

**Educational, Audiovisual and Culture Executive Agency
Lifelong Learning Programme
Action with Multiple Beneficiaries**



DEVICE – DEsign for Vulnerable generatlons: Children and Elderly

Project Number 518749-LLP-12011-IT-ERASMUS-ECUE

Grant Agreement number 2011-5046/001-001

D2.2 Competences Portfolio

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List of abbreviations

TERM	DESCRIPTION
Design for all / universal design / inclusive design	Refer to broad-spectrum ideas meant to produce buildings, products and environments that are inherently accessible to both people without impairments and people with physical/sensory/cognitive impairments
Vulnerable generation	Sections of the population who are more at risk of injury or disadvantage due to the design of products, environments, and services than others due to their age. Specifically within this project the focus is on children and the elderly
Usability	The ease of use of a human-made product/environment/system
Accessibility	Is the degree to which a product/service/environment is available to be used/interacted with by as many people as possible
Ergonomics / human factors	A multidisciplinary field incorporating psychology, engineering, design, operations research and anthropometry. It is the study of designing equipment and devices that fit the human body and its cognitive abilities
Anthropometry	Is the measurement of parts of the human body e.g. stature, arm length, etc.
Empathy-building tools	These are tools and methods developed to assist in giving a 'first hand' experience of age and/or impairment. These include full body suits which restrict movement and cause discomfort to simulate arthritis and stiffness of the joints, to simple measures to simulate visual impairment such as putting a layer of grease on a pair of glasses to reduce clarity of vision for the wearer. These can then be used by those involved in the design process to gain empathy for people with such conditions, and so design products/services/environments with those aspects in mind
Smart homes	These are homes designed with automation and technology built into the structure and fabric of the dwelling. This can range from automated lighting and entertainment systems, to include technologies for watering plants, feeding pets, ensuring that all appliances are switched off when the home is empty, and so on.

Executive Summary

The overall aim of DEVICE - DEsign for Vulnerable generations: Children and Elderly is to bridge traditional industrial design programmes with ergonomics, usability concepts and user experience approaches with a specific focus on vulnerable generations. It intends to address the need to modernise and develop educational programmes with a specific focus on design for vulnerable generations and ultimately be a milestone towards the modernisation of design education.

This deliverable presents the results of work undertaken to identify training needs and priorities in education for design students and professionals for them to design for vulnerable generations, particularly elderly people and children. Interviews conducted with professionals and sector specialists to ascertain their views on training needs and literature reviews were combined with project partners' identified training needs.

Twenty-seven interviews were conducted by project partners in the UK, Australia, Italy, Sweden and Romania, involving both professionals and specialists with experience of working in the area of design for children and elderly people of the built environment, transport, ICT and smart technology, and toys. The seven project partner groups contributed 43 identified training needs. The results of both these Tasks were combined to provide an overall list of required competences that have been identified as being required by design students and professionals if they are to be able to consider the needs of vulnerable groups when designing.

In Task 2.1 participants were asked what information they currently felt was needed and important in order for them to consider the needs of elderly people or children in the design process, how to support future consideration of the same, and how they involved end users in the design process. Information needs that were identified included: Legislation, engineering and manufacturing, fashion and style, physical dimensions, cognitive issues, capabilities and abilities (and how these change over time), physical strength and changes over time, information about context/environment/setting, cultural information, end-user motivations, end-user confidence levels, end-user habits, details of the changing market, costs/financial considerations, and the need to build empathy with end-users.

Task 2.2 identified competences from the experience and expertise of project partners. The training needs identified included: legal issues, empathy, end-user abilities and capabilities, ethics, methods, context of use, literature and theory, translation and tools, inspiration and information, constraints, evaluation, awareness raising, engagement, cost of usability, creativity, working a multidisciplinary team, materials, accidents and near-miss analysis, anthropometric library.

A final Competences Portfolio was developed based on the results of these two Tasks. This identified six core categories or groupings of competences identified. These are: physical/cognitive information about vulnerable groups, context and costs, end-user involvement and considerations, methods, inspiration and awareness raising, and literature and legislation.

The Competences Portfolio developed within this Deliverable will be used as the basis of the work to be conducted in WP3. WP3 will develop educational modules to support these competencies which will then be piloted.

1. Introduction

The **overall aim** of **DEVICE - D**esign for **Vulnerable generations: Children and Elderly** is bridging traditional industrial design programs with ergonomics, usability concepts and user experience approaches with a specific focus on vulnerable generations. It intends to address the need to modernise and develop educational programs with a specific focus on vulnerable generations and ultimately be a milestone towards the modernization of design education.

The **DEVICE specific objectives** are:

- a) To analyse and study the current status of research and innovative practices on design for vulnerable generations and methodologies for involving children and elderly in product design
- b) On this basis elaborate a competences portfolio and educational programmes aimed at training students and employees in enterprises in designing and developing human-centred complex products that integrate advanced technological innovations for vulnerable generations
- c) Perform pilot educational programmes on design for vulnerable generations
- d) Multiply impact through a Vulnerable generation compliant award and a searchable database accessible online aimed at easing knowledge management
- e) Analyse transferability of results obtained towards and from different target groups (e.g. disabled people) and different geographic contexts (e.g. USA and other developed countries)
- f) Identify sustainability pathways aimed at fostering university-enterprise collaboration on concrete design and innovation projects

The sequence of the DEVICE work packages and how they relate to each other is given in Figure 1.

