapes, augmenting reality to provide a richer understanding of their surroundings.

Our testing demonstrates that the technology helps people feel more comfortable in their surroundings and better placed to navigate their environment. But this is just the start: we believe that this research provides a new way of thinking about people, places and the information that flows between the two. By opening the flow of data within cities, we can help everyone move around their city with confidence.

It's time to unlock our cities for all of their citizens.

"Recent years have seen a focus on assistive technologies in the home, usually for an ageing population with associated chronic disorders. It would be great to see some of the associated innovations in materials and smart surfaces moved into a broader urban environment."

JESSICA BLAND,
Technology Analyst Nesta

We have developed the Cities Unlocked demonstrator, which allows Nokia Lumia 930 and 1520 handsets to interact with an Aftershokz headset to provide three-dimensional audio to augment reality. The headset has been adapted using GPS, accelerometers and a compass to detect head orientation and provide spatially tailored audio, to give the wearer a better understanding of their surroundings. Currently it interacts with GPS, Bluetooth beacons and Wi-Fi along a technologically enabled route between London and Reading.

CHAPTER 1
Identifying the Challenges

As a first step, we undertook a series of research projects to better understand the challenges faced by people with sight loss as they plan and make a journey. One project quantified the emotional experiences of individuals with sight loss as they walk through cities: this identified road crossings, pedestrianised shopping areas and train stations as especially stressful.

We have developed almost 100 short videos which depict the physical, emotional and digital challenges that people with sight loss face when planning and making journeys in the city. These will be used to help build understanding and empathy among city leaders, and to help share the insights that the Cities Unlocked team has gained during this research.

CHAPTER 2
Building the Demonstrator

Based on our research, and equipped with a model of well-being, which set the benchmark for all our work, we developed a new sound-based technology designed to assist and enable people with sight loss as they plan and undertake journeys in the city.

The demonstrator technology has been tested on a route from Reading to London. This included walking to a bus stop, catching a bus to Reading rail station, navigating the station, catching a train to Paddington and navigating from the train to the ticket barrier. It also involved a personalised retail experience at a supermarket.

On the journey, a single app provides the user with real-time information about where they are, what's around them, and transport timetables. The technology seamlessly provides verbal and non-verbal information regarding orientation, navigation and points of interest using a 3D-SoundScape.

The technology is still only a concept demonstrator, but initial test results show that it helps people with sight loss to feel more competent, autonomous and engaged with their environment, and significantly improved 10 of 17 measures of wellbeing including confidence, relaxation, reassurance, spontaneity, a reduced need for planning journeys and increased awareness of location and surroundings.

CHAPTER 3
Identifying Opportunities

We believe that this is the beginning of an exciting shift in how we think about the relationship between people and place. Using different sources of data from our cities – from transport information to historical movements of individuals – we can generate further insights and services for people with sight loss and others by catering to their needs in a nuanced and tailored way. This will, of course, need to be done in ways that protects the privacy of individuals and puts them in control of their data.

We have shown the importance of using both data and human insight in developing urban innovations. Now we need city leaders to help boost citizen participation and ownership by acting on our suggestions and improving urban environments for everyone.

MARKET

7m

"We want to live like normal people, we don't always want to plan ahead to see if we can get community transport, or a taxi or something, we want to be able to just jump on a bus and go sometimes and have that freedom"

KIRSTIE, LONG CANE USER

Using the technology along Tamarisk Avenue in Reading

Understanding the everyday mobility problems of the visually impaired

1

IDENTIFYING THE CHALLENGES

Many people with sight loss are too anxious to leave home alone

Getting around cities is a nerve-wracking experience for too many people, especially those living with sight loss. It can often feel as though public spaces and services – from parks to transport systems – are designed with insufficient consideration for the people they serve.

Although many people with sight loss already tackle the challenge of getting around our cities independently, this can be extremely difficult. We know that 180,000 people with sight loss rarely leave home alone, as the thought leaves them feeling anxious and vulnerable.

This causes problems for society as well as individuals. Limited mobility is one of the factors contributing to unemployment rates among the blind

Superflux studio out with visually impaired participant using a go-pro camera

THE JOURNEY

We have created a route between Reading and London Paddington which is enriched with technology. Wi-FI and Bluetooth beacons deliver information to our demonstrator device, which can then be used to help the wearer understand their surroundings. Along the way, the hardware provides audio information to help the user navigate, board transport, find their way around shops and discover rich information about the world around them.
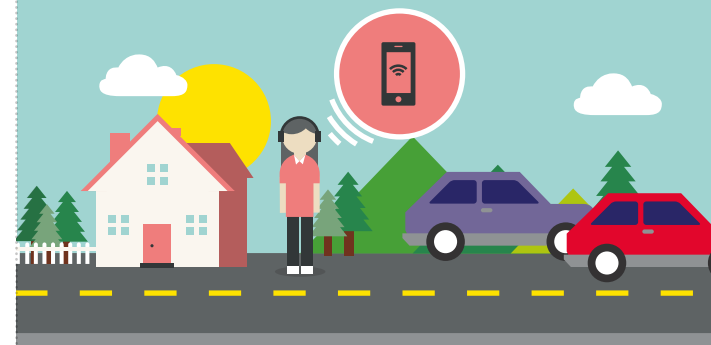
Walking down the street

Kate leaves her house and walks down Tamarisk Avenue towards Reading town centre. She's informed that there are cars parked on the pavement and low-hanging branches overhead.

of over 70%, compared to 7% for the general population. The absolute number of people with sight loss is likely to increase as the proportion of people in the UK with a visual impairment doubles between 2008 and 2050 to four million. This will put more pressure on city authorities as budgets continue to decline.

