



Lifelong Learning Programme

DEsignfor VULNERABLE Generations: Children and Elderly



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<http://deviceproject.eu/>

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Introduction

The rationale and motivation for the DEVICE project relied in the observation of three major social and economic trends: first, technology and ICT particularly are permeating everyday life at an increasing pace; second, with the ageing of the European population , elderly people will come to constitute within a few years more than one third of the population; third, the needs of children are becoming an increasingly crucial focus, with a raised consciousness of the importance of early learning and caring activities urging increased investment from both private and public sectors. For these reasons, children and elderly will be considered as a single target group and referred to here as Vulnerable Generations (VG) for the purpose of the activities described in this report. In addition, as a significant shift from standard business to knowledge and technology intensive services is taking place within many national economies, innovative design can play a pivotal role in promoting smart, inclusive and sustainable growth. Surprisingly, little has been done to bridge traditional design knowledge and skills towards vulnerable generations user-oriented design, and as a consequence, potential marketing and social benefits have been seriously diminished. Thus, there is considerable scope for research, , development and

policy to deliver improved user-centered solutions for children and elderly people in the near future.

Education and training are crucial in helping individuals to develop their talent and creativity. Moreover, they become more and more important when trying to impart future marketable skills for new students and new skills to broaden incumbent professionals' competences portfolios. Additionally, there is a growing consensus for the idea that creativity and innovation, together with a highly skilled workforce, and the subsequent cross-pollination amongst different fields of knowledge and research, are key drivers of the improvement and overall competitiveness of European countries and cities [13, 14, 15, 16, 17 and 18]. From an ecological perspective, creativity is required in the workplace in order to adapt to changing scenarios and environments. Education and training play a crucial role in improving individual educational levels with positive effects on the innovative performance of the society as a whole and a further beneficial impact on business growth and productivity [19]. With the increasing influence of children and elderly, both as consumers and end users, there is an urgent need to train designers and students to design for these user groups in order to fully exploit market intrinsic potentials and address social, educational and health needs.

The report provides a summary of the the DEVICE project and discusses in more detail a set of educational modules based on the identified training needs.

1 The Project

User-centered problem solving activities has considerable potential as an effective and efficient approach to identify and address user needs and

problems. These activities are carried out either by studying users or by involving them with visual and/or participatory design techniques, such as co-creation [1]. User-centred design, in its broader capacity, identifies and highlights human needs, aspirations and abilities [12]. In order to promote the satisfaction of such needs, the DEVICE project has developed an educational and training framework, termed Vulnerable Generation View (VGV) [10] that has guided all its activities and implementations. The VGV does not constitute an attempt to build a new methodology for design processes as it simply proposes a new way to look at vulnerable generations during the design process. In a sentence, the VGV is intended to direct the attention of both design students and senior professionals towards children and elderly people in order to spot new opportunities for the adaptation of the existing methods of design to these user groups' needs.

The rationale and motivation for DEVICE relied in the realization that while a lot of attention has been paid to general design and to design for people with sensory impairments, only a little has been done with respect to other groups, children and elderly people above all. Accordingly, the overall goal of the DEVICE project was to combine knowledge, competences and skills encapsulated in the traditional design curricula with insights on ergonomics, usability issues, user-centered and participatory design techniques, keeping a specific focus on VG. What it is important to stress here is that it is crucial for designers to understand users' needs by deeply understanding their point of view as human beings and their expectations with respect to the products that are to be designed. This deep and broad understanding requires to look at users as part of the

design process and, possibly, to involve them either directly or taking into account their needs by other means.

Objectives and expected results Figure 2 shows the diagram of the project and the linkages between its constituent working packages, here listed as “WP”. First, the state of the art has been analyzed. This has allowed the Consortium to effectively perform WP2 (realization of a competences portfolio), WP3 (pilot educational activities) and WP 4 (by establishing the award assignment criteria), Quality Plan (WP5), Exploitation (WP6), Dissemination (WP 7), and Project Management (WP 8) accompanied DEVICE during its whole lifecycle.