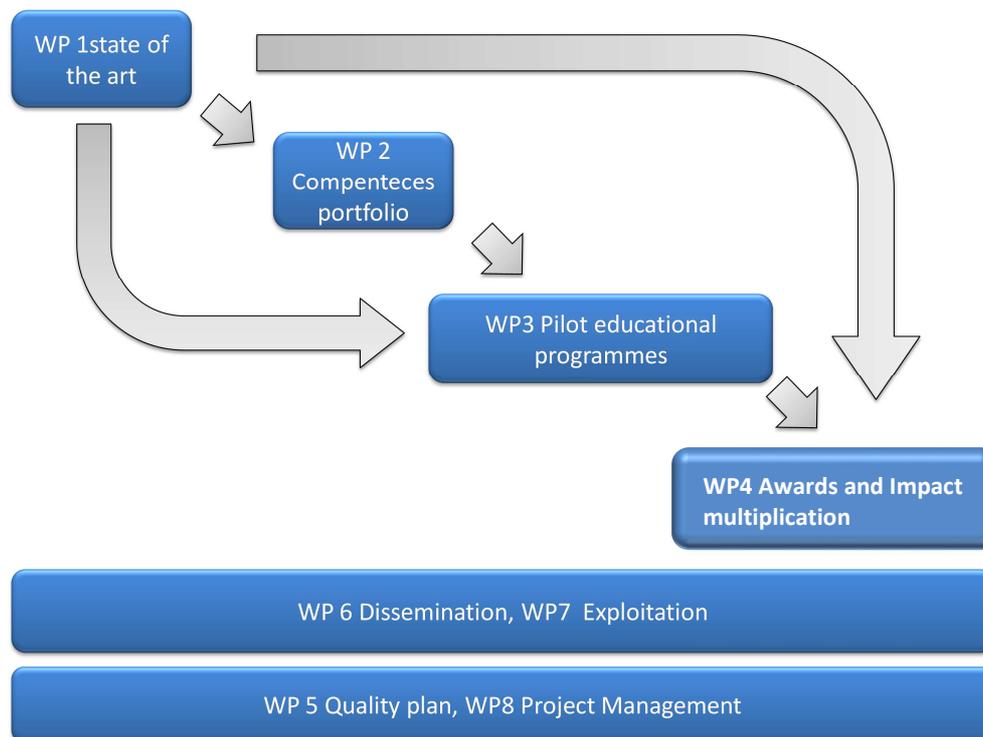


Figure 1: DEVICE diagram

First the state of the art is to be analysed in WP1. This then feeds in to WP2 and WP3. Project work resulting from the Pilot experiences and innovative practices described in WP1 will be reviewed by the consortium in view of attributing an award for other projects that are compliant in considering vulnerable generations, and build a database (WP4). WP 5-6-7-8 will continue throughout the project lifecycle.

This report relates to activities undertaken within WP2 whose objectives are to:

- Perform a training need analysis involving universities and enterprises belonging to the consortium, as well as students and professionals in design and related fields
- Undertake the Co-Development of a competences portfolio for products design for vulnerable generation

1.1. Task 2.1 Training needs analysis

In the proposal it was stated that, on the basis of WP1, educational priorities in the field of design for vulnerable generation will be broadly sketched. These will be further refined by **performing a training needs analysis**. This will be done by involving universities and enterprise representatives belonging to the consortium but also **students and professionals in design and related fields**. Collaborative work, project meetings as well as the existing scientific knowledge will support this stage. The results of this work were presented in D2.1.

1.2. Task 2.2 Definition of DEVICE learning and professional development goals

The results of Task 2.2 will allow the **detailed definition of learning and professional development goals for students and professionals** in the DEVICE related areas in a multidisciplinary perspective, bridging industrial design programmes with ergonomics, usability concepts and user experience approaches **with a specific focus on vulnerable generations**. The results will be presented in this document.

1.3. Structure of this Deliverable

Section 2 details the methodology used for defining the DEVICE learning and professional development goals to complete the competences portfolio. Section 3 gives the list of competences identified from the work conducted in Task 2.1, whilst Section 4 details the competences identified by project partners during Task 2.2. Section 5 gives the competences portfolio and definition of the DEVICE learning and professional development goals, Section 6 is the conclusions and how the work conducted will be taken into consideration in WP3.

2. Methodology

2.1. Task 2.1

The methodology was developed from the approach outlined within the proposal relating to Task 2.1 'Training needs analysis'. This was discussed and developed by the DEVICE project team at the second plenary meeting held on 3rd-4th September 2012. The resultant methodology was further progressed by the WP2 leader in consultation with the project co-ordinator and is described below.

Interviews were conducted with professionals with experience of working with children or elderly people, and working specifically in design for children or elderly people in one of four areas (built environment, transport, ICT and smart devices, and toys).

Literature reviews were also conducted in parallel with the interviews. The purpose of the reviews was to identify what information regarding training needs and the needs of elderly people and children should be considered in the design process. The literature reviews were conducted using key word searches in a variety of academic and lay online search engines, and summaries were made of appropriate sources identified. The four literature reviews covered: transport and elderly people; ICT and smart environments and children; the built environment and elderly people; and children and the built environment, computers and toys.

2.2. Task 2.2

The methodology was developed based on the project proposal and informed by discussion at the third plenary meeting held in February 2013 attended by all project partners. A template was drawn up and circulated to all partners along with the draft of Deliverable 2.1, which detailed the training needs detailed in the interviews conducted in Task 2.1. Project partners were asked to identify, using the template, training needs for design students and professionals based on the findings of Task 2.1 and their own experience and expertise in the area of working with / design for vulnerable groups.

Training need short name	
Description of the training need identified:	
Vulnerable Generation Addressed (Children, Elderly, both)	
Reference to the source (D2.1 interview/literature review/previous experience)	
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	

Figure 2: Template given to project partners for completion in Task 2.2

Project partners were asked to give the training need a name, to describe the need, to rate how important they considered the need to be (from 1 to 5, with 5 being high priority), and provide a reference for where the training need had been identified (own experience, literature review conducted in Task 2.1, interviews conducted in Task 2.1, etc.).

The completed templates were collated and compared. Where there was overlap between the training needs being suggested, then these were combined as appropriate. The full set of completed templates is given in Annex 1.

3. Competences identified in Task 2.1

Task 2.1 of WP2 of the DEVICE project concerned performing a training needs analysis. This was done by interviewing academics and professionals in design and related fields. Literature reviews were also conducted to determine the training needs that were deemed as being required for design professionals to consider the needs of vulnerable groups.

