**Wayfinding Project**

Executive Summary Report

Version 4.0

**RNIB Innovation Unit**

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**Prepared for:**

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# 1.0 Introduction

This document summarises the findings of the initial phase of the Wayfinding project. The Wayfinding project forms part of RNIB’s five year strategy aimed at ending the isolation which blind and partially sighted people face. In particular, this project addresses Goal 8 - That more blind and partially sighted people are able to make journeys independently.

This initial phase of work has highlighted the main focus areas and recommendations which should be concentrated on in terms of innovative solutions.

A glossary of Wayfinding terms is provided at the end of this document.

# 2.0 The Project

Within the first part of the project there have been three distinct phases of work. These have been carried out to identify innovative solutions to existing barriers which hinder blind and partially sighted people when making journeys. These three phases are:

1. Review the current available solutions

2. Understanding the problem

3. Identifying the next steps

**Phase 1: Review the current available solutions** – This evaluated current Wayfinding solutions, which were known to the group. It did not provide a meansto evaluate what might be needed to allow for successful Wayfinding. The project team for this phase included RNIB Innovation and Digital Accessibility teams, plus resource from Guide Dogs for the Blind.

**Phase 2: Understanding the problem** –Through analysis of the Wayfinding solutions, we found that making a journey cannot be regarded as a single act, but can be broken up into different journeys utilising different modes of transport. We further identified nine discrete journey stages which we called the "Journey Map", with each stage having its own requirements. These being:

1. Information gathering/pre-journey planning

2. Walking

3. Getting Car/taxi

4. Catching a bus from a bus stop

5. Catching a bus from a bus station

6. Catching a train from a manned train station

7. Catching a train from an unmanned train station

8. Catching a plane from an airport

9. In an Internal structure (Navigating within a building)

We added additional information to this Journey Map, including, the necessary decisions/activities to be carried out and also the barriers/problems from a user perspective (e.g. unable to find an entrance).

Once the barriers/problems had been included, the possible solutions were identified and classified in terms of availability using a red, amber and green indicator:

* Green: Widespread availability and commonly used
* Amber: Could be used, but is not widely adopted
* Red: Possibilities not utilised or not available.

Walking is the journey stage which binds the entire journey together and is therefore very important. It is also the journey stage where there is usually the least amount of information or assistance to help the individual.

The various solutions and the barriers/problems identified within the nine journey stages are very rarely unique and only confined to one stage of the journey process. For example, the use of ‘cane’, ‘dog’ and ‘asking someone’ were common across processes. These solutions allow someone to navigate by trial and error although ideally we are looking for more streamlined and reliable solutions.

**Phase 3: Identifying next steps** - Common activities which were repeated within and across journeys were identified. This gave rise to four activities which people do when making journeys regardless of how they are making them. These are as follows:

1. Getting information and using it
2. Orientating within the environment
3. Navigating within the environment
4. Entrance and exit location

Equally these activities are performed within differing environments, these being determined as ‘internal’, ‘external’ and ‘in vehicle’ environments.

Of the activities defined, ‘Getting Information and using it’ has been considered the most important part of all. Without relevant and meaningful information the decisions made along the journey may be flawed. Getting information and using it in whatever environment you are in, be it ‘internal’, ‘external’ or within ‘a vehicle’, is the key to successful orientation, navigation and entrance and exit location.

# 3.0 Recommendations

There are 23 recommendations and these have been categorised into the following three phases:

## 3.1 Phase one

### 3.1.1 Conduct a series of pilots

Perform a number of pilots to:

a) Test how blind and partially sighted people interact with current technological Wayfinding solutions, adding new solutions as they become available

b) Validate the theories from the Wayfinding report and to provide a means to determine progress.

Benefit: To give blind and partially sighted people the opportunity to tell us how useful and practical they find the various Wayfinding technologies

### 3.1.2 Research Augmented Reality (AR) solutions

Research AR on mobile and other devices with the following aims:

a) Investigate how AR can be integrated with Personal Positioning Systems (PPS) solutions and mapping technology (e.g. Google Streetview on a handheld device)

b) Investigate and trial the integration of spatial audio (audio with positioning information) with AR as a means to provide feedback

c) Determine if there is a need to mix the audio feedback with audio from the live environment (to avoid isolation)

d) In partnership with University of Nottingham investigate user requirement and potential Wayfinding solutions e.g. guidance hoops.

Benefits: To determine how blind and partially sighted people can utilise AR solutions to enhance their understanding of their environment, by presenting them with additional information.

