Ambient Assisted Living Joint Programme

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D.1.2 User requirements input and High level functional specifications

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1 HISTORY

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5 EXECUTIVE SUMMARY

Since its' inception and as it has been seen during this first execution year, it can be stated that the ALICE project is based on two main pillars. On the one hand, several technological and science disciplines (like cognitive sciences, physiology, computer vision or artificial intelligence among others) are being essential to develop the project. On the other hand, the project has a social side as its' main objective is to provide visual disabled people with a useful product in order to help them live independently and easily conduct their daily lives.

In order to achieve this main objective, a product which really covers the necessities of end users will be developed. In this sense, end-users interests are being and will be taken into consideration in a cross and transversal manner during the whole project. The involvement of active end-users from the beginning to the end of the project will ensure that the project is being carried out in the correct direction to achieve a successful and socially acceptable solution.

At this stage of the project, the requirements of the end-users have been compiled (as it will be explained in further sections) in order to develop a first prototype. Further on, this first navigational assistant based on a fusion of perceptions gathered from a range of sensors and will be improved after further tests of end-users when new requirements will be included until all the "nice to have" features are in place and have been taken into consideration for the final product development.

6 INTRODUCTION

As it has been mentioned in the previous section, the main goal of the project is to provide to visually disabled people a useful product in order to help them live independently and easily conduct their daily lives via several technological and science disciplines.

In order to ensure a helpful product, users will be involved during the whole execution of the project. In order to achieve the users' involvement, a user involvement plan has been developed in D 1.1. The involvement plan, implicates users in different stages during the project

During this first phase of the project (work package 1), the collaboration of final users is needed in order to detect and compile their needs and requirements. With the execution of this phase, users will be given an active role in the definition of the system. The results of this compilation (which will be detailed in further sections) have been analyzed and reflected in this deliverable. Further prototypes of the navigational device will be tested and described in work package 4.

7 METHODOLOGY

7.1 ESTABLISHING CONTACT WITH RESPONDANTS

As mentioned in section 8.1 of D 1.1, the User Centred Design (UCD) methodology will be used. UCD means a development approach which focuses on the end-users who will use the product or service created (Courage & Baxter, 2005). The aim of UCD is that the product/service developed should suit the user, rather than making the user suit the product/service. A scheme of the UCD can be found in figure 1.

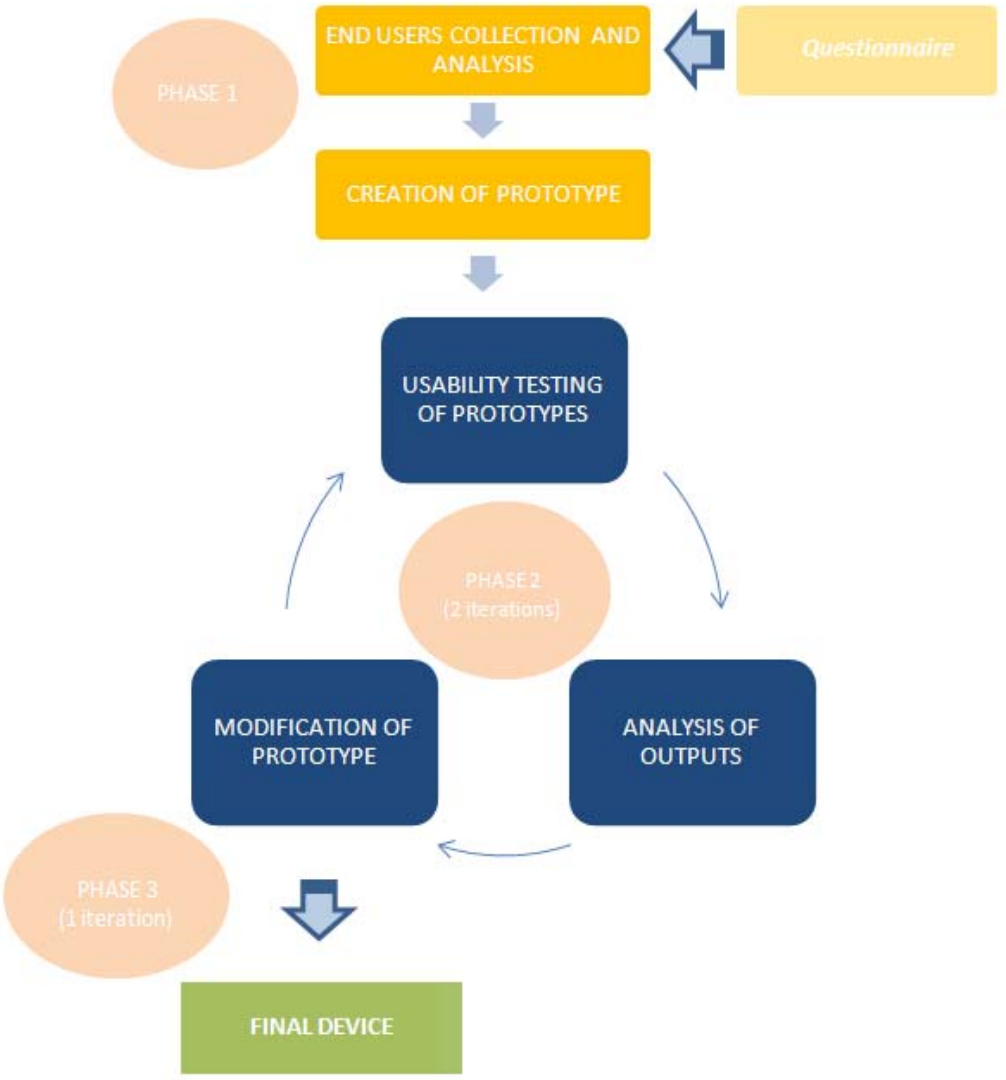


Figure 1: Schema of the UCD and the users involvement phases.

In this schema, the phases in which users will be involved, are also reflected, and are as follows:

- **Phase 1:** Requirements collection.
- **Phase 2:** Initial trial and iterations.
- **Phase 3:** Final trial.

At this stage of the project, the first phase about the user requirement data collection has been carried out. In order to compile this data, it has been arranged to use a questionnaire addressed to final users or potential final users. Interviews are one of the most frequently used user requirements gathering techniques and have been successfully used in previous projects. For the ALICE project the structured interview with closed questions is considered the most appropriate way for gathering user requirements. Structured interviews have some positive features like: quick to analyze, questions asked are consistent across participants, and also generally more questions can be asked than in an unstructured interview. More details about the questionnaire will be given in section 7.2. Moreover, the interviews have been done using mail, telephone and in person at the respondent's home.

During the interviews, participants were emotionally at ease with their disabilities and are within the normal intelligence range. In this sense, they have understood their objective, which is to test a special kind of smartphone which will give them a range of useful mobility information in a way which will not bombard their senses. They will expect to be handling headphones and a camera. Furthermore, participants understand that it will not be possible within the project budget to provide a free ALICE at the conclusion. Furthermore, all testers have been provided with questionnaires and samples of consent letter and other documents which will be detailed in section 7.2.

All the testers have been willing volunteers; however, the specialized organizations responsible for their involvement (UBPS and COMBD, section 7.2 of D 1.1) agreed to pay them a small fee plus any appropriate travel expenses. This is a total amount of €67..

To protect anonymity and identity of the end-users, UBPS and COMBD have devoted special attention to several aspects. First of all, the researchers and developers of the ALICE project will not put participants at risk at any point in the project and will respect fundamental ethical principles in their dealings with participants. The typed interviews or any other document will NOT contain any mention of the end-users name, and any identifying information will be removed. A unique numbered code will be used rather than names or other personal details. All the research material will be stored in a secured location within the specialized associations.

7.2 MATERIAL

In order to compile the required data, two main documents have been created for the correct development of the interviews. On the one hand the questionnaire and on the other hand the consent letter. Both will be explained in the following sections.

7.2.1 QUESTIONNAIRE

In addition to questions related to the ALICE device itself, the psychophysical state of the tester will be considered when developing the system, since it can modify the system development. Consequently, the information needed from the tester, which will be obtained from the questionnaire, will cover several areas as it is shown in figure 2.