In total, 27 interviews were conducted by project partners in the UK, Australia, Italy, Sweden and Romania. Nine interviews focussed on the needs of elderly people whilst 17 focussed on design for children. Five participants discussed general issues concerning design for these groups, whilst in terms of sector specialisms 7 focussed on transport issues, 6 on the built environment, 5 on ICT and technology, and 4 on toy design.

Participants worked in a variety of settings, including 14 working in industry or private practice, 10 academics, and 3 who were in specialise roles considering design for elderly people or children .e.g. occupational therapist and user specialist consultant researcher.

Participants were asked what information they currently felt was needed and important in order for them to consider the needs of elderly people or children in the design process. Examples were provided to the participants in order to keep the data focussed on the project brief: legislation, engineering and manufacturing information, fashion and style, and information about end users. Participants identified and

endorsed the importance of many examples of the investigator-prompted types of information and also generated several other classes of information.

Legislation was stated as being important by 18 participants, whilst 11 cited engineering and manufacturing engineering, and 7 discussed fashion and style. "Information about end-users" generated many different responses, including:

- Physical dimensions (16 participants)
- Cognitive issues (15 participants)
- Capabilities and abilities/how these change over time (14 participants)
- Physical strength (9 participants)
- Physical changes over time (8 participants)
- Information about the context/environment/setting (8 participants)
- Cultural information (7 participants)
- Information concerning end-user motivations (4 participants)
- Information on end-user confidence levels (3 participants)
- End-user habits (2 participants)

Other information that was mentioned as being useful currently was: details of the changing market (3 participants); costs/financial considerations (2 participants); legal regulations (2 participants); and the need to build empathy with end-users (7 participants).

Participants were asked whether they considered that it was possible to involve end-users early in the design process and whether this was important, and how they involved end-users in the design process (if they did). Twenty participants stated that it was possible to involve end-users early in the design process and that it was important to do so, but that it might require more effort at times. Different methods of involving end-users were discussed by participants:

- 10 participants felt that co-research and co-design were valuable and important
- 8 participants used a variety of methods at different times
- 7 participants conducted surveys with end-users
- 6 participants used empathy-building methods
- 7 participants found focus groups useful, whereas 3 participants disliked them and found their usefulness to be limited.

Participants were finally asked if they had any ideas about ways that consideration of vulnerable groups, including elderly people and children, could be supported and encouraged in the design process. They were asked directly whether they thought the following would be useful in this matter (number of participants answering 'yes' in brackets):

- Formal training on issues (24)
- Computer-aided design human modelling software / online systems (22)
- Legislation (18)
- Procedures for evaluating designs (17)
- Anthropometry in appropriate formats (12)

- Checklists for inclusive design (12)

Participants were also free to mention any other ways to support and encourage consideration of vulnerable groups in the design process. Suggestions that were made include:

- Highlighting the changing consumer market (11 participants)
- Highlighting the value of difference (9 participants)
- Promoting 'design for all' / inclusive design generally (9 participants)
- Involving end-users in the design process (9 participants)
- Using empathy-building tools / techniques (5 participants)
- Working in multi-disciplinary design teams (5 participants)

The literature review undertaken to identify the ways in which designers and planners accommodate (or could potentially accommodate) the specific requirements of older road users within the transport system found literature relating to the age-related changes in physical and cognitive functioning that can impact on the well-being of older road users in ways that reduce their safety, security, comfort, accessibility, and health. The impact of these changes on overall wellbeing depends, to some degree, on the type on transport mode (walking, cycling, driving, or using public transport) and the extent to which that mode can accommodate the specific capabilities of elderly road users within the system. The review identified a larger focus on design issues impacting older road users as drivers ahead of pedestrians and public transport users and on safety over other aspects of well-being relating to comfort, security, and accessibility.

The literature review undertaken to identify the ways designers accommodate the specific requirements of older people within the built environment found that recent studies have shown that people prefer to age in their familiar environments. It is therefore very important to guide designers to provide a safe and functionally appropriate environment for ageing people, regardless of their physical condition or limitations. A relevant source of support is represented by the so called "Smart home technology", defined as the integration of home-based technology and services for a better quality of living. Despite the importance of this branch of technology, some critical points emerged: first of all the limited familiarity of many older people with the advanced technologies of smart homes. Older people's acceptance of assistive home-based technology depends on the complex relationship between cognitive, affective and emotional components. Research indicates that older adults would be more likely to make needed changes in their homes if they understood that the change would truly make a difference. The acquisition of information, initial learning and ongoing support all need to occur in the context of real interactions.

With regard to literature on the needs of children in the design process, the built environment, computers and toys and play were documented.

Built environment: research was found that indicated that the physical surroundings in which children and young people grow has a deep influence on shaping their personal development and experience. The design of the environment must be able to accommodate children at their current level of development, provide challenges, and encourage the development of new skills. The layout and arrangement of the space does not have to be, and should not be, permanent but there should be the possibility to change its features with the actual needs of children. Creating built environments that shield children from harmful

exposure, but create spaces and transportation systems that are safe for active use and promote healthy habits will ensure that the built environment supports a sustainable future with long-lasting effects.

Computers: Today's children are the first generation of what are being called "digital natives". Nevertheless spelling, typing, query formulation, and deciphering results are all still potential barriers to finding the information they need. Children have a lack of planning when attempting a complex search and a desire for the easiest path to information. This can lead children to prefer browsing to keyword searches. Furthermore children can also have difficulty understanding the information presented to them on the results page due to their cognitive abilities, the amount of information presented and the design of the page.

Toys and play: Although educators have an important role in facilitating and supporting play, it is essential for children to be involved in play experiences that they have chosen: children who only play with plastic toys are missing out on important sensory experiences and learning opportunities. Sensory stimulation derived from interacting with natural materials allows children to learn with and engage all of their senses. Furthermore collaborative fantasy play and storytelling serve an important role in preschool children's development: they allow children to explore different possibilities in their life without the risk of failure and frustration from unexpected events.