We wanted to understand why

Cities Unlocked came together to better understand and improve the experiences of individuals living with sight loss. We commissioned the Helen Hamlyn Centre at the Royal College of Art to shadow eight people with sight loss as they planned and undertook journeys and made a number of discoveries about how they experience the city.

The research showed that people with sight loss spend a lot of time planning their journeys, particularly those they're less familiar with, which is both time consuming and reduces opportunities for spontaneous outings and exploration.

Once out of the house, people with sight loss depend on a certain level of predictability when navigating roads. Things need to be where they usually are, as many of the group used a combination of memory and sensory cues – often heard or smelled – to locate themselves in the environment. Changes in a known route, such as road works or repositioned bus stops, can cause problems and may mean the individual requires assistance from a passer by.

We found people with sight loss are often dependent on other people to help
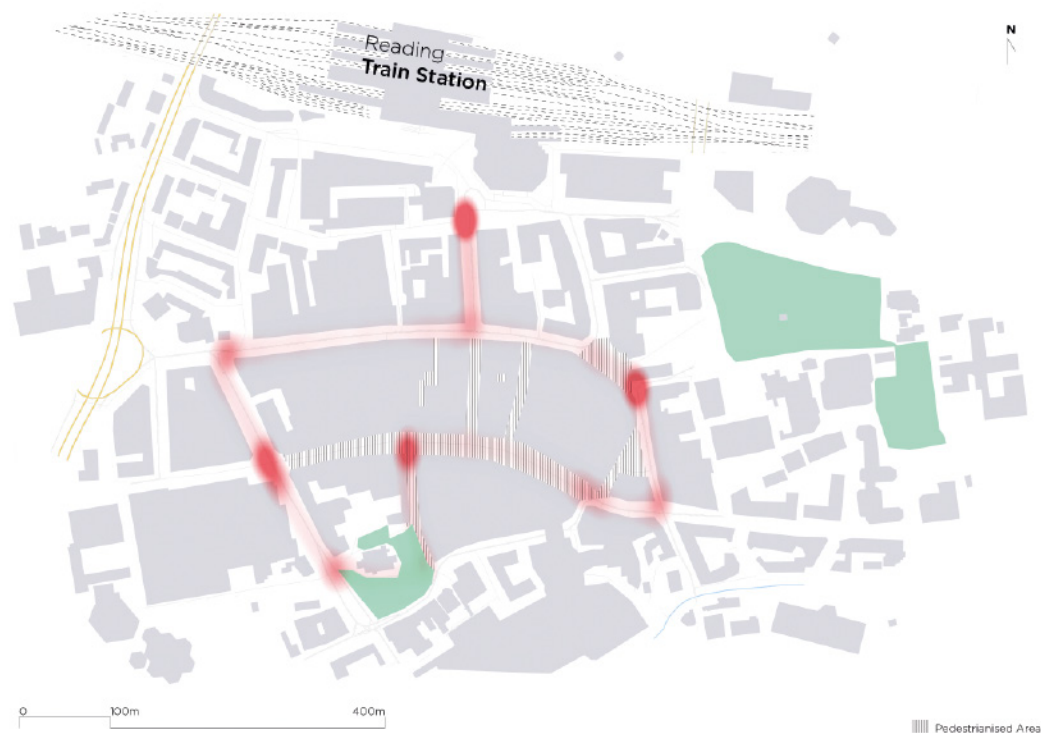
Heat map showing stress hot-spots from EEG brain monitoring revealing stress-points on the road network around Reading station of visually impaired participants

them when they're out and about. While most people go out of their way to be helpful, some members of the public are inexperienced in providing support to people with sight loss, which can cause social embarrassment and detract from the experience of independent travel.

Getting onto buses and trains can be stressful, particularly finding the doors, opening them and then finding an appropriate and available seat. Likewise knowing when and where to get off a bus or train can be a challenge, for example overcoming unexpected gaps or changes in height when stepping off the vehicle.

Train stations are complicated environments and are particularly difficult for people with sight loss, especially where their needs have not been factored into the design. Signage isn't always to the required standard

and the movement of large numbers of people in large public spaces can cause confusion and reduce confidence.

Maintaining confidence is another critical requirement for those with visual impairments when out and about. Making a familiar, let alone an unfamiliar journey, requires huge levels of concentration and can be extremely tiring. Confidence, once lost, can be hard to regain and can result in people 'giving up'.