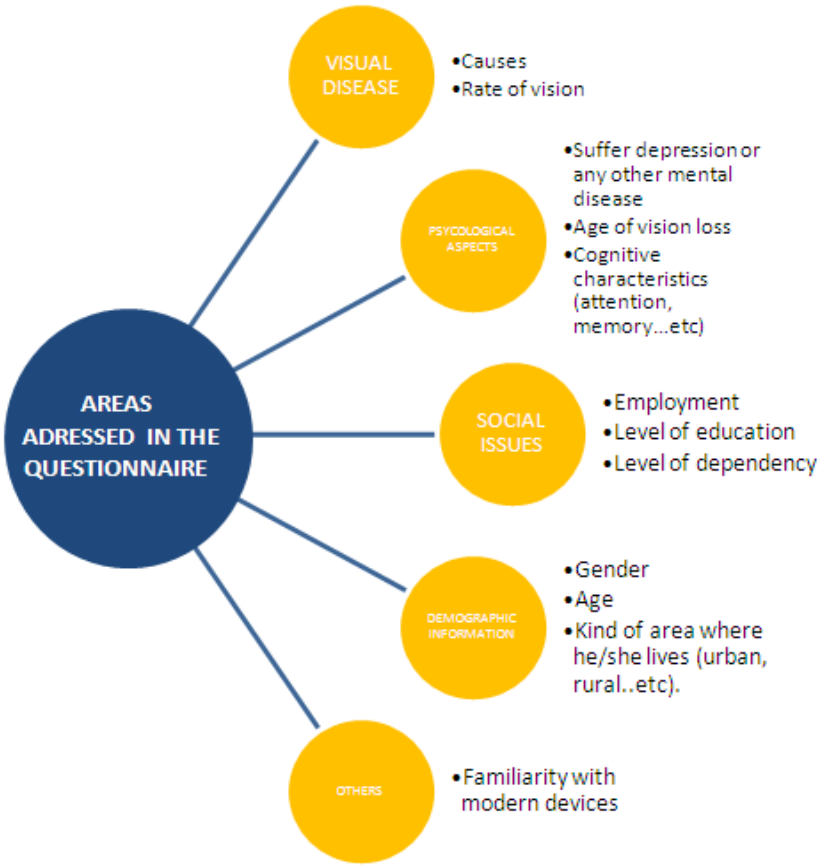


Figure 2: Scheme of the areas addressed in the questionnaire.

A sample of the questionnaire that has been used can be found in annex I.

7.2.2 LETTER OF CONSENT

In order to inform properly the participant about what the Project ALICE is, how and when will they be involved during the development of the project and also to ensure them their anonymity, a letter of consent has been developed among all partners. A sample of this letter can be found in annex II.

8 PARTICIPANTS CHARACTERISTICS

As it has been mentioned in section 7.1.3 of deliverable D 1.1, in order to carry out a successful analysis of end-users, the first step to follow is to target the users or to classify them according to their distinguishing feature within the project context. In this sense, the target group of this project are principally people in the age group called 'young old' – people from 55 to 75 years of age with visual impairments. The reason to choose this age range is that life expectancy is rising, and elderly people are more likely to have some vision problems.

The end-users testers will be provided by two specialized organisations: UBPS from Slovenia. Four groups will be assembled in total, two groups in Slovenia and two more groups in the United Kingdom. One of these two groups for each country will be partially sighted and the other group will be totally blind. The main features of end-users that will participate in the project are shown in table 1.

Target groups of end-users	
Number of groups	4 groups (2 in UK, 2 in SLO).
Characteristics of subgroups	In each country 2 groups (1 blind and 1 partially sighted)
Age of participants	55-75
Number of participants	20 (in each country)[1]

Table 1: Testers groups characteristics.

[1] For project purposes 15 participants is the minimum. In order to avoid some problems, which might occur later on because of possible participant's withdrawal, we suggest 18-20 people (9-10 for each group).

9 DATA ANALYSIS

In this section, the data compiled after the questionnaires have been answered by the testers, has been analyzed. This analysis has been done gathering the most similar answers in order to obtain a quantitative (% respondents) result that can guide the prototype developers. For those questions with a very high variety of responses (which could not be gathered together for a quantitative analysis), raw data is provided in order to be taken into consideration for developers as qualitative data.

Some of the answers have been considered to be a must for being taken into consideration by developers of the pilot device. In order to have a clear picture of these key users' requests, they have been summarized in section 11.

Each answers of the question of each section of the questionnaire (which can be found in annex I) will be analyzed as follows.

I.DEMOGRAPHIC DATA

1. Regarding the gender of the respondents, a 50% were males and a 50% were females.

2. The idea was that collaborators cover an age range from 55 to 75. The age of respondents who have collaborated with the compilation of the initial Alice users requirements, is as follows:

Response	% Respondents
50's	30%
60's	40%
70's	30%

3. Regarding the characteristics of the place where the respondents live:

Response	% Respondents
Village	23%
Small town	13%
Large town	5%
Big city	60%

II. Visual Acuity

4. Regarding the eye condition of the respondents:

Responses	% Respondents
Blind	32,5%
Severe vision loss	35%
Partially sighted	30%
Other	2,5%

5. Regarding the cause of the eye disease, the causes for the visual impairment of testers are (taking into consideration that some testers had chosen more than one answer):

Responses	Number of responses
Cataract	5
Glaucoma	8
Age related Macular Degeneration	12
Corneal opacities	2
Diabetic retinopathy	2
Childhood blindness	4
Trachoma	0
Other*	17

*Other: Retinoblastoma, bleeding of macula, retinitis pigmentosa, eye nerve atrophy, congenital cataract, myopia, entropy, albinism, chorioretinitis, nystagmus, car accident, retrolentalfibroplasia, accident after operation, detached retina and visual perception affected by chronic fatigue syndrome…etc.

6. Regarding users' self-assessment of vision:

Responses	% Respondents
Excellent	0%
Good	2,5%
Medium	12,5%
Poor	77,5%
Other*	10%

*Other: None and variable.

III.PSYCOLOGICAL, SOCIAL AND PHYSICAL ASPECTS

7. Regarding other impairments:

Responses	% Respondents
YES*	40%
NO	60%

*YES: People who answered yes determined their impairment as: Spinal injuries, deafness, heart defects and hip replacements, diabetes, high blood pressure, knee replacements, balance and co-ordination problem, RSI with wrists, chronic fatigue syndrome, osteoarthritis and osteoporosis.

8. Regarding the suffering of any other disease:

Responses	% Respondents
YES	17,5%
NO	80%
NO ANSWER	2,5%

9. Concerning mobility abilities:

Responses	% Respondents
Bad	25%
Good	47,5%
Excellent	25%
Other	2,5%

10. Concerning self-assessment of hearing::

Responses	% Respondents
Good	47,5%
Medium	47,5%
Poor	5%
I cannot hear	0%

11. Concerning the age when the participant became visual impaired:

Responses	% Respondents
Birth	12,5%
Childhood	20%
30s	20%
40s	12,5%
50s	22,5%
60s	7,5%
70s	5%

12. Regarding the use of a white cane:

Responses	% Respondents
YES	52,5%
NO	47,5%

13. Regarding the use of a guide-dog:

Responses	% Respondents
YES	15%
NO	85%

14. egarding the level of education:

Responses	% Respondents
Primary school	2,5%
Secondary school	27,5%
Vocational or similar qualification	22,5%
Undergraduate degree	22,5%
Master degree	17,5%
Doctorate or another higher degree	7,5%

15. Regarding the working hours of the participants:

Responses	% Respondents
I am retired	32,5%
I am working full time	20%
I am working part time	5%
I am self employed	5%
I am unemployed	0%
I am early retired due to disability	37,5%

16. Regarding the needs that participants have when they are out and taking into consideration that the participant could choose more than one option, respondents have answered:

Responses	Number respondents
I need someone to guide me always. I cannot walk around by myself	9
I need someone to guide me at certain places. I am able to walk alone, but because of anxiety I need guidance of the other person	15
I manage to walk around with white cane	7
I am a guide dog user	2
I can walk around by my own without any kind of help	5
I do not walk	1