The literature reviews reflect the information requirements identified by the professionals and sector specialists who were interviewed: namely, the need for information on the physical, cognitive and emotional abilities of vulnerable groups; specific information on design recommendations for these groups; and the need to involve (and know about methods to involve) end users in the design process.

4. Training needs identified in Task 2.2

Task 2.2 concerned the detailed definition of learning and professional development goals for students and professionals with a specific focus on vulnerable generations, with a multidisciplinary perspective. Templates requesting identified training needs, details and assigned priorities for the importance of the identified training need for consideration of vulnerable groups were completed by project partners.

In total 43 completed templates were received from project partners during Task 2.2. When these were read and compared it was found that there was overlap and similarities between some of the training needs identified by different partners. Where appropriate and applicable these were combined. In this way a list of identified training needs was developed, and is given in Table 1.

The priority ratings are those given by the project partners for the training needs they identified. Where identified needs were combined / similar for different project partners, this is indicated by all the priority ratings being given. This also indicates how many project partners identified the same training need, for example, if three priority ratings are given then three project partners identified the same training need, if only one is given then only one person identified that need.

Table 1: Consolidated training needs identified by project partners during Task 2.2

Training need	Description	Priority ratings given
Legal issues	<p>The designers should have minimum legal regulations knowledge related to the field when started a new design. Overview of the main legislation related to product materials, requirement for safety both for elderly and children. In the design process consider the safety of the first target user as well as the safety of the second target user.</p> <p>In each design domain there are a huge amount of homologation directives, norms, constraints that very often have a deep legislation sound and are difficult to apply into concrete design matters. It will be very useful to know how to translate active and passive safety standards into device, objects and space design and installation, according also to ISO norms and user-centred design methodology.</p>	4, 4, 4
Empathy	<p>People will not design with consideration for the varying needs of different generations if they are not aware of the need to do so. Therefore raising awareness is a key need for designers. This can be achieved by a variety of methods e.g. personas, empathic modelling, etc. The designers need to put themselves in point of view of someone else in order to consider issues from the start of the process.</p> <p>The designer can perform a realistic/immersive experience of the simulation, using proper devices (i.e. gloves, clothes, glasses, etc.).</p>	5, 5, 4, 5
End-user abilities and capabilities - elderly	<p>This will include a wide range of information on physical, sensory and cognitive characteristics and capabilities and what impact these have on a person's ability to use a product effectively, efficiently and with satisfaction. The designers should have extensive understanding regarding the change in time of capabilities and abilities of elderly people and how these changes might affect the way they interact with the designed product. Lectures from specialists, such as orthopaedist, geriatrician, etc. It is useful to learn more about the following impairments: Blind and low-vision impairments, Motor impairments, Cognitive impairments, Hearing impairments, Speech impairments. Present end-user information in a good way to help people considering them in a positive way / promote existing literature and resources in a positive way, make it cool to work with elderly. Much knowledge in ID relates to considerations of meeting physical needs; less is known about cognitive aspects. Also given that most countries have an ageing population and that the incidence of dementia is rising, this is an area which designers need to be actively addressing. It's important to know the physical and cognitive constraints of the group you are designing for. Physical aspects (the body and how it works), as well as attitudes, ideas, motivations and perceptions.</p>	5, 5, 4, 3, 5, 2, 5

Training need	Description	Priority ratings given
End-user abilities and capabilities - children	This will include a wide range of information on physical, sensory and cognitive characteristics and capabilities and what impact these have on a person's ability to use a product effectively, efficiently and with satisfaction. The designers should have extensive understanding regarding the change in time of capabilities and abilities and how these changes might affect the way they interact with the designed product. Present end user information in a good way to help people considering them in a positive way / promote existing literature and resource in a positive way. It's important to know the physical and cognitive constraints of the group you are designing for. Physical aspects (the body and how it works), as well as attitudes, ideas, motivation and perceptions. Children are "unfinished users", since they are evolving. For this reason is very important for designers to be aware of children capabilities, possibilities and difficulties. Lecturers with domain expertise (i.e. kindergarten teachers, paediatrician, physiotherapists). To express their potential children need environments/products capable of responding to their needs and support them in their search for the meaning of things and life. So it's important to have children in mind, well defined in their ways of relating, communication, and learning.	5, 5, 4, 3, 5, 2, 5
Ethics	Communication skills, confidentiality and respect, legal issues regarding e.g. schools, how to handle data. This will emphasise the importance of following ethical protocols in all data collection with vulnerable generations, including informed consent, participant information, etc. Whilst the aim is to encourage greater use of these methods, it is our responsibility to ensure that it is also appropriate use. The involvement of vulnerable generation in the design process should follow some ethical rules that should be defined, explained and shared with designer.	3, 4, 5
Methods	This will require a number of sub-headings, introducing a range of methods for collecting user requirements and evaluation with vulnerable groups, the strengths and weaknesses of using these methods with vulnerable people, and suggestions or tips for using such methods with vulnerable groups, e.g. length of interviews, accessibility issues, size of font/contrast on materials, etc. Whilst the aim is to encourage greater use of these methods, it is our responsibility to ensure that it is also appropriate use. End-users should be the basis for the design so involving them should be prioritised. Show students/professionals the main (most used, most effective) usability and UCD methods underlying how to use them effectively with children and elderly. It should be good to give tips to students on how to use these standard methods with these particular kinds of user.	5,5,5