We also found that many people with sight loss are already confident users of smart phones and some travel with two, so they have a back up if one should fail them. Though hands-free solutions are preferred (one hand is often occupied holding a guide-dog harness or long-cane) the combination of new low-cost technologies and more traditional mobility aids could, in time, become the 'new norm' for many people with

sight loss and could be used in different combinations according to specific needs and circumstances.

New mobile technology has provided further opportunities for new research. We asked the Centre for Advanced Spatial Analysis (CASA) at UCL to use electroencephalography (EEG) brain monitoring, a technology usually confined to the lab, to measure the cognitive and emotional responses of people with sight loss as they moved around the city, allowing us to – almost literally – get inside the heads of people with visual impairments.

The EEG monitoring research study recorded much higher levels of excitement and frustration for people

Stopping off for lunch

She stops off at Tesco to buy lunch. She uses the technology to do a quick sweep of the store and find the sandwich section. Once at the shelves, she uses the tag scanner on her phone to find out what's available. She chooses a sandwich, selects a drink from the adjacent fridge and then heads to the checkout to pay.

with sight loss than for those without. The data suggests that pedestrian shopping streets created increased frustration in the group with sight loss, and that green spaces decreased stress in both groups. As expected, road crossings were particularly high peaks for the visually impaired.

We set out to find solutions

Cities Unlocked first formed in 2011 following conversations between Guide Dogs and Microsoft about the potential of technology to improve mobility and navigation for people with sight loss. Future Cities Catapult joined in 2013, and over the last year the three organizations have been working together with one ambition – to make cities more accessible for people with sight loss.

During this time, many other organisations – from both the private and public sectors – have worked with the project to share their expertise and support the initiative. A quest as bold and ambitious as this cannot be done by one organisation alone but requires a unique collaboration and a willingness to share knowledge, experience and insight – which all of our partners have done.

We set out to develop a technology-enabled smart city experience that will enhance wellbeing. It is therefore important that we clearly understand what 'wellbeing' means, particularly in the context of visual impairment. Research conducted by Guide Dogs defines wellbeing as having four components:

Panos Mavros of CASA, UCL showing the data output of the emotiv EEG brain monitoring headset

Developing an innovative device to help people with sight loss explore their cities with confidence

- Physical wellbeing relates to bodily processes and systems.
- Emotional wellbeing concerns thoughts and feelings and the degree to which one feels positive and enthusiastic about oneself and about life.
- Social wellbeing concerns interdependence with others and the pursuit of harmonious relationships.
- Spiritual wellbeing may be intrapersonal (an individual's own sense of meaning, purpose and values in life), interpersonal (connecting with people, nature or animals) or transpersonal (connectedness to a higher, unknown power or energy)

This definition has informed the work of the project throughout, from research to concept development and testing.

The research enabled the user-experience architects at Microsoft to develop an 'experience blueprint' of a journey from Reading to London. This blueprint reflected all the problematic moments along the journey where it was felt technology could help the individual feel empowered to do more, through a sound-based experience which would create a greater sense of wellbeing.

The research also provided a wider tapestry of knowledge around journey-making, which offers various opportunities for planners and others delivering public services to make improvements which contribute to this effort.

2

BUILDING THE DEMONSTRATOR

Boarding the bus in Reading

The technology provided useful information: "I really liked how...it was describing the layout of the train and it was telling you where the toilets were and the buffet car and the baggage rack, it told you a lot about the context... you knew that it was describing the directions in the context of where you were going."
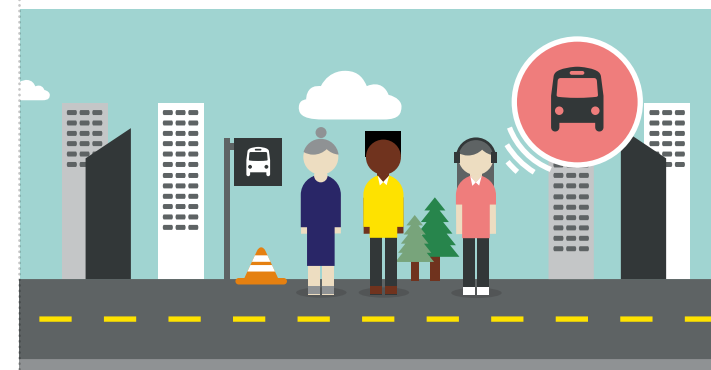
PARTICIPANT

Waiting for the bus

Kate heads to the bus stop. She is told what type of bus stop it is and given advice on how long she needs to wait as well as where to sit. A few minutes later she's notified the bus is just around the corner. This gives Kate plenty of time to gather her cane and bags.