17. Regarding if the users find any difficulties for orientating themselves throughout indoor public institutions:

Response	% Respondents
NO	15%
YES	85%

Those who selected "yes" mentioned the following reasons (participants could choose more than one answer):

Responses	Number Respondents
Because of the size of the indoor room	17
Glitering surfaces	14
Too dark room	10
No orientating points to navigate with white cane	8
Difficulties for seeing landmarks	2
Background music is distracting	2
No queuing system so I don't know when to approach the desk	2

IV. ALICE NAVIGATIONAL DEVICE

18. The participants have chosen, among some practical possibilities, what they would do in a busy street wanting to find a particular building, when lost and not knowing the area or the people around. What they would do would be the following (it must be taken into consideration that the participant could choose more than one option):

Response	% respondents
I call the frend/family by mobile phone and ask them to pick me up	7,5
I call the emergency	0
I ask people around me for help	35
I ask some people around me for the information where I am and try to find the way back on my own	35
I would like to ask people around me for help, but I feel uncomfortable to do so. I don't do anything. I try to find the way back on my own	0
Would not be out by myself	20
Ask a taxi driver	2,5

19. Regarding the familiarity of the routes the participant usually does:

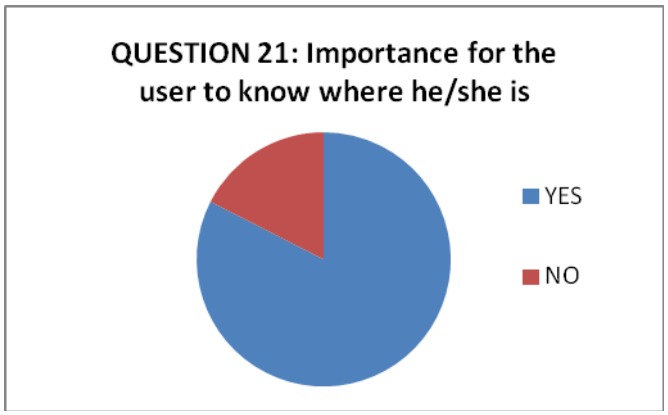
Response	% respondents
YES	50%
NO	45%
NO ANSWER	5%

20. Regarding how the participant finds out where he/she is at a particular moment, the responses have been as follows (it must be taken into consideration that the participant could choose more than one option):

Responses	Number respondents
A guide tells me	2
Listening, familiar sounds	7
Looking for something familiar, assess all visual info (edges of pavements, crossroads, very large inscriptions…etc)	3
Using my Georgie phone	3
Asking someone for help	10
I don't go out anywhere without someone	1
I don't go to unfamiliar routes	4
Underfoot textures	2
Different surfaces	1
Ask the dog	2
Explore	
Pray	1
Sun/wind direction	1
Smell	1
Knock on a door	1
Use GPS	1
Expected obstacles (names of streets,buildings…etc).	9
Road signs	
Retrace steps till I find somewhere familiar	2
Mental map	5

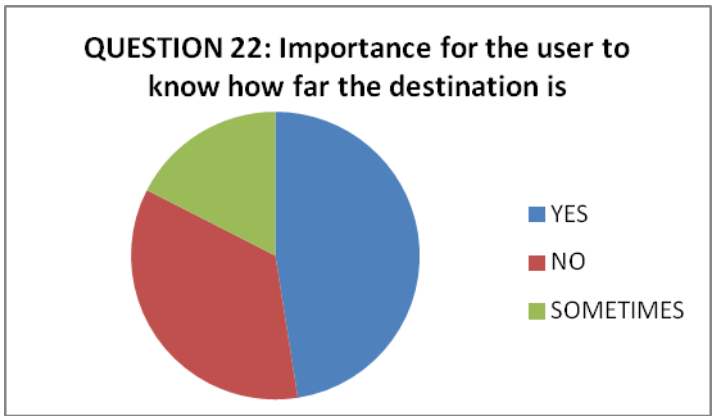
21. ncerning the importance of participants knowing where they are when travelling:

Response	% Respondents
YES	82,5%
NO	17,5%



22. Concerning the importance of knowing how far the destination of the participant would be:

Response	% Respondents
YES	47,5%
NO	35%
SOMETIMES	17,5%

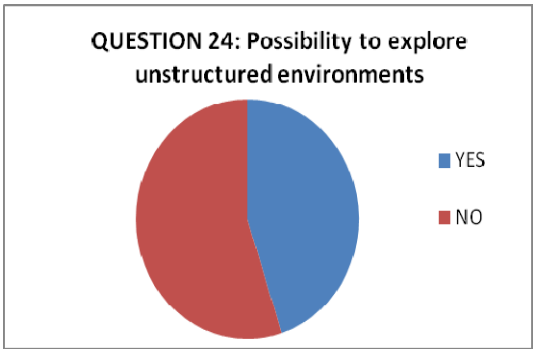


23. Concerning the capacity that the participant has in order to work independently around a non-structural environment (parks):

Response	% Respondents
YES	55%
NO	45%

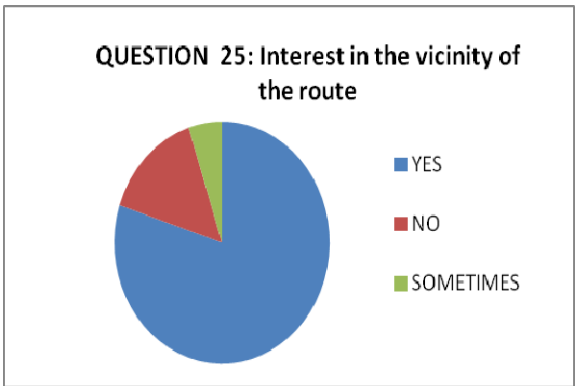
24. Regarding the possibility of exploring unstructured environments (e.g. parks)by the participants:

Response	% Respondents
YES	45%
NO	55%



25. Concerning the interest in the vicinity of the route where the participant walks:

Response	% Respondents
YES	80%
NO	15%
SOMETIMES	5%



26. Regarding what does the participant expect that a mobility aid would do for him/her, the responses have been as follows (it must be taken into consideration that the participant could choose more than one option):

Responses	Number respondents
Give me distance to buildings, finding my bus stop, post box..etc. That could give me information of my environment.	7
A simple phone with 1 2 or 3 buttons that would help at the press of just a single button..	1
Could tell me where there is a safe crossing point when the light is bad.	3
Read my letters and journey instructions and street inscriptions.	4
Tell me where I am on a particular route (address).	3
Tell me the coming weather, temperature, local taxi availability, lighting up time, bus and train real time information.	2
That could warn me about obstacles, overhead branches, steps and holes. Warn of nearby danger (e.g. overhanging obstacles).	12
Speak the shops I am passing, speak the name of roads. Audible description of places of interest and talking ATM's.That it could tell me the colour of things around me.	7
Pickup echoes from environment	1
Not interested in recognising faces of people I meet.	1
provide directions in unstructured spaces.	1
To know how far my destination is.	4
There are many problems about using a technical aid for navigation. A blind person has only one hand free – the other is holding a cane or a dog lead – to hold a device. A navigational aid located in headphones, or in a pocket, would solve this problem – but would only exacerbates another major problem, which is that a blind person needs to have his/her own hearing as free, and as sharp as possible, as this is the only major sense that will give him/her a continuous sense of the environment and the moment-by-moment changes in it. I'm honestly not sure what an electronic navigational device could do for me. I would love something that would help me get on and off trains and buses unaided, but it's just so much easier to ask someone for help.	2
Use of phone and texting	1
Don't know	2
Recognise faces and speak the person's name.	1
plan a walking route for me at home (that could inform me of going from point A to B).	8
To be small	4

27. Regarding the expectation the participant would have about the navigation device when crossing the road. (it must be taken into consideration that the participant could choose more than one option):

Responses	Number respondents
Tell me if traffic is coming (Im concerned of electric cars)	9
Not sure . I use my senses and only cross with a person. Wouldn't trust.	10
Help me find a safe and formal crossing point	9
Not at all. The guide dog does this.	1
Help me find the crossing buttons	1
I don't need help in the safe crossing of the road.	1
Tell when the green light is on or when it's safe to cross if there is no traffic light	12
Would use it in conjunction with my hearing. If very heavy traffic I would ask for help.	
bleep about nearness of obstacle	2
Don't know	3

