



Project Description

Digi-Dog-Nav is a mobile application which incorporates GPS and other navigation technologies for guiding the visually impaired and blind within interior and exterior environments.

Digi-Dog-Nav is an application that possesses all the standard functionality of a normal GPS application for navigating outdoors but unlike normal devices it will use a combination of cellular, Wi-Fi and sensory technology to navigate indoors.

It uses advanced audio and visual guidance techniques tailored towards the visually impaired and blind.

The app will use voice recognition for user requests and use positioning technology indoors and outdoors to give audio directions to the user to help navigate them safely and easily to their destination.

Design document specification

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Changes since last version

None

Known Omissions

None

Approvals

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1. Introduction

1.1 Purpose of the Document

The purpose of this document is to specify the interaction design of the Digi Dog app for a visually impaired user with 10% vision or more.

1.2 Document Naming Conventions

Documents uploaded will be named as follows
DOCUMENT_NAME_VERSION_NUMBER

Documents will be stored on the Digi Dog directory on Google Drive
Where large alterations have taken place a new numbered version of the document will be saved and the previous version will be stored in the "Attic" directory.

The highest permitted version will be X.3 then the newest version must be named (X+1..1 and so on.

Example : Version 1.3 => Version 2.1

1.3 Intended Audience

This document is intended for all project personnel that will be involved in the product delivery – designers, developers, testers, trainers, business process designers.

This document is the result of the presentation of wireframes, mock-ups and prototypes to stakeholders, users, focus groups and market consumers. The designs and user interactions described here have been validated by in the field observations, workshops, interaction walkthroughs, interaction testing and they have been approved by stakeholder.

This is a working document as the team iterates through build sprints the principles, premises and interactions resulting from each build will be evaluated with stakeholders, users, focus groups, market consumers, support personnel, operations personnel trainers and business process designers. Following on from these assessments functionality, interactions, branding, style and deployment environments may change. These changes will be communicated, assessed and approved via the policy's, processes and procedures outlined in the project initiation document (PID..

1.4 Definitions, Acronyms and Abbreviations

UCD	User Centred Design
GPS	Global Positioning System
IPS	Indoor Positioning System
DDN	Digi Dog Nav (application.
WIFI	Wireless Fidelity
UI	User Interface
iOS	Mobile operating system developed by Apple Inc for the iPhone

2. Design Overview

2.1 Product Definition

Digi Dog Nav is a navigation system for visually impaired people . It directs and navigates users around the city and links up with existing real time travel information to provide a pillar to post directional aid to anyone with visual impairment.

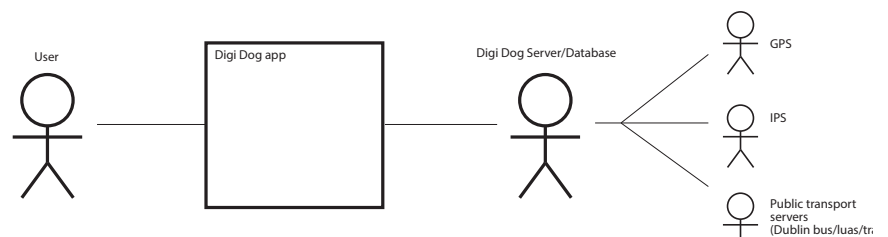
This application addresses the need for a navigation system that interacts with GPS , IPS and Real Time Travel information to provide a reliable and pleasant user experience for the user.

There are currently some successful outdoor navigation apps .There are technologies available for indoor navigation but at present there is no accepted industry standard.

Also at present there is no application which integrates real time travel information with outdoor navigation (GPS..

Digi – Dog Nav will integrate GPS, IPS and real time travel information in the one application. While the technologies for these services exist individually , Dig Dog will be the first joined up solution in the market.

2.2 Concept Design



1. The user Activates the app.
2. The User gives audio instruction to request a route to be planned.
3. The app Searches for the location.
4. The app asks for Confirmation.
5. The app Contacts the Digi-Dog Sever.
6. Digi-Dog Contacts the GPS, IPS and travel info server.
7. Digi-Dog Server returns the planned route information to the user.
8. The user is ready to start their journey.



3. Personas

3.1 Introduction

This is a list of the personas for the Digi Dog app use.

3.2 List of Personas

<i>Ref</i>	<i>Name</i>	<i>Type/Attitude</i>	<i>Interface</i>
IR-0001	Oscar	Tech Savvy and willing to try new things.	Visual Interface & Audio Real time travel interface.
IR-0002	Cornelius	Prefers traditional methods like cane. Not Tech savvy. Open minded about new technologies	Audio Only
IR-0003	Peter	Novice Technology User Open to New Ideas Finds a cane reliable	Visual Interface & Audio Real time travel interface.

3.3 Informed by Data Gathering and Analysis

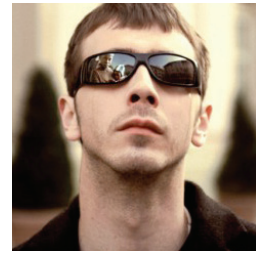
3.3.1

Real people

<i>Ref</i>	<i>Gender</i>	<i>Age</i>	<i>Background</i>	<i>Their main comments and views on the proposed product</i>
IR-0001	Male	35	Visually Impaired since Birth.	Stressed the importance of reliability Expressed the use of colour coding Suggested giving the user full summary of the route at the beginning
IR-0002	Male	61	Previously had full sight now 100% blind.	Expressed interest in being able to enter public spaces like shopping centers but said it's pretty daunting and generally avoided unless necessary. His age and experiences have also left him less adventurous to try new places and things.
IR-0003	Male	38	Always needed glasses but sight has deteriorated further in recent years	Suggested combining this with tactile aids in areas specifically for blind people. Suggested Large Screen Icons with Colour Coding

3.4 Persona 1

Frequent user of app technology - 'lookaround' to navigate street. Uses buses to commute from home to town. Uses technology - computer, phone, app software. 5% vision gives ability to use basic visuals on an app. Oscar is moving house and is a member of 'sports for blind people'. He's an active and his 5% vision in one eye gives him a fair bit of mobility and accessibility to using technologies. His attitude would make him open minded to trying new apps, technologies or ideas.



Occupation/Education:	Third level education
Age:	61
Goals	To use the Digi-Dog app to navigate external and internal areas using public transport when necessary.
Attitude / skills:	Tech Savy and open minded

3.5 Persona 2

Cornelius is studying for a Phd at NCAD in the area of multi sensory design. He was a working architect until the age of 32 when he lost his sight completely. He is now 61 and lives in Howth. He is very interested in helping the blind community and meets regularly with a blind group that look at how technology can help them. His goals are regular trips into town to meetings such as the blind tech group. He expressed an interest in being able to know where public spaces like good restaurants that are visually impaired friendly but said info isn't really out there. His age are also leaving him less adventurous to try new places and things.