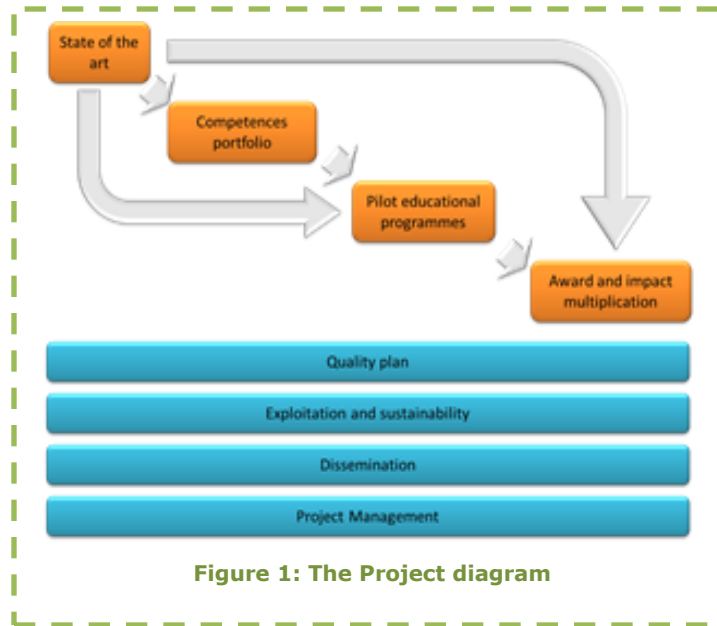


Figure 1: The Project diagram

A key focus of the project was to explore potential pathways for enhancing the teaching of inclusive design for vulnerable generations. The overall aim of the project was to bridge traditional industrial design programs with ergonomics, usability concepts and user experience approaches with a specific focus on vulnerable generations with a specific focus on VG. In addition, it aimed at addressing the need to develop and modernize higher education programmes in design by putting in contact researchers and professionals. The main objectives of DEVICE can be summarized as follows:

1. To analyze and study the current state of the art with special reference to scientific research and innovative practices in the field of design for vulnerable generations;
2. In addition, the review of the relevant literature and practices will also encompass the existing methodologies for involving children and elderly people in product design in order to study their inclusion in the design process;
3. To create a competences portfolio that is suitable to guide programmes aimed at training designers and professionals operating in the area of design for VG;
4. To test and validate the proposed competences portfolio by developing and conducting a set of pilot educational programmes and training modules. This validation takes place in a way that is capable to facilitate the collaboration between researchers (affiliated with either universities or research centers) and professionals and thus facilitating the interaction between the two groups;
5. To multiply the impact of the Project by disseminating its achievements through a Vulnerable Generation Compliant Award and a searchable online database of best practices and e-learning materials on

the Project website aimed at improving knowledge sharing and management;

6. To analyze the trans-national and sectorial transferability of the achieved results, studying the feasibility of further applications to different target groups (e.g. people with disabilities) and across different geographic contexts (e.g. USA and other developed countries).

7. To identify sustainability pathways aimed at fostering university-industry collaborations on design and innovation projects.

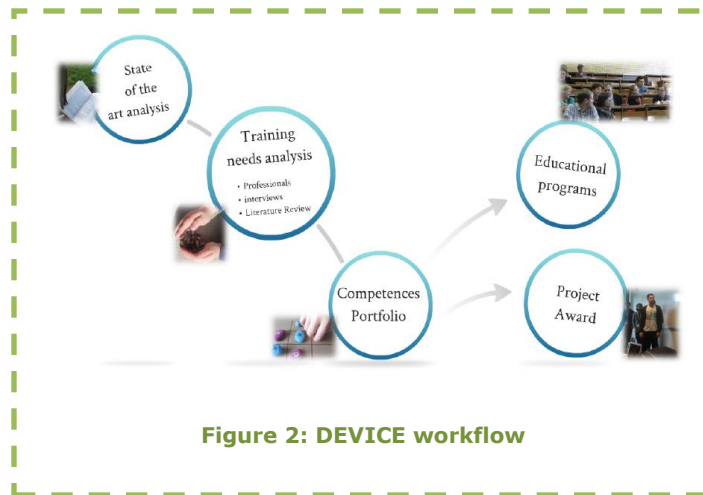


Figure 2: DEVICE workflow

The major outcomes of DEVICE are:

1. A report or a background paper reviewing the state of the art in terms of research and innovative practices both in the field of general/universal design and with a specific focus on VG (Obj. no. 1 and 2);
2. A competences portfolio encompassing all the relevant and constituent skills and knowledge in the field of design for VGs and a number of educational

programmes and training modules capable to impart them to both students and professionals (Obj. no. 3);

3. A report containing a thorough evaluation of the pilot seminars implemented to test the relevance and effectiveness of the educational and training programmes to be developed (Obj. no. 4);

4. A Vulnerable Generation Compliant Award (Obj. no. 5); 5. A searchable online database containing educational materials and information regarding good practices in the field of focused design on VGs (Obj. no. 5);

6. A transferability and sustainability report indicating further possible developments and applications of the Project's findings to other sectors and countries together with feasible pathways to keep up a minimum desirable level of cooperation between firms and universities or research centers in the VGs field (Obj. no. 6-7).

The objectives and expected results of the DEVICE project are presented and deeply discussed on the dedicated website [7] and [8]. However, it is salutary to remember the most important characteristics of the proposed educational and training modules. First, they are tailored to match the training needs highlighted by both professionals and researchers in the field of design for VG [8]. Second, they take advantage of a learning tool consisting of an online database containing the state of the art of the scientific research and the relevant innovative practices in design for VG [4], developed including an e-learning platform capable to support e-learning materials and the exchange of good practices [5]. Finally, they constitute a framework for learning and collaboration activities to be carried out through the sharing of good experiences for design

professionals and students. These last can be facilitated by the creation of the specific design compliance award.