We developed a technology demonstrator

Pairing Guide Dogs' mobility expertise and research into personal wellbeing with the technical capabilities of Microsoft proved to be a powerful combination. Our learning on the emotional responses of people with sight loss when navigating cities demonstrated a clear need to enhance and enrich their experience of urban environments. While navigation is an important part of this, just providing directions can be prescriptive, limiting and actually disempowering. Instead, we came to understand that providing people with a richer understanding of their surroundings was the best way to make them feel more confident in their city.

We started by considering how we could use consumer electronic devices to enable a person to build a richer picture of the environment around them through sound, without compromising their safety. Taking a user-centred design approach, we developed a demonstrator device that can supply the user with 3D audio which complements their own hearing and helps them build a more nuanced understanding of their surroundings

The concept we've created uses an app, currently on a Windows Phone, which supplies a personalised 3D-SoundScape to the wearer via a hands-free wearable headset using bone-conducting headphones. Crucially, these headphones don't cover the ears or impede the perception of the outside world, instead supplying sound by inducing vibrations in the wearer's skull.

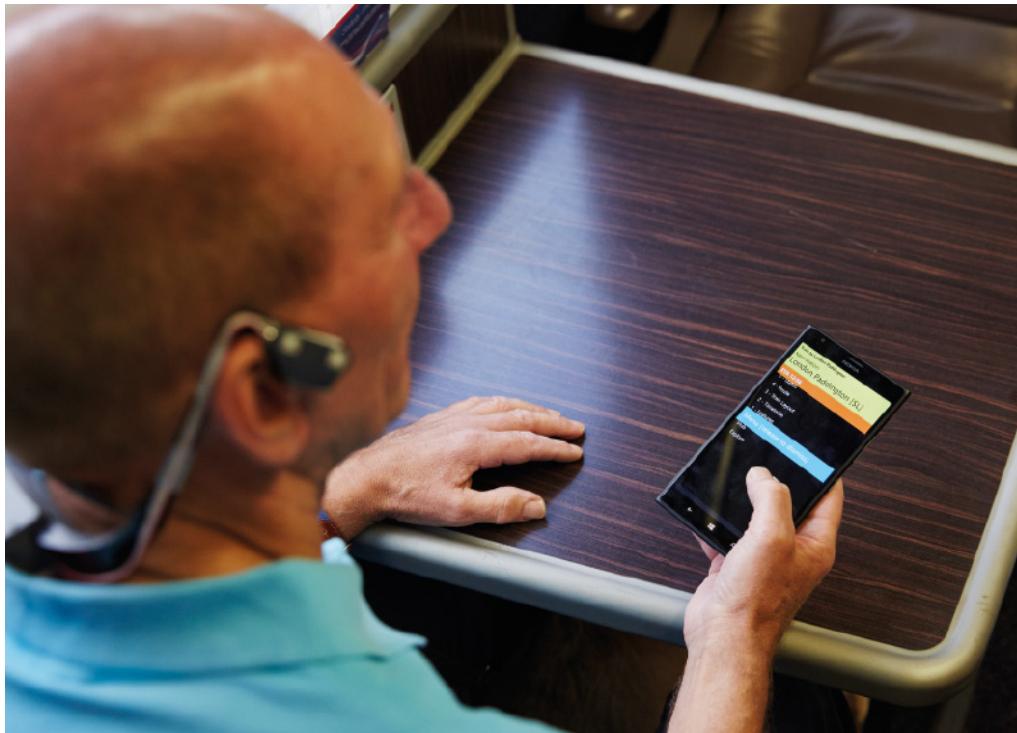The headset interacts with GPS, Wi-Fi and Bluetooth beacons in the urban

On the platform at Reading station

The headset and application for smart phone

environment, supplying sound cues for improved orientation and navigation and explanations of local points of interest and their relative distance. The headset also contains a series of custom additions, including a compass, accelerometer and gyroscope, which are used in conjunction with Bing maps to gain extra contextual information about the user's surroundings. These are also supplied as part of the audio soundscape.

The sounds provided to the user are tailored to them specifically. Using a Microsoft Kinect, we were able to perform head scans of each user to produce a personalised Head Related Transfer Function. This was used to model how the users process and

perceive sound, allowing us to deliver a personally targeted unique audio experience for each person. Taken as a whole, the demonstrator provides the user with additional information that they wouldn't usually gain from just using a guide dog or long cane, considerably enhancing their experience of moving through the city.

We tested the technology

The demonstrator was tested on a journey from a residential area in Reading to Paddington railway station in London – a route that was boosted with GPS, Wi-Fi and Bluetooth beacons to provide information delivered via the headset. The journey involved walking through the urban environment to a bus stop, catching a bus into Reading town centre, navigating to and around Reading rail station, catching a train to Paddington and navigating to the ticket barrier. It also involved a focused retail experience at Tesco Metro along the way.