Linked to the following recommendations:

* 3.1.5 Generate a Personal Positioning Systems (PPS) functional specification
* 3.2.1 Improve the accessibility of maps
* 3.2.5 Influence Augmented Reality (AR) development
* 3.3.2 Encourage the creation of internal maps

Section in the Report: Augmented Reality

### 3.1.3 Research Internal Positioning Systems (IPS) (buildings/in-vehicle).

Research internal (buildings) and in vehicle positioning systems both current and up and coming to:

a) Understand the problems and potential solutions

b) Investigate suitable infrastructure to enable IPS (e.g. usefulness of existing Digital TV broadcast infrastructure,   
Wi-Fi, etc)

c) Investigate suitable mapping to enable IPS

d) Focus on transition/handover mechanisms from external to internal systems and vice versa

e) Investigate the integration of IPS with mapping

Benefits: To determine how blind and partially sighted people might use technology to navigate through buildings (e.g. such as open shopping centres).

Linked to the following recommendations:

* 3.1.4 Improve existing Wayfinding solutions
* 3.1.5 Generate a Personal Positioning Systems (PPS) functional specification
* 3.2.1 Improve the accessibility of maps
* 3.3.2 Encourage the creation of internal maps
* 3.3.3 Enhance the location of goods and services

Section in report: Personal Positioning Systems

### 3.1.4 Improve existing Wayfinding solutions

Working with manufacturers of mainstream Wayfinding solutions (e.g. GPS, IPS and RTI) to:

a) Identify manufacturers and solutions to work with

b) Improve accessibility of their solutions

c) Where possible improve the functionality and usability (e.g. layered information, tolerances, multiple map sources, etc)

Benefit: To enable blind and partially sighted people to take better advantage of existing mainstream Wayfinding solutions by making them accessible.

Linked to the following recommendations:

* 3.1.3 Research Internal Positioning Systems (IPS) (buildings/in-vehicle).
* 3.1.5 Generate a Personal Positioning Systems (PPS) functional specification
* 3.2.1 Improve the accessibility of maps
* 3.3.1 Improve choice of map sources

Section in report: Personal Positioning Systems

### 3.1.5 Generate a Personal Positioning Systems (PPS) functional specification

Creating a functional specification which defines:

a) The integration of internal and external positioning functionality

b) The mechanism for handover between internal and external systems

c) The integration of suitable complimentary systems such as compass and accelerometer

d) The use of internal and external mapping information

Benefits: To enable us to better communicate the needs of blind and partially sighted people to the key providers of Wayfinding systems.

Linked to the following recommendations:

* 3.1.3 Research Internal Positioning Systems (IPS) (buildings/in-vehicle).
* 3.1.4 Improve existing Wayfinding solutions
* 3.2.1 Improve the accessibility of maps
* 3.2.4 Maximise Points of Interest (POI) information
* 3.3.1 Improve choice of map sources

Section in report:

* Personal Positioning Systems
* Location and suitability of information

### 3.1.6 Improve access to Real Time Information Systems (RTI).

Research to:

a) Understand what RTI solutions and barriers exist, and what the current state of play is, liaising with the RTI group as appropriate, and identifying the most appropriate option

b) Investigate how accessibility can be integrated into current and new RTI systems (in terms of budget provision, infrastructure constraints and user interaction) in different transport infrastructures. This would include RNIB REACT.

c) Determine the most effective ways of conveying information in terms of importance, order and delivery method.

Benefits: To provide Blind and partially sighted people access to Real Time Information in a form they can understand which will enable them to make independent decisions about their journey.

Linked to the following recommendations:

* 3.2.6 Enhance audio announcements
* 3.2.7 Increase access to transport information
* 3.2.8 Further enhance RNIB REACT

Section in the report: Triggered Information

### 3.1.7 Provision of a “help me” service

Engage with key stakeholders to create a sustainable and viable ‘help me’ service that could be used when you get lost out and about and need assistance. With the aim of facilitating the following:

a) A buddy system. This will allow you to request personal assistance that will guide you from one place to another or provide you with information.

b) Call back system - this will allow someone to send a photograph or make a video call (ideally geo tagged for location information) which an operator or system will respond back with relevant information.

c) Easy access - This will allow the user to access different types of help me solutions via, an operator, Interactive Voice Response (IVR), TXT message, mobile application.

Benefits: This will provide a means for people to get help when they need it to overcome barriers/difficulties. This will encourage blind and partially sighted people to make more successful journeys as they know help is available should they need it.