Training need	Description	Priority ratings given
Context of use	This will include issues concerning the context of use when products are being used by vulnerable generations, and the extent to which this will impact on usability and accessibility. This will cover the physical environment as well as the social environment in which products are used (e.g. whether a person is using a product, technology or environment on their own or with the support of others). How vulnerable users act and interact in their community life (i.e. kindergarten, hospice). Observe vulnerable users in their community life, with the guidance and explanations of domain specialists (i.e. teachers, nurses, etc.). The designers should have the knowledge on available methodologies/techniques on how the information about context/environment/setting can be retrieved for a given product. Cultural issue must be considered: elderly people are less globalised than younger people. Observation of the daily life contexts is very important to enter in the world of the vulnerable generation considered.	4,2,5
Literature and Theory	It is essential for students to read research papers focussed on practical methods to complement their findings, and learn how to do workshops etc. Much information already exists regarding designing for vulnerable generations and the methods which can be used. However people may not be aware of it and how to access it. Therefore within a training programme there needs to be an element which pinpoints these resources and sign-posts people to them.	4,4
Translation / tools	To translate findings into design specifications. It could be useful to show students/professionals different tool that they can use during the design process. The tool could be software tool to make prototype, open source tool to make sketch/lo fi prototype, physical tool that helps the design process. Supplying people with a toolkit of design methods may not be enough; there may be a need to provide a supportive framework around when these methods are applied. An overview of the design process overlaid with the various methods which shows what can be used at what point and why it is appropriate may help to provide a complete understanding/appreciation of using these methods.	4,4,2
Inspiration and Information	To gain access and insight into the everyday life	5
Constraints	Teach to have one focus at a time.	4
Evaluation	It is important to know how to evaluate the design in order to reflect on the design	4
Awareness raising	Raising awareness of the need to consider vulnerable groups in the design process. This will include definitions, e.g. of inclusive design, accessibility, etc., as well as the business, ethical and legal case for designing for vulnerable generations. (Also relevant here will be legislation, guidelines and directives in various countries and to what extent they relate to vulnerable generations.)	5

Training need	Description	Priority ratings given
Engagement	Engaging for both designer and user.	4
Cost of usability	The costs of the design are crucial; there is the need to show the implications of considering or not considering different user groups on the final design and sales of it. Give the designer some basic information on how to evaluate the importance of usability- It would be good to find examples on products/companies where it has made a difference.	2
Creativity	There is the need to look away from the cognitive to the creative: it could be useful to teach the designer how to be creative to teach them some exercise and experiment with them some creative process to add creativity to their work.	3
Working in a multidisciplinary team	It is important that designers know children in their complex dimensions. It's could be possible through narrations, reflections, exchanges with people who know children because they have daily life experience with them (like teachers, cooks, parents). The strategy would be to promote training sessions in which there are contributions from neuroscientists, psychologists, professionals in various fields. For designers, architects and engineers, working in multidisciplinary team could enrich the way to look at how people live in spaces, how to use objects/tools bringing greater attention to the complexity of relation they could support.	4
Materials	In designing for vulnerable groups, knowledge is needed of the risks and opportunities of the materials used. In terms of toxicity, endurance and flammability of materials, and the best use according to the context (i.e. anti-slip materials that empower the grasp).	3
Accidents and near-miss analysis	Learning from errors: examples of bad or ineffective design, studying failure causes, accidents (if any) dynamics, near-miss and misuse of objects, devices and spaces.	3
Anthropometric library	In order to proper design for vulnerable users it will be useful to know how to use an anthropometric library that encompasses models of the various categories of vulnerable users, including those with impairments.	5
Information concerning end-user motivations	The designers should have the knowledge of the available methodologies/techniques to collect information concerning end-user motivation.	5

5. Competence portfolio

The work conducted in Tasks 2.1 and 2.2 has led to the generation of a number of identified training needs and competences that have been identified by professionals, sector specialists, from the literature and from existing expertise, of the skills and knowledge that design professionals need if they are to consider the needs of vulnerable groups (specifically elderly people and children) in the design process. Table 2 details a final list of competences and training needs identified (with no descriptions to save space) and the

number of people that identified these needs and competences (and where from) during the process of Tasks 2.1 and 2.2.

Table 2: Final list of identified training needs and competences arising from Tasks 2.1 and 2.2

Category of competence	Training need / competency identified	Number of times identified in interviews	Number of times identified by project partners	Mean priority given by project partners	
Physical / cognitive information about vulnerable groups	Physical dimensions	16	9	4.25	
	Physical strength	9			
	Physical changes over time	8			
	Anthropometry in appropriate formats	12	2		
	Cognitive issues	15	9		
	Capabilities/abilities, how these change over time	14	1		
Context and costs	Context (environment/setting)	8	3	3.67	
	Cultural information	7			
	Details of the changing market	11	1		
	Costs/financial considerations	2	2		2
	Materials		2		3
End-user involvement and considerations	End-user confidence levels	3			
	End-user habits	2	1		
	Empathy with end-users	18	5	4.75	
	End-user motivations	4	1	5	
	Ethics		3	4	
Methods	Methods for involving end-users in the design process	15	4	5	
	Translation and tools CAD/online tools Procedures for evaluating designs Checklists for inclusive design			1	3.33
			22		
			17		
			12		
	Working in multi-disciplinary teams	5	1	4	
	Engagement		1	4	
Creativity		1	3		
Inspiration and awareness raising	Inspiration and information		1	5	
	Awareness raising		1	5	
	Highlighting the value of difference	9			
	Promoting 'design for all' / inclusive design generally	9			
Literature and legislation	Literature and theory		3	4	
	Legislation and legal issues	18	4	4	
	Constraints		2	4	
	Accidents and near-miss analysis		2	3	

Discussion with project partners of the results enabled a final list of competences, a competences portfolio, to be described. Table 2 is arranged to form six categories or groupings of the types of competences and training needs that have been identified. These are: physical/cognitive information about vulnerable groups, context and costs, end-user involvement and considerations, methods, inspiration and awareness raising, and literature and legislation.

6. Conclusions

These will be taken on into Work Package 3 where a number of these competences will be developed into educational modules. These modules will then be piloted in six locations. Whilst experts and practitioners, academics and those working in industry, may have their own views on what is the most important skills and knowledge for design professionals to have when considering vulnerable groups, it is clear that there is considerable overlap on many of the competences, which are mentioned by groups of those consulted during these Tasks.

Annex 1

Using the template below, project partners were asked to identify training needs for design students and professionals based on the findings of Task 2.1 and their own experience and expertise in the area of working with / design for vulnerable groups. Project partners were asked to give the training need a name, to describe the need, to rate how important they considered the need to be (from 1 to 5, with 5 being high priority), and provide a reference for where the training need had been identified (own experience, literature review conducted in Task 2.1, interviews conducted in Task 2.1, etc.).