Occupation/Education:	Unemployed
Age:	61
Goals	Get from home to locations in city
Attitude / skills:	Tech aware and open minded but becoming more cautious with age

3.6 Persona 3

Peter's sight has deteriorated in recent years. 0-50% visibility Sometimes uses a cane in low visibility situations , darkly lit roads etc. He likes to be guided to seating in crowded areas such as pubs.

Peter uses magnifying technology to read better. Has a smart phone which he can use with a visual aid. He is very interested in our project.



Occupation/Education:	Secondary School
Age:	38
Goals	To navigate public transport and external spaces

3.7 List of Goals

<i>Ref</i>	<i>Name</i>	
UG-0001	Oscar	Navigate user from point A to B to C A & B are external (GPS reliant. C is internal location and is IPS reliant. This would include use of public transport and walking.
UG-0002	Cornelius	Navigate user from point A to B to C A & C are external (GPS reliant. B is public transport and is relies on a public transport database. Walking and bus/luas would be the modes of transport
UG-0003	Peter	Navigate user from point A to B to C A & C are external (GPS reliant. B is public transport and is relies on a public transport database. Walking and bus/luas would be the modes of transport

4. Scenarios

4.1 Introduction

A list of 3 test scenarios that users of the Digi Dog Nav app would find themselves in.

4.2 Scenarios

<i>Ref</i>	<i>Name</i>	<i>Persona</i>	<i>Goal</i>
US-0001	Oscar	<p>"I want to meet a friend of mine Paul for coffee in St. Stephen's green shopping centre"</p> <p>Oscar lives in Santry in an estate just off the Swords road. The 16 bus will bring him as far as D'Olier Street or Dame Street. He'd prefer to avoid Grafton street as it is often very crowded and people move at greater speed than he likes.</p> <p>If the people walking towards him get distracted by a phone or a busker he can walk collide with his cane and the possibility of a bigger collision makes him anxious.</p> <p>His Journey is as follows: Oscar's house in Santry > Bus Stop > Dame Street > Rear Entrance Stephens Green > Coffee Shop</p>	UG-0001
US-0002	Cornelius	<p>"I've to attend a blind support group that talks about technology every week at George St. The journey from Dame St. to George St. alone can be pure hell. Cars can be revving at the lights, Dublin City Council turned the volume down on the pedestrian crossing beeps so they're not loud enough to hear at the far side of the road or when you're in the middle of the road crossing (they're also drowned out by traffic noise.. New smoking areas popping up unexpectedly outside buildings which changes your mental map, these also catch your cane."</p> <p>Twice a week Cornelius has a meeting with his friends at a blind support group. The journey is from his home near the Red Cow to Georges St where the group meet.</p> <p>His Journey is as follows: House (walk. > Luas Station (Luas. > Abbey St Luas station (Luas. > Georges St (walk..</p>	UG-0002
US-0003	Peter	<p>Peter lives in a semi detached house in a small housing estate in Booterstown. His Sister, Marie, and her family live in Dun Laoghaire who he likes to visit often. Peter gets the 4 bus to Dun Laoghaire. In order to get to the bus stop he has to navigate out of the housing estate, down to the sea front and cross the main road safely to the bus stop.</p> <p>His Journey is as follows: Peter's House (walk. > Booterstown Bus Stop no.2 (Bus. > Dun Laoghaire Bus Stop no.4 (Bus. > Marie's House (Walk.</p>	UG-0003

5. Task Cases

5.1 Introduction

A list of task cases for the Digi Dog app.

5.2 List of Task cases

<i>Ref</i>	<i>Name</i>	<i>Persona</i>	<i>Scenario Cross Ref</i>
US-0001	Oscar	Get Oscar from Home to an internal destination	US-0001
UG-0002	Cornelius	Get user Cornelius from home at Red Cow to destination at George's St.	US-0002
UG-0002	Peter	Get Peter from his house in Booterstown to his sister's house in Dun Laoghaire.	US-0003

5.3 Task Case 1

5.3.1 User intention

Get Oscar from Home to a coffee shop in St. Stephen's Green Shopping Centre.

5.3.2 Activity Description

<i>Step</i>	<i>User activity</i>	<i>System responsibility</i>
1	User opens app with voice to iPhone recognition software. Then selects audio only option for navigation.	App opens on phone request and switches to audio only mode on users prompt.
2	User searches app with audio prompt for desired destination specifying the avoidance of one street using necessary keywords.	The audio recognition chip in the app communicates input to database and then asks user to confirm relayed destination is correct.
3	User confirms destination.	App recognises the confirmation and requests journey from the Digi Dog database/server. The Digi Dog server communicates with GPS and Dublin Bus database/server to relay stages of journey to app and then on to user. The app will then give user direction for walking to the nearest 16 Bus stop by communicating with GPS. (external walk, bus, external walk, internal walk ..
4	User follows directions from app to bus stop.	When user reaches Bus stop app updates user when next 16 Bus will arrive with communication from Dublin Bus real time database.
5	User boards Bus	When user boards bus, app keeps user informed with status of bus journey by relaying info from Dublin bus real time database. Just before Bus destination is reached app prompts user to ready for departure.
6	User gets off Bus and starts last walking leg of the journey to George's St.	On departure app connects to GPS for walking direction from Dame Street. > Rear entrance Stephen's Green Shopping Centre
7	User arrives at rear entrance to Stephen's Green Shopping Centre.	The app then directs the user to the front door of the coffee shop.

5.4 Task Case 2

5.4.1 User intention

Get user Cornelius from home at Red Cow roundabout to his meeting in George's Street.

5.4.2 Activity Description

Step	User activity	System responsibility
1	User opens app with voice to iPhone recognition software. Then selects audio only option for navigation.	App opens on phone request and switches to audio only mode on users prompt.
2	User searches app with audio prompt for desired destination specifying the avoidance of one street using necessary keywords.	Takes user input and uses audio recognition chip to find destination match from the Digi Dog database. Then relays option to user and ask for confirmation.
3	User confirms destination.	App recognises the confirmation and requests journey from the Digi Dog database/server. The Digi Dog server communicates with GPS and Luas database/server to relay stages of journey to app and then on to user. Stage 1 of walking to Luas stop is then communicated to the user.
4	User follows directions from app to Luas stop with use of cane.	App communicates with DDN and Luas servers and gives user update of when next Luas tram arrives.
5	User boards Luas	App relays update on journey estimation time. When journey is almost complete app prompts user with warning to exit at next stop.
6	User gets off Luas and starts last walking leg of the journey to George's St.	App starts communicating with DDN and GPS servers to relay walking directions to user.

5.5 Task Case 3

5.5.1 User intention

Get user Peter from his house in Booterstown to his sister's house in Dun Laoghaire.

