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Analysis of the pilot survey INKLUGI about aging and disabilities to promote Inclusive Design in industry.

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Abstract: This study is part of the project INKLUGI. The main objective of the project is to create new tools that help to introduce Inclusive Design methods in the industry of the region of Gipuzkoa. To make companies understand the aging of the population as an opportunity for innovation and competitiveness is necessary to create new quantitative tools. The survey about disability and aging is the best way to gather data for a quantitative data base that will feed the future quantitative tools for Inclusive Design. In this study the process followed to carry out the pilot survey INKLUGI is presented. Then, the results obtained from the survey are analysed and discussed in a collaborative workshop with stakeholders. Finally, the contributions of experts from different sectors are explained.

Keywords: Inclusive Design, disability survey, aging, quantitative, exclusion

1. Context

The aim of the analysis of the pilot survey INKLUGI is to assess its suitability for the collection of information on disability and ageing. This information should be useful to assess the exclusion caused by products and services from different sectors. In addition, the questionnaire must be compatible with surveys carried out periodically by the Instituto Nacional de Estadística (INE, 2008) and with the standard questionnaires proposed by the United Nations (Washington Group on Disability Statistics, 2011). Thus, on the one hand, the information is intended to be usable by industry and comparable with other statistics provided by statistical institutes at national and international level.

The ageing of the population is one of the greatest challenges facing society today. Spain will be one of the oldest countries in the world, according to United Nations projections, 40% of its population will be over 60 in 2050 (United Nations, 2015). This phenomenon will bring about an increase in diversity among the retired society, but also in the active population.

The diversity of capabilities increases with age, as each person ages differently (Kalache & Kickbusch, 1997). In addition, living longer often translates into more years of dependent life, which will lead, in the short term, to a higher percentage of people needing support to carry out daily activities (WHO, 2016).

1.1. Opportunities for the industry

In one hand, the industrial companies that learn how to include this growing section of the population in their target market will have an advantage over those that do not. Inclusive Design is necessary to address the needs of elderly, and contrary to the opinion of industry professionals, products and services designed from this perspective are usually more convenient for everyone. Furthermore, apart from benefiting the end users, and rather than causing higher costs, it can be a source of benefits for both companies and their clients.

On the other hand, another challenging impact of the aging of the population will be the aging of the workforce that will affect companies directly. Work environments will need to be adapted to prevent and compensate for the slight losses of vision, audition and dexterity capabilities that occur during medium adulthood. The industry of automotive has been the first sector to adapt the work environments to this new challenge. For example, Mercedes has been working (Streb & Voelpel, 2009) to dispel common attitudes about older workers and testing ergonomic tools such as an exoskeleton which reduces muscle strain for workers installing parts overhead. BMW has also taken steps including installing wooden floors (Loch, Sting, Bauer, & Mauermann, 2010) to soften the impact on workers' knees and rotating jobs during shifts so staff avoid too many repetitive movements.

Inclusive Design is "The design of mainstream products and/or services that are accessible to, and usable by, as many people as reasonably possible... Without the need for special adaptation or specialised design." (Goodman-Deane, Waller, Williams, Langdon, & Clarkson, 2011) (British Standard, 2005). However, as described in the previous paragraph, industrial companies often do not trust the business opportunity that Inclusive Design can provide. We believe that the fact that most of the tools used in Inclusive Design are qualitative tools does not help in this sense. The reason being that qualitative research suffered a "legitimation crisis" during the last decades as stated by different authors (Weil et al. 2008). In contrast, quantitative tools would give us the possibility to quantify the market opportunity of Inclusive Design. Nowadays there are few tools like the Exclusion Calculator (Goodman-Deane et al., 2011; Waller, Langdon, & Clarkson, 2009) that help to quantify the degree of exclusion caused by a product or service. Furthermore, this tool is based on a very exhaustive survey carried out in the United Kingdom in 1997, so the results, although very precise, are very difficult to update. Therefore, it is believed that it is necessary to create new quantitative data that can be fed by the statistics that countries collect periodically.

