

Innovative PROcurement for Visual Impaired People



Elicitation of needs and definition of relevant ontologies report

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DOCUMENT INFORMATION

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Abstract	<p>This document describes the activities performed since the early stages of the project to carry out a cross-border contextual inquiry aimed at problem domain analysis. The investigation has involved two categories of stakeholders, who are knowledgeable about the domain of low-vision, namely the clinicians, who helped in the analysis of the extent to which assistive solutions are being adopted and of the issues that are worth to be explored, and low-vision people themselves, who were the primary target of this analysis phase, for which their feedback was considered paramount. The document explains the process that PRO4VIP partners underwent to prepare the survey, in the form of a questionnaire, to be distributed through partners' networks, on European scale. In particular, an iterative process started in June 2015, which saw the active participation of all the partners. All of them have contributed to the incremental</p>

	<p>improvement of the questionnaires dedicated to low-vision people and to clinicians, respectively, relying on experts in the domain of low-vision, ranging from clinicians, to vocational rehabilitation professionals, to operators in the social care field.</p> <p>The survey results will form the basis to build an ontology for the conceptual modeling of low-vision domain. Domain's concepts resulting from the analysis will be properly categorised and hierarchized as an initial step towards one of the workpackage goals, namely the identification of common uncovered needs.</p>
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1 INTRODUCTION

This document describes the activities performed since the early stages of the project to carry out a cross-border contextual inquiry aimed at problem domain analysis. The investigation has involved two categories of stakeholders, who are knowledgeable about the domain of low-vision, namely the clinicians, who helped in the analysis of the extent to which assistive solutions are being adopted and of the issues that are worth to be explored, and low-vision people themselves, who were the primary target of this analysis phase, for which their feedback was considered paramount.

The document explains the process that PRO4VIP partners underwent to prepare the survey, in the form of a questionnaire, to be distributed through partners' networks, on European scale. In particular, an iterative process started in June 2015, which saw the active participation of all the partners. All of them have contributed to the incremental improvement of the questionnaires dedicated to low-vision people and to clinicians, respectively, relying on experts in the domain of low-vision, ranging from clinicians, to vocational rehabilitation professionals, to operators in the social care field.

Domain's concepts resulting from the survey will be properly categorised and hierarchized as an initial step towards one of the work package goals, namely the identification of common uncovered needs.

2 CONSTRUCTING THE PATIENTS QUESTIONNAIRE

In the following sections we give details on the phases the task2.2 has traversed before the survey questionnaire has been ready for distribution across European countries. The whole process took longer than initially expected, due to

- the criticality of certain contents, on which much brainstorming activity took place through remote meetings among AQuAS, US and the other involved partners, and
- the typology of target population, namely low-vision people, for which accessibility of the online questionnaire was paramount.

The process necessarily involved all PRO4VIP partners but the results gained in the initial stage of distribution are encouraging and confirm that was the right way to proceed, in order to pursue WP2 goals.

2.1 THE QUESTIONNAIRE GOALS

The purpose of the survey questionnaire is to collect information about

- the needs and problems people with functional low vision face in their daily life
- the kind of aids and precautions they use daily in order to improve their quality of life
- their desired experience
- the desired assistive solutions to improve their quality of life.

The achieved responses will help us achieve a deeper understanding and pursue PRO4VIP general goal to build a technological platform, where present and future needs may be adequately classified and the instrument of Public Procurement profitably exploited to better support the provision of innovative low-vision technology and services.

2.2 THE QUESTIONNAIRE STRUCTURE

The questionnaire has been divided into three separate sections:

- Section A is meant to collect information about respondent's personal situation.
- Section B includes questions about assistive technology and /or assistive services the respondent can currently rely on.
- Section C focuses on needs elicitation and enquires about any additional assistive technology devices or services that would help the respondent with his/her daily activities.

Many of the questions allow respondent to select multiple responses, if appropriate, including a free form text for any additional response he/she wishes to provide. A few questions were made deliberately Open Ended [OE],

to solicit personal comments from respondents and possibly to discover un-tackled issues.

2.3 PROFILING RESPONDENTS

The first section of the questionnaire was designed to collect information about the typology of low-vision person, who was responding. Nationality, age, social situation (student, working person, retired, homemaker, etc.), household composition as well as the status of their impairment, were all considered relevant to the planned analysis of needs. The country the respondent comes from (any of the 44 member countries in EBU) was also considered, so that a geographical dimension could be added to the analysed data. With respect to its initial version, the questions and multiple responses of this portion of the questionnaire evolved, based on experts' advice, so as to be able to capture the variety of aspects of a profile which may affect the way an assistive service/technology is used. As an example, experts pointed out that people aged between 25 and 64 may have different interests and motivation towards assistive technology, also depending on their employment state. Useful feedback also came from clinicians, who noticed that many patients would not know the exact medical terms corresponding to their low-vision impairment. They would rather be able to describe it in terms of functional disability. Clinicians suggested that medical terms should be removed and that this part of the questionnaire should rather inquiry about:

- the time when the visual impairment first occurred (whether from birth, in early childhood or more recently),
- if it is stable or worsening,
- the visual acuity¹ and visual field,
- the factors influencing respondent's vision problems (including, e.g., Low contrast sensitivity, Light adaptation and light sensitivity, glare sensitivity, and colour vision),

¹ Dr. Michael Crossland, from Department of Optometry, Moorfields Eye Hospital, London suggested that responses should be also displayed in terms of Snellen notation, for UK respondents.

- the time of the last visit at the ophthalmologist

An optional open ended question was added to let knowledgeable respondents describe their low vision medical diagnosis.

2.4 ASSISTIVE DEVICES/SERVICES IN USE

The second section of the questionnaire was aimed at the analysis of the kind of aids and precautions used daily by low vision people in order to improve their quality of life. Here, we wanted to initially understand the areas of life that each respondent considers important for his/her daily functioning, including, e.g., mobility and orientation, access to information, goods and services, personal care, and social activities. Then, we investigated about the kind of rehabilitation, if any, and the possible current use of low vision technical aid. For those who do use low vision devices we wanted to know whether they received any funding, e.g., from the national health system or from some organization of blind and partially sighted. More importantly, for those who do not currently use low vision technology, we needed to understand their reasons. The choice may fall on any of the following: financial reasons, scarcely accessible environment, not accessible transport, support from sighted person needed, current aids are not meeting personal needs. Also, we decided to enquire about the current use of assistive technology/service during respondents' daily activities, for mobility or other purposes. The respondent may choose among commonly adopted assistive devices or services. With respect to this, Dr. Hellen Juergen, from BFW Dueren, suggested we could consider, as an appropriate starting point, the public database <http://www.rehadat-hilfsmittel.de/en/index.html>, listing the available assistive products for all kind of impairments. Here again, experts gave a valuable feedback, suggesting that devices should be listed in terms of their functionality rather than through their technical name, as in the initial version of the questionnaire. Thus, respondents would find, among the possible responses, 'Lenses and Lens Systems for Magnification' or 'Glasses characterized by their lightness, design and by the fact its lenses are smart and they are able to adapt themselves to the user gathering the information from the environment and displaying to the user compensating his/her issue'

or ‘Easy-to-use aid that enable reading everywhere without major efforts and that does not make use of text-to-speech technology’ or ‘Aid to enable the capability to read text far from the individual (black boards, congress slides) and to take notes during classes or congresses,’ and others.