5.5.2 Activity Description

Step	User activity	System responsibility
1	Peter opens the DigiDog Navigation app on his smartphone. Presses the centre button to activate the app visual/audio mode and waits for the app to load and gather his GPS location.	App open on phone request and switches to audio/visual mode on users prompt.
2	He asks the app for directions to Marie's house, a previously saved favorite.	Takes user input and uses audio recognition chip to find destination match from the Digi Dog database. App then relays option to user and ask for confirmation.
3	Peter is then directed from his home, out of the estate to bus stop via the apps audio system.	App communicates with DDN and Bus servers then gives user update of when next Bus arrives.
4	Peter boards the bus and is updated regularly on his journey's stage. Peter is then warned when the bus is approaching his stop.	App relays update on journey estimation time. When journey is almost complete app prompts user with warning to exit at next stop.
5	The bus is full and Peter is unable to get off the bus in time.	Digi Dog is using real time technologies, DDN can still direct Peter safely to his destination even though Peters route is now changed.
7	He exits the bus at the next stop and is directed to Marie's house.	App starts communicating with DDN and GPS servers to relay walking directions to Peter.

6. Use Case Diagrams

6.1 Introduction

This section contains the use case diagrams for DDN.

6.2 List of Use Case Diagrams

Ref	Description	Scope (in/out. (1 – 3.	Complexity (1 – 3.	Priority (1 – 3.
UCD-0010	Overview of App	In	3	2
UCD-0020	Options on the first interface	In	2	1
UCD-0030	Level 2 functionality	In	3	1
UCD-0040	Level 2 functionality	In	2	1

Level 0	Digi Dog app	UCD-0010
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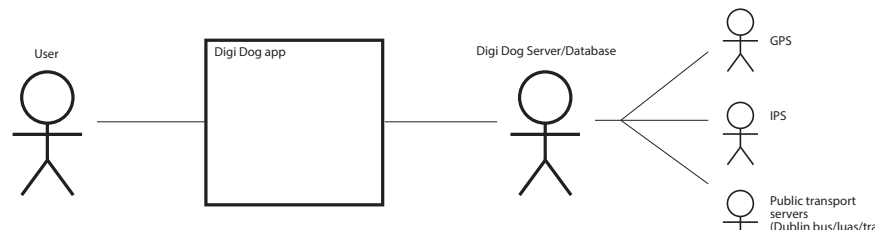


Fig 1 : Use case diagram level 0

Level 1	Main functionality	UCD-0020
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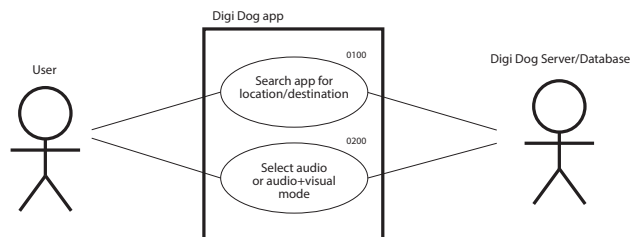


Fig 2 : Use case diagram level 1

Level 2.1	Search functionality	UCD-0030
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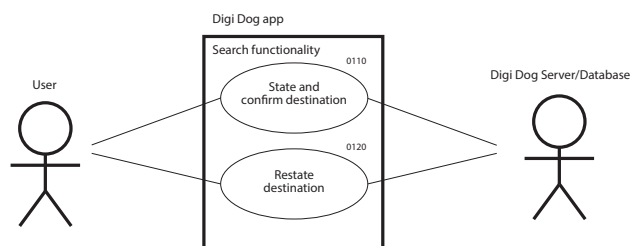


Fig 3 : Use case diagram level 2

Level 2.2	Audio/visual select functionality	UCD-0040
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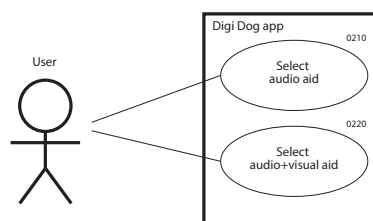


Fig 4 : Use case diagram level 2.2

7. Use Cases

7.1 Introduction

This section contains the use cases for DDN

7.2 List of actors

<i>Ref</i>	<i>Description</i>
UA-0010	App user
UA-0020	DigiDog Database/Server
UA-0030	Dublin Bus Database
UA-0040	Luas Database
UA-0050	GPS
UA-0060	IPS

7.3 List of use cases

<i>Ref</i>	<i>Description</i>
UC-0010	Oscar goes from his santry home for Coffee in Stevens Green using a bus
UC-0020	Cornelius goes to his meeting in dame street using the luas
UC-0030	Peter goes from Booterstown to Dun Laoghaoire using a bus and get's off the bus one stop too late

7.4 UC-0010 – Name of use case

<i>Use case ref</i>	UC-0010
<i>Use case title</i>	Oscar goes for Coffee
<i>Author</i>	David Masterson
<i>Creation date</i>	08-12-12
<i>Version</i>	1.0
<i>Last modified by</i>	
<i>Date modified</i>	

7.4.1

<i>Ref</i>	<i>Actors</i>
UA-002	User
UA-003	Digi Dog Server
UA-004	Digi Dog Database
UA-005	Dublin Bus Database
UA-006	Luas Database
UA-007	GPS
UA-008	IPS

7.4.1.1 User interface components description



Start up



Input destination



Confirm destination



Journey started



Prompt turn upcoming



Turn more to right



Turn more to left



Warning Level 1



Warning Level 2



Public transport route display

7.4.2 Brief Description

Oscar lives in Santry in an estate just off the Swords road . The 16 bus will bring him as far as D'Olier Street or Dame Street. He'd prefer to avoid Grafton street as it is often very crowded and people move at greater speed than he likes.

If the people walking towards him get distracted by a phone or a busker the can walk collide with his cane and the possibility of a bigger collision makes him anxious.

7.4.3 Trigger Event

Oscar Opens the app . Oscar presses the centre button to activate the app.

1. Digi Dog Screen
2. Start up Screen.



7.4.4 Basic Flow

He asks the app for directions to Stephen's Green Shopping centre.and stipulates the Grafton Street avoidance using key words.

3. Enter directions Screen. He confirms the directions
4. Confirm screen. Oscar is directed from house to bus stop
5. Screen showing straight



6. Screen - turn left

7. Screen turn Left. Oscar is told he is as the bus stop

8. Audio Bubble

Oscar is informed of the bus waiting time by the realtime service which links into the app.



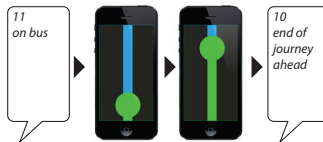
9. Audio Bubble Oscar gets on the bus.