We conducted a trial with eight participants, four of whom have some residual vision and four of whom have no residual vision and across a range of experience levels with technology. On a day-to-day basis, four of them use a guide dog as their primary mobility aid, three use a long cane, and one does not use a mobility aid at all, instead relying on their residual vision. Collecting data while the participants undertook the long, complex and unfamiliar intermodal journey, we were able to assess their wellbeing both with and without the technology.
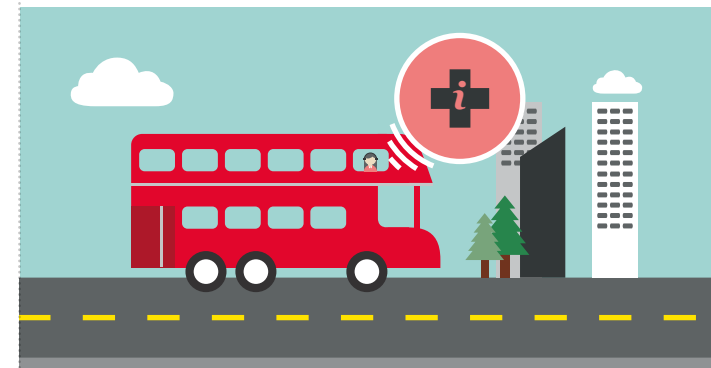
On the bus

Kate boards the bus and finds her seat. As she travels into town she learns that she's passing the university, the hospital, and other points of interest. She gets herself ready, as the bus pulls into the station and is guided to a quiet area so she can get her bearings before making her way into the station.

RESIDUAL VISION

PHYSIOLOGY

SAFETY

ORIENTATION

MOBILITY

COGNITIVE/ CONCEPTUAL
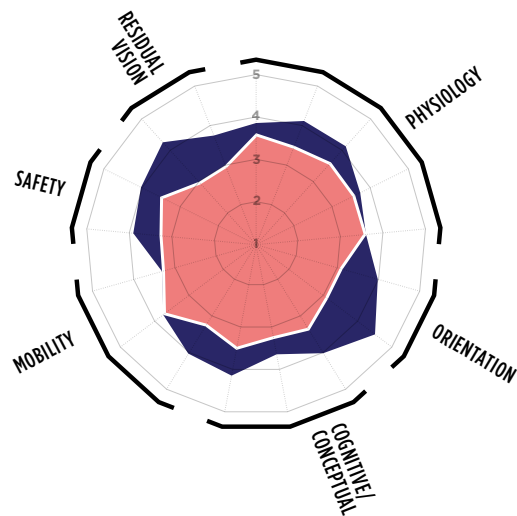
Results of research conducted by Guide Dogs showing the positive impact on wellbeing measures of the technology

What we can do to unlock cities for everyone

The results were better than we dared hope

The results are compelling. Guide Dogs' research found that 10 out of 17 measures of wellbeing were significantly increased when using the technology, with 62% of participants showing an increase in safety, confidence and resilience, allowing them to relax into the journey. The technology also made the journey less labour intensive and mentally challenging, reducing the need for planning journeys, and increasing awareness of location and surroundings. Importantly, the technology was shown to have no negative impact for any of the users.

These results suggest that the concept demonstrator is an extremely positive complement to traditional mobility aids. We're very excited about developing the next iteration of the technology.

A qualitative study of the observation transcripts and questionnaires collected on the trials was undertaken by the University of Nottingham. This independent analysis also used an Autographer device and stress measurements through a galvanic skin response bracelet and corroborated many of our own findings. Further, it stated that the technology has the potential to have a substantial positive

impact on journeys made by blind and partially sighted people. In particular, the technology:

• Increases confidence and ability to relax
• Provides reassurance
• Enables spontaneity
• Reduces the need for planning journeys to unfamiliar places
• increases awareness of the user's location and surroundings.

Although the information provided was easy to use and understand for most participants, some of the information provided by the technology will need some refinement. The amount and nature of the audio as well as the volume will need further consideration to ensure that even in loud environments the experience is not compromised.

Most participants were able to balance the use of the technology and their mobility aids effectively and found that these complemented each other. Participants generally trusted the technology but with the caveat that their mobility aid would take precedence if they received conflicting information. Encouragingly, all of the participants stated that they would use the technology again.

3

IDENTIFYING OPPORTUNITIES

Physical icons were used in a workshop run by Superflux Studio to build stories around possible future new ways of moving around and navigating in the city

"Increasing varieties of wearable technology will be available to augment our urban experiences. As manufacturing costs reduce, more bespoke products will become possible. Perhaps there is an opportunity to develop a product that can be modified or at least iteratively designed with blind or partially sighted people."

JESSICA BLAND, Technology Analyst Nesta

Empowering people is good for business and government

Cities Unlocked has shown that taking time to understand how people interact with their environment, and putting the user at the heart of both the research and the design process, can deliver high-impact results.

Business could also benefit from this approach and, more specifically, from a deeper engagement with people with sight loss. Ensuring that services work for this sector of society, and making best use of available technologies, could lead to a revolution in what we understand and expect from customer services. This could also lead to a host of new life-enhancing innovations that could benefit everyone.