The consortium. The project consortium comprised four research institutions and three industry partners, spread across five countries. The former are Chalmers University of Technology (Sweden), Loughborough Design School (UK), Monash University (Australia), The Interuniversity Consortium for Optimization and Operations Research – ICOOR (Italy) and the latter are RE:Lab (Italy), Innovate4Future (Romania) and Reggio Children (Italy).

The partners' disciplinary backgrounds included: ergonomics, computer science, interaction design, children education and Information and Communication Technology (ICT) [4]. **Chalmers University of Technology** is one of Sweden's larger universities of technology. Research areas involve, among the others, civil engineering, computer science, materials technology, logistics, technology management and economics and product and production development. Chalmers have long experience of R&D work addressing all kinds of ICT mediated services in numerous EU projects. The work has involved the elicitation of user requirements for, e.g., ISA systems and different ICT based information systems. R&D has included evaluation of design solutions, addressing their impacts on different abstraction levels of the transportation system. The **Loughborough Design School** brings together the complementary strengths of Design and Technology, Ergonomics and Safety Research Institute (ESRI) and Ergonomics (formerly in Human Sciences) through the synergy that comes from greater interaction and co-location. This distinctive approach reflects the strength of design-related activity across a particularly broad spectrum, ranging from product

styling to engineering design, nurturing the development of existing strengths in design ergonomics, transport safety, technology, sustainability, environmental ergonomics, design practice and education. The **Monash University Accident Research Centre (MUARC)** is a world leader in the field of injury prevention. MUARC's research includes safety in all modes of transport, the workplace, home and community, and across the lifespan. Monash has an excellent history of collaborative research in Europe and has strong partnerships with European universities including Loughborough and Chalmers Universities. MUARC researchers have expertise in a range of disciplines including engineering, human factors, psychology, epidemiology and statistics.

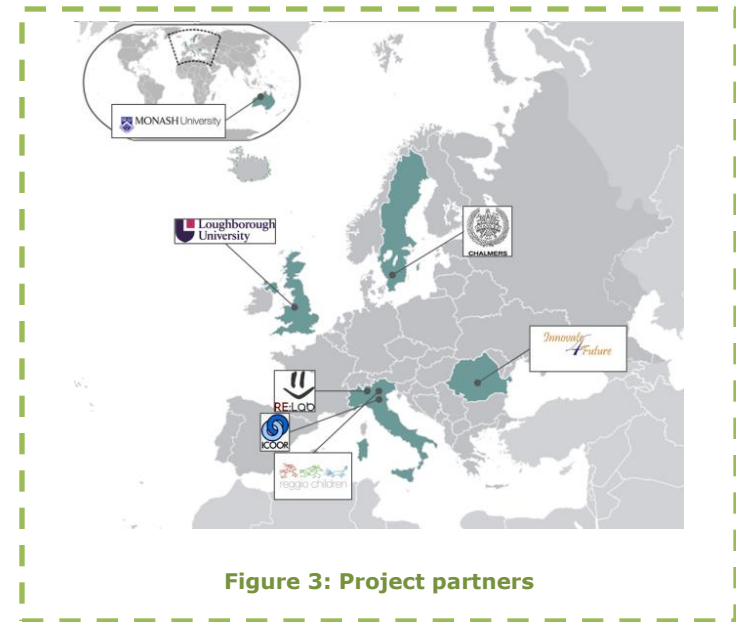


Figure 3: Project partners

ICOOR was founded by University of Bologna, University of Modena and Reggio Emilia, Politecnico di Milano and Politecnico di Torino to promote and coordinate research in the field of operation research applied to Industrial design and to encourage collaboration between associated universities, research bodies and national and international industries. The added value of ICOOR is to join several different competencies and abilities into a single body. ICOOR has participated to the DEVICE project through the Department of Sciences and Methods of Engineering. This Department includes different competencies and research groups, among which it is particularly relevant to mention the Human Machine Interaction (HMI) Group (<http://www.hmi.unimore.it/>), whose research mission can be broadly identified with design, development and implementation of HMI systems, mainly for automotive and industrial applications.

RE:Lab's mission is based on interaction engineering, which focuses on improving human-machine interaction. More specifically the spin-off seeks to engineer, develop and evaluate the best possible means of interaction between technological devices and their users. RE:Lab operates in several application domains as automotive, off-highway vehicles, industrial automation, biomedical equipment, media, and advanced web applications.

Innovate4Future – Center for Advanced Educational Solutions is a private funded research and solutions provider active in the field of education and training. Innovate4Future promotes the European principles and values in the field of education & training through innovative approaches and technologies. Innovate4Future develops research projects at national and international level in the following areas: technology enhanced learning, observation of education

systems, policies and innovation, training needs analysis, advanced multimedia content development and training of trainers for the use of new methodologies and technologies. **Reggio Children** is a mixed public-private company established in 1994 in Reggio Emilia (Italy). The company aims and purposes are inspired by the philosophy and values of the educational project developed and practiced in the Municipal Infant-toddler Centers and Preschools of Reggio Emilia, the so-called Reggio Emilia Approach. This puts the natural development of children as well as the close relationships that they share with their environment at the center of its philosophy. The Reggio Emilia approach is recognized worldwide for its innovativeness in education. The Reggio Emilia philosophy is based upon a set of principles, one of the most important one is that toddlers, infant and children must be able to learn through experiences of touching, moving, listening, seeing, and hearing.