10. Screen showing start of bus journey.

Oscar is then warned warned when approaching his stop

11 . Audio Bubble

12. Screen showing end of bus journey. Exits bus



13. Screen Left

14. Screen Straight

15. Screen Right

Oscar is then directed to frontdoor of shopping centre



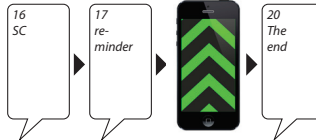
16. Audio Bubble shopping centre

17. Audio Reminder of directions

18. Screen - Straight Ahead

19. Screen Left

20. Audio Bubble- you have reached your destination



7.4.5 Alternative Flows

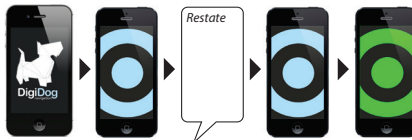
The User has to restate his destination

Screen - State destination

Audio Bubble – please restate

Screen State – state destination

Screen Confirm Destination



7.4.6 Non-functional Requirements

Every Function has an audio file associated with it.

Every Function has a visual UI associated with it.

7.4.6.1 Usability

Colours need to be suitable for the blind person

Audio interpreter must understand particular dialect.

7.4.6.2 Reliability

Must be reliable within a certain range
Audio must be able to understand certain dialect

7.4.6.3 Performance

GPs must respond in a certain amount of time .
Must get response from real time

7.4.6.4 Supportability

The app must check for new external and internal maps every week.
Error messages are sent to the developer

7.4.7 Artifacts

Print a report out of it
Anything that is created . Output?

7.4.8 Pre-conditions

Users must have access to a stable cellular connection.
Location services must be enabled on the phone.
When using internal navigation users must have access to wi-fi.

7.4.9 Post-conditions

The app will announce the users arrival at it's destination and then ask for confirmation to switch off the app.

7.4.10 Volumes

This app is expected to be used between 2-4 times a day.

7.4.11 Expandability

We may wish to expand the product for use of Apple Maps once the technology becomes a bit more reliable.

7.4.12 Assumptions

Audio recognition and keywords will be programmed by geographical regions therefore allowing for dialectal differences. Internal Floor plans will be made available for all public buildings listed in the app.

7.4.14 Constraints

The app will only work in areas of strong cellular coverage. Indoor navigation is dependant on reliable wi-fi coverage.

7.5 UC-0010 – Name of use case

<i>Use case ref</i>	UC-0020
<i>Use case title</i>	Cornelius travels from home to town
<i>Author</i>	Geoffrey mcardle
<i>Creation date</i>	08-12-12
<i>Version</i>	1.0
<i>Last modified by</i>	
<i>Date modified</i>	

7.5.1

<i>Ref</i>	<i>Actors</i>
UA-002	User
UA-003	Digi Dog Server
UA-004	Digi Dog Database
UA-006	Luas Database
UA-007	GPS
UA-008	IPS

7.4.1.1 User interface components description

Keywords of audio UI

- *Digi Dog*: Opens Digi Dog app
- *Locations*: Any location that can be recognised on the DDN database
- *Start*: Confirms destination
- *Cancel*: Used for aborting a journey

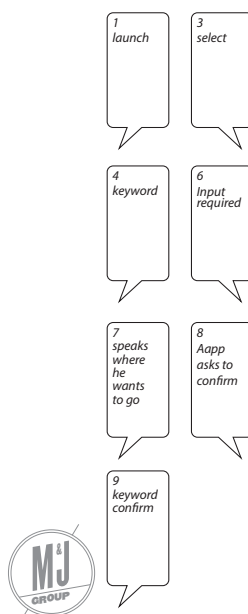
7.5.2 Brief Description

Twice a week Cornelius has a meeting with his friends at a blind support group. The journey is from his home near the Red Cow to Georges St where the group meet is the use case outlined.

7.5.3 Trigger Event

User starts the app with audio prompt '*Digi Dog*' to iPhones voice recognition software.

7.5.4 Basic Flow



1. Launch app with audio prompt by speaking app name to the iPhone '*Digi Dog*'
2. Audio recognition chip on iPhone launches Digi Dog
3. Digi Dog app asks user with audio to choose '*1. Audio mode or 2. Audio & visual mode*'
4. User audio prompts app with option one saying the key word '*Audio*'
5. Audio mode is activated on the app
6. App outputs audio question to user to find destination. '*Please call out destination you'd like to travel to*'
7. User speaks to app saying '*George's St. offices for the blind*'
8. App relays to user asking to confirm destination is '*George's St. Dublin City*'
9. User speaks to app confirming verbally with keyword '*confirm*'
10. DDN app communicates with DDN, GPS, Dublin bus and Luas servers and collects info for user journey.

11 journey over view

12 keyword start

13 directions

16 journey end alert

17 walk prompts from app

7.5.4 continued

11. DDN app gives audio output to user of the different stages of the journey.

'There are 3 stages to the journey. Stage one is to walk to the nearest Luas stop. Stage two is to take the Luas from the Red Cow stop to Abbey St. Stage three is to walk from Abbey St. to George's Street.' Say start if you are ready.

12. User prompts app with keyword
'start'

13. App gives audio directions from users home to Luas stop by communicating with GPS

- *'walk straight for 200 meters'*
- *'you are now 100 meters from Luas stop'*
- *'you are approaching a right turn in 20 meters'*
- *'you are at the right turn and should veer right'*
- *'the next Luas will arrive in 7 minutes'*

14. User boards the Luas

15. App updates user on length of journey on route by communicating with Luas servers

- *'you are 15 minutes from Abbey street'*

16. App updates user that journey is about to end

- *'you will be getting of at the next stop, please be ready'*

16. User leaves Luas at Abbey Street and listens to further walking directions to Georges Street.

17. App gives user audio walking directions from Abbey Street to George's Street.

- *'there is a set of traffic lights 100 meters ahead and we will cross the road here'*
- *'take left/right turn/straight'*

18. User arrives at destination.

19. App closes

7.5.5 Alternative Flows

User may cancel a journey by using keyword.

'Cancel'

7.5.6 Non-functional Requirements

Every Function has an audio file associated with it.

Every Function has a visual UI associated with it.

7.5.6.1 Usability

Audio interpreter must understand particular dialect.

7.5.6.2 Reliability

Audio must be able to understand certain dialect.

7.5.6.3 Performance

GPs must respond in a certain amount of time.

Must have real time response.

7.5.6.4 Supportability

The app must check for new external and internal maps every week.

Error messages are sent to the developer

7.5.7 Artifacts

Print a report out of it

Anything that is created .

7.5.8 Pre-conditions

Users must have access to a stable cellular connection.

Location services must be enabled on the phone.

When using internal navigation users must have access to wi-fi.

7.5.9 Post-conditions

The app will announce the users arrival at it's destination and then ask for confirmation to switch off the app.