Governments could also benefit. It is estimated that sight loss cost £22 billion in 2008 in the UK alone. A 2013 study by Deloitte on the economic impact of social care services estimated that for every £100 invested in care and support to assist adults with moderate care needs (including vision impairment), the state could benefit through a net return on investment of £130. Using technology to get people out and about could be a source of considerable cost savings to UK PLC.
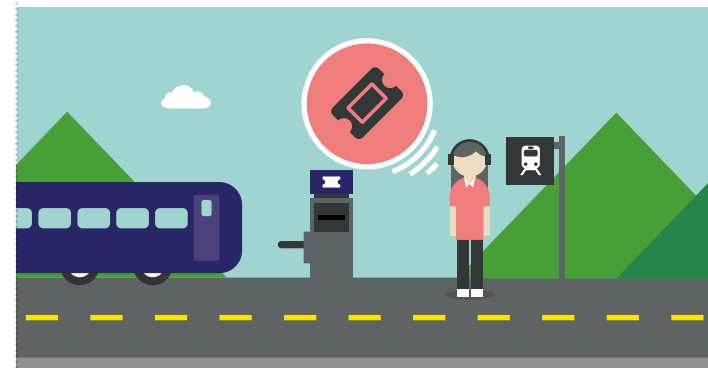
Navigating the train station

The layout of the station is described to her, so she knows exactly where the stairs, lifts and ticket barriers are. As her ticket and seat have been pre-booked, Kate goes straight to the ticket barriers and comes in range of beacons which let her know where the 'manned barriers' are.

In mixed groups, people with sight loss and city experts developed journey stories

Discussions developed into building scenarios for entire journeys and were then translated into a collage

Developing technologies collaboratively works

The Cities Unlocked technology has demonstrated that we can significantly improve the wellbeing of individuals by taking a joined-up approach to developing technologies.

Before starting to develop the demonstrator, the technology development team spent a considerable amount of time understanding the problems faced by people with sight loss, as well as the specific needs of partners across rail, bus and retail in order to develop a solution that would work for everyone.

There are five key lessons that we want to share with other organisations in the public and private sectors developing urban innovations:

1
Work collaboratively

2
Evidence the problem

3
Use human-centred design

4
Deploy pilot across a whole user experience/ range of city systems

5
Test and gauge your impact with holistic measures and refine

"I also think there's so much more thinking to be done at the systems level, rather than at the product level—but systems research where designers and artists are key contributors at every stage."

SARA HENDREN,
Expert in Assistive Technologies

Boarding the train

As she exits the lift to the platform she is told that her platform is number 10, which is seven metres to her right. Beacons direct her to the correct point to board the train and guide her through the carriage door, all the way to her reserved seat. She is told where the buffet carriage and toilets are and whether she is facing forwards or backwards. Armed with the knowledge, Kate is able to relax into the journey.
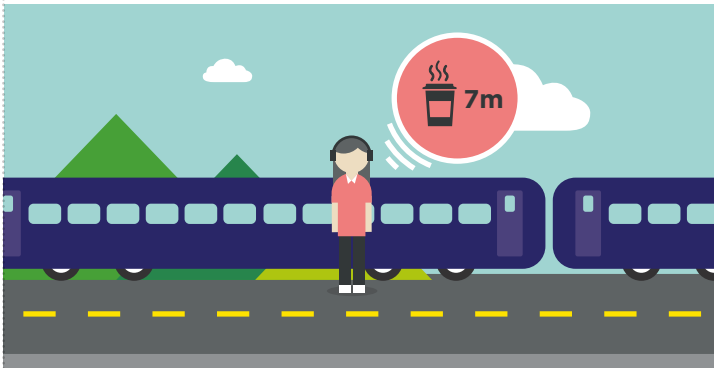
Five areas ripe for urban innovation

Cities Unlocked has identified five areas that we believe hold potential for further innovation in the near future. We worked with a group of eight individuals with sight loss, experts from design, technology and city planning and Superflux Studio to consider broad societal and technological trends in the context of mobility in cities for the visually impaired.

1. CITY AS LAB

The development and pervasive spread of smart phones and location-based sensors have allowed city planners to capture fine-grain, real-time data on how people move through the city, and they have been using this information to improve our cities. The next stage in this fast-evolving field of personalised technologies is likely to be wearable kit that measures our individual health and wellbeing, a trend called the 'quantified self'. This, should individuals choose to share data with city planners, provide more information on how we interact with our environment and how infrastructure can be improved through better design.

Innovations we can expect include more tailored routing of pedestrians through cities and improved information services for individuals with specific needs. Visualisations of this data can also help professionals to better understand the needs of different populations and develop services accordingly.

Collage of ideas for new developments in cities which improve mobility for people with sight loss

2. SENSORY CITY

Current urban design places great emphasis on sight as a sense, often at the expense of sound, touch and smell. There is huge potential to make better use of our other senses in the design of streets, transport and the delivery of information. Wearable technologies, combined with more accurate methods for measuring wellbeing, will allow us to cater to the needs of our other senses and deliver a richer, fuller experience of the city.