Linked to the following recommendations:

* 3.2.3 Influence mainstream with a single online portal
* 3.3.2 Encourage the creation of internal maps

Section in the report: Triggered Assistance

### 3.1.8 Utilise a homing beacon

Investigate methods that provide an awareness of the existence of systems/markers that:

a) Will guide people to existing Wayfinding solutions e.g. a type of 'homing' system e.g. to find RNIB REACT units

b) Will provide Wayfinding points/markers to allow navigation e.g. join the dots concepts

c) Will identify Points of Interest

d) Will identify building feature e.g. entrances or information desk

e) Could be triggered/activated based on user profile and need e.g. push technology to alert you to the arrival of the appropriate train

Benefits: This will enable blind and partially people to home in on systems that would help them in their journeys (e.g. RNIB REACT). Currently a system is rendered useless unless a blind or partially sighted person becomes aware of it’s existence and is in range of the system.

Not linked to any other recommendations

Section in the report: Triggered information

## 

## 3.2 Phase two

### 3.2.1 Improve the accessibility of maps

Improve external and internal (where available) mapping by:

a) Create a functional specification of what an accessible map is and how it is navigated

b) Engage with key stakeholders (e.g. Teleatlas that supply Google, software developers and building owners) to provide accessible navigation and information of existing and new map data

c) Understand requirements to integrate with PPS solutions

Benefits: Improving the accessibility of maps will not only enable blind and partially sighted people to use them but also enable their use within other solutions (e.g. Points of Interest).

Linked to the following recommendations:

* 3.1.3 Research Internal Positioning Systems (IPS) (buildings/in-vehicle).
* 3.1.5 Generate a Personal Positioning Systems (PPS) functional specification

Section in report: Mapping information

### 3.2.2 Standardise the location of information

Standardise the location of information so it can be found easily e.g. bus timetable are always positioned on the left hand side of the stop

This involves utilising the expertise of different RNIB teams to:

a) Research to determine any existing standards in information location and engage with key stakeholders

b) To improve on or create standards

c) Promote and monitor these standards

Benefits: Blind and partially sighted people will always know where to find information easily.

Not linked to any other recommendations

Section in the report: Location and suitability of information

### 3.2.3 Influence mainstream with a single online portal

Engage with stakeholders to enable the creation of an online portal to provide access to various sources of information that aid making journey's (e.g. Government portal direct.gov.uk use information from www.transportdirect.info). The portal should be beneficial to everyone as it will:

a) Act as a launch pad to link services

b) Provide a simple means of getting Wayfinding information

c) Deliver information to you if you request updates

Benefits: Linking information sources together will mean blind and partially sighted people can easily access this information and do not need to go and search for it. Having this in the mainstream will broaden the benefits to all.

Linked to the following recommendations:

* 3.1.7 Provision of a “help me” service
* 3.2.7 Increase access of transport information
* 3.3.2 Encourage the creation of internal maps

Section in the report: Location and suitability of information

### 3.2.4 Maximise Points of Interest (POI) information

Improve mapping functionality by:

(a) Allowing navigation via Points of Interest (POI's)

(b) Utilising of user generated Points of Interest (POI's)

(c) Allowing navigation within certain tolerances e.g. only 10mins from away from a public toilet,

Benefits: This will give blind and partially sighted people greater flexibility when making journeys. This allows them to better utilise information which they require.

Linked to the following recommendations:

* 3.1.5 Generate a Personal Positioning Systems (PPS) functional specification
* 3.2.1 Improve the accessibility of maps
* 3.2.9 Utilise community base
* 3.3.1 Improve choice of map sources

Section in the report: Mapping Information

### 3.2.5 Influence Augmented Reality (AR) development

To engage with stakeholders to:

a) Share our research

b) Enhance the accessibility requirements of current and future augmented reality solutions.

c) Influence and improve the functionality in terms of preferences, layered information, mapping and feedback tolerances, etc.

Benefits: More Augmented Reality solutions will be accessible to blind and partially sighted people.

Linked to the following recommendations:

* 3.1.2 Research Augmented Reality (AR) solutions
* 3.2.10 Maximise user preferences

Section in the report: Augmented Reality

### 3.2.6 Enhance audio announcements

Research to establish a more efficient method of conveying pertinent information contained within audible information (audio announcements) by:

a) The use of increasing and decreasing pre tones to attract attention

b) In terms of importance, order and delivery method

c) Levels/layers of information, e.g. based on user preference

Benefits: To improve the delivery of audio information so that blind and partially sighted people can understand it and find it easy to use.