7.5.10 Volumes

This app is expected to be used between 2-4 times a day.

7.5.11 Expandability

We may wish to expand the product for use of Apple Maps once the technology becomes a bit more reliable.

7.5.12 Assumptions

Audio recognition and keywords will be programmed by geographical regions therefore allowing for dialectal differences. Internal Floor plans will be made available for all public buildings listed in the app.

7.5.14 Constraints

The app will only work in areas of strong cellular coverage. Indoor navigation is dependant on reliable wi-fi coverage.

7.6 UC-0010 – Name of use case

<i>Use case ref</i>	UC-0020
<i>Use case title</i>	Peter travels from home to sisters house
<i>Author</i>	Jess Boyd
<i>Creation date</i>	08-12-12
<i>Version</i>	1.0
<i>Last modified by</i>	
<i>Date modified</i>	

7.6.1

<i>Ref</i>	<i>Actors</i>
UA-002	User
UA-003	Digi Dog Server
UA-004	Digi Dog Database
UA-007	GPS
UA-008	IPS

7.6.1.1 User interface components description



7.6.2 Brief Description

Peter is travelling from his home to his sisters by walking and using bus.

7.6.3 Trigger Event

Peter opens the DigiDog Navigation app on his smartphone. Presses the centre button to activate the app and waits for the app to load and gather his GPS location.

1. Activation Screen



7.6.4 Basic Flow

He asks the app for directions to Marie's house, a previously saved favorite.

3. State Destination Screen

4. Confirm destination Screen

Peter is then directed from his home, out of the estate to bus stop via the apps audio system.

5. Straight Screen

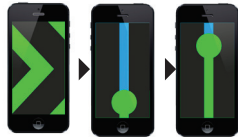


6. Turn right

Once at the bus stop safely, DDN informs Peter of the bus waiting time by the real time service which links into the app via Dublin Bus

7. Journey Screen

Peter boards the bus and is updated regularly on his journey's stage. Peter is then warned when the bus is approaching his stop. The bus is full and Peter is unable to get off the bus in time. As DD is using real time technologies, DDN can still direct Peter safely to his destination even though Peters route is now changed. He exits the bus at the next stop and is directed to Marie's house



8. Red Screen

He gets off the bus and turns around

10. Straight Screen

11. Turn Right Screen

12. Audio Bubble confirmation of arrival

Peter stops the Journey on DDN.



7.6.5 Alternative Flows

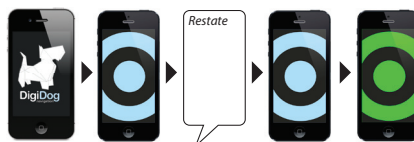
The User has to restate his destination

1. Screen - State destination

2. Audio Bubble – please restate

3. Screen State – state destination

4. Screen Confirm Destination



7.6.6 Non-functional Requirements

Every Function has an audio file associated with it.

Every Function has a visual UI associated with it.

7.6.6.1 Usability

Audio interpreter must understand particular dialect.

7.6.6.2 Reliability

Audio must be able to understand certain dialect.

7.6.6.3 Performance

GPs must respond in a certain amount of time. Must have real time response.

7.6.6.4 Supportability

The app must check for new external and internal maps every week.
Error messages are sent to the developer

7.6.7 Artifacts

Print a report out of it. Anything that is created .

7.6.8 Pre-conditions

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Location services must be enabled on the phone.
When using internal navigation users must have access to wi-fi.

7.6.9 Post-conditions

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We may wish to expand the product for use of Apple Maps once the technology becomes a bit more reliable.

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Audio recognition and keywords will be programmed by geographical regions therefore allowing for dialectal differences. Internal Floor plans will be made available for all public buildings listed in the app.

7.6.14 Constraints

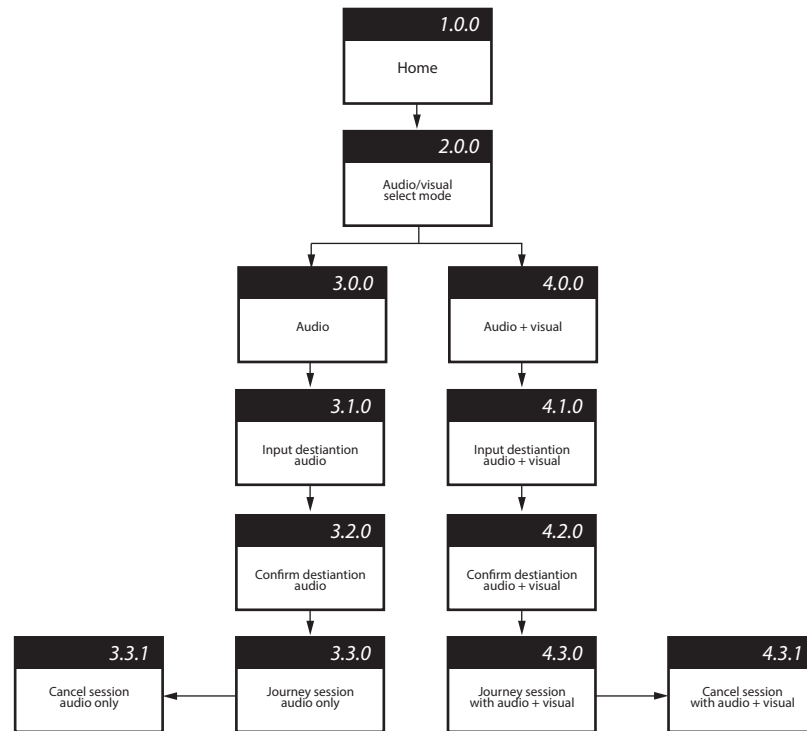
The app will only work in areas of strong cellular coverage. Indoor navigation is dependant on reliable wi-fi coverage.

8. Structure Maps

8.1 Introduction

This section contains the structure maps for DDN

8.2 Map



8.3 List of wireframes



9.Storyboards

9.1 Introduction

This section contains story boards for the various DDN UI states.

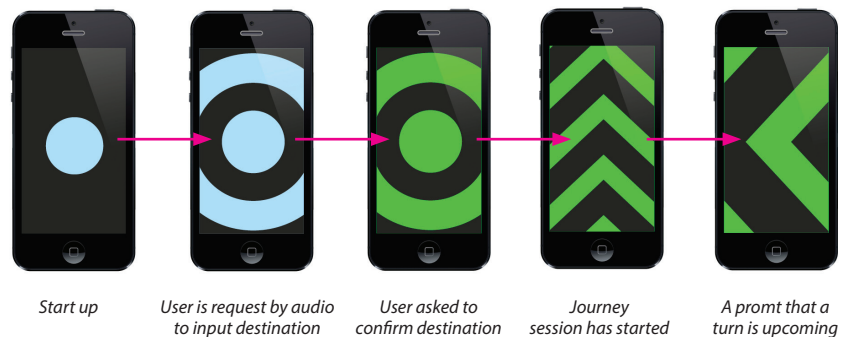
9.2 List of Storyboards

Ref	Description	Cross-ref to 0.0.0.0
UI SB-0001	App activation, input and confirmation	
UI SB-0002	App during walking mode	
UI SB-0003	App during public transport mode	

The storyboards below shows the different states a user might encounter with the Digi Dog UI.