28. Regarding what would the participant like to be warned about:

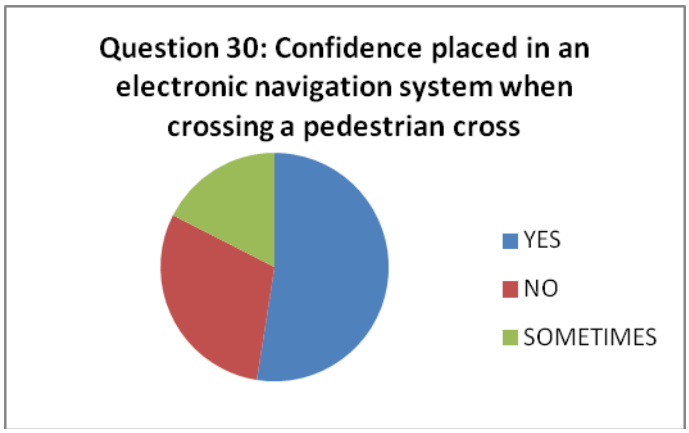
Responses	Number respondents
The edge of pavement	7
Detour on the way	4
Post	10
Pillar	10
Bollards	3
Overhead branches or head high stuff	8
Street furniture (benches, bins..etc).	6
Steps	2
Shared walkways	1
No idea	2
Down slopes	1
Holes	3
Ramp	2
Changes in floor surfaces	2
Fences	1
Bumps	1

29. Regarding what would convince the participant to trust an electronic navigation system (it must be taken into consideration that the participant could choose more than one option):

Responses	Number respondents
After successful trials	18
If it gave me lots of travel info, width of doors, steps up or down, low doors..etc.	1
If it worked in bad light	1
Never totally trust, but I would use it as an additional device	5
If it was recommended to me by the Blind Association	1
Don't know	1
Reliability and predictability	5

30. Regarding the trust and confidence that the participant would place in a system such as the one presented in ALICE in order to cross a pedestrian crossing:

Response	% Respondents
YES	52,5%
NO	30%
SOMETIMES	17,5%

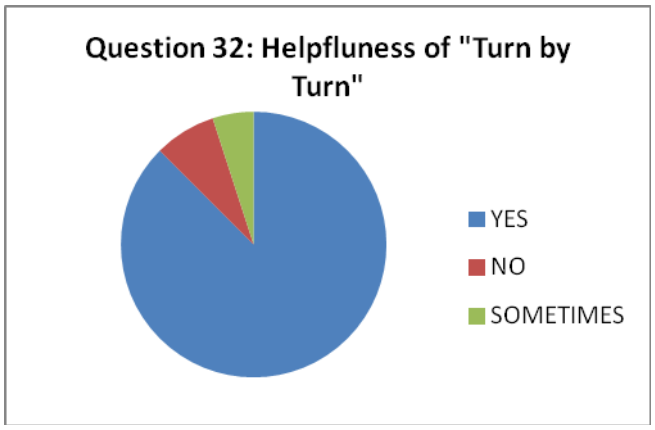


31. Regarding which moving objects would the participant like to be warned about (it must be taken into consideration that the participant could choose more than one option):

Response	Number respondents
VEHICLES	27
PEOPLE	24
BIKES	37

32. Regarding the importance given by participants to a “Turn by Turn” when walking in a totally unfamiliar place:

Response	% Respondents
YES	87.5%
NO	7.5%
SOMETIMES	5%

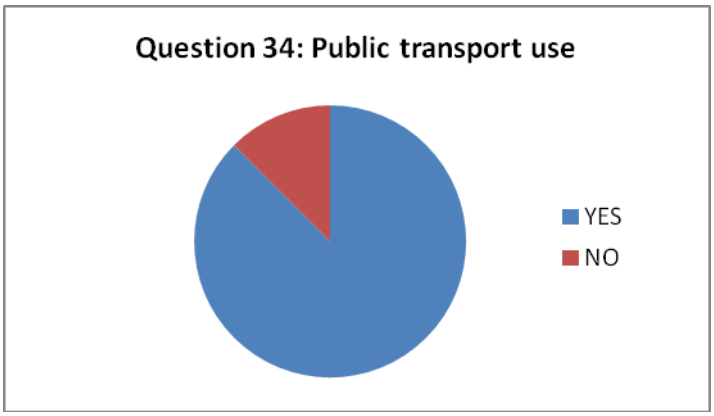


33. Regarding how does the participant know when he/she is lost (it must be taken into consideration that the participant could choose more than one option):

Responses	Number respondents
Unfamiliar landmarks, expected buildings or surface of the floor…	13
Never alone or never unfamiliar routes so never lost	5
Sounds, smells or underfoot unfamiliar	9
Don’t know	6
When I have been travelling for longer than expected before reaching my destination	5
When my mental map cannot be squared with the environment	2

34. Concerning the use of Public /transport (buses, trains…):

Response	% Respondents
YES	87,5%
NO	12,5%

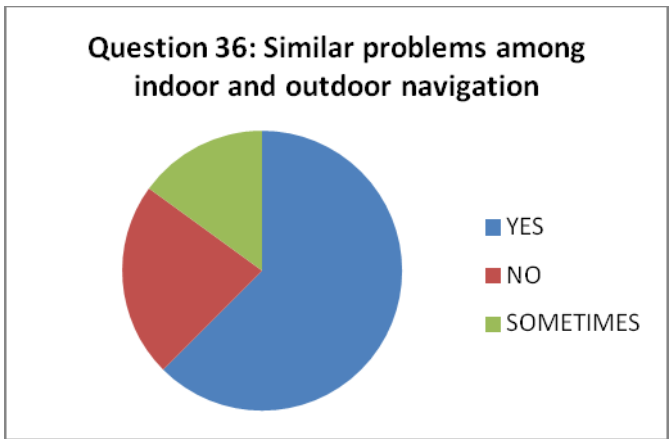


35. Regarding the participant way to know when the desired bus or train arrives at the station: (it must be taken into consideration that the participant could choose more than one option):

Responses	Number respondents
Shout the driver	12
Use disability assistance on trains and bus when coming	1
I can see them	4
Not applicable	3
Listen for trains announcements	8
Ask fellow travelers	19
Use the application on my phone	1
By the sound of the bus different engines	1
Formal help of staff at rail station	4
Orientate according to the direction from which the bus is coming	1

36. Regarding the similarity among navigation indoor compared to outdoor:

Response	% Respondents
YES	62,5%
NO	22,5%
SOMETIMES	15%



37. Regarding data about how does the participant find out where he/she is when he/she is in shopping malls (it must be taken into consideration that the participant could choose more than one option):

Responses	Number respondents
Ask someone	9
By sight	2
Not applicable (I never go because it is very hard. Can't manage)	11
Guide dog	1
By smells	3
Mental map	1
Never alone inside shopping malls.Always go with sighted person	9
Visual prompts	1
Information desk/staff	2

38. Regarding how would the participant like shops to be adapted to his/her needs(it must be taken into consideration that the participant could choose more than one option):

Responses	Number respondents
To have a handrail from the entrance to the customers service	1
Very good lighting	2
Place to sit down	1
No answer (not applicable, I go always with someone)	5
Wider layout	1
Provide me a sales assistant aware of vision impaired need. The help point should have to be near the doorway in order to be easy to find ask for help.	13
Speaking the title of each counter or isle in the large shop, speaking the title of the shop as I entered	1
Automatic doors (that would have some kind of alarm in order to know when they are opened or not, if possible)	2
To not change their layout so I can expect to find things in the same place	8
Speaking lift announcements	1
Alternative stairways to escalators for the benefit of my dog	1
Technology to read signs	1
Everything in larger print	6
Wide aisles	2
Adapted furniture (not low or high shelving)	3
Speaking lift when opening and closing and that could also tell you in which floor you are on.	1
Pen near a box that could read the detail. Barcode talking	1

39. Regarding on how the participants imagine electronic assistance in a shop (it must be taken into consideration that the participant could choose more than one option):