The subsequent questions in this section were considered especially relevant to the survey we are conducting, focusing on the way assistive aids currently in use were gained by respondents. Two matters are especially investigated, namely how they learnt about the device(s) or service(s), and whether they received help by some organization during the selection of the device or service and, in case, their degree of satisfaction. The first matter is meant to understand the most common means to receive information, perhaps in different areas of Europe. In particular, we are interested in getting insight into the extent to which low vision people are informed by professionals or by figures like vocational rehabilitation counsellors or on the role which manufacturers of assistive devices may play in informing directly their end-users, possibly through trade fairs for devices. Moreover, in order to know who paid for the device/service, respondent is given the choice among self-financed or paid through some private health insurance or by public healthcare system, or by employer, or by employment service or through other Insurances of the public social system or else. As for the second matter, respondent is asked to indicate whether he/she received help from an agency or organization during the selection and purchase of the device or service in use and, in case, how satisfied he/she is about that support. An optional open-ended question was added to investigate the possible kind of service and support that the respondent missed from that organization/agency.

2.5 ASSISTIVE DEVICES/SERVICES NEEDS

The last section of the questionnaire has been conceived as the one from which emerging, possibly unexpected needs should be discovered. Given the significance of this portion of the survey questionnaire, comments and suggestions were solicited from all the PRO4VIP partners, so as to make sure we would not miss any aspect of the analysis, which could be useful to the subsequent tasks of the work-package and, ultimately, to the overall project goals. As a first valuable feedback, the public procurement experts

involved in the project suggested a ‘wouldn't it be great if...’ methodology, in order to stimulate respondents’ imagination and free expression of what assistive technology/service they feel may really improve the quality of their lives. The section starts with an optional open-ended question on the shortcomings (quality, functionalities, costs, maintenance activity....) of the devices currently used by respondent. Then, the respondent is asked to specify, for each relevant area of his/her life, the kind of support they would appreciate. As in the previous sections, and again based on low-vision domain experts’ advice, for each area of interest we give the choice among a few devices/services described in terms of aid provided to the individual, rather than using technical terms (e.g., for everyday life and housekeeping, a possible choice is household appliances provided with large print, tactile markings or speech output). For each area, we have also displayed the open ended response ‘Please specify any other "magic" solution you may wish’. Furthermore, the extent to which the specified additional devices or services would help is also subject to our analysis. That kind of responses will allow us to weigh the uncovered needs within the ontology. Finally, in line with the mentioned ‘wouldn't it be great if...’ methodology, respondents are then enquired about what they wish innovation could solve for them, the sentence “It would be great if innovation could create a solution for me in the area of.... in order to....”. A classical ‘Anything else?’ questionnaire concludes the questionnaire.

2.6 DESIGNING FOR ACCESSIBILITY

Accessibility of the questionnaire has been a major concern since the beginning of task 2.2. Of course, we needed to make sure that low-vision respondents would be able to read and compile the questionnaire properly through their assistive tools. In this context, a significant contribution came from EBU accessibility experts who iteratively checked the initial web version of the questionnaire against W3C accessibility guidelines, so that its contents and structure could be progressively improved up to its final version, before we started to distribute it.

3 IMPLEMENTATION DETAILS

The online questionnaire has been implemented through a web server based software, LimeSurvey, which enables users using a web interface to develop and publish on-line surveys, collect responses, create statistics, and export the resulting data to other applications. LimeSurvey is a free and open source on-line survey application written in PHP based on a MySQL database, distributed under the GNU General Public License. The accessibility plugin “More accessibility for LimeSurvey“ was integrated and the required templates were used throughout the questionnaire sections.

The choice of this software was also motivated by the fact that statistical and graphical analyses of survey results can be performed in a seamless way, which has helped us recover from the extra time employed to design the survey contents.

Last but not least, participants can be anonymous.

4 THE DISTRIBUTION PROCESS

The survey questionnaire (available at <http://www.pro4vip.eu/quest/>) is being distributed through EBU 44 member countries as well as through the communities in touch with the other partners, including Rittmeyer Institute, FVG Region, BMF, BFW Duren, ECRIN, AQuAS and UCLPartners. At its initial stage, the questionnaire has been distributed only in English. However, Spanish, German, Italian and French versions are being created, in order to ensure a wider response from the target population. A .doc version of the questionnaire has also been created for those who cannot access the Web.

Some of the communities, which have actively collaborated to the data collection phase are:

- Unione Italiana dei Ciechi e degli Ipovedenti,
- Istituto Rittmeyer
- Gruppo facebook IPOVISIONE - <https://www.facebook.com/ipovisione/>

- Centro Ipovisione e Riabilitazione Visiva, Policlinico Milano, centroipovisione@policlinico.mi.it
- Hareonna Diversity Limited, <http://www.hareonna.com>, UK
- Royal National Institute of Blind People (RNIB), UK
- VIEWS International.
- Società oftalmologica italiana.

According to World Health Organization, over 23.800.000 low vision people are estimated in geographical Europe. While we cannot quantify the exact number of people who received the invitation to submit the questionnaire, we can assert that

- the questionnaire was circulated to the 44 EBU member organisations in continental Europe. Then, each organisation circulated the questionnaire through its own dissemination channels, mostly national mailing list(s) of regional and local branches, website, Facebook, audio broadcast, on-line magazine.

The questionnaire was also circulated through the following lists:

- EBU low vision network -> 22 email addresses.
- EBU network of elderly blind and partially sighted persons -> 8 email addresses.
- EBU network of blind and partially sighted women -> 75 email addresses.
- Participants in a training on youth employability in 2015 -> 15 email addresses.

To guarantee a fair data collection process, when introducing the questionnaire we made clear to respondents its purpose and the value of their contribution at this stage of the project. We also informed them that the data collected would be stored on University of Salerno' servers under its responsibility and would be anonymized before its use by the project partners (the official statement from the University of Salerno is attached to the present deliverable).

5 ANALYSIS OF RESULTS

We fixed a target of 250 questionnaires, and to the end of February 2016, we received 263 complete responses from different European countries.