2. INKLUGI survey

This survey is part of the project INKLUGI. The main objective of the project is to create new tools that help to introduce Inclusive Design methods in the industry of the region of Gipuzkoa. In this way, it is intended that the business sector in Gipuzkoa learn about aging, diversity and inclusion.

The survey about disability and aging is the best way to gather data for a quantitative data base that will feed the future quantitative tools. Specifically, this study presents and analyses the results of the pilot survey conducted in Debagoiena and the workshop organized with different stakeholders. The pilot survey will work as a test to evaluate the complexities of gathering data about disabilities and to estimate the possibility of introducing new and more specific questions easier to link to inclusive design.

3. Development of the survey

3.1. Analysis

Different questionnaires were analysed for the design of the pilot questionnaire. The questionnaires used in national and international surveys about disability and dependency, the surveys about aging and the survey used to feed the Exclusion Calculator of the University of Cambridge were compared.

Table 1. Comparison of surveys about disability and aging (Authors, 2018)

Nº	Survey	First year	Location	Frequency
1	Washington Group Extended Question Set on Functioning (Washington Group on Disability Statistics, 2011)	2011	60 countries	Varies from country to country
2	World Health Survey (World Health Organization, 2002)	2002	70 countries	Varies from country to country
3	European Health Interview Survey (European Commission, 2006)	2006	31 European countries	Every 5 years
4	English Longitudinal Study of Aging (ELSA) (Marmot, Banks, Blundell, Lessof, & Nazroo, 2002)	2002	England	Every year but longitudinal
5	The Disability Follow-up Survey (Grundy et al., 1999)	1996	UK	One-off
6	Towards Better Design survey (Tenneti, Johnson, Goldenberg, Parker, & Huppert, 2012)	2011	England and Wales	One-off
7	Survey on Disability, Personal Autonomy and Dependency Situations 2008 (EDAD2008) (INE, 2008)	2008	Spain	Every 10 years
8	Elderly people survey IMSERSO2010_(CSIC, 2010)	2010	Spain	2004, 2006, 2010

It is difficult to compare disability prevalence and characteristics between countries due to the fact that disability measures and sampling methods vary from country to country. The World Health Organization have taken steps to address this with the World Health Survey, using the same questions in multiple (though not all) countries. In addition, the Washington Group has proposed tools to help countries carry out surveys in a coordinated way. These include a short and extended questionnaire on the prevalence and levels of disability in the adult population (Washington Group on Disability Statistics, 2011). These questionnaires are based on the International Classification of Functioning Disability and Health proposed by the World Health Organization (World Health Organization (WHO), 2003).

3.2. Design of the questionnaire

After analysing all these aspects, the team selected the questions that are most relevant to determine the degree of each capability. Questions related to the basic and instrumental activities of daily life (Lawton & Brody, 1969; Mahoney & Barthel, 1965) as well as questions about leisure activities and participation were also selected, Table 2. The survey was designed as a structured interview with closed multiple-choice questions that represent the level of difficulty performing each activity related to capabilities, the use of assistive products and the level of frequency for the free time activities.

Table 2. Structure of the questionnaire

Category	Number of questions	Sources
Demographic information	5	
Capabilities	15	Washington Group, EDAD2008
Assistive AIDs	4 (12 answers)	EDAD2008
Activities of Daily Life	12	BADL, IADL
Leisure activities	19	EDAD2008

As shown in Table 3, the questionnaire included questions about specific capabilities, such as, vision, hearing, mobility, communication, cognition and dexterity; questions related to the activities of daily life, questions related to leisure activities and questions related to the use of assistive products. We choose the section of specific capabilities because they are the most related to product features to analyse the way in what people understand them and too compare if the results for both sections are coherent.