Responses	Number respondents
Kind of speaker that could tell me in which isle I am on	1
Device that could tell me prizes, clothes sights or ingredients. Bar code readers	16
Don't need it/don't go/ I always go with a sighted person	12
Assistant available	2
Have an idea of the layout of the shop (maping)/ kind of application you choose the product and the system guides you to where it is	10

40. Regarding the assistance the participant needs or already has in the Grocery Store (it must be taken into consideration that the participant could choose more than one option):

Responses	Number respondents
Someone who tells me what is around	21
I never go to the grocery shop without a companion	15
I currently see what I need	1
Trolley and packing	1
I go with someone sighted a couple of times and then I remember	1
No go	2

41. Regarding the preferences participants have regarding the kind of objects they would like to recognize(it must be taken into consideration that the participant could choose more than one option) :

Responses	Number respondents
Kind of meats (beef, lamb..), kind of vegetables	10
Prizes and incriptions	5
No applicable/ don't know	15
Clothes and its' sizes	2
Food package labels	5
Colour	1
Sells and new products	2
Counters	1

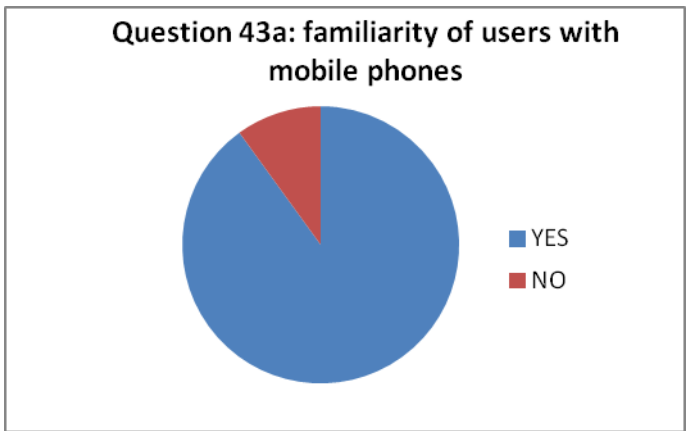
Bluetooth assistants	2

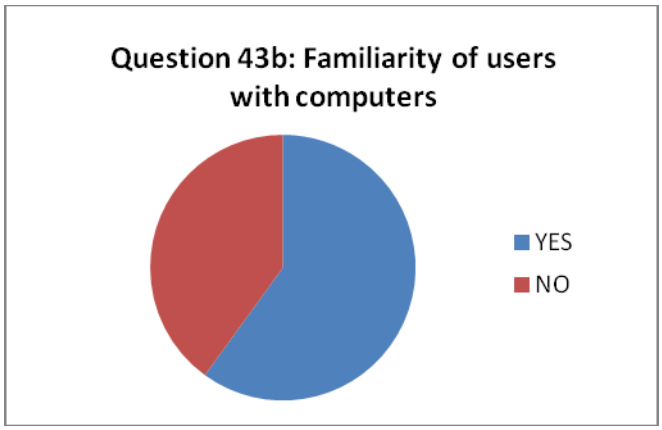
42. Regarding how the participant recognizes such objects (it must be taken into consideration that the participant could choose more than one option):

Responses	Number respondents
Shape	23
Colour	6
Size	19
None	8
Texture	3
No applicable	5
By sight	2
Bigger print	1

43. Regarding the familiarity the user has with the use of modern devices like mobile phones or computers (it must be taken into consideration that the participant could choose more than one option):

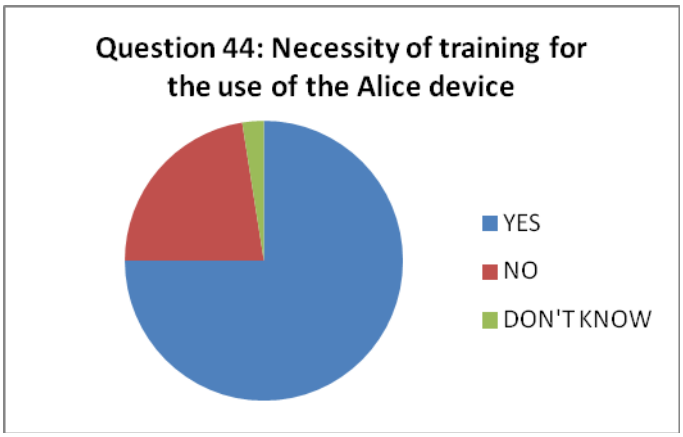
Responses	% respondents
MOBILE PHONE	
YES	90
NO	10
COMPUTER	
YES	60
NO	40





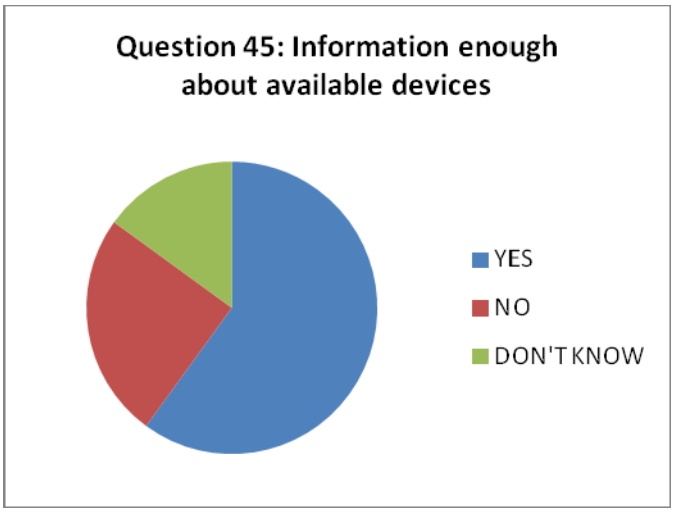
44. Regarding the importance that users give to the necessity of training for the use of the Alice device.

Response	% Respondents
YES	75%
NO	22,5%
DON'T KNOW	2,5%



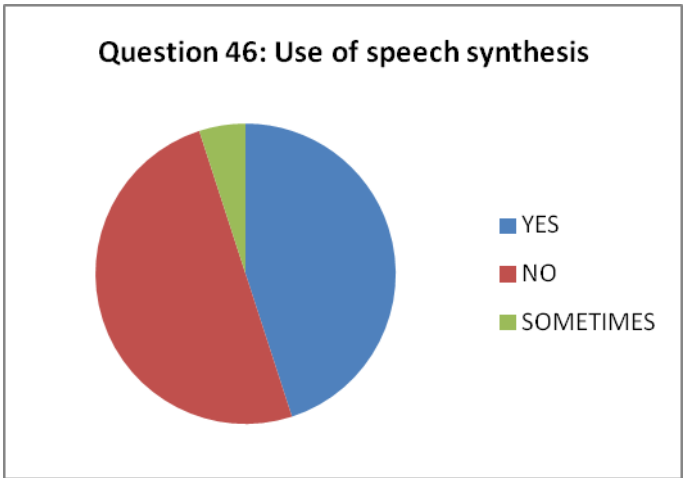
45. Regarding the participants' consideration about enough information available about phones/smartphones/computers for him/her:

Response	% Respondents
YES	60
NO	25
DON'T KNOW	15



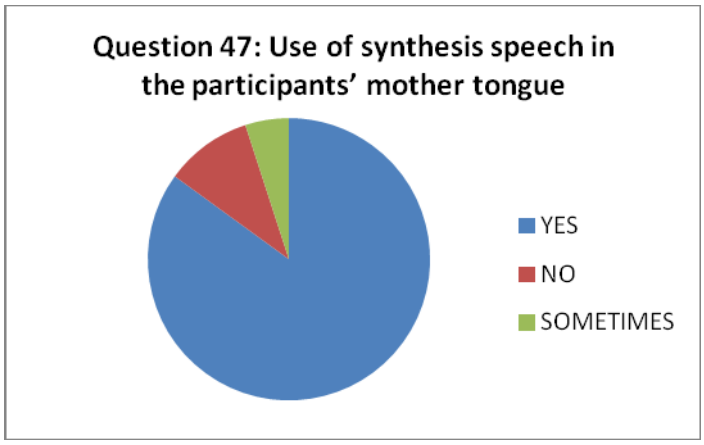
46. Regarding the use of speech synthesis on personal computers and/or mobile phones:

Response	% Respondents
YES	45 %
NO	50%
SOMETIMES	5%



47. Regarding the wish to use the synthesis speech in the participants' mother tongue:

Response	% Respondents
YES	85%
NO	10%
SOMETIMES	5%



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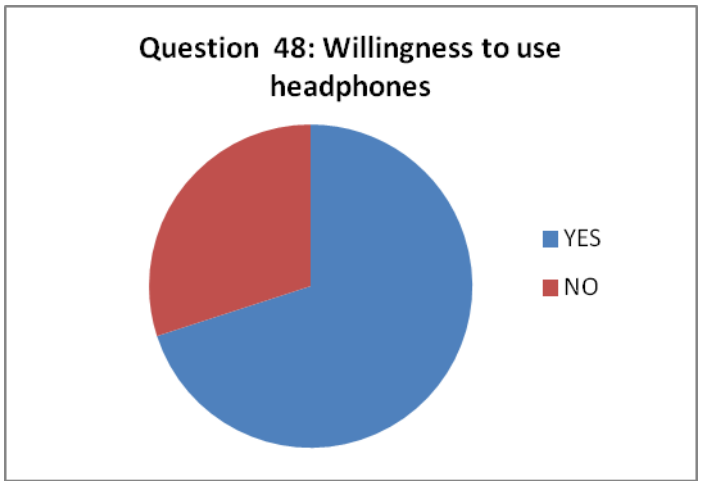
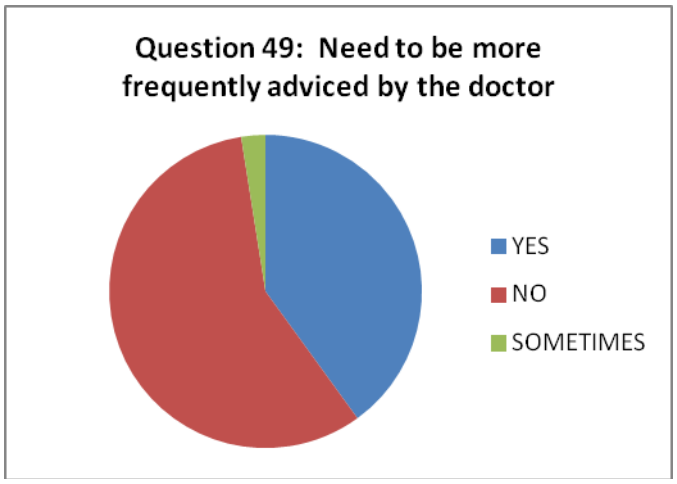
48. Regarding the willingness to wear headphones out and about to hear the mobile phone:

Response	% Respondents
YES	70
NO	30



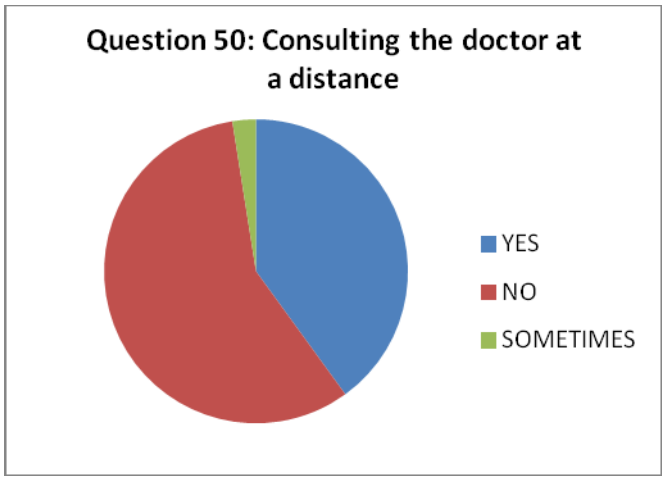
49. Regarding the need to be more frequently adviced by the doctor:

Response	% respondents
YES	40%
NO	57,5%
SOMETIMES	2,5%



50. Regarding the possibility to call their doctor at a distance:

Response	% respondents
YES	40%
NO	57,5%
SOMETIMES	2,5%



51. Regarding other comments or suggestions that the participant considers that it should be taken into consideration, the answers of respondants have been compiled in annex III.

10 HIGH-LEVEL FUNCTIONAL SPECIFICATIONS

Based on a general overview of user responses, which have been shown in section 9 (and taking into consideration that nearly a 90% of significantly visually impaired people have some sight and that they need to maximize its' use), it can be stated that Alice would be a mobility tool that would be a huge help for users.

Regarding the key questions or essential issues that should have to be taken into account, it can be stated that:

- The main causes of visual impairment are still Age-related Macular Degeneration, Glaucoma and Cataract. Therefore the device and especially the user interface should be adapted to the needs of people with these conditions: different adjustments for enlarging letters, icons and buttons should be available as well as various effective and high colour contrasts, quality speech synthesis in mother tongue etc.

- It must be taken into consideration that most (77 %) of respondents consider their sight as poor, but this doesn't necessary mean the person is totally blind.

- More than half people from among the whole end-user sample are white cane users but only 15 % have a guide dog. Alice device could therefore present an additional efficient supportive mobility aid for visually impaired people.

- For the user, it is important to know just where he/she is. 82% of users answered positively to this question.

- For the user it's quite important to know how far the destination is at any point on the journey. Nearly half of the testers stated that they found it important and around 20% stated that it was important sometimes.

- Users are interested in the nearby features of the route, so points of interest of the route should be added. As it was mention during the Peterborough meeting, Google maps could be a possibility in order to add this information, however, if it gives any kind of problems, Openstreet maps could also be taken into account.

- Regarding the expectation the participant would have about the navigation device when crossing the road; most of the responses have been that testers would like to know when the green traffic light is on or when it's safe to cross if there is no traffic light. Another answer that has been repeated several times is that testers would like to know if traffic is coming. They are especially worried about electric cars, which make no noise, so they cannot be aware of them.

- What users want to be warned about the most, regarding street obstacles, are posts, pillars, curves, street furniture, steps, down sloaps, ramps, holes, bumps and edge of pavements. Overhead branches and high stuff has also been mentioned several times.

- It is clearly stated that users would only trust an electronic navigation system like the Alice device, after the device has passed appropriate testing procedures.

- Regarding the use of this kind of device for pedestrian crossings, the user doesn't place much confidence in an electronic navigation system.

- Regarding street moving object of which users would like to be warned about the most, are bicycles.

- Users find very helpful a "Turn by Turn" methodology. However, it is mentioned several times that users wouldn't like to have a device which bothered them too much, so a careful balance must be sought between deficient and overload information.

- Users are quite familiar with the use of mobile phones; however they are not so familiar with the use of computers.
- Training in the use of the device is quite important to users.

- Half of users use speech synthesis. 45% state that they don't use it and a 5% states that they only use it sometimes. However, in case they had to use it, they would prefer that it would be in their mother tongue. During the Peterborough meeting it was agreed that maybe it would be useful to have a switch on/off button which activate the speech synthesis facility.

- There is a majority willingness to use headphones, however it is repeated several times that they would like to use a kind of device that did not interfere with one of the senses they use most: hearing. Maybe the project should consider the ability to clip the phone not too far the from ears (e.g. on clothing).

- Nearly half of the respondents would like to consult the doctor at a distance. During the Peterborough meeting it was agreed that a help button could be very useful: A button that would request help in case of emergency. The call emergency would be sent to someone who the user would choose (carer, family member, friend etc).

Further analysis of the compiled responses showed that the users would like to have a product, which will be a small-sized aid with simple use of phone or texting. It should have a large buttons or

icons. Users have very different expectations as to what the device should be like. As mentioned before, Alice should give the user the distance to buildings, find the right bus stop, post box and give information about the environment. Moreover, it would be very beneficial, if the device would be capable of reading the individual's letters, journey instructions, street names and inscriptions on buildings or speak the names of shops. It could also give some weather information, recognize faces and speak the person's name.

For most respondents the indoor navigation is very challenging since 85 % of them find difficulties with orientating themselves throughout indoor public institutions. The most common reasons for that are: the size of the room, dazzling surfaces, rooms too dark, no orientating points to navigate with white cane, difficulties in recognising landmarks, background music etc. However, these answers are not the scope of this project as the consortium at the 2nd Plenary Meeting decided that indoor navigation is defined as navigation through structured environment such as pedestrian tunnel under the railroad/highway and not for example the navigation inside the shopping centre. Nevertheless, this information is seen as very important and should be regarded as vital for the purposes of future projects.