We decided to leave open the questionnaire for the duration of the project and analyse the data collected each month to update the results and assure statistically relevance of the results. We assume a need to be relevant and eligible, for the purposes of the subsequent stages, if:

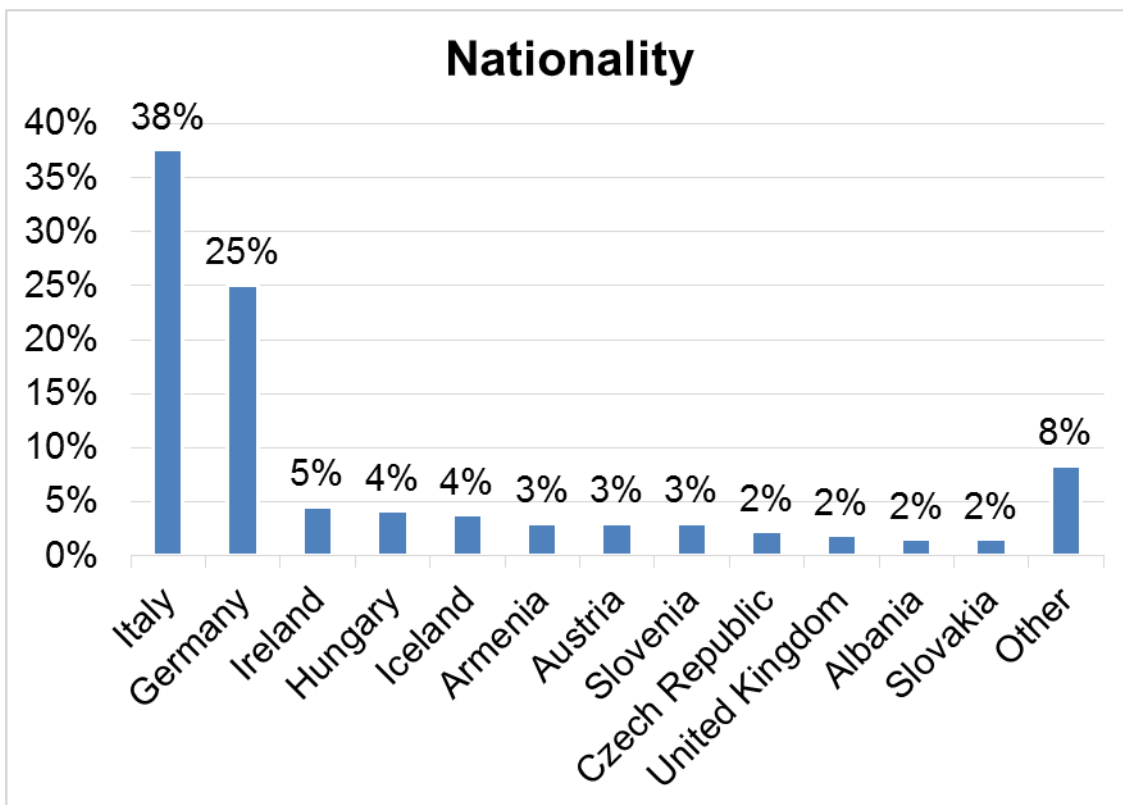
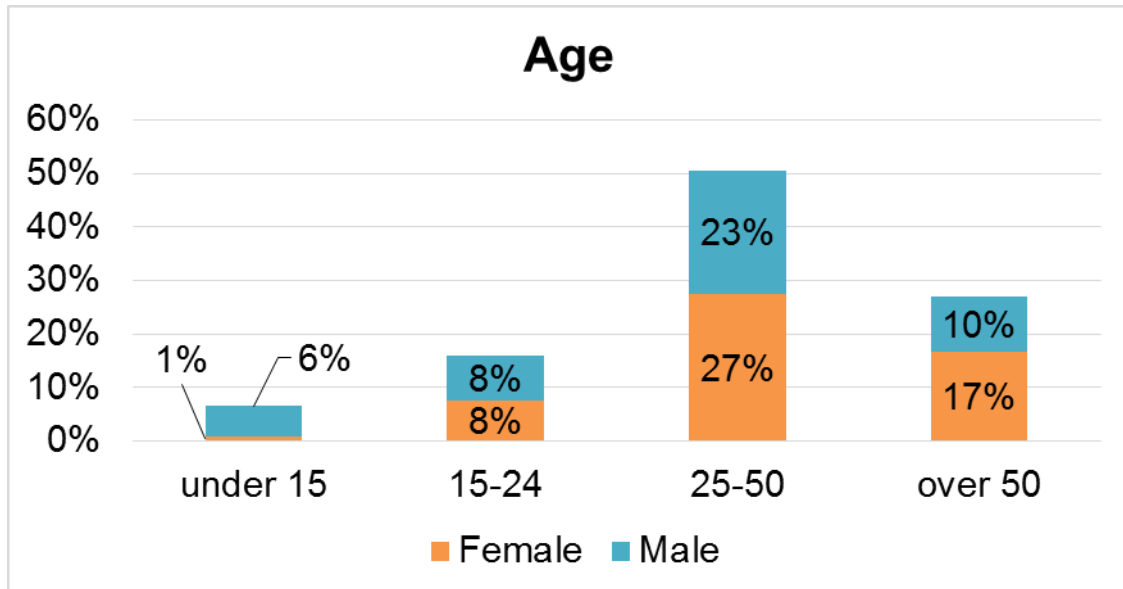
- it is represented by 5% of the respondents and/or
- it objectively and specifically documents a specific functional innovation gap, based on the evaluation of the state of the art.

Actually, respondents' group forms a representative sample of low vision population. In particular,

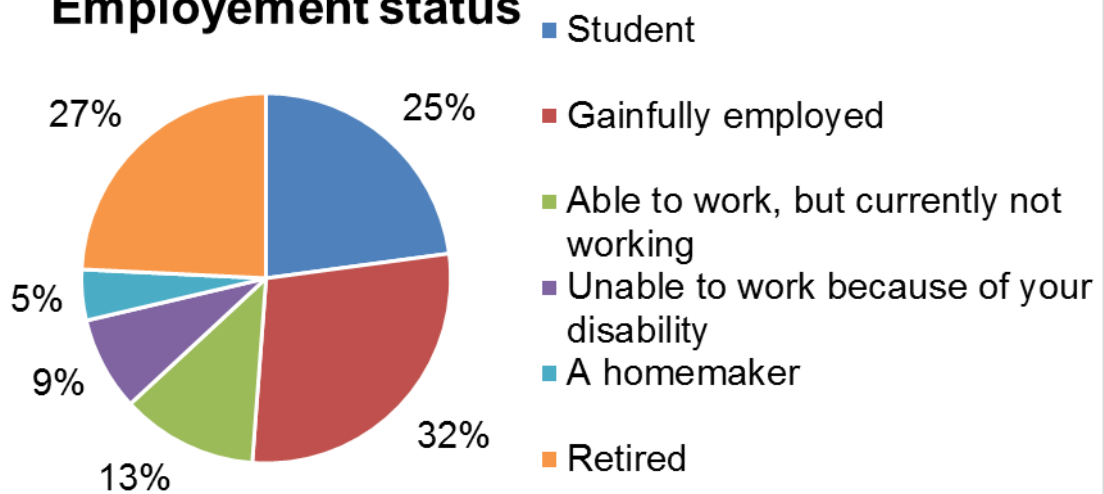
- 52% are women, confirming the fact that, according to WHO, women are more at risk of becoming blind or partially sighted than men
- 47% are able to work (32% gainfully employed), and 25% are students.
- 27% are aged over 50.