Table 3. Questions about capabilities on the survey INKLUGI

Capability	Questions
Vision	Do you have any difficulty seeing the newspaper print?
	Do you have any difficulty seeing someone's face across the street (4 meters)?
Hearing	Do you have any difficulty hearing?
	Do you have any difficulty hearing what someone says in a quiet room?
	Do you have any important difficulty what someone says in a noisy room?
Mobility	Do you have any difficulty walking or climbing steps?
	Do you have difficulty walking 100 meters on level ground (the length of one city block) without the use of any help?
	Do you have difficulty walking 100 meters on level ground (the length of one city block) with help?
	Do you have difficulty walking half a km on level ground (the length of five city blocks) with help?
	Do you have difficulty walking up or down 12 steps without the use of any help?
	Do you have difficulty walking up or down 12 steps with help?
	Do you have difficulty walking up or down 12 steps with help?
Communication	Using your usual language, do you have difficulty communicating, for example understanding or being understood?
	Do you have difficulty remembering or concentrating?
Dexterity	Do you have difficulty raising a 2 liter bottle of water or soda from waist to eye level?
	Do you have difficulty using your hands and fingers, such as picking up small objects, for example, a button or pencil, or opening or closing containers or bottles?

There is an important difference between the data used for the Exclusion Calculator and the data in the survey INKLUGI. The answers to the questions in the case of INKLUGI are divided into four levels of difficulty: mild difficulty, moderate difficulty, severe difficulty and cannot do it at all. In consequence, the mild difficulties that arise during the first stages of the aging process will be more visible than in the Disability Follow Up Survey dataset.

3.3. Data gathering

The data collection was carried out in two phases. Firstly, the survey was launched through social networks and using *Whatsapp*. Subsequently, the survey had to be relaunched because, the channels used, mainly *Whatsapp* and web, few responses were obtained from people over 50 years old. For this reason, a second round was carried out through face-to-face and paperbased surveys in the day centers, associations and gerontological centers in different towns of Debagoiena: Antzuola, Aretxabaleta, Arrasate-Mondragon, Elgeta, Eskoriatza, LeintzGatzaga and Oñati.

3.4. Sample and answer time

In total, 630 responses have been obtained among the residents in Debagoiena. Specifically, there were 377 women, 250 men and 3 people who chose the third option related to sex. In this sense, it should be analysed why more women than men have answered and, if it is possible, the recruitment process should be changed to improve the gender balance in the final survey. Regarding age ranges, 202 people between 18 and 40 years old, 231 people between 41 and 64 years old, and 197 people between 65 and 100 years old responded. It can be said that sufficient representativeness has been achieved in each age range.

Regarding the time required to answer the survey, it can be said that the survey can be completed easily and quickly. The average time required to complete it was 6 minutes, which leads us to think that the final survey could include more questions. Including more questions for each capability would provide the database with more detailed and reliable information when feeding the quantitative tool.

3.5. Results of the pilot survey INKLUGI

The results show that difficulties increase with age. People aged 65 or over reported more difficulties in performing the different activities. It is also clear that some difficulties, such as auditory difficulties are experienced earlier than motor difficulties, see Figure 1.