Linked to the following recommendations:

* 3.2.8 Further enhance RNIB REACT

Section in the report: Location and suitability of information

### 3.2.7 Increase access to transport information

Engage with service providers to understand how they can share their Real Time Information (RTI) to a wider audience (e.g. application developers) in the most efficient and maintainable way by:

a) Making it available on the cloud (e.g. allowing developers to create mobile and Augmented Reality application).

b) Improving deployment connectivity (e.g. Femtocells with GPS).

Benefits: To increase the availability of Real Time Information to blind and partially sighted people by making it available through different delivery methods.

Linked to the following recommendations:

* 3.2.6 Enhance audio announcements
* 3.2.8 Further enhance RNIB REACT
* 3.2.10 Maximise user preferences

Section in the report: Location and suitability of information

### 3.2.8 Further enhance RNIB REACT

Review with the intention of:

(a) Improving and building on the functionality where applicable e.g. improve connectivity, daisy chaining, type and level of information provided, user experience, etc

(b) Being able to promote the use of RNIB REACT units by linking it with other devices/solutions and seeking new locations

(c) Efficient use of ancillary components/units (e.g. fob and triggerboard)

Benefits: Blind and Partially sighted users of RNIB REACT will be given a more flexible and comprehensive solution.

Linked to the following recommendations:

3.1.8 Utilise a homing beacon

3.2.6 Enhance audio announcements

Section in the report: Triggered information

### 3.2.9 Utilise Community Base

Community driven information gathering has the potential to generate a lot of useful Wayfinding information. Engage with community bases to provide user generated mapping information, e.g. Points of Interest, best routes and things to avoid.

Benefits: Blind and partially sighted people can be involved in generating content they need and utilise this information when using Wayfinding solutions.

Linked to the following recommendations:

* 3.2.4 Maximise Points of Interest (POI) information

Section in the report:

* Mapping information
* Location and suitability of information

### 3.2.10 Maximise user preferences

Research the use of the cloud in collaboration with key stakeholders (e.g. Google) to hold device independent information that provides:

(a) Interoperability

(b) User profiles and preferences e.g. PPS device defining personal speed, distance, and avoidance criteria, etc

Benefits: This allows blind and partially sighted people to use different systems based on their individual preferences.

Linked to the following recommendations:

* 3.3.1 Improve choice of map sources

Section in the report:

* Mapping information
* Location and suitability of information

### 3.2.11 Expand the use of Optical Character Recognition (OCR) on mobile devices

Research a low cost option that will:

a) Capture and interpret information within the environment e.g. bus timetables and information signage

b) Capture and interpret information within publications e.g. information sheets and publications

c) Research as to whether the OCR solution should reside within the device or be server based

Benefits: Blind and partially sighted people can gain access to information by capturing and interpreting printed information on their mobile phones.

Not linked to any other recommendations

Section in the report: OCR

## 3.3 Phase three

### 3.3.1 Improve choice of map sources

Engage with stakeholders to allow Wayfinding solutions to access a variety of mapping sources (e.g. Ordinance Survey and Teleatlas). This should help alleviate pedestrian anxiety levels because they can access relevant information (e.g. Ordinance Survey provides street furniture which means a person can identify obstacles in their way). This can be achieved by:

a) Allowing solutions to interchange maps sources

b) Integrating information from different sources on the same map which are shown as different layers based on personal preferences

Benefits: This maximises flexibility by allowing blind and partially sighted people to utilise different maps based on their environment and needs.

Linked to the following recommendations:

* 3.2.1 Improve the accessibility of maps
* 3.2.10 Maximise user preferences

Section in the report: Mapping information

### 3.3.2 Encourage the creation of internal maps

Engage with key stakeholders (e.g. building owners) to facilitate the creation of new maps of internal spaces (e.g. shopping centres, public buildings).

Benefits: This provides the internal maps to allow people to navigate through buildings (such as open shopping centres). The creation of new maps will mean that Internal Positions Systems are sustainable.

Linked to the following recommendations:

* 3.1.3 Research Internal Positioning Systems (IPS) (buildings/in-vehicle).
* 3.1.5 Generate a Personal Positioning systems (PPS) functional specification
* 3.1.7 Provision of a “help me” service
* 3.2.1 Improve the accessibility of maps

Section in report: Mapping information

### 3.3.3 Enhance the location of goods and services

Engage with stakeholders to enhance the specific location of goods/services using PPS e.g. linking the layout of a supermarket with the location of goods to efficiently guide you round the store.