The latter value apparently contradicts the fact that about 65% of all people who are visually impaired are aged 50 and older. However, considering that elderly people, who may be unfamiliar with computer use, are included in that range and given the web-based nature of the questionnaire, we observe that 27% respondents can be considered a satisfactory value.

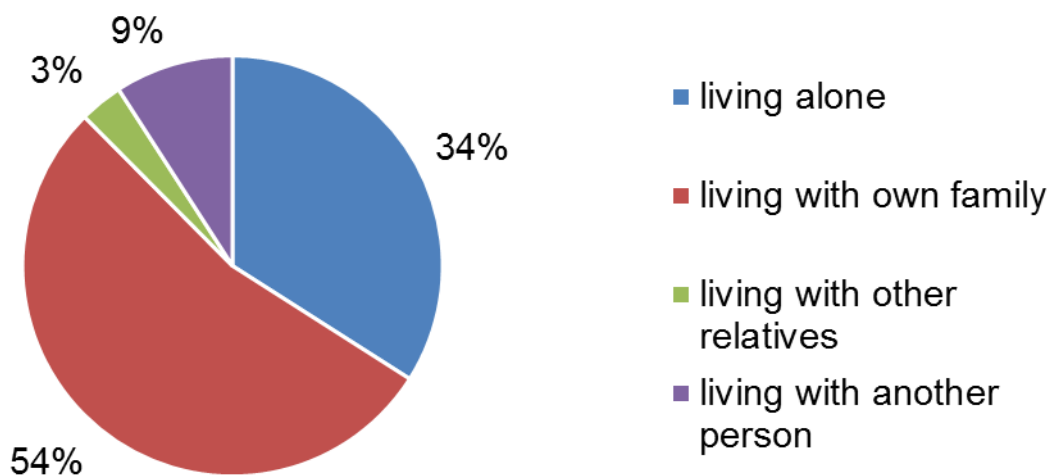
The charts below illustrate the characteristics of respondents' population, also with respect to their employment status and their household composition.



Employment status



Household composition

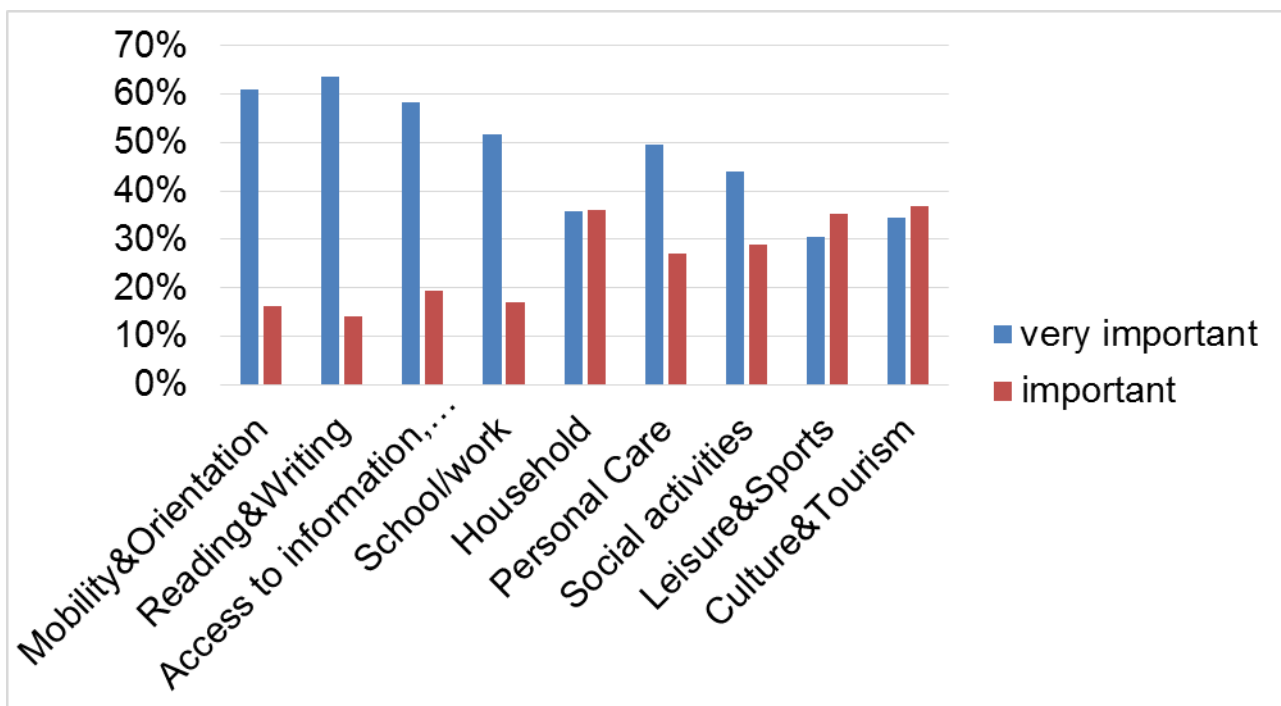


The analysis of responses reveals useful information about needs and about assistive solutions which low-vision people may wish to improve their quality of life. Results are encouraging in that they confirm that the devised closed questions and the associated responses as well as the open-ended questions, cover a correct and complete set of issues, with an appropriate approach, and that the data collected can be analyzed under different perspectives, referring to respondent's profile (including his/her nationality, age, social situation, household composition, and, of course, the status of

his/her impairment) and to the different areas of life supported by assistive solutions.