2 Educational modules and pilot studies

The competences identified in the assessment of the state of the art are articulated in 9 teaching modules. Each of these modules is intended to match specific training needs grouped into clusters of competences as identified in the Competences Portfolio. Training needs have been assessed and aggregated by the project partners based either on the relevant scientific literature or on the relevant market experience. The methodology can be described as an on desk qualitative assessment carried out separately by experts affiliated with the different Project partners via questionnaires.

Namely, experts from the participating beneficiaries were asked to fill in a questionnaire where they had to assign a priority score to each training need previously identified by the partners. The score is based on a 1-5 point scale, where 1 equals a very low priority and 5 the maximum priority. Training needs were thus grouped into clusters of competence and the average of their priority score was taken as the priority score of the relative cluster as a whole. The mean priority score of the competences encapsulated in a given module was then adopted as the overall priority score of that module. This mechanism represents a good evaluation method to assess the consistence among training needs, competences and modules. In fact, the Project partners were asked to assign an equivalent 1-5 point scale score to each training need they proposed to address in the module, before these were in turn evaluated by the above mentioned experts. As a result, even if they were assigned at different stages in the research process and by different persons, the two priority scores associated with the same competences came out to be very similar. A board has then compared the different outcomes and agreed the final set of educational modules. These last ones have been in turn tested and validated with a number of pilot seminars publicly performed in order to give a chance to students and professionals to evaluate the overall quality of the training activity along with feedback questionnaires aimed at assessing their relative effectiveness [4].

2.1 The state of the art

Focused on user-centred problem solving, design is seen as a way of identifying and solving user problems

by for example studying users and/or by involving them through visualization and participatory design techniques such as co-creation. User-centred design stresses human needs, aspirations and abilities.

The current STATE OF THE ART in research and innovative practices in the field of design for vulnerable generations has been analyzed by collecting around 100 examples of already existing educational programmes, courses or projects related to design for children and elderly people in EU and Extra-EU countries.

Available online:

<http://www.deviceproject.eu/database.php>

The project topic is more related to children-elderly people that represent the two main target groups (but not the only ones) and the case studies collected helped us to have a picture of existing experiences. Following an in depth analysis of the research and training programs addressing the DDesign for Vulnerable generations: Children and Elderly, the project partnership identified educational priorities to be addressed by DEVICE such as: Designers need to be trained for all, not just average users; Child/older adults not a primary focus in explicit coursework; Children and elderly are different. There is no obvious way to find common methods suitable for both; Look at Interaction design field in which substantial work has been done on design focusing on children and elderly people; Look at inclusive and universal design - these areas are not specifically targeted to children and elderly but a lot could be learnt from these

communities; Categorize the relevant knowledge into the following: Knowledge about the characteristics of the group and Knowledge about methods; Perceived 'new era' for industrial design courses - with the relative ease of producing bespoke/custom product, design can be much more specifically targeted to user needs and profiles. The capacity to produce sophisticated design for smaller consumer groups is now much more achievable.

2.2 Training needs

A list of training needs for design students and professionals is the major result of a two-part study involving i) a survey of design professionals and specialists; and ii) a literature review to identify what information regarding training needs of students and the needs of elderly people and children should be considered in the design process. A number of training needs (fully reported in Table 1) were identified through the interview process; some were elicited by direct questions (e.g. the need for formal training, the importance of legislation for vulnerable groups, physical dimensions of end-users) and others emerged from participant-generated (e.g. empathy-building methods, ways of involving end-users in the design process, and cognitive issues). Other themes arose from the literature review (e.g. specific design issues based on the cognitive abilities of children).

A TRAINING NEEDS ANALYSIS has been conducted with a multidisciplinary approach in order to define the learning and development goals.

27 interviews were conducted with professionals and sector specialists to ascertain their point of view on the training needs of design students and professionals in the UK, Australia, Italy, Sweden, Denmark and Romania.

The training requirements of designers, as well as the specific needs of elderly people and children have been put into evidence through a literature review.

2.3 Educational modules

The modules are intended to be used as building blocks in courses aimed at training students and professionals in the area of design for VG.

Module 1 - Interaction design and HCI. The first module consists in an initial overview of the topics and concepts to be addressed during the learning programme. These include: i) Human Machine Interaction: concept and history; ii) Usability; iii) Human Factors; iv) Natural Interfaces; v) Inclusive Design; vi) Interaction Design; vii) User-centered Design; viii) Emotional Design; ix) Design Principles; x) Prototyping; xi) Evaluation Methods.