Benefits: Blind and partially sighted people can navigate successfully around a shop, therefore achieving the aim of their journey independently.

Linked to the following recommendations:

3.1.3 Research Internal Positioning Systems (IPS) (buildings/in-vehicle).

3.1.5 Generate a Personal Positioning Systems (PPS) functional specification

3.2.1 Improve the accessibility of maps

3.3.2 Encourage the creation of internal maps

Section in the report: Mapping information

### 3.3.4 Enable control of the environment

Research the triggering of infrastructure to create a temporary change within the environment (e.g. to turn on or extend timings at a pedestrian crossing). This includes:

a) What do users need to control in their environment?

b) A mechanism to allow users to control their environment utilising other systems (e.g. RNIB REACT fob)

Benefits: To allow blind and partially sighted people to have more control of their environment depending on their needs and preferences.

Not linked to any other recommendations

Section in the report: Triggered assistance

# 4.0 Glossary of Wayfinding terms

**Wayfinding -** encompasses all of the ways in which people orient themselves in physical space and navigate from place to place.

**Accelerometer** - An electromechanical device that will measure acceleration forces. By measuring the amount of static and dynamic acceleration, software can determine the way the device is moving within the environment.

**Augmented Reality (AR)** – a term used to describe the method of superimposing or combining virtual computer-generated graphics, audio and other sensory enhancements over a real-world environment in real time. The information presented about the surrounding real world of the user becomes interactive and usable therefore it can be presented in the form that is needed.

**Cloud** - is the term used to describe Internet-based computing, whereby shared resources, software, and information are provided to computers and other devices on demand though the internet. Clouds often appear as single points of access for all consumers' computing needs.

**Femtocell** - Is a communications access point or base station that connects to the service providers networks via a broadband connection. It acts like a miniature tower and broadcasts a low-level cellular signal in order to extend the service coverage indoors, especially where access would otherwise be limited or unavailable.

**Geo tagged** - a geo tagged photograph will contain the GPS location (longitude and latitude) where a picture was taken; these photographs can then be overlaid as POI on a digital map and therefore the location of where the photograph was taken can be determined.

**Global Positioning System (GPS)** – this utilises the satellites which orbit the earth providing reliable location and time information in all weather and at all times. GPS location can be obtained anywhere on the Earth using a GPS receiver when there is an unobstructed line of sight to four or more GPS satellites. GPS services do not work indoors very well as the signal is reduced.

**Interoperability** - Interoperability is a property of a product or system, which works with other products or systems, present or future, without any restricted access or implementation.

**Interactive Voice Response (IVR)** – is an audio based solution which allows customers to access a system via a telephone keypad or by speech recognition, after which they can service their own inquiries by following the audible instructions.

**Optical Character Recognition (OCR)** – is the process of converting/interpreting captured images of text into machine readable characters.

**Points of Interest (POI)** - a specific point location that someone may find useful or interesting. A POI may or may not present additional information. Within GPS navigation software a POI may be referred to as a waypoint and will contain the latitude and longitude of the POI, a name and description for the POI and other information such as altitude or a telephone number or web link may also be included.

**Push technology** – describes a method by which servicesdeliver information which is not directly requested from the user. Such push services are activated by an event, which could be triggered if a specific area is entered or triggered by a timer. It is contrasted with pull technology, where the request for the transmission of information is initiated by the receiver.

**Real Time Information (RTI)** – provides up-to-the-minute information. In the case of travel, this could be bus arrival and departure passenger information. RTI can be utilised by many different systems providing information both locally and wider afield.

**Internal Positioning System (IPS)** – is a term describing the technology used to enable the navigation of internal structures using guidance systems. IPS replicates the benefits provided by external GPS technology indoors. IPS is only viable with indoor mapping.

**Personal Positioning Systems (PPS)** – A handheld device that is capable of Wayfinding both internal and external environments. To do this the PPS will make use of GPS, IPS and mapping technologies.

**Wi-Fi** - **The facility or ability to connect to broadband Internet and networks wirelessly.**

**Mapping technology** – is the umbrella term for all types of mapping solutions such as hardcopy and electronic.

### About RNIB’s research

RNIB is a leading source of information on sight loss and the issues affecting blind and partially sighted people. Our Research and Knowledge Hub contains key information and statistics about blind and partially sighted people including our Sight Loss Data Tool, which provides information about sight loss at a local level throughout the UK. You’ll also find research reports on a range of topics including employment, education, technology, accessibility and more. Visit our Knowledge and Research Hub at: **rnib.org.uk/research** or **email research@rnib.org.uk.**