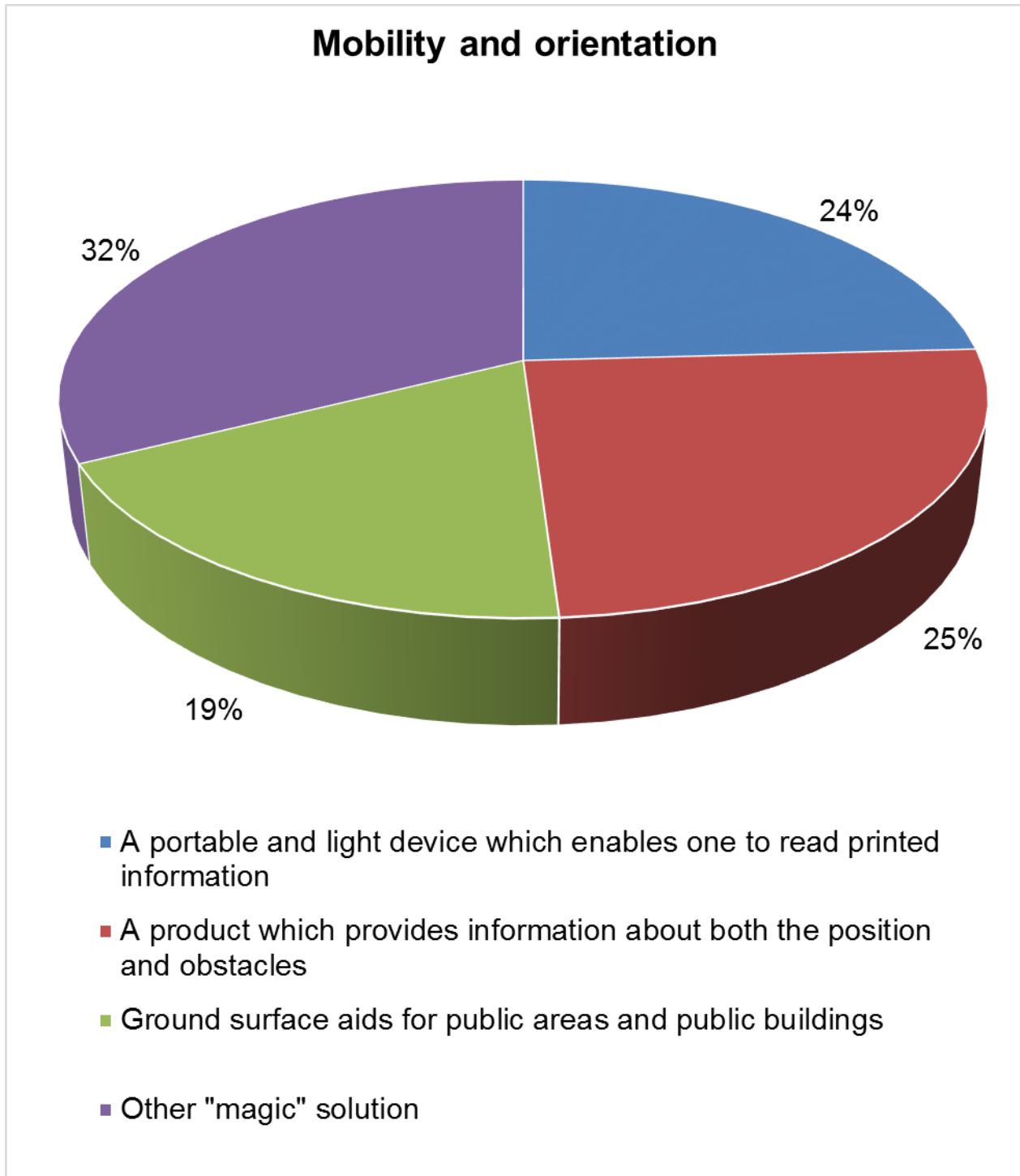
The following histogram, from Section B of the questionnaire, reports the areas which are considered most important for daily functioning. In the figure, we see, for example, that, so far, the areas of Reading and Writing, of Mobility and Orientation and of Access to information, goods and services have been considered ‘very important’ by most respondents.

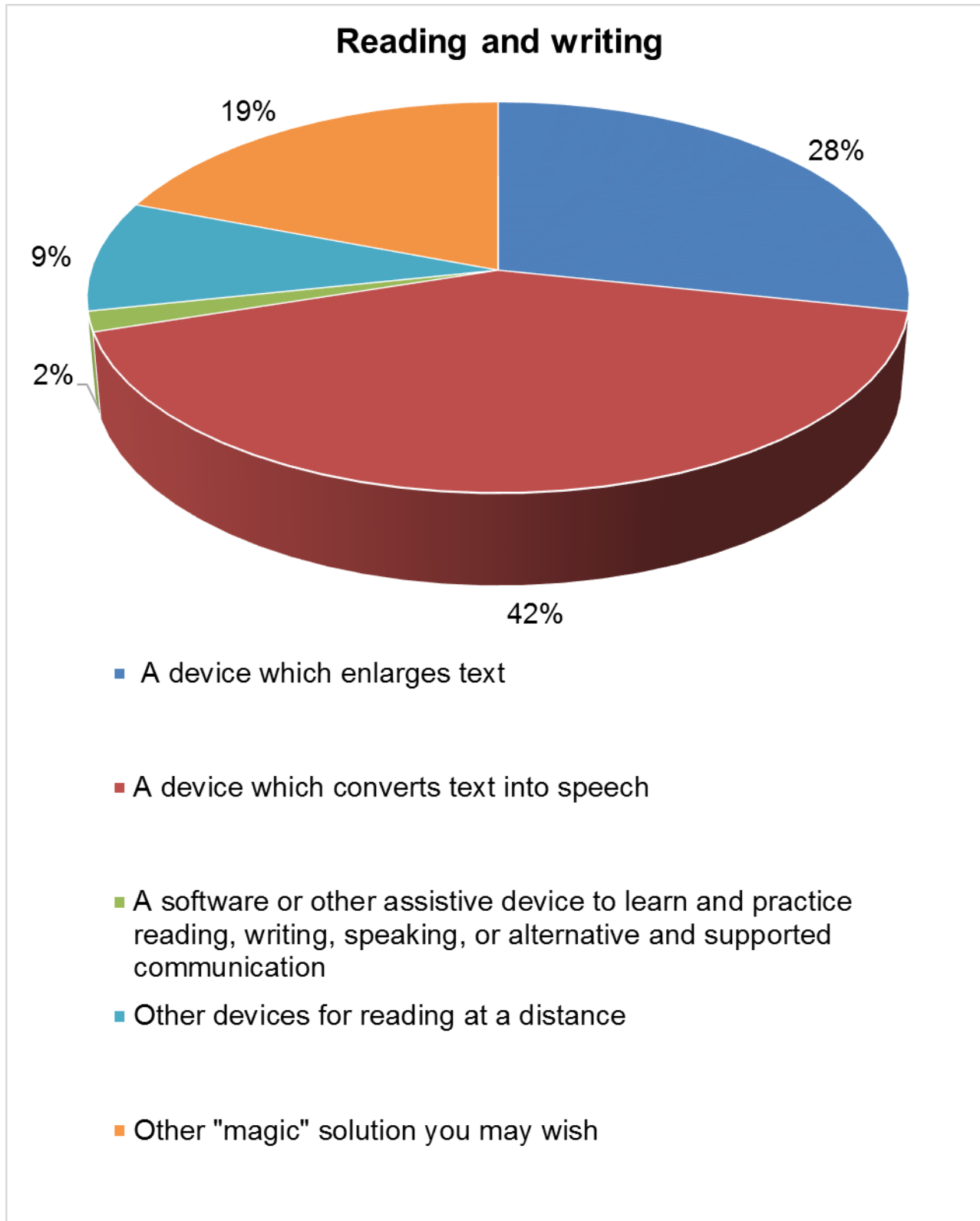
B1. How important are the following areas for you in your daily functioning?