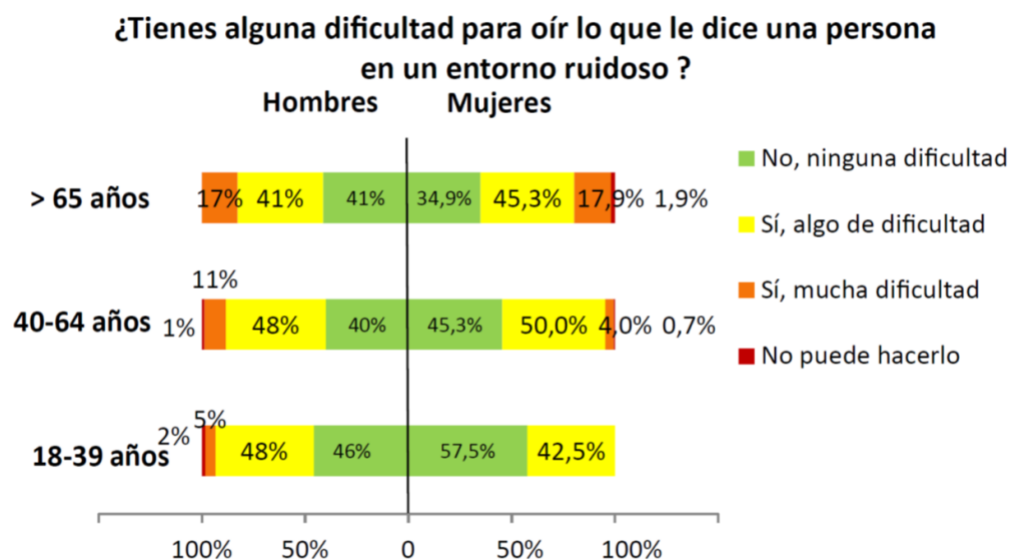


Figure 1. Results obtained for the third question about hearing in the survey INKLUGI

However, a high prevalence of motor difficulties among older people is detected Figure 2. In contrast, older people who go out for a walk more often.

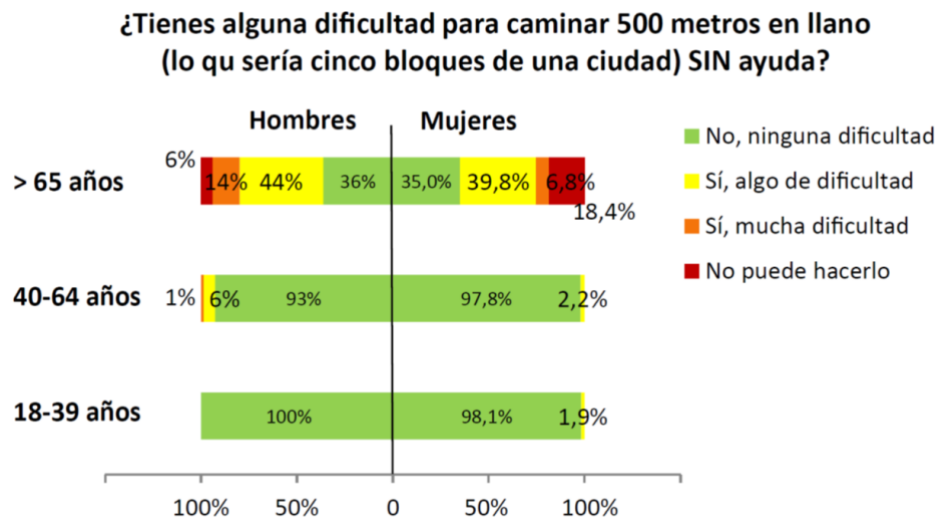


Figure 2. Results obtained for the fourth question about mobility in the survey INKLUGI

The use of communication technologies such as mobile phones, tablets and computers is less frequent among people over 65, with the number of people using these technologies several times a week being higher than the number of people using them every day.

In addition, the team has identified that some people had difficulty interpreting the questions and, in order to allow them to respond to the team, have adapted the questions to the specific circumstances of some interviewees. This aspect has reinforced the idea of adapting the questions by sectors.

Another important finding is that, as we predicted, the amount of people that reported having mild difficulties with some activities is not negligible. In contrast, this information was not gathered in the EDAD2008 survey due to the method used to collect data. In this survey they asked interviewees to state whether they had moderate or severe difficulty. The option to select mild difficulty was not available. This led us to think that, if we want significant datasets to understand the aging process, we should influence not only on the kind of questionnaire but also on the methodology to follow on national and international statistics.

4. Workshop with stakeholders

After analysing the data obtained from the survey INKLUGI, a workshop with stakeholders was organized to analyse the usefulness of the survey for the different sectors. In this section, the method followed during the workshop and the feedback received from stakeholders are explained.

4.1. Method

The workshop was announced among different stakeholders from industry, social organizations, administrations and design consultancies from the region of Gipuzkoa. The workshop was held on the morning of 9 November 2018. A total of 25 people registered but finally 17 people attended the meeting. Participants came from different industrial and social sectors as it can be seen in Table 4.