Category of competence	Training need / competency identified
Physical / cognitive information about Vulnerable groups	Physical dimensions
	Physical strength
	Physical changes over time
	Anthropometry in appropriate formats
	Cognitive issues
	Capabilities/abilities, how these change over time
Context and costs	Context (environment/setting)
	Cultural information
	Details of the changing market
	Costs/financial considerations
	Materials
End-user involvement and considerations	End-user confidence levels
	End-user habits
	Empathy with end-users
	End-user motivations
	Ethics
Methods	Methods for involving end-users in the design process
	Translation and tools
	CAD/online tools
	Procedures for evaluating designs
	Checklists for inclusive design
	Working in multi-disciplinary teams
	Engagement
	Creativity
Inspiration and awareness raising	Inspiration and information
	Awareness raising
	Highlighting the value of difference
	Promoting 'design for all' / inclusive design generally
Literature and legislation	Literature and theory
	Legislation and legal issues
	Constraints
	Accidents and near-miss analysis

Table 1: Final list of identified training needs and competences arising from WP2

Module 2 - Market analysis and legislation. This module aims at preparing students and professionals to be aware of societal issues and business principles related to designing activities with a specific focus on VGs needs. Relevant topics are: i) Business scenarios: market and enterprises analysis, materials and technologies, future trends, marketing activities; ii) Legal and ethical issues: general information about the relevant legal framework and possibly ethical issues that deal with working with users. The information given should be compliant with the national rules of the country in which the course is carried out; iii) Legislation: European and national legislation and directives.

Module 3 - Context. This module provides designers with appropriate tools to understand and analyze the context in which they are designing and thus representing the major focus on VGs by addressing the following issues: i) Literature review and theory analysis: practical methods and research skills are provided (e.g. how to conduct workshops with children and elderly people etc.) ii) Inspiration and Information: how to gain access to relevant information and insight into everyday life; iii) Multidisciplinary approach to technologies: technology has to penetrate everyday life and match the needs of VGs needs; iv) Technologies and learning contexts: technologies as a connecting environment for different fields of knowledge and multidisciplinary explorations; v) Environment and settings: users' capabilities and implications of the context of use for design; vi) Children context and vii) Elderly person context: the context and the cultural background of children and elderly people, keeping in mind their individual habits and characteristics.

Module 4 - User capabilities. The module aims at providing participants with knowledge concerning specific capabilities and limitations of VGs that are to be taken into account when designing products specifically targeting these social groupings. The relevant topics are: i) Physical and cognitive ergonomics: introduction to education, psychology, and cognitive ergonomics; ii) Children capabilities and iii) Elderly capabilities: information concerning physical, sensory and cognitive capabilities along with learning processes of the targeted VG.

Module 5 - User involvement. This module shows how to involve VG users in design processes. Approaches to user-centered designing activities should involve the targeted users at all stages of the process in order to be regarded as sustainable. In such an approach, users and designers melt together, enabling users to design themselves what they actually need. The discussed topics include: i) End user involvement and considerations: ethical issues in the involvement of the end users; ii) Methods for involving VGs in the design process: a number methods is described in general terms and then applied to the needs of the targeted VGs. The aim is to give students a deep knowledge of all the available methods and how to apply them during the design process.

Module 6 - Design. The purpose of this module is to improve designers' skills in managing design processes with a specific focus on VGs products. This module addresses the following topics: i) How to handle a design project: requirements collection analysis, designing, prototyping, evaluation and redesign; ii) Methods: task analysis with end users including interviews and observations; iii) Translation: to

translate findings into design specifications; iv) Constraints: this topic stresses the importance to have just one focus per time.

Module 7 - Evaluation. This module presents the main evaluation methods that allow designers to test and validate what they have designed with users. The standard evaluation methods are adapted to children and elderly in order to stress the main tips that have to be used to adapt these methods to the targeted VGs. The following evaluation methods have been taken into consideration: i) Heuristic evaluation; ii) Cognitive walkthrough; iii) Usability testing.

Module 8 - Creativity. The purpose of this module is to train the designers' ability in creative thinking and design for VGs. The module addresses the following topics: i) Innovation & creativity in design; ii) Strategies for sustainable innovation in the field of toy design; iii) Differences between innovation and creativity; iv) Engagement: how to create engagement for both designer and user.

Module 9 - Empathy. The purpose of this module is to provide students and professionals with tools that will increase their ability to use an empathic approach when working with design for vulnerable generations. The module encompasses the following topics: i) Inspiration and awareness rising: empathy with end users using empathic modelling and simulation; ii) Empathy: one of the most basic and profound competences is for the students to be able to properly describe a child or an elderly, in order to understand their users and the users' needs and motivation.

2.4 The pilot experience

The effectiveness of the educational modules has been tested in pilot seminars carried out in different locations across Europe: a total number of fourteen pilots were performed by the six partners across four countries. Associated pilots were organized aiming at fostering collaboration between universities and industry, in accordance with one of the most important overall aims of the DEVICE project.