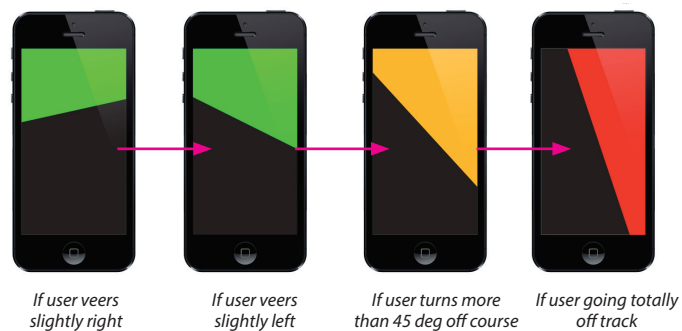
9.3 Activation, input, confirmation

UI SB-0001



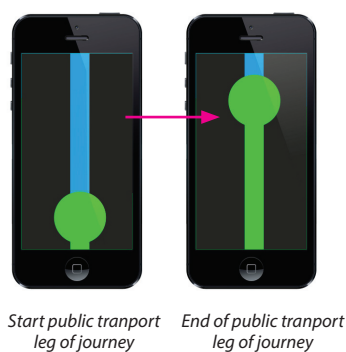
9.4 Walking

UI SB-0002



9.5 Public transport

UI SB-0003



10. State Transition Diagram

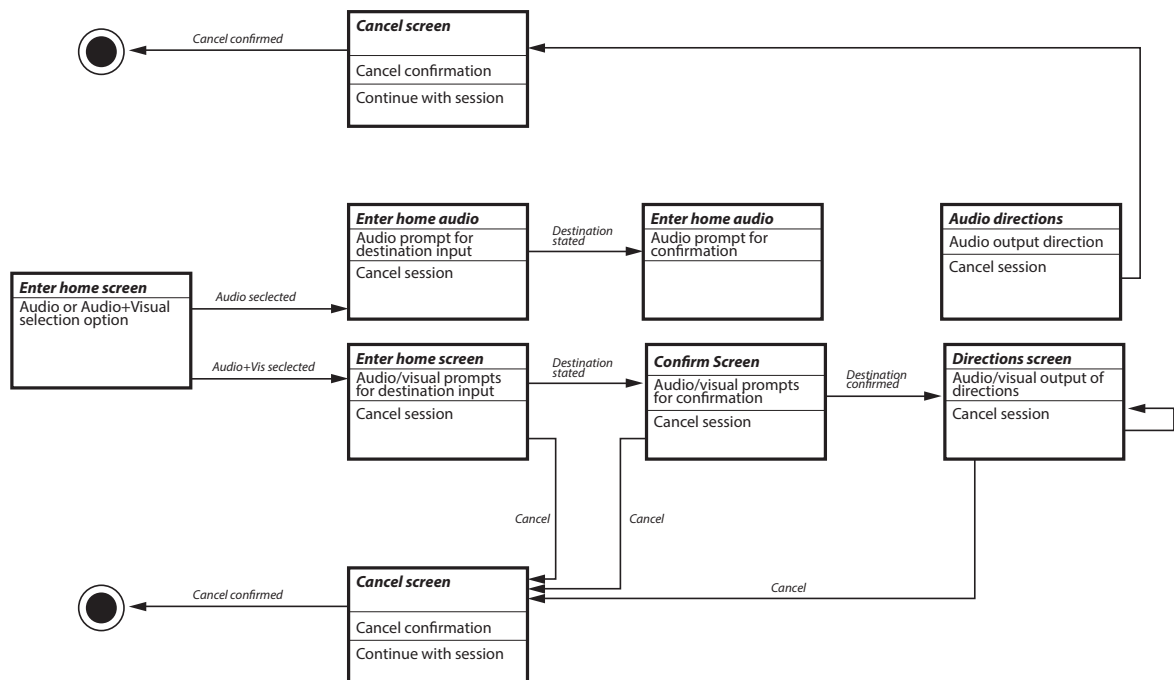
11.1 Introduction

This section contains the state transition diagrams for DDN.

11.2 List of State Transition Diagrams

Ref	Description	Cross-ref to 0.0.0.0
UIST-0001	Level 0	

UIST-0001



11. References

General facts for blind and visually impaired

Worldwide - 800 million people worldwide are blind or severely visually impaired.
45 million people are blind and 269 million are significantly visually impaired; an additional 517 million people require spectacles for reading and other close up activities.
90% approx. of the world's visually impaired live in developing countries.
Cataract - leading cause of blindness in middle- and low-income countries.
80% of all visual impairment can be avoided or cured.
UK – 2 million in the UK are living with sight loss, 1 in 30 and 2/3 are women.

Source: <http://www.who.int/mediacentre/factsheets/fs282/en/>

Europe –

Over 30 million blind and partially sighted people in geographical Europe.
An average of 1 in 30 Europeans experience sight loss. There are four times as many partially sighted persons as blind persons.

Source : <http://www.euroblind.org/resources/information/nr/215>

The average unemployment rate of blind and partially sighted persons of working age is over 75 percent. More women are unemployed than men. Women are more at risk of becoming blind or partially sighted than men. 90 percent visually impaired persons is over the age of 65

(Information, 2012)

Definitions

Four levels of visual function: (Visual impairment and blindness , 2012)

- normal vision
- moderate visual impairment
- severe visual impairment
- blindness. (Visual impairment and blindness , 2012)

Market for app

The numbers of people with sight problems in the UK will increase dramatically over the next 25 years. 19 million children are visually impaired (aged to 18).

(Vision Statistics for World Sight Day , 2012)

65 % of all people who are visually impaired are aged 50 and older.

This age group comprises about 20 % of the world's population.

With the increasing elderly population in many countries, more people will be at risk of age-related visual impairment.

(Vision Statistics for World Sight Day , 2012)

(Key information and statistics , 2012)

Bibliography Information. (2012). Retrieved from [www.euroblind.org: http://www.euroblind.org/resources/information/nr/215](http://www.euroblind.org/resources/information/nr/215) Key information and statistics . (2012, October). Retrieved from [www.rnib.org.uk: http://www.rnib.org.uk/aboutus/research/statistics/Pages/statistics.aspx](http://www.rnib.org.uk) Vision Statistics for World Sight Day . (2012). Retrieved from [www.cibavision.com: http://www.cibavision.com/eye--health--care/vision--statistics.shtml](http://www.cibavision.com) Visual impairment and blindness . (2012, June).