Training need short name	Safety standards application
Description of the training need identified:	
<p>In each design domain there are a huge amount of homologation directives, norms, constraints that very often have a deep legislation sound and are difficult to apply into concrete design matters.</p> <p>Although a wide range of principles, guidelines and standards for accessibility and universal design for various types of applications, services, goods and infrastructures are available from standardization organizations, adopting and verifying them during design and development is not always sufficient even in the user-centered design process, since they do not provide explicit guidelines to the developers.</p> <p>It will be very useful to know how to translate active and passive safety standards into device, objects and space design and installation, according also to ISO norms and user-centred design methodology.</p>	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	D.2.1 interview
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	4

Training need short name	Materials
Description of the training need identified:	
In designing for vulnerable categories, the knowledge of risks and opportunities of the used materials is of paramount importance. The designer must be aware of the allowed/not allowed materials (i.e. in terms of toxicity, endurance and flammability of materials) and of their best use according to the focused context (i.e anti-slip materials that empower the grasp).	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	Previous experience
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	3

Training need short name	Community life
Description of the training need identified:	
<p>The most part of people (hence of students and professionals) cope with children (i.e. kids) and elderly (i.e. grandparents) and has the opportunity to learn about their habits, object/space way of use, learning capabilities and cognitive/physical difficulties. But a very little part of people has an idea of how vulnerable users act and interact in their community life (i.e kindergarten, hospice). For example just one or two children may interact and use objects and space (i.e. their own house) in a precise way, but how do many children behave in the kindergarten? Are the interaction the same that in their family?</p> <p>Understanding the community life plays an important role in the design project. It will be useful to have the opportunity to observe vulnerable users in their community life, with the guidance and explanations of domain specialists (i.e. teachers, nurses, ecc.)</p>	
Vulnerable Generation Addressed (Children, Elderly, both)	both
Reference to the source (D2.1 interview/literature review/previous experience)	Previous experience
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	2

Training need short name	Accidents and near-miss analysis
Description of the training need identified:	
Learning from errors: examples of bad or ineffective design, studying failure causes, accidents (if any) dynamics, near-miss and misuse of objects, devices and spaces.	
Vulnerable Generation Addressed (Children, Elderly, both)	both
Reference to the source (D2.1 interview/literature review/previous experience)	Previous experience
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	3

Training need short name	Impairments and diseases
Description of the training need identified:	
<p>As there is a wide variety of impairments and diseases that make of elderly a vulnerable category of users, it is important to support developers and designers in coping with these impairments during the design process, in order to improve safety and accessibility of ICT and non-ICT products.</p> <p>Lectures of a domain specialist as orthopedist, geriatrician, ecc. is useful to learn more about the following impairments:</p> <ul style="list-style-type: none"> • Blind and low-vision impairments • Motor impairments • Cognitive impairments • Hearing impairments • Speech impairments 	
Vulnerable Generation Addressed (Children, Elderly, both)	elderly
Reference to the source (D2.1 interview/literature review/previous experience)	Literature review
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	4

Training need short name	Human motion phylogeny
Description of the training need identified:	
<p>Children are “unfinished users”, since they are evolving. For this reason is very important for designers to be aware of children capabilities, possibilities and difficulties. This is possible studying the evolution of human motion starting from birth, through the whole childhood, considering deambulation, grasping, and balance.</p> <p>Very useful can be lecturers with domain experts (i.e. kindergarten teachers, pediatrician, physiotherapist).</p>	
Vulnerable Generation Addressed (Children, Elderly, both)	children
Reference to the source (D2.1 interview/literature review/previous experience)	Literature review
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	2

Training need short name	Anthropometric library
Description of the training need identified:	
<p>In order to proper design for vulnerable users it will be useful to know how to use an anthropometric library that encompass parameterized models of the various categories of vulnerable users, taking care of impairments.</p>	
Vulnerable Generation Addressed (Children, Elderly, both)	both
Reference to the source (D2.1 interview/literature review/previous experience)	D2.1 Interview
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	5

Training need short name	Accessibility testing
Description of the training need identified:	
If the designing tool doesn't include virtual user models to be used for simulation and Testing, the designer can perform itself a realistic/immersive experience of the simulation, using proper devices (i.e gloves, clothes, glasses, ecc.). Hence it is important to be able in performing such immersive simulation test and to evaluate the results.	
Vulnerable Generation Addressed (Children, Elderly, both)	elderly
Reference to the source (D2.1 interview/literature review/previous experience)	Previous experience
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	5

Training need short name	Constraints
Description of the training need identified:	
Teach to have one focus at a time.	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	Students
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	4

Training need short name	Empathy
Description of the training need identified:	
<p>One of the most basic and profound competences is for the students to be able to describe a child or an elderly, in order to understand their users and the users needs and motivation</p> <p>Design for Mr Hippo</p> <p>“Designing for mr Hippo” (Read et al, 2009). Design for a hippopotamus (or another animal) who speaks another language and have very different physical abilities compared to us.</p> <p>A similar exercise can be to design something with just one button.</p> <p>Personas</p> <ul style="list-style-type: none"> » Tricky to arrange encounters with children and elderly. » Personas can be used as method for compensation on basic level. » Antle (2008): The child-personas framework <p>Wöckl et al created a set of 30 basic senior personas representing Europeans aged 60 and older (2012). (http://elderlypersonas.cure.at).</p>	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	“Designing for mr Hippo” (Read et al, 2009). (http://elderlypersonas.cure.at) http://www.antle.iat.sfu.ca/courses/iat834/resources/Antle_CTW08_Personas.pdf
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	5

Training need short name	Engagement
Description of the training need identified:	
Engaging for both designer and user	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	4