14 PILOT SEMINARS AND TRAINING SESSIONS of the DEVICE project were carried out by 6 different partners at 7 different locations within Europe: Italy (4 pilots performed), United Kingdom (7), Sweden (2), Romania (1).



272 participants of 17 different nationalities took part in the DEVICE pilots, expressing their appreciation for the educational experience they attended to. DEVICE e-learning platform is available at: www.e-learning.deviceproject.eu

Pilot experiences were held at different organizations involving academic staff from the consortium. There were 272 participants from 15 different nationalities, 99 females and 173 males and the average age was 24

years. These participants had various backgrounds; professional designers (n=58) and students (n=214). At the end of the learning experience, participants were asked to complete an evaluation questionnaire in order to express their opinion about the effectiveness and value of the learning experience. What it is interesting to highlight is that a vast majority of participants declared not to have been trained to design for children or elderly people (59%, n=160). This is in line with previous evidence highlighted in the analysis held by the Project consortium concerning the current state of the art in the field of research and innovative practices on design for VGs. Generally speaking, participants found this learning experience intellectually stimulating and valuable for their training experience (67%, n=182) and they were able to assess the increase of their skills after their participation. As shown in Figure 4 almost sixty-nine participants stated that they started from an Average level and reached a Good level of skills at the end of the pilot.

An e-learning platform built up with all educational modules has been developed and will be used to support the DEVICE project exploitation and as an exchange of practices among researchers.

The second pilot organized by Chalmers was particularly challenging as it consisted of a master level course (200 hours) with one scheduled day a week (7 hours) plus self-studies, project work and supervision. During the project students had to attend at least three applied sessions with children for observation, co-design and evaluation. The purpose of these sessions was to learn more about the target group and practicing co-design with children and get inputs for further design activities.

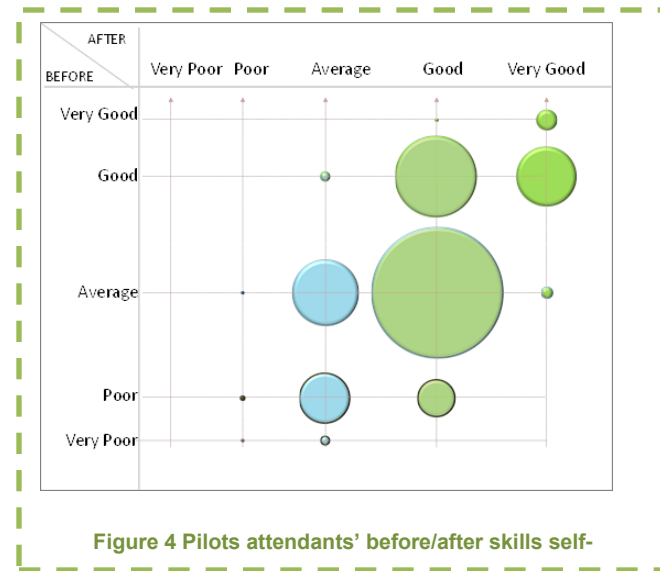


Table 2 Educational modules tested in each pilot and relative targeted age group

			ICOOR		LOUGHBOROUGH					RELAB	CHALMERS		I4FUTURE	RECHILD			
			Pilot I	Pilot II	Pilot I	Pilot II	Pilot III	Pilot IV	Pilot V	Pilot VI	Pilot VII	Pilot I	Pilot I	Pilot II	Pilot I	Pilot II	
Module e1	Introduction to Design and HCI	Initial overview of the topics and concepts	C	C								E			E	C	
Module 2	Market Analysis and Legislation	About societal issues and business principles												C			
Module 3	Context	Tools to understand and analyse the context	C	C			E	E				E		C		C	
Module 4	User Capabilities	Specific capabilities and limitations of vulnerable generations	C	C	E	E						E	E	C	C	E	C
Module e5	User Involvement	How to involve users in the design process							E			E	E	C	C	E	
Module 6	Design	Improving designers' skills in managing a design process		C								E		C		C	
Module 7	Evaluation	Evaluation methods to test and validate with users	C	C										C			
Module 8	Creativity	Ranging from creative thinking to design	C	C													
Module e9	Empathy	Tools for an empathic approach.								E	E	E	E	C	C	E	

3 Design award

In addition to the surveys and pilots, DEVICE has instigated an award of excellence in designing for VG. The Award was targeted towards professionals, researchers and students, and concerned all different types of design [5]. This is a first step in order to establish an international award of excellence in designing for VG and to test the goodness of the state of the art assessed by the consortium on such topics. It was the consortium, in fact, who judged the awards. Additionally, the award provided a good chance to disseminate the achieved results to a vast audience of stakeholders such as students, professionals and the general public. In order to do this, the largest possible effort has been put in place by the consortium by announcing the different rounds of the award on the relative website and on the partners websites in addition to further announcements made at relevant public conferences, workshops and other events which the partners have participated during the project lifecycle.