3. WEARABLES

The commercial potential of wearable technologies will drive innovation, producing cheaper and more powerful devices that people can use to augment their experience of the world. If developed with universal design principles, while being flexible enough to meet specific needs, they could prove especially useful for people with disabilities. Of particular interest is a device that sends out electromagnetic pulses from the wrist. These pulses bounce off hard surfaces allowing a person to 'feel' the shapes and contours of the physical world around

them. Taking into account the natural neuroplasticity of the human brain, this technology opens up opportunities to transform how we experience the world around us.

4. INTEGRATION

One of the key complaints of people with sight loss relates to boundaries (moving from the pavement to the road or transitioning from one app to another), edges (platform edges, walls, etc.) and switching between services (e.g. from train to bus, or from a GPS map to a museum guide). A human-centred approach to the development of products and services in the city will create a seamless experience for everyone. This requires collaboration as well as technology developed with open principles.

5. COMMUNITY CONNECTION

Overall, one of the biggest opportunities lies in physical and on-line community support networks for people with sight loss. There is huge potential for crowd-sourced route-sharing websites as well as social networking.

On the train

The train heads into London Paddington. Kate receives information about the route and is told that she's passing Windsor Castle. The directional nature of the technology means she has a good sense of where it is in relation to her. A man sitting opposite, not recognising that she is blind, asks her what the building 'over there' is. Kate asks him to describe it and confirms it is Windsor Castle.

"In the future we will know how the people move and how the people will want to move in the future… they will have feedback from the network that they themselves contribute to… so they might actually say: "rather than anonymising my data, in return for certain services over the network, I'm quite happy for my data to become personalised, and identifiable to me."

NICK BROMLEY, Founding Partner, iCity

CITIES UNLOCKED NEEDS YOU!

We need your support.
For more information about how you can get involved visit www.citiesunlocked.org.uk

"A sound trail or a scent trail in a woodland park... you can lead your friends and family... because so often you're being led"

AMIEE

Quick wins

We have identified a set of quick wins for professionals who contribute to how our cities look and feel. We think the following could help things move in the right direction in the short term and make cities more accessible for everyone.

Technologists and designers
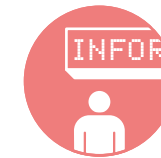
CONNECTED SIGNS
Digital signage needs to be designed with as much thought as analogue signs. High-contrast, high-resolution display systems such as e-paper could make information boards usable for more people.
Alternatives to street-cluttering sandwich-boards should be devised for business owners.

SOCIAL NETWORKING
Smart phones provide the opportunity for online communities to reach people when they're out in the city, feeling isolated or experiencing difficulties. People are already sharing route information but this could be developed further to help reach a larger number of people.

"What's really exciting about this is about how we can use technology to enhance the lives of customers, not just those that are visually impaired, but everybody, through giving them a more personalized shopping experience."
PAUL WILKINSON, Tesco

"One of the things that would be great is if I could walk my dog on my own, through the park, without a harness... having a sense of where I am and not having to rely on my dog"
MARY

Rail providers

SIMPLE TRAIN TICKET
A digital ticket, if compatible with assistive technology such as VoiceOver and PC screen readers, is a good alternative to paper tickets. However there must be standardisation across digital ticketing and all service providers to make it easy and consistent for all users. Although paper tickets are being phased out, in the interim period paper tickets need better information design to make them easier to understand for everyone. Paper tickets should also be readable by a digital device.

CUSTOMER SERVICE
Being able to request assistance digitally, or having automatic alerts when you enter a station, and being reassured that assistance is on its way and how long it will be, would ease anxiety.

City Planners

DIGITAL TAGGING
Digital tagging of obstacles such as wheelie bins using Near Field Communication (NFC) technologies could help people with sight loss.

SMART CURBS
Traditionally the curb edge has been used to separate people and cars. New solutions are being developed including digital and tactile edges, but must be easy for both guide dogs and people to recognise. Likewise, design best-practice should always acknowledge that long-cane users navigate by following the building line.

Policy Makers
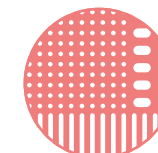
TACTILE PAVING
In 1998 the Department for Transport published its 'Guidance on the use of Tactile Paving Surfaces' but this guidance is often ignored or applied inconsistently to the built environment. Updating this national guidance document to ensure it included current best practice street design, and then making this a binding requirement, would improve both the consistency and usefulness of tactile paving.

RETRAINING
Developers should be required by law to provide retraining for local people with sight loss where pedestrian routes have been changed. Section 106 funds could be used to fund mobility instructors to provide this training.

Bus providers

BUS INFORMATION
Making journey information digitally accessible (e.g. for timings of bus services outside London) and making 'next stop' and destination information compulsory in audio (see Guide Dogs' Talking Buses campaign) could improve access and use of these services.

SENSABLE SEATS
Sensors could be used to help people with sight loss locate empty seats and communicate directly with a personal device.