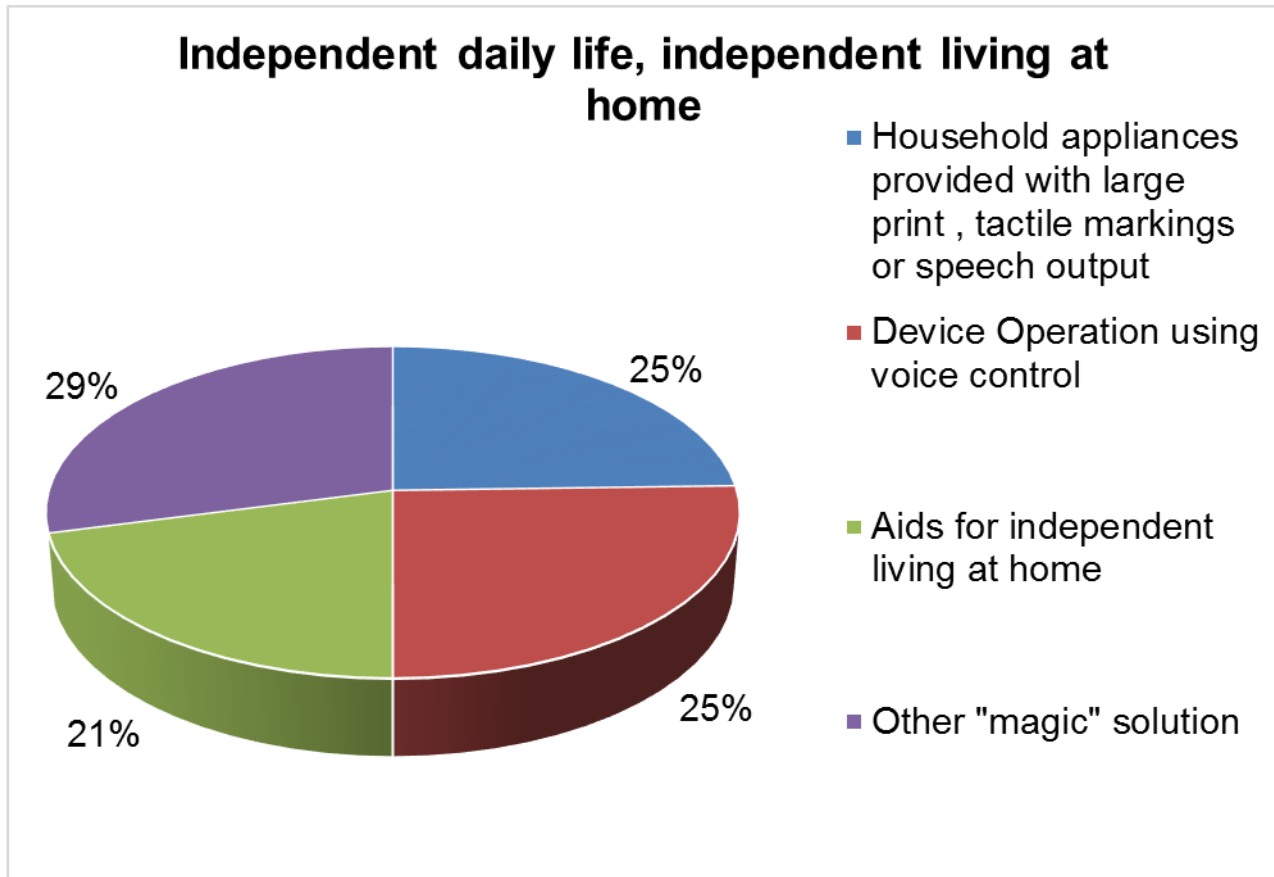


The following pie charts, from Section C, are derived from the responses to question C2, referring to the areas of Mobility and Orientation, of Reading and Writing and of Independent Daily Life, Independent Living at Home, respectively:

C2. What assistive device or service you miss the most and would like to make your life easier?







In the charts the item ‘Other “magic” solution’ refers to open ended responses. Useful insight into real needs came from those answers. We report a few meaningful examples:

- A unique device which reads street signs, billboards, face recognition, reading timetables, price labels
- App to support shopping
- Due to massive lack of infrastructure and public transport in my domestic area, a service would be needed to supply flexible mobility comparable to that of individual mobility of people without disabilities (until autonomous vehicles become everyday reality)
- In my case a non-bulky (a size of normal glasses perhaps) device would be needed that would allow me to immediately zoom in or focus a desired object in my line of sight and quickly zoom it out and return to unaided sight without having to stop and readjust the settings (a small remote-control for the device could do the trick). This would be

particularly useful for some unpredictable changes in the surrounding, such as a temporary road block, some obstacle on the path and so forth, as to obviate "the need" of almost hitting the obstacle (especially in the dark) before realising that you'll have to find a way around. I presume that such a device would also allow one to read printed information and other signs that allow sighted people to navigate.

- Announcement of numbers of busses/trams/trains
- An app that speaks and identifies where you are and clear directions in where you want to be
- Software or device to distinguish colours
- I have been told that there are electronic spectacles that put a digital image just a few centimetres from the eye. This would be perfect for my particular vision problem because I can see pretty well at about two or three centimetres.
- Signs with illuminated letters, indicating location of stores or offices.
- Home automation to carry out housekeeping tasks more easily
- Rehabilitation aimed at enabling me to drive
- Bionic eye
- A device which converts text either to voice or to Braille, on demand.
- Portable device assisting in the indoor positioning in public buildings and helping in the choice of products during grocery shopping
- Medical device for hemianopia and quadrantanopia rehabilitation treatment to create new visual ability thanks to multi sensorial neurons stimulation, the solution needs to be small, wearable and enable remote review and monitoring (from specialist).
- ...

The answers to the patient questionnaire highlighted three main unsatisfied needs:

1. the need for tools that support the display and / or reading of text contents using electronic devices.
2. the need for tools that contribute to the individual ease of movement both in private and public buildings, including tools for helping detecting dangers and obstacles.
3. the need for tools that increase autonomy and independence at home and at work.

The first need was reported various times by respondents. Here an example of answers expressing the need.

- In my case a non-bulky (a size of normal glasses perhaps) device would be needed that would allow me to immediately zoom in or focus a desired object in my line of sight and quickly zoom it out and return to unaided sight without having to stop and readjust the settings (a small remote-control for the device could do the trick). This would be particularly useful for some unpredictable changes in the surrounding, such as a temporary road block, some obstacle on the path and so forth, as to obviate "the need" of almost hitting the obstacle (especially in the dark) before realising that you'll have to find a way around. I presume that such a device would also allow one to read printed information and other signs that allow sighted people to navigate.
- I have been told that there are electronic spectacles that put a digital image just a few centimetres from the eye. This would be perfect for my particular vision problem because I can see pretty well at about two or three centimetres.
- A device which converts text either to voice or to Braille, on demand.

Respondents have referred to tools that allow the processing and modification of different formats. Among them we can find Braille and written texts. In general, the need expressed is for instruments that allow for an easier access to any type of written message. The need for an assistive

device that would allow for an easier reading of text has been expressed various times for question C4.

C4. What would you wish innovation could solve for you? Please answer completing the sentence “It would be great if innovation could create a solution for me in the area of.... in order to....”

Here are some examples:

- A device which enlarges text
- A device which converts text into speech
- Some "magic" (electrical) glasses that magnifies directly what I am looking. Currently, I have to take out a lens or telescope for reading or recognition every time, have to adjust it or to come very close to the object, this is annoying, and face recognition is impossible
- I would like to have program in computer that would zoom all board and that I would actually see all board (not only one part). For example: when I hold ctrl + I can see all part of text, not just one part.
- It would be nice that devices with input via display can be handled by blind persons in the same way

The freedom provided by open questions allowed for the description of various cases of use, related to the translation of text into vocal message and enlargement of text.