Training need short name	Involving end users in the design process
Description of the training need identified:	
<p>Explorative games</p> <ul style="list-style-type: none"> » Exploratory games are a tool for participation and exploration, and can work well with students designing for children and elderly. » Games provides a set of formalized rules, which makes everybody participating on equal ground, no matter preferences, qualifications and ambitions (Lössing et al, 2007). <p>It is a non-existing space, a place to act out.</p>	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	(Lössing et al, 2007). Eva Brandt, explorative games
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	4

Training need short name	Ethics
Description of the training need identified:	
<ul style="list-style-type: none"> » Communication skills are important. You must always give very clear information about who you are, what data you collect is used for and what the purpose of the design is. » Try to form a good relation with elderly participants. Ensure confidentiality and respect, and keep ethics in mind. It can be useful to create a VIP group of elderly connected to a certain course or teaching element, to ensure that the group can take part of different parts of the design processes. » Before interventions in schools and centers, the teacher have to make sure about the ethical and legal issues, and make arrangements <p>It is important to teach how to handle the data that comes out of the meetings with the users, especially about the ethics and similar issues.</p>	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	4

Training need short name	Evaluation
Description of the training need identified:	
It is important to know how to evaluate the design in order to be able to reflect on the design	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	4

Training need short name	Intervention
Description of the training need identified:	
To evaluate products and prototypes, interviews are not the preferred method, but rather doing interventions. Children will only tell you what they think that you want them to say, and elderly are too polite to be honest	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	

Training need short name	Inspiration and information
Description of the training need identified:	
<p>To gain access and insight into the everyday life</p> <p>e.g. probes: The probes can be seen as static appearance of the designer, and the user and their practice materialized and represented in the probe.</p> <ul style="list-style-type: none"> » Photo Diaries, Oosterhoelt et al (1996) » Technology probes, Hutchinson (2003) » MMS messages, Iversen & Nielsen (2003) » Mobile Probes (open resource) <p>Gaver et al, 1999 Cultural probes</p> <p>Mission from Mars, role playing</p> <ul style="list-style-type: none"> » The method is an inquiry technique which allows designers to ask odd questions about the user's everyday life and everyday artifacts. <p>Mission from Mars is (Dindler et al, 2005).</p>	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	5

Training need short name	Literature and theory
Description of the training need identified:	
<p>It is essential for the students to read research papers focused on practical methods to complement their findings, and to learn how to do workshops etc.</p> <p>e.g DSD cards</p> <ul style="list-style-type: none"> » The DSD cards are a design tool that makes age specific information about children’s developing cognitive, physical, social, and emotional abilities readily accessible for designers of children's technology. » The cards function as a light version of theory, imposing examples and dividing the children into sexes and ages 3-6, 7-9 and 10-12. <p>Bekker and Antle http://www.antle.iat.sfu.ca/DSD/</p>	
Vulnerable Generation Addressed (Children, Elderly, both)	Children
Reference to the source (D2.1 interview/literature review/previous experience)	
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	

Training need short name	Translation
Description of the training need identified:	
<p>To translate findings into design specifications</p> <p>e.g. physical materials</p> <p>To translate findings into design specifications, different physical materials and sketching can be used. The different rubbish physical materials do not really make any sense, but are important tools in order to communicate and visualize findings and ideas between designer and the children and elderly.</p>	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	4

Training need short name	User involvement
Description of the training need identified:	
<p>The users can preferably be involved in the entire design process. This is the sustainable approach, where users and designers melt together, and the design is created by the users themselves.</p> <p>The uses are the basis of everything in the design, so it should be prioritized to involve them in the design process.</p> <p>e.g. Communities of practice</p> <ul style="list-style-type: none"> » What can be difficult with participatory design for elderly is that you bring people together or involve them because of their weakness or disease, focusing on the negative aspects » Communities of practice is a preferred way of approaching design with elderly, rather than dividing into specific age groups <p>Eva Brandt, Thomas Binder, Lone Malmborg, Tomas Sokoler: Communities of everyday practice and situated elderliness as an approach to co-design for senior interaction. <u>OZCHI 2010</u>: 400-403</p> <p>Participatory design</p> <ul style="list-style-type: none"> » Participatory design seems to work very well with children and elderly, though the students must learn that sometimes to involve users in the design process might not seem relevant to the stakeholders. » To involve the elderly in the design process, ethnographic studies of actual daily life can be used » Participatory design; ethnographic studies, workshops, in the home, settings, hospitals, testing, Wizard of Oz. 	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	5

Training need short name	Image of the child
Description of the training need identified:	
<p>The design of a product for children is not only a response to their needs but a way to enhance their potential for growth and knowledge. Now many approaches to education consider the child as competent, able to research, to think, to play, to know, to learn. When you design for children you must consider the child in his dimension of human being, in his capacity and potential to learn and build relationships. To express their potentialities children needs environments/products capable of responding to their needs and support them in their search for the meaning of things and life. So it's important to have children in mind, well defined in their ways of relating, communication, learning. Pedagogical and psychological insights are important but for producing an answer to this question our most used approach is the documentation process, a way of listening children needs and potentialities through the practice of observation – documentation – interpretation in children's living contexts.</p>	
Vulnerable Generation Addressed (Children, Elderly, both)	Children
Reference to the source (D2.1 interview/literature review/previous experience)	Interview
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	5

Training need short name	Working in a multidisciplinary team
Description of the training need identified:	
<p>It is important that designers know children in their complex dimensions. It's could be possible through narrations, reflections, exchanges with people who know children because they have daily life experience with them (like teachers, cooks, parents...).</p> <p>Then it's important to offer to designers training opportunities and exciting contexts in schools and society where they can observe children and their ways of living and learning.</p> <p>The strategy would be to promote training sessions in which besides seeing documentaries on children or where children speak through their actions and experiences, there are contributions from neuroscientists, psychologists, professionals in various fields.</p> <p>People who work with children can learn an higher sensitivity to the language of spaces, a richer grammar of spaces and over the time this sensitivity had repercussions on didactic implemented with children. For designers, architects and engineers working in multidisciplinary team could enrich the way to look how to live spaces, how to use objects/tools bringing greater attention to the complexity of relation they could support.</p> <p>This team typology is linked to an approach to design and research that is a training process for the team itself.</p>	
Vulnerable Generation Addressed (Children, Elderly, both)	Children
Reference to the source (D2.1 interview/literature review/previous experience)	Interview

Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	4
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Training need short name	1. Awareness Raising
Description of the training need identified:	
Raising awareness of the need to consider vulnerable groups in the design process. This will include definitions, e.g. of inclusive design, accessibility, etc., as well as the business, ethical and legal case for designing for vulnerable generations. (Also relevant here will be legislation, guidelines and directives in various countries and to what extent they relate to vulnerable generations.)	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	D2.1 interview/literature review/previous experience
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	5.Very high priority

Training need short name	2. Information on end users
Description of the training need identified:	
This will include a wide range of information on physical, sensory and cognitive characteristics and capabilities and what impact these have on a person's ability to use a product effectively, efficiently and with satisfaction.	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	D2.1 interview/literature review/previous experience
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	5. Very high priority

Training need short name	3. Methods, their strengths, weaknesses and tips
Description of the training need identified:	
This will require a number of sub-headings, introducing a range of methods for collecting user requirements and evaluation with vulnerable groups, the strengths and weaknesses of using these methods with vulnerable people, and suggestions or tips for using such methods with vulnerable groups, e.g. length of interviews, accessibility issues, size of font/contrast on materials, etc.	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	D2.1 interview/literature review but drawing more from previous experience
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	5.Very high priority

Training need short name	Ethics
Description of the training need identified:	
This will emphasise the importance of following ethical protocols in all data collection with vulnerable generations, including informed consent, participant information, etc.	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	D2.1 interview/literature review/previous experience
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	5.Very high priority

Training need short name	4. Context of use
Description of the training need identified:	
This will include issues concerning the context of use when products are being used by vulnerable generations, and the extent to which this will impact on usability and accessibility. This will cover the physical environment as well as the social environment in which products are used (e.g. whether a person is using a product, technology or environment on their own or with the support of others)	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	Previous experience
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	4 High Priority

Training need short name	5. Information access
Description of the training need identified:	
Much information already exists regarding designing for vulnerable generations and the methods which can be used. However people may not be aware of it and how to access it. Therefore within a training programme there needs to be an element which pinpoints these resources and sign-posts people to them.	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	Loughborough team discussion
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	4.High priority

Training need short name	2. Information application
Description of the training need identified:	
Supplying people with a toolkit of design methods may not be enough; there may be a need to provide a supportive framework around when these methods are applied. An overview of the design process overlaid with the various methods which shows what can be used at what point and why it is appropriate may help to provide a complete understanding/appreciation of using these methods.	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	Team member thought, Links to checklist for ID – D2.1, section 3.4
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	2. Low priority

Training need short name	6. Cognitive abilities (Elder)
Description of the training need identified:	
Whilst considerations of cognitive abilities are relevant to both older and younger generations (and I would be interested to see if and where the areas of overlap are between them), this training need focuses specifically on understanding elders. Much knowledge in ID relates to considerations of meeting physical needs; less is known about cognitive aspects. Also given that most countries have an ageing population and that the incidence of dementia is rising, this is an area which designers need to be actively addressing.	
Vulnerable Generation Addressed (Children, Elderly, both)	Elderly
Reference to the source (D2.1 interview/literature review/previous experience)	D2.1 interview/literature review/previous experience, Demographics
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	5. Very high priority

Training need short name	7. Empathy
Description of the training need identified:	
<p>People will not design with consideration for the varying needs of different generations if they are not aware of the need to do so. Once they are aware of the need (and providing they are sufficiently motivated), then the methods available are likely to be considered for use. Therefore raising awareness is a key need for designers. This can be achieved by a variety of methods e.g. personas, empathic modeling, etc.</p> <p>Further advantages of empathy are:</p> <ul style="list-style-type: none"> • Some methods can be quick, simple and effective • Can be used to obtain 'buy-in' from others • Shared appreciation across the design team and beyond <p>For these reasons, I consider that empathy training is very valuable.</p>	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	D2.1 Interview; Previous experience; Link to D2,1; section 3.5 Table 2 'Motivate people to consider vulnerable users'
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	5 Very high priority

Training need short name	Legal regulations
Description of the training need identified:	
<p>The designers should have minimum legal regulations knowledge related to the field when started a new design. Even in many design companies there are legal departments dealing with this issue, the designer should be able to point the critical aspects related to his design.</p>	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	D2.1/Literature review
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	4

Training need short name	Capabilities and abilities – how this change over time
Description of the training need identified:	
The designers should have extensive understanding regarding the change in time of capabilities and abilities of elderly people and how these changes might affect the way they interact with the designed product.	
Vulnerable Generation Addressed (Children, Elderly, both)	Elderly
Reference to the source (D2.1 interview/literature review/previous experience)	D2.1
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	5

Training need short name	Information concerning end-user motivations
Description of the training need identified:	
The designers should have the knowledge on the available methodologies/techniques to collect information concerning end-user motivation.	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	D2.1/Literature review
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	5

Training need short name	Information about context/environment/setting
Description of the training need identified:	
The designers should have the knowledge on available methodologies/techniques on how the information about context/environment/setting can be retrieved for a given product.	
Vulnerable Generation Addressed (Children, Elderly, both)	Both
Reference to the source (D2.1 interview/literature review/previous experience)	D2.1/Literature review
Training Need priority (1-5 Scale -1 very low priority, 5 very high priority)	5

<p>Training needs identified by Monash</p>	<p>Anthropometry in appropriate formats</p> <p>Cognitive issues</p> <p>Capabilities/abilities and how these change over time</p> <p>Details of the changing market</p> <p>Costs/financial considerations</p> <p>Materials and context of use</p> <p>Methods for involving end-users in the design process</p> <p>Literature and theory</p> <p>Legislation and legal issues</p> <p>Constraints</p> <p>Accidents and near-miss analysis</p>
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