The final device should meet the needs of the user and for that matter the data compilation of the questionnaire is very important for the Alice developers. The data analysis indicates several end-users' expectations, needs and requirements. In order to fulfil them, the trial scenarios will be designed in the forthcoming phases and testing with evaluation will follow in work package 4. It should be emphasised that the first prototype will require the following specifications:

A detailed route should safely lead the user from starting point A to the final point B.

Information about the route should be given: clear announcement of the starting point, the distance to the final destination, the description of waypoints (the distance between them) and information about nearby points of interests should be included.

The user should get the information about his/her current position (about the direction he/she is facing and about the direction he/she should take/turn).

Information about GPS is required as well as different detection mechanisms : Detectors for pedestrian crossing, traffic lights, moving objects (especially important detector for bicycle than for cars or people passing by) and detectors for different obstacles (vertical and horizontal).

***The user requirements analysis has where possible been conducted quantitively but a good deal of raw data, insights gained from experienced blind and visually impaired people which could not easily be aggraded, has served to inform the project and influence the developers of the Alice device.

11 CONCLUSIONS

The deliverable presents the important outcomes of the data analysis, compiled with the questionnaires. The document aims to improve better understanding of respondent's needs and requirements thus used material and methodology are described as well as some of the end-user characteristics. In section 9 key elements are presented, which will serve for further stages of the projects, especially for designing the trial scenarios in D1.3.

With this deliverable the end-users, whose role was defined in D 1.1, now become a fully active part of the project's chain. Trial scenarios as the next step of the project will follow their needs and will be modified, whenever needed. For these purposes specifications for prototype 1 were proposed. Further prototypes of the navigational device will be tested and described in later work packages.

ANNEX

ANNEX I: QUESTIONNAIRE

End-User Requirements

- Questionnaire-

Code of the respondent: _____

Date: _____

Dear respondent. You are being invited to participate in a project ALICE, whose purpose is to improve the quality of life of ageing people with impaired vision by providing a navigational assistant with cognitive abilities.

The navigational assistant developed within the ALICE project will be able to offer visually impaired users a cognitive description based on a fusion of perceptions gathered from a range of sensors. Alice project is combining research developments in cognitive sciences, psychology, computer vision, artificial intelligence and robot navigation.

In order to offer the best qualitative device as possible regarding end-users needs, we are in particular interested in what are end-users requirements and how visual impairment affects to some people life-experiences. Therefore, we would like to require some answers from the respondents. Please, find bellow the questionnaire and help as with research. Should you have any further questions, do not hesistate to ask us.

I. DEMOGRAPHIC DATA

1. **Sex of the respondent:**
   - Male ☐
   - Female ☐
2. **Age of the respondent:** _____
3. **Where do you live?**

- In a village ☐
- In a small town ☐
- In a medium-sized town or city ☐
- In a large city ☐

II. VISUAL DISEASE

4. What is your eye condition?

- I am blind (I cannot tell the light from the dark) ☐
- I am blind by definition. / I have severe vision loss ☐
- I am partially sighted ☐
- Other, please specify:_____

5. If is it your eye condition related to any of the causes of visual impairment listed below, please mark one of the options.

- Cataract ☐
- Glaucoma ☐
- Age-related Macular Degeneration ☐
- Corneal opacities ☐
- Diabetic retinopathy ☐
- Childhood blindness ☐
- Trachoma ☐
- Other ☐ please specify:_____

6. How would you, personally rate your vision?

- Excellent ☐
- Good ☐
- Medium ☐
- Poor ☐
- Other ☐ please specify:_____

III. PSYCOLOGICAL, SOCIAL AND PHYSICAL ASPECTS

7. Do you have any other condition/impairment?

- Yes ☐ If yes, please specify:_____
- No ☐

8. Have you suffered any disease (for example epilepsia, depression...etc?

- Yes ☐ If yes, please specify the disease you suffer:_____
- No ☐

9. Concerning your eye condiditon, how would you rate your mobility abilities?

- Bad ☐
- Good ☐
- Excelent ☐
- Other ☐ please specify:_____

10. How would you rate your hearing?

- Good ☐
- Medium ☐
- Poor ☐
- I cannot hear ☐

11. At what age did you become visually impaired?_____

12. Do you use a white cane?

- Yes ☐
- No ☐

13. Are you using a guide dog?

- Yes ☐
- No ☐

14. Which is your highest level of education?

- Primary school ☐
- Secondary school ☐
- Vocational or similar qualification ☐
- Undergraduate degree ☐
- Masters degree ☐

Doctorate or another higher degree ☐

15. Please mark the statement, which applies for you the most:

- I am retired ☐
- I am working full time ☐
- I am working part time ☐
- I am self employed ☐
- I am unemployed ☐
- I am unemployed ☐
- I am early retired due to disability ☐
- Other ☐

16. Please, select the statement that best applies to you when you are out:

- I need someone to guide me. I can not walk around by myself . ☐
- I need someone to guide me at certain places. I am able to walk alone, but because of anxiety I need guidance of the other person. ☐
- I manage to walk around with white cane ☐
- I am a guide dog user ☐
- I can walk around by my own without any kind of help ☐

17. When indoor's of public institiutions (e.g. hospital, farmacy, doctor, shopping centre, library etc.) do you find any difficulties to orientate yourself?

- No ☐
- Yes ☐ yes, why would you think that is so? (Please select one or more options listed bellow.)
    - o Because of the size of the indoor room (e.g.: building is too big, I can not find the corridor/office/department I am looking for) ☐
    - o Glitering surfaces (e.g.: floors and walls glare to that extend I can not see) ☐
    - o Too dark room ☐
    - o No orientating points to navigate with white cane ☐
    - o Other ☐ please specify:_____

IV. ALICE NAVIGATIONAL DEVICE

18. Imagine you are in the city in a very traffic street. You supposed to find the particular building, but you've got lost. You are there for the first time and you do not know the area, nor the people around you. What would you do?

- I call the frend/family by mobile phone and ask them to pick me up ☐
- I call the emergency ☐
- I ask people around me for help ☐
- I ask some people around me for the information where I am and try to find the way back on my own ☐
- I would like to ask people around me for help, but I feel uncomfortable to do so. I don't do anything. I try to find the way back on my own ☐

19. Do you travel only familiar routes?

- Yes ☐
- No ☐
- Sometimes ☐

20. How do you find out where you are in a particular moment?

_____

21. When you are travelling, is it important to know just where you are?

- Yes ☐
- No ☐
- Sometimes ☐

22. Is it important to know how far away your destination is?

- Yes ☐
- No ☐
- Sometimes ☐

23. Can you walk independently around a non-structural environment (parks)?

- Yes ☐
- No ☐

24. Do you sometimes independently explore and walk through unknown paths?

- Yes ☐
- No ☐

25. Are you interested in what is in the vicinity of the route where you walk and what are you interested in (buildings, monuments, restaurants, ATM)?

- Yes ☐
- No ☐
- Sometimes ☐

26. What do you imagine a technical mobility aid would do for you?

_____

27. How could navigation assistive device help you in the safe crossing of the road? What do you expect? _____

28. Which obstacle or distraction would you like to be warned about?

- The edge of the pavement ☐
- Detour on the way ☐
- Post ☐
- Pillar ☐

29. What would convince you to trust an electronic navigation system?

---

30. Would you trust such a system to tell you when it is safe to cross a pedestrian crossing?

- Yes ☐
- No ☐
- Sometimes ☐

31. Which moving objects would you like to be warned about?

- Vehicles ☐
- People ☐
- Bikes ☐

32. When walking in a totally unfamiliar place, would "Turn by Turn" be helpful?

- Yes ☐
- No ☐
- Sometimes ☐

33. How do you know when you are lost?

_____

34. Do you use public transport Buses/trains?

- Yes ☐
- No. ☐
- Sometimes. ☐

35. How do you know when the desired bus or train arrives at your station?

_____

36. Do you have similar problems with indoor navigation?

- Yes. ☐
- No. ☐
- Sometimes. ☐

37. When you visit shopping centres, how do you find out where you are?

_____

38. How would you like shops to be adapted to your needs?

_____

39. How do you imagine electronic assistance?

_____

40. What assistance do you need or already have in the Grocery Store?

_____

41. What objects would you especially want to recognize?

_____

42. How would you recognize such objects?

- Shape ☐
- Colour ☐
- Size. ☐

43. Are you familiar with the use of modern devices such as mobile phones, or computers?

- Yes ☐
- No ☐

44. Do you find useful to get training for how to use mobile phone/smarphone/computer?

- Yes, I would like to have this kind of training ☐
- No, I am not interested to have it ☐
- I do not know ☐

45. According to your needs, do you consider there is enough information available about appropriate phones/smarphones/computers for you?