The second need, related to an increased ease of movement through some tool that identifies obstacles providing guidance in directing an individual with low vision, can be traced in the following responses related to the functionalities of a possible magic solution.

- A unique device which reads street signs, billboards, face recognition, reading timetables, price labels

- Due to massive lack of infrastructure and public transport in my domestic area, a service would be needed to supply flexible mobility comparable to that of individual mobility of people without disabilities (until autonomous vehicles become everyday reality)
- Announcement of numbers of busses/trams/trains
- An app that speaks and identifies where you are and clear directions in where you want to be
- Signs with illuminated letters, indicating location of stores or offices
- Rehabilitation aimed at enabling me to drive
- Portable device assisting in the indoor positioning in public buildings and helping in the choice of products during grocery shopping

The previous 8 open answers allowed for the identification of this need as an emerging one. The relevance of this topic emerged also with responses generated by question C4.

- It would be great if innovation could create a solution for me in the area of automotive(a special car that I can use by myself) as well as innovation on public transport in order to let me be more independent in travel and transports
- Mobility area to ride a bicycle
- It would be great if innovation could set up solutions in order to have easier and accessible devices at the workplace
- ...to have an external orientation device to visit a new city in complete autonomy, at least the city centre.
- Ambulation - I wish I could move in a safer, quicker and more precise way
- orientation to find my way on my own, see the light of traffic lights, recognize bicycles...
- ...in the area of driving a car in order to see better and faster the traffic signs and situation...in the area of reading the sheet music in order to play the instrument "prima vista"
- in the area of reading the sheet music in order to play the instrument "prima vista"

- It would be great if innovation could create a solution for me in the area of social relations in order to let others know that I cannot see well even if I am not using a cane
- It would be great if I could handle the actual service machines, like ticket machine, cash-dispenser independent

The third need, increased autonomy and independence at home and at work, has been expressed various times by survey respondents. Here some examples from question C4

- It would be wonderful if innovation could create a solution for me in the domestic autonomy so I can get help especially in cooking
- IT sector to be more autonomous. The computers are built for the able-bodied. We need PC for the visually impaired people. It's very annoying to work with an enlarger and be forced to look at a screen where most of the information is hidden and you have to look for it in the screen with a big time loss.
- To improve and simplify daily life for the blind and visually impaired
- It would be great if innovation could set up solutions in order to be independent at home
- It would be great if innovation could set up solutions in order to have easier and accessible devices at the workplace
- Electronic devices to allow me watch TV
- in the work sector so to facilitate the ordinary life
- It would be great to have devices which can create results in the field of work, and communication. Face recognition. Device which enables me to handle my farm tractor to work in my vineyard
- It would be great if innovation could create a solution for me the area of literature in order to enjoy more independence in cultural goods.
- It would be great if innovation could create a solution for me in the area of house work and cooking in order to find objects moved by others

- It would be great if innovation could create a solution for me in order to allow me to study less-known materials which are not available in adaptive formats
- A solution concerning "white" devices e. g. washing machine would be great. It would be useful if they were voice controlled

6 THE COMPLEMENTARY INVESTIGATION WITH CLINICIANS

This part of the survey is meant to integrate the findings achieved through the focus groups carried out so far, with the goal to reach a wider and distributed sample of this category of stakeholders relying, again, on the web based LimeSurvey system to quickly collect responses, create statistics, and export the resulting data, if needed.

6.1 THE QUESTIONNAIRE GOALS

The purpose of the questionnaire has been to collect information about the state of available technologies according to visual impairment professionals and the potential area of innovation for the development of new technologies in the field. The response coming from this category of stakeholders is considered as important as the one gained through the end-user questionnaire and will help us better assert the emerging needs towards the goal of adopting the instrument of Public Procurement to support the provision of innovative low-vision technology and services.

6.2 THE QUESTIONNAIRE STRUCTURE

The questionnaire is divided into two sections, which can be completed in approximately 20 minutes.

- Section A is meant to collect information about respondent's profile and role.

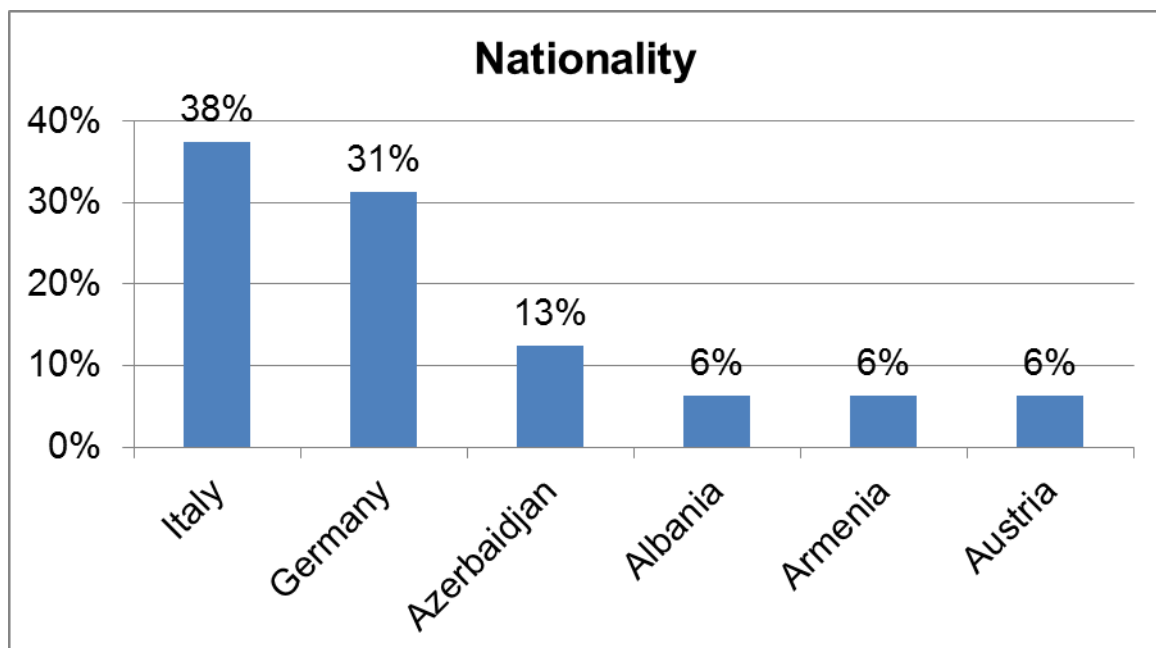
- Section B includes questions about innovation gaps and needs for innovative clinical technologies and /or services in the domain of low-vision.