In order to test and evaluate the most suitable criteria for the award assignment, a student award was announced during the Student Interaction Design Research Conference (SIDeR) in Aarhus, Denmark 2013. Two projects out of the 12 considered submissions (the total number of application was 47) were chosen as winners, namely one for the "design for children" category and one for the "design for elderly people" category [10].

SIDeR Award – Winners

The award winners received a diploma printed on a special smooth paper with their name and the paper awarded printed on it.



1) "DESIGN FOR ELDERLY" CATEGORY

LinkFit: Motivating the elderly to be more active using messaging and progress tracking

By Jack Ord Rasmussen, Aarhus University / Eindhoven University of Technology

The paper presents a prototype of a product intended to motivate residents of a living complex for elderly people to engage in planned physical activities.

2) "DESIGN FOR CHILDREN" CATEGORY

Physical-digital Interaction Design for Children

By Kenneth Christensen, Mikkel Andersen, Erik Monsen, Saman Safiri, Jakob Vest Hansen, University of Southern Denmark

The paper describes the design of a social drawing application based on interaction using gestural/natural interaction.

Through the student award, the state of the art of designing for children and elderly people in interaction design was tested as well. Appropriate evaluation criteria were also developed at this stage in accordance with the findings achieved at the date.

In the second iteration, the Project has rewarded innovative ideas in design for vulnerable generations - specifically for children and elderly people. During the Award competition 18 original works were submitted, and reviewed by refined criteria. The prize for professional category was assigned to a design project about older people, while the prize for student category was assigned to a design project about children. Additionally, an Award for "best practice" based on the 100 case studies collected during the State of the Art analysis was also assigned to a method related to design for children. For details about the winners, please refer to [10]. The awards have been evaluated based on the following criteria: i) Contributing to the development of design for VG; ii) Involving VG in the design; iii) The connection between the VG and their context; iv) Improving or adding to facilities, products or services for VG; v) Method development for VG design.

See the ANNEX for further details concerning the received submissions.

Final DEVICE AWARD – WINNERS

1. STUDENT CATEGORY

TWIG CEILING: Emotional Design in Hospital Environment - From a Child perspective

By Linda Lundeholm, Linda Lundeholm Design, Sweden

Motivation:

The design is innovative and very useful for children, and there is potential for improved health through the intention to reduce pain. The methods used to develop the idea and design are well explained and fit very well with the DEVICE Award requirements, using children, parents and staff in its development. There was good identification of context of use, and the design also has potential to be used with other user groups.

2. PROFESSIONAL CATEGORY

LinkLights: Supporting Home-based Vestibular Rehabilitation

By Erik Grönvall & Gunnar Kramp, IT University of Copenhagen & Aarhus University, DK

Motivation:

The design is innovative and can be a very useful tool for elderly supporting home rehabilitation exercises. It is adaptable to the user needs, and the design considered the person, the task and the environment, and fit well with the DEVICE Award requirements. The participatory design based development process is clearly described. Further, the paper presents general considerations to take into account when designing similar tools.

STATE OF THE ART AWARD – WINNER

Developmentally Situated Design (DSD) cards

by Alissa Antle (CA) and Tilde Bekker (NL)

A design tool that makes age specific information about children's developing cognitive, physical, social, and emotional abilities readily accessible for designers. DSD cards are a useful and easy to apply design method that considers the needs of the end user in the design process.

Reference: Bekker, M.M. and Antle, A.N.

Developmentally Situated Design (DSD): A design tool for child-computer interaction. In Proceedings of CHI '11, ACM Press <http://www.antle.iat.sfu.ca/DSD>

4 Transferability, medium term impact and exploitation

A secondary objective of DEVICE was to advance the transferability of project outcomes to other countries and to other applicable domains (i.e. people with disabilities and additional needs). Desk-based research was carried out in order to identify one or two exemplary projects/organizations for possible collaboration with the project partners. Forty-six results were identified and classified by their applicability to each transferability target and grouped according to the most relevant target group (Children, Elderly people, Other Target Groups). Furthermore the learning material initially developed for the project has been

enriched adding a special lecture focused on design for children with special needs.

The knowledge accumulated by the partners during the project has enabled them to identify exploitation targets and initial strategies by means of the conjunction with university-owned "technology transfer companies" (or similar names), which are very experienced in all post-R&D, business-oriented tasks.

4.1 Firms and enterprises (large and SMEs)

Marketable potentials for firms include: Inclusion of end users in the design and development process of products in order to put into evidence the specific requirements of vulnerable generations; Possibility to create well accepted and successful products that closely corresponds to the needs of end users; Support enterprises in improving their approach to users. This first set of exploitable items developed within the project lifecycle can be assessed through the these indicators, respectively: Sponsorships for design courses aimed at vulnerable generations • Contractual research based on project findings; Professional opportunities (e.g. spin off) for participants to the Project seminars; New Business opportunities (e.g. new clients for Design projects); Consultancy on design for vulnerable generations; Development of innovative products for elderly and children.