Retrieved from www.who.int: <http://www.who.int/mediacentre/factsheets/fs282/en/>

21.5 million in the USA visually impaired or blind

American Foundation for the blind

<http://www.afb.org/section.aspx?SectionID=15>

Stats on Mobile Market

iPhone Mobile app downloads have surged by 33% in October it was reported by wthr.com. As of 2012, the App Store offered more than 700,000 apps by Apple and third parties.

The growing number of smartphones, technology convergence, mobile commerce, and location-based shopping are all expected to boost the GPS market worldwide. The driver of this growth is the widespread use of mobile mapping applications in the United States and Europe. GPS is a key component in many of the location-aware smartphone applications that have become so popular in recent times. Thus, the number of subscribers of GPS-enabled location-based services (LBS) is anticipated to grow substantially in near future, with market revenue touching the mark of US\$ 10 Billion by 2013. Speedy enhancements and developments in digital mapping software will present this positive outlook for the industry in future.

<http://www.reportlinker.com/p0116472-summary/World-GPS-Market-Forecast-to.html>

The GPS market generated \$9.1 billion in 2011 and is expected to generate \$26.36 billion by 2016 at a CAGR of 23.7% from 2011 to 2016. The global GPS product market is segmented into GPS-enabled smartphones, GPS cameras, and portable automation devices.

<http://www.marketsandmarkets.com/Market-Reports/global-GPS-market-and-its-applications-142.htm>

References for Competitors Mentioned

Kapten Plus Navigation System

Outdoor GPS for the blind has pedestrian and vehicle mode. GPS signal seems to be a big issue here. Worst instructional video in the world, uses audio keywords to interact with the user.

<http://www.youtube.com/watch?v=-MTo4eFHa-s&noredirect=1>

References for Competitors Mentioned

Kapten Plus Navigation System

Outdoor GPS for the blind has pedestrian and vehicle mode. GPS signal seems to be a big issue here. Worst instructional video in the world, uses audio keywords to interact with the user.

<http://www.youtube.com/watch?v=-MTo4eFHa-s&noredirect=1>

Navizon

This uses cellular and wifi technology for indoor tracking of other cellular devices. You can choose a phone/user to track.

<http://www.navizon.com/product-navizon-indoor-triangulation-system>

IPCS

Similar to Navizon, locates devices/users within a building using nodes and bluetooth

<http://www.9solutions.com/ipcs-technology>

TalkingPlaces

A GPS Android app which uses information from Google Maps, Wikipedia and OpenStreetMap to guide the visually impaired.

<http://code.google.com/p/augmented-reality-android-diploma-thesis/&usg=AFQjCNHhDhIXr92Veei6OG9EUPnWzW2lg>

Sendero LookAround

An iOS and Android app - aimed at the visually impaired - which audibly announces the nearest points of interest and current location at a shake of the phone. However, it is not a fully functional GPS and does not provide routing.

<http://senderogroup.com/support/supportiphone.htm>

On Track

An Android app which audibly relays compass and directional data to the user. Currently in Beta.

https://play.google.com/store/apps/details?id=com.jeffarnold.ontrackadverts&feature=search_result#?t=W251bGwsMSwxLDEsImNvbS5qZWZmYXJub2xkLm9udHJhY2thZHZlc3RzIl0



Ariadne GPS

An iOS GPS app which, while not specifically aimed at the visually impaired, claims to be completely accessible via voiceovers and speech synthesization. App helps 'explore whats around you' and gives current location.

<http://www.ariadnegps.eu/>

Virtual Eye

A navigation iOS app specifically aimed at the blind and visually impaired community. Using Apple's accessibility system and Siri-like voice recognition technology, the app claims to be completely usable via speech controls. Its main features are route planning, location awareness, 'advanced neighbourhood scanner', route recorder, weather and points of interest.

http://www.apps.tt.com.pl/virtualeye/moveassistant/index_en.html

Tom Tom

<http://corporate.tomtom.com/factsheet.cfm>

Section 12

Interviews

Cearbhall

Interview Notes

Level of visual impairment : 0% vision in both eyes.

Can read braille and navigate places he already knows.

How do you find navigating the city?

'pure hell' journey for a short journey.

Some things he listed are below :

He makes the following journey :

145 bus from Bray > Suffolk st > South Great George street.

These are some of the obstacles issues he faces :

- People at bus cues
- Guidelines disappearing
- Finding road edges
- Injured himself on the low bollards that are at hand level that stikes him
- Cafes have smoking areas outside with loose framing that wobble and catch stick
- Bleepers at crossing are turned down by Dublin authority, they are so low you cant hear the other side or the both sides when your in the middle
- The cars are rumbling with foot on accelerator causing distress
- Tactile pavements. 1 they're uncomfortable to walk on but 2 satisfying to know your across.

Do you use any navigation apps currently?

He doesn't use apps for navigating (odd use of 'Ariadne')

<http://www.ariadnegps.eu/>

Cane is his method. Would be open minded to use an app that would give him that information.

Would you travel to new places regularly? How do you find this experience?

Would venture to new places but would help if he was aided to earmark his route for second time.

Would 'stand useless' at the front of shopping centre and wait for someone to help him usually to navigate within.

Audio feedback would suit but he listens a lot to the radio and might get distracted. His attention is then away from feedback or road. He mentioned, he got beat up once when not checking the road ahead with his attention.

Would you have any suggestions for this app?

Kinesthetic feedback he said could be an option. 'Interesting to explore' / 'Not so much in the shoes' because you need your feet for reading the pavement and that would distract. The waist area is not sensitive enough for use of a belt but suggested perhaps feedback somewhere in hands, arms or chest.

Headband

Other touch points he directed me to

Highly regarded source

<http://www.empowermentzone.com/bio.txt>

<http://www.nvda-project.org/>

<http://www.afb.org/default.aspx>

His own research

<http://www.multisensorydesign.ie/>

Prefers Mac / iPhone because it more accessible

Android has too many models of phone.

Gave a history story that some visually impaired people used to work on developing with the apple.

Interview with Peter

What level of visibility do you have?

40-50% in both eyes

Can you read icons/text on a phone?

With a special reading device (like a magnifying glass)

This is our idea. What do you think?

Peter thinks this is a great idea. Many people with low vision would already use some sort of GPS for getting directions. He thinks people would require a lot of confidence in the system to go to a new public indoor space on their own.

In a school for the blind this could be mixed with tactile directions for ease of use.

He asked how the system would be setup for somebody completely blind?

People with low vision should be accommodated with large on screen icons which are colour coded or something simple.

Do you use any directional aids at present?

GPS with google maps for outdoor areas and a cane .