TANDEM BIKE SHARING SERVICE
Bikes Available: 4
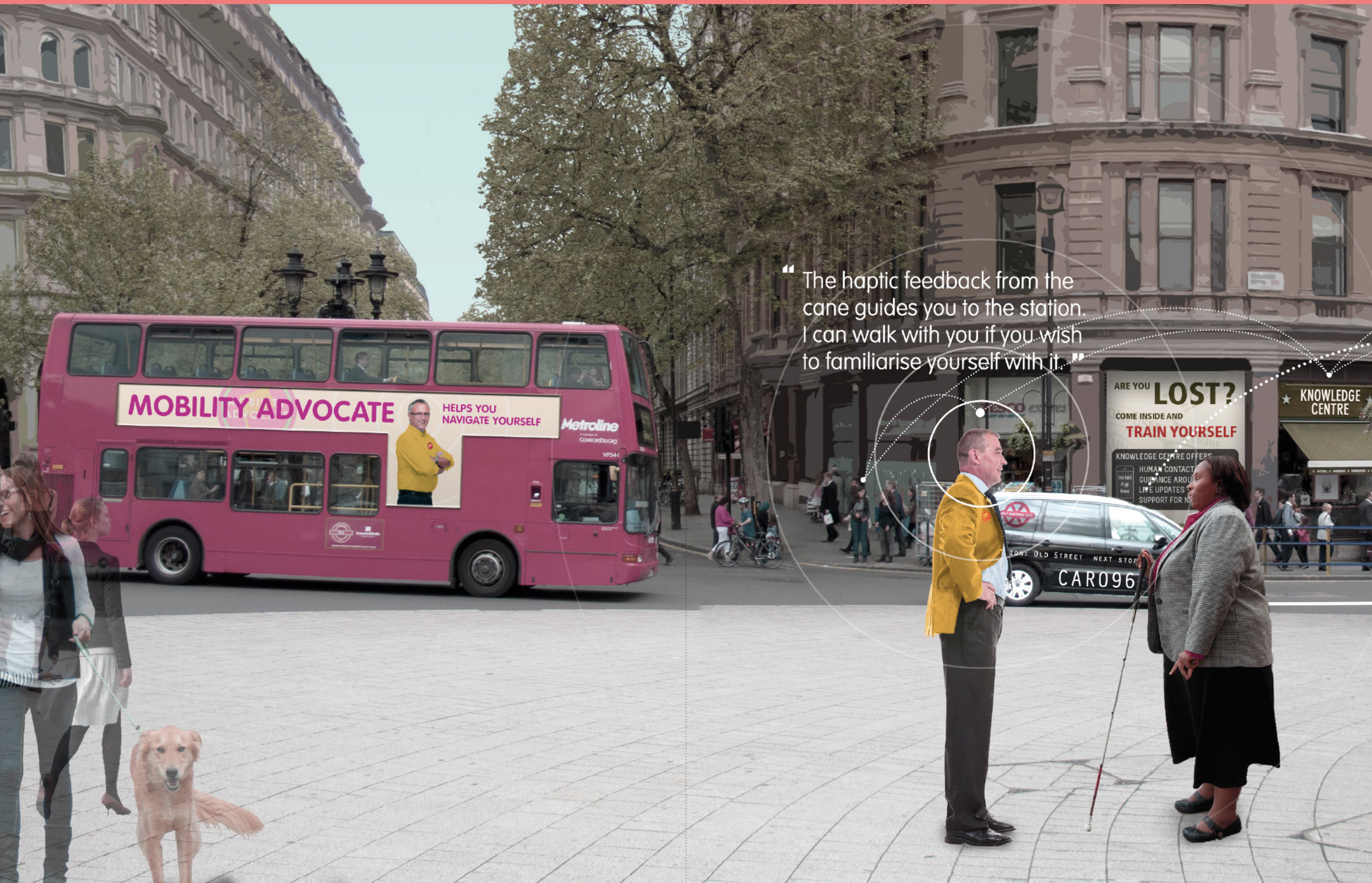Lead cyclists nearby: 3

MUSIC VISTA

SELF DRIVING CAR 0034
Next car: 50 seconds
Destination: Knowledge Centre
Voice Support: Yes

Sensory Maps

SCENT TRAIL
Type : Food (Bakery)
Epicentre : 30 Metre Away

The haptic feedback from the cane guides you to the station. I can walk with you if you wish to familiarise yourself with it.

MOBILITY ADVOCATE
HELPS YOU NAVIGATE YOURSELF

Metroline

ARE YOU LOST?
COME INSIDE AND TRAIN YOURSELF

KNOWLEDGE CENTRE OFFERS
HUMAN CONTACT
GUIDANCE AROUND
LIVE UPDATES
SUPPORT FOR N...

KNOWLEDGE CENTRE

SELF DRIVING CAR 0034
Next car: 3 mins 20 seconds
Destination: Chance Street Circle
Voice Support: Yes

" Self-Driving Car Sharing "
System has an app you can use
to check the real-time update.

KNOWLEDGE
CENTRE

Cities **Unlocked**

www.citiesunlocked.org.uk