Table 4. Stakeholders that participated in the workshop

Sector	Number of attendants
Hand tools industry	1
Locking devices industry	1
Heating industry	1
Engineering consultancy	1
Electric and electronic equipment	1
Associations and 3th sector	3
Design Studios	3
Health promotion in industry	1
Employment of people with disabilities	2
Education	3

The process for the workshop was as follows:

- Description of the context. Opportunities of the aging population
- Practical exercise to evaluate the suitability of the questionnaire for the different sectors.

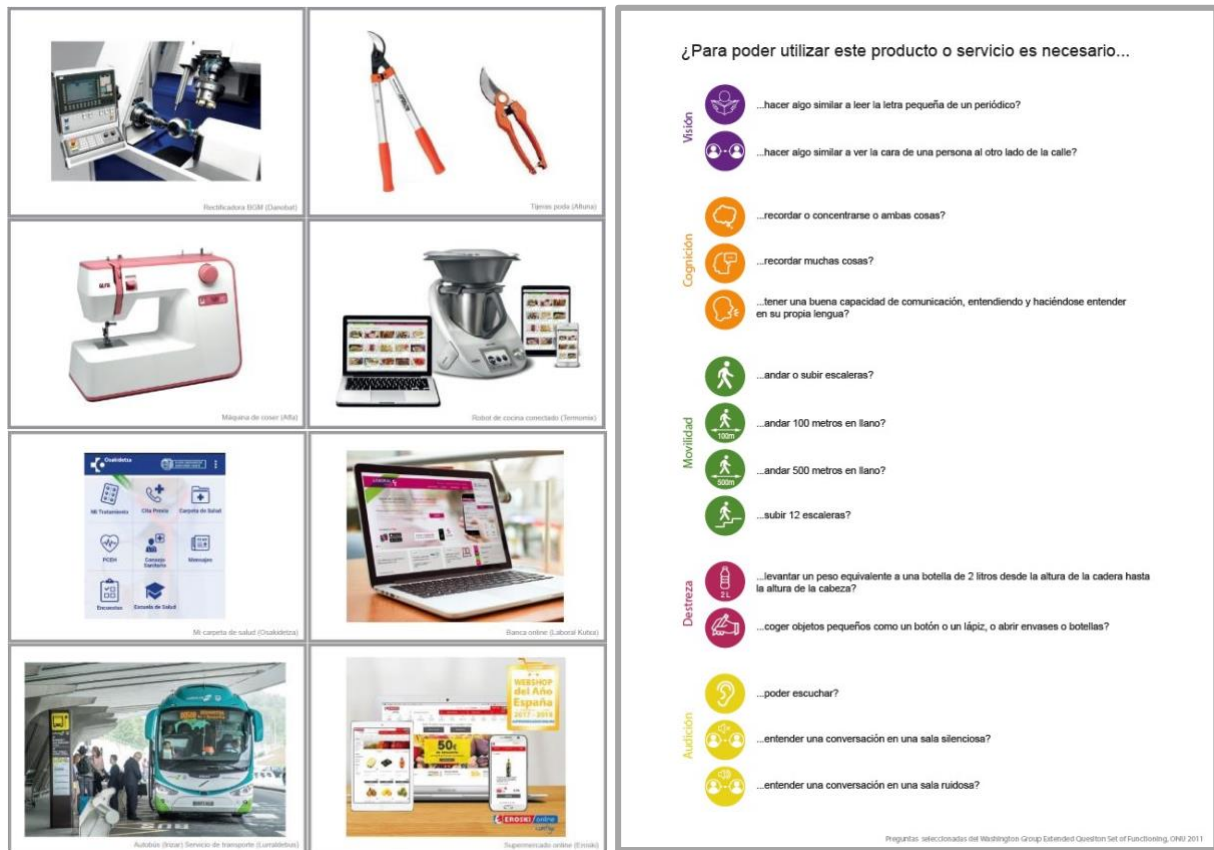
The first part of the workshop consisted in a description of the context and an explanation of the importance of Inclusive Design in the aging society. Participants were divided into three teams.