Do you use any GPS apps currently?

Google maps , GPS on a Phone

Which phone or device do you think is easiest to use?

Iphone

Why?

good screen size and easy to use.

Battery not great for somebody that has to spend a lot of time looking at the screen

How do you find public buildings such as shopping centres to navigate?

He feels ok with familiar places . New large crowded places – he would find a bit daunting at first

If you were building this app what would you use?

Large colorful icons as listed above

Reliability would be very important (GPS and indoor)

[David Comments] – Perhaps you would preload the map or directions before going to a new public building..

Would you go to a public building where you haven't been before without a guide?

Peter would prefer to go with a guide initially but he would go if he had to but would find the event more stressful than normal day to day life.

Rahime

What level of visual impairment do you have?

5/10% in one eye.

Can see icons on phone uses speech function to read out what is on screen. Cant read text, uses braille.

Do you use any apps currently for navigation?

Uses apps on an iPhone. Look around by sodaro (spoke highly) and bus time tabel app. Has used a walking GPS app.

Has a few people/friends all using apps and even more GPS

What mobile device do you think is best for people with visual impairments?



Prefers iPhone because it more accessible
Android has too many models of phone.
Gave a history story that some visually impaired people used
to work on developing with the apple.

How do you get around at the moment?
Uses bus and walk for nav.
Uses a cane only at night or maybe in shopping centre
to let people know so they are aware.

Would you regularly go to new places unaccompanied?
Shopping centres are difficult to navigate. Think it would be
a great idea to navigate this kind of building.

Have you any suggestions on how to make this app?
He suggested
- colour coded doors and entrances.
- where are the bus stops from the centres. Where are the lifts.
- where are the restaurants.
- connecting the building to transport services
- perhaps giving an indication of what is in certain shops.

Would prefers audio with kinaesthetic combo for feedback.

Morris Cleary - Interview

Background :

Age: 47
Visually impaired since birth but has decreased.
experienced internet user

What level of visibility do you have?
10% in left eye and 15% in right

Can you read icons/text on a phone?
Can see large colour icons but not text.
Uses braille and and VoiceOver/Screen reader

Do you read braille?
Yes

This is our idea. What do you think?
Interesting idea, GPS very helpful already. would be beneficial to move indoor buildings

Finds it hard to navigate in close surroundings such as department stores. Main because of many
obstacles rather than not knowing where to go.

Do you use any directional aids at present?
Uses Cane and gps app already but only helpful outdoors

Which phone or device do you think is easiest to use?
iPhone

Why?
has magnifying glass and zoom functions with many apps available
How do you find public buildings such as shopping centres to navigate?
Very hard due to obstacles and people. App wont help avoid those, will still use cane, but will help
get from a to b.
If you were building this app what would you use?

Colour coding ? / Relative Directions / Description of destination?



"Colour important for me as i can see minimal colouring. Audio for directions a must"

Would you go to a public building where you haven't been before without a guide / unaccompanied?

Always a challenge, hard to find people to ask. Not always a help desk

How do you get to a help desk ? Relies on people a lot to ask.

Sinead - Late 20s

What level of visibility do you have?

10-15% both eyes

Can you read icons/text on a phone?

Depends on size and color

Do you read braille?

Yes

This is our idea. What do you think?

Sinead liked the idea as she finds GPS quite useful to use already.

She thought Sendaro was a useful app.

Do you use any directional aids at present?

GPS and a cane and directions from memory. (counting steps)

Which phone or device do you think is easiest to use?

She uses a Samsung Galaxy at present.

Why?

Large screen.

How do you find public buildings such as shopping centres to navigate?

She doesn't go to unfamiliar places without a guide.

If you were building this app what would you use?

Very clear concise audio directions.

Colour coding would be important also

4 People

Four blind people from a blind walking group were interviewed and asked a series of questions about DDN. Their comments are as follows:

What particular difficulties do you have in built up/urban areas?

Interviewee A:

Crowds, Christmas is a hard time to get around, but then the roundabout routes you mightn't know as well... buses are hard and the council turned down the lights, the beeps you can't hear like you could.

Interviewee B:

It's getting in more, I'm ok when I'm here. The buses it's hard not knowing the timetables and you could be waiting.

Interviewee C:

Ah well I know Dublin well, maybe sometimes with crowds but I'd come into town early or late and I'm in town today but just to get this bus, wouldn't be in on a Saturday close to Christmas normally. But ah I'd know town so would be comfortable

Interviewee D:

More off the beaten track, from here [D'Oiler Street] down to Grafton and Stephan's Green and over back to O'Connell Street I'm fine. Maybe if you have to find a new place.

What technology do you use as an aid right now?

Interviewee A:

I've the smart phone and it talks to me and I can make voice commands. And there are more apps so I might start using some of them. That's it really.

Interviewee B:

Nothing. The voice stuff at home and I might get the phones like the rest of them.

Interviewee C:

Phones and I'd try all the new apps and all of that...and you might try them and see but they'd be good for trying, I wouldn't be using them all the time now and you might use one and then you'd lose faith in it like... Ah they can be good and all but I wouldn't have the patience, if it wasn't perfect I'd say fuck it. But I'd try them all now.

Interviewee D:

The voice commands and the smart phones and then everyone is telling me to get the apps and this and the other. But.... the gps the guide just to get from A to B, but not everywhere now.

Digi Dog Nav would enable navigation indoors and provide information on different places to go to. Is that something that would interest?

Interviewee A:

I'd try it, like if you're in a new place, like if you have to head up to the tax office or you know a big building where you have to find that room on the fifth floor. But you'd have the help from people but it would be good that you didn't need that.

Interviewee B:

Well I have to get the phone yet! But I might yeah I'd say I'll start trying and seeing what's out there.

Interviewee C:

Yeah I would try anything, like Gus was saying with the A to B, they might just get one one stage of the way so if you had the directions from A to B to C you know?

Interviewee

Interviewee D:

I'd try it yes, I'd try it, if it could tell you what is the best place to go to, like if it was like a guide not just directions that would be good yes.

Interview with Child Vision

Interviewee: Ruth Hickey, the Communications officer inside Childvision (formerly St Josephs school for the Blind).

Ruth Hickey sat down with M&J Group and was told about the DDN application and what her thoughts and opinions were about the innovative app. Her thoughts are as follows:

Ruth seems quite interested in Digi Dog and is willing to help us by putting us in contact with the relevant experts inside their organisation who can give us some valuable feedback on our ideas.

Ruth's thoughts -

One concern she did raise about our app is that - for example, in Childvision - they encourage their students to use their canes, as opposed to guide dogs. In this vein - they hope students can learn their own paths and be independent in their navigation, instead of relying on guide dogs - and by extension, technology.

Navigation apps for the blind and visually impaired are a little controversial in that respect, particularly among younger people.