- I think there is enough information ☐
- I think there is too much information. I do not know which device would be the most suitable for me ☐
- No, I would like to require some further information ☐

46. Do you use speech synthesis on personal computers and / or mobile phones?

- Yes ☐
- No ☐
- Sometimes ☐

47. "Would you like the speech synthesis on your mobile device/phone would speak in your language (mother tongue)?"

- Yes ☐
- No ☐

48. Would you be willing to wear headphones out and about to hear the mobile phone messages?

- Yes ☐
- No ☐

49. Would you need more frequent advice of your doctor?

- Yes ☐
- No ☐

50. Do you think it would be enough in some cases if you consult your doctor at a distance?

- Yes ☐
- No ☐

51. If you have any other comments /suggestion you think we should take into consideration, we would apprecite very much if you could describe them here:_____

Thanks a lot for your answers and contributions. We appreciate very much your collaboration. Once the analysis of data is done, we will contact you again for further steps.

Thanks again,

WP1 ALICE partners.

ANNEX II: LETTER OF CONSENT

LETTER OF CONSENT

- SAMPLE

Dear participant,

You are being invited to participate in a project called ALICE. ALICE is an international project with different partners from France, United Kingdom, Spain and Slovenia. The project's purpose is to improve the quality of life of ageing people with impaired vision by providing an intelligent navigational assistant.

The navigational assistant will be able to offer visually impaired users an understanding of what is around them based on information from several sensors within the device. The ALICE project is combining research developments in cognitive sciences, psychology, computer vision, artificial intelligence and robot navigation.

ALICE will consist of a smartphone wirelessly connected to remote processing unit. As well as the camera, ALICE will utilise sensors for position detection, orientation, movement and distance from obstacles. The position and distance mapping will be cross-referenced and processed in combination with the visual information, so as to avoid confusion and misunderstanding. ALICE will use artificial intelligence to plan and anticipate based on bringing together all the information from sensors and combining it with previous knowledge. The system will deliver the information from the sensors as sounds and words via a synthetic voice. You will be able to communicate with the system via voice input, by talking to ALICE.

The project itself will last for 30 months. During this time, you will be interviewed about your requirements to inform the development of the project. The interview will be conducted wherever you prefer (e.g. in your home).

In the next phase, you will be requested to participate in testing of the device. Because of safety concerns, the testing of the system will be divided into three consecutive phases:

1. **Phase 1:** Requirements collection. The first step for the user requirement data collection is to develop a questionnaire in order to obtain users preferences to guide the developers to design and adapt the ALICE platform
2. **Phase 2:** Initial trial and iterations. The system will first be tested as a virtual model where possible collision situations can be simulated thus checking for flaws in the interpretation of the environment. You will not participate in testing scenarios at this stage as the tester should be able to correct decisions of the system.
3. **Phase 3: Final trial.** A 'Man behind the curtain' testing methodology will be utilized in the later stages of testing, when you will be participating in the device evaluation.

The researchers and developers of the ALICE project will not put you at risk at any stage of the project and will respect the fundamental ethical principles included in the Charter for Fundamental Rights of the European Union.

Several steps will be taken to protect your anonymity and identity. The typed interviews or any other document will NOT contain any mention of your name, and any identifying information will be removed. A unique numbered code will be used rather than names or other personal details. All the research material will be stored in a secured location within the participant organisations and the procedures for sharing information subject to a confidentiality and data security policy. Data will not be available on the Internet and staff involved in the project will need a password to access a data base.

Your participation in this research is completely voluntary and your expenses will be covered. However, you may withdraw from the study at any time for any reason.

The results from this project will be presented to the world in different ways, in the form of newspaper and scientific articles, photographs, videos or on different web pages including our project web page. We will present our work to conferences and seminars.

However, at no time will your name be used or any identifying information revealed. Any photograph or video will only be used, if you provide permission.

Should you require any further information about this project, please do not hesitate to contact us: (e.g.: UBPS in Slovenia or COMBD in the UK).

I have read the above information regarding the ALICE project and consent to participate in this project.

Printed Name:_____

Signature:_____

Date and place: _____

Notes:

The Informed Consent Discussion with Legally Blind Subjects

If you are enrolling subjects who cannot read the consent materials due to blindness, or the subject's legally authorized representative is legally blind:

- It is recommended that an impartial witness observe the consent process.
- Sufficient time should be allowed for questions to be asked and answered, both by the subject, and by the person obtaining consent to ensure the subject comprehends the consent information.

- Consider using an audio recording of the consent discussion as part of the documentation of informed consent.

Guidance set forth by the International Conference on Harmonisation (ICH E-6 4.8.9): If the subject (or subject's legally authorized representative) verbally agrees to participate in the study:

- If capable of doing so, the subject signs and personally dates the consent form.
- The witness signs and personally dates the consent form. By doing so the witness attests that the consent information was accurately explained and that the subject apparently understood the information and informed consent was given freely.
- The person obtaining consent signs and dates the consent form.
- Signed copies are given to the subject.

ANNEX III: OTHER COMMENTS

Regarding question 51 about other comments or suggestions that the participant thinks that should have to be taken into consideration, the answers are compiled below:

UBPS COMMENTS:

- Thank you for inviting me into this project.
- I am looking forward to try this device.
- I really hope device will help blind and partially sighted people to navigate around by themselves.
- Thank you to all researchers and partners in this project, who are trying to do something good for us.
- I am very scared of new devices, but I would like to try Alice and see how it works.
- If device will navigate me around at least to some locations, that would be a big leap for me.
- I have some doubt for this device, but first I would like to try it and only after that I will be able to see, if it has any of benefits or not.
- Maybe the device could also hold info about the arrivals and departures of city busses: when certain bus is coming to the certain bus stop.
- For now, all programmes with speech synthesis for mobile phone are not good and there are not many available.
- I definitely support the development in this area, especially because some devices could really benefit blind people's lives. On the other hand I am worried about harmful impacts on our health though. Hereby I am thinking about radiation. Furthermore, with sighted guide (personal assistant) you can also make a comment on certain situation, with electronic device this is impossible to interact in this way. The question is alos, how much info is

enough for particular situation that blind person is informed in a right way about obstacle. Too much info is making blind nervous. By my opinion, a combination of personal assistance and electronic assistance is the best for now. Personally, I wouldn't decide to use electronic assistance, since I don't know yet exactly what impact it has on our health.

COMBD COMMENTS:

- I would like to hear the good results of the Alice project.
- On the iPhone, you can ask Siri to open an application for you or find an email from someone or a contact. Keeping a diary or to do list is useful too. Being able to carry it round with you is essential for me. Voice recognition is important. It has to be good to cope with noisy environments when people are out and about. A quiet environment though desirable is not always possible when you need to get an important message to someone. Reading books would be nice on a train, listening to a podcast. Setting an alarm or timer. If I felt the device was reliable I would try to use it to guide me. But things like roads, how busy they are etc, I don't see how it could tell me that kind of information,, so walking with someone first on a route may be desirable. I am nervous of walking diagonally if there are no kerbs to guide me. I would be terrified of walking on shared space if I thought I was walking where cars need to drive. Train times and buses are important to me, real time, will they be late etc. what platform is a train going to arrive on. Nearest places of interest like a cinema with a phone number would be useful. When using an iPhone or Android it is essential to be able to dial numbers from within a call, e.g., when asked to press 1 2 3 to get to different options.