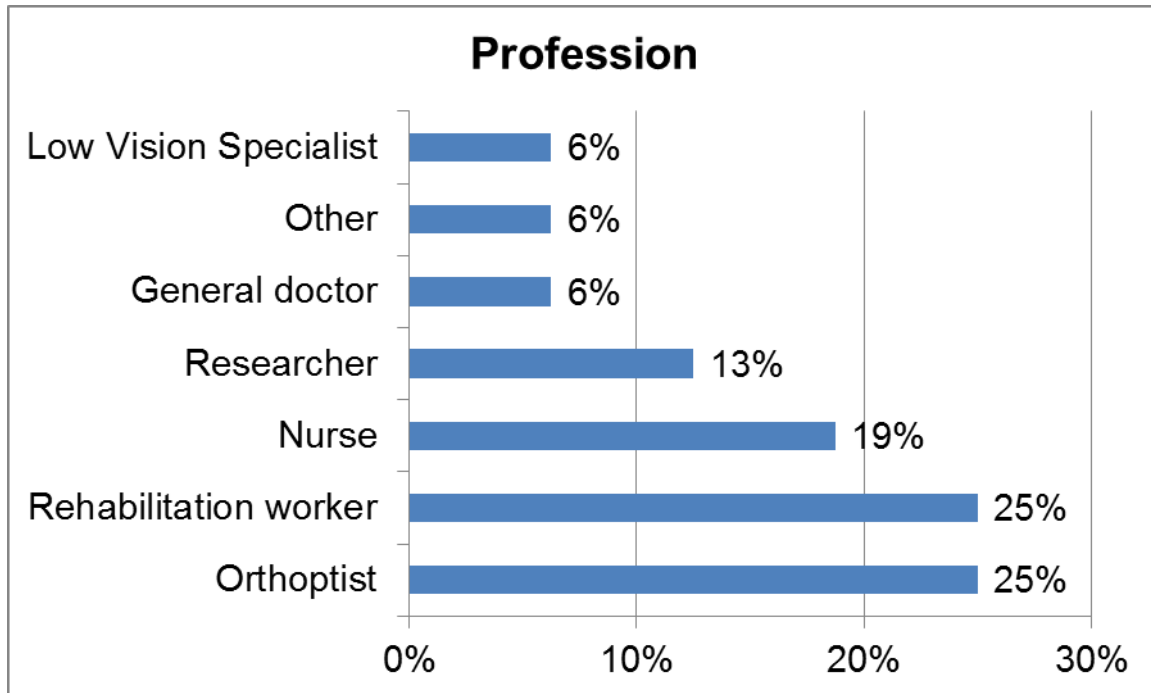
Most questions have been deliberately left open and to encourage personal comments and advices.

6.3 RESPONDENTS' PROFILES

The first section of the questionnaire was designed to collect information about respondent's background. Nationality and role were especially considered relevant to the planned analysis of needs as well as the typology of organization she/he belongs to (e.g., public or private). Respondent could be any individual who is directly or indirectly involved in low-vision patients' care, belonging to some (private or public) organization. He/she can be, for instance, a general doctor as well as an ophthalmologist/ophthalmic surgeon as well as a low vision specialist, etc.

The graphs below describe the respondents' characteristics according to nationality and role as medical operators.





In the second section, also inquiring about the visual disease considered as most impacting on quality of life, out of the Health Organization official classification², low vision domain experts are asked to mention the main inefficiencies in the process of diagnosis-treatment-rehabilitation-recovery, and how could ICT and telemedicine reduce them.

They are taken through a number of open-ended questions, where they are encouraged to suggest

- ways to foster individual patient empowerment, enabling them to actively participate in the treatment and recovery from eye disease
- the most important area of technological innovation to reduce the number of severe post-treatment events and complications
- how technology can improve diagnostic techniques to monitor disease and progression

² World Health Organisation (WHO) disease definitions for blindness and partial sight
<http://apps.who.int/classifications/icd10/browse/2010/en#/>.

- the types of rehabilitation programs which could be implemented for patients to be used at home

Respondents are then invited to mention a problem, an associated innovation gap and the functionalities and performances which a solution should warrant, in any of the four major areas of care: (a) diagnosis, (b) medical and surgical treatment, (c) monitoring and evaluation of disease progression, and (d) rehabilitation.

The questionnaire is concluded soliciting respondent's personal opinion on where research and development investments should be prioritised and on which disruptive technologies are most likely to significantly improve the quality of life of people with low vision.

7 EMERGING NEEDS AND PERSPECTIVE SOLUTIONS

So far, we have received 24 responses to clinicians' questionnaire from the following institutions:

- Istituto Oftalmologico di Milano, Italy
- A vocational school for adults, Germany
- A Training Center for VIP, Germany
- Uniklinik, Germany
- Rittmeyer institute for the blind, Italy
- A blind's institute, Italy
- Institute for blind and visual impairment people, Italy
- NHS Moorfields Eye Hospital, UK
- University of Manchester, UK
- University, Spain
- Charity center, UK

The responses coming from those professionals, compared against the insight gained from the analysis of end-users' questionnaires, has allowed us to identify an initial set of emerging needs and perspective solutions, on which further in-depth investigation can be performed in the subsequent stages of the project.

Some worth-mentioning innovation gaps resulting from section B of the questionnaire are

1. Need: In retinal degeneration, early diagnosis identification of progression and restoration of lost tissue.
Solution: Adaptive optics to identify early losses.
2. Need: Current monitoring systems not online and shortage of resources with respect to the increasing numbers of patients.
Solution: Use of tele-medicine and remote access clinics, and different healthcare professionals to do the job
3. Need: Poor access to rehabilitation services, also due to the lack of collaborative thinking between health and social care
Solution: Improved communication systems and easier access to refer between services
4. Need: Lack of ability to engage visually at a distance for people with visual impairment. Desired a wearable zoomable magnifier to allow an extended visual reach. Telescopes are available but used less due to social pressure and the rise of technology to place information in one's hand
Solution: discrete, easy to use, minimal user controls.

When inquired about the disruptive technologies which may significantly improve the quality of life of people with low vision, some clinicians mentioned the following:

- the daily use of appropriate technologies to mitigate the problem of impaired sight
- Hand held tablet devices are making a real difference to the QoL for people with Low Vision- have a readily affordable version (i.e. not an iPad) would be great.
- Driverless cars
- electronic technology that allows people to access the same information as sighted peers, without being too different. To take advantage of tablet computers and phones and make them accessible and then let them make the internet, reading etc accessible
- Smartphones
- assistive technology, i.e. using the new tablets and eye phone with the screen reader applications, and the satellite navigations for mobility. Also being able to access the beacons in the open city, this will enable V.I people to access the city using the technology.
- Optegenetic field

- High quality Accessibility settings on mainstream devices that allow me to use the same device as others. I feel included and empowered
- In terms of diagnosis, adaptive optics if better implemented. In terms of treatment, tissue regeneration
- Macular surgery / transplantation / RPE regeneration etc

The discovered innovation gaps and perspective solutions may have clear impacts on the areas, which low-vision individuals, during the first stage of the study, judged priority to improve their life quality, namely reading and writing, mobility and orientation and access to information, goods and services. Such findings therefore lay the basis for the upcoming focus groups, providing a set of meaningful issues from which discussion may start.