4.2 Universities and research centers

A second set of outcomes include: Skills acquisition of students and teachers, thanks to the portfolio of competences and the searchable database of good practices; Curriculum development in the field of user centered design for vulnerable generations; Possibility to transfer technological knowledge based on the specific needs of vulnerable end users to user friendly, commercially successful products; Consultancy packages. The impact of this second set of exploitable outcomes can be monitored with their relative indicators: qualitative and quantitative indicators for further research outcomes; Impact factor of publications; Better living and working opportunities thanks to the Project educational programs; The publication and reports produced by the Project are able to steer, support and disseminate further initiatives in this field; Change in the curricula of European universities over time in relation to Project and sustainability of change (Number of curricula changed thanks to the Project).

4.3 Institutions (Public authorities, other industry interface mechanisms)

A further target group for exploitation potential is represented by public organizations and private innovative firms operating in design-related sectors. For such stakeholders, potentials include: Strategic advice on education policies from the Project partners; Exploitation of the know-how for specific training originated by the analysis carried out within the Project; Improvement of European R&D capacity

through innovative methodologies based on user centered design and oriented towards vulnerable generations. Impact indicators for these fields have been identified in: Sponsorships for design courses aimed at vulnerable generations; Development of further initiatives in this field; Professional opportunities for participants to Project seminars.

4.4 NGOs (Enterprises association, Networks aiming to promote Creativity, innovation)

By improving the quality of the European research in terms of meeting the special requirements of VGs, the Project is expected to contribute to the achievement of the mission of several networks and organizations; by fostering dialogue between universities, enterprises and final users and enhanced possibilities for networking. In order to assess such impacts, the following list of indicators should be measure and monitors: Number, scope and profile of individuals' networks, associations; NGOs and public bodies aware of the Project activities and results; Number, scope and profile of individuals' networks/associations; NGOs and public bodies willing to utilize the Project results.

5 Conclusions

In this report, the objectives, methods and final results of DEVICE have been presented. The primary objective of the project was to extend and enhance current training in Design through a more targeted focus on the needs of VG in a user-centered design perspective.

Based on both desk research and interviews, nine different educational modules have been developed, open accessible for anyone. Based on several rounds of testing, the activities undertaken in writing educational modules were found to be useful and meaningful for the design international community. Students and professionals who participated in the pilot programs reported a significant improvement in their overall skill levels and regarded the experience as valuable for their professional development.

Further analysis of the views of participants in the children-related activities, revealed a high element of novelty: participants reported discovering for the first time, what it means to experience the world "through children's eyes" – that is, with the cognitive and physical abilities of a small child; and to experience how this evolves over time. Thus, including interactive sessions with children in educational or training modules for design students seems to be an effective strategy for enhancing users' knowledge and skills for design for VG.

The modules were developed using findings of a review of training needs identified in the early phases of DEVICE [2]. First, in WP 1, a review of the state-of-the-art in design for VG identified a significant body of relevant material and ideas. This information was complemented and extended with information derived from interviews with design leaders in industry and academia (WP 1) and a review of relevant design training literature (WP 2). The accumulated understanding of the educational needs for design for VG provided a critical platform for defining the content and delivery approach for the DEVICE modules.

An important feature of the DEVICE curriculum presented in this report is its modular structure and free access online availability. This allows educational and training institutions to select and use only those components deemed relevant for their purposes.

The teaching modules from the Project can be seen as a complement to other resources that can be useful like the Inclusive design toolkit [11].

Overall, the early findings from the pilot program suggests that the DEVICE modules have considerable promise for application in design curricula, for enhancing knowledge and skills of designers to design more effectively for VG. The outcomes and achievements of DEVICE project presented in this report and spread through the dissemination activities undertaken during the whole DEVICE lifecycle are suitable to raise the awareness and knowledge about VG needs in design educational programmes.

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ANNEX

Some of the entries of DEVICE DESIGN AWARD 2014 are reported below and attached as annexes to this report as agreed with authors:

TWIG CEILING Emotional Design in Hospital Environment - From a Child Perspective
by Linda Lundeholm

LinkLights: Supporting Home-based Vestibular Rehabilitation
by Erik Grönvall and Gunnar Kramp

CamQuest: Design and Evaluation of a Tablet Application for Educational Use in Preschools
by Jennie Berggren and Catherine Hedler

GLUCOO A Userfriendly Blood Glucose Measurement Device
by Linda Lundeholm

ORIS: Conceptual Design for Bonding Through Maternal Scent
by Dominika Potuzakova

Overcoming elderly loneliness through explorative approach of co-design
by Natalia Vila Iglesias and Anne Guenand

VIBE-ING 2.0: Smart Textile Tool for Healthcare & Well-being
by Dominika Potuzakova, Indre Kalinauskaite; Petr Kosnar; Derec Wu; Carmen van der Zwaluw

VIBRO PES -Standardized Measurement of Neurologic Impairment in Feet
by Linda Lundeholm.

The Baobab, A Bilingual Storybook App Designed for Deaf Children
by Melissa Malzkuhn & Melissa Herzig