Figure 2. Stakeholders working on teams during the workshop

During the second half of the morning a practical exercise was organized to obtain the feedback of the different stakeholders. The exercise consisted on giving to each person a card with a product or service, see Figure 3 a, and a check list with the fifteen questions related to capabilities, see Figure 3 b. In this check list, in contrast with the survey questionnaire, the questions were formulated in

terms of capability demand, that is, the first question was *To be able to use this product or service it is necessary to do something similar to read a newspaper print?*



a)

b)

Figure 3. a) Images of the eight products and services analysed in the workshop. B) Image of the check list about the capability demands.

After analysing the eight products and service individually, teams were asked to share their findings, explaining which capabilities were the most demanded by their product or service and if they missed any question and why. Then, the three teams shared their conclusions about each sector.

4.2. Feedback from stakeholders

The teams suggested additional questions which confirmed the need to adapt the questionnaire to each kind of product and service. The people attending made contributions both at a general level and at the specific level of each capability.

In general, the attendees considered that in order to use the questionnaire they should receive training due to the difficulty of understanding some of the questions. They also proposed adding illustrative examples to each question in order to make it easier to understand. On the other hand, they raised the need to take into account all the experience of using a product or service in order to evaluate the real exclusion.

With regard to the contributions for each type of capacity, the contributions were as follows:

- Vision: the second question about seeing someone's face on the other side of the street is not easy to interpret and it was proposed to replace it with a more general one: is it necessary to see at a distance? On the other hand, they proposed questions about the need

to distinguish colours or the level of contrast of the elements with respect to the background.

- **Cognition:** the teams proposed differentiating between comprehension and communication because in their opinion they are different. On the other hand, they proposed to include a question regarding the need to know other languages to use the product or service. They also proposed to ask if it is necessary to configure the product or service since this step can be critical for some people even if they do not have difficulties to use it in a daily use.
- **Mobility:** In this case, doubts arose as to whether wheelchairs or lifts should be taken into account. Participants missed a question about the need to bend over and get up to use the product.
- **Dexterity:** The dexterity section also gave rise to numerous contributions. The first proposal was to include a question concerning the need for reach. The second question proposed was related to the need to press buttons. A third proposal was made regarding the necessity of grip force to use the product. Finally, several of the attendees stated that it did not seem the same to them to take a small object as to press a small button.
- **Audition:** In this section some doubt arose regarding noisy or quiet rooms. It was also raised as a curiosity that normally alarms have high-pitched sounds and that these are precisely the ones that people with low hearing tend to lose before.

In conclusion, the workshop was successful and useful to receive feedback from different sectors and to recruit companies interested in collaborating with the next steps of the INKLUGI project.

5. Conclusions

In summary, it can be said that the main objective of this study has been achieved. A survey about disability and aging has been carried out, obtaining a larger sample than originally planned, 630 answers, much larger than the 375 defined to obtain a minimum reliability of the data. The results of the pilot survey have been analysed and the team has identified relevant information that can be used to influence on the design of new national surveys. In addition, companies that attended the workshop and other that could not attend the meeting showed their interest in collaborating with the next steps of the INKLUGI project. This survey will serve as a database for the development of new quantitative tools that will promote Inclusive Design in the industry of Gipuzkoa. It can be said that with this project we are reducing the gap between academic research and industry (Law, Bevan, Christou, Springett, & Lárusdóttir, 2008)

The next step will be the design of the data visualization and the design of the interface of the new tools. It is necessary to remind that the new users of this tools may not have deep knowledge about Inclusive Design, so this should be a primarily pedagogical tool. Then, the quantitative data will also serve to quantify the different segments of the population or Personas profiles that will arise from the qualitative interviews that will be carried out with elderly people. Thus, Personas which initially pursue the goal of creating empathy towards diversity, will also highlight the economic relevance of the people they represent. Finally, to assess the value of these quantitative tools different case studies will be developed during the last phase of the project INKLUGI. The case studies will be run in collaboration with the companies that were recruited during the workshop.

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