

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



**DEVICE – DDesign for Vulnerable generations: Children and Elderly**

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**DEVICE results transferability**

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## List of abbreviations

ACRONYM	DESCRIPTION
DEVICE	DEsign for Vulnerable generations: Children and Elderly
WP	Work Package

## Executive Summary

**Background and Aims:** The DEVICE Project was established with the primary aim to improve the quality of life of future generations by developing training resources for designers which will support them in including the specific needs of children and elderly people as well as people with disabilities within their designs. The project aspires to bridge traditional industrial design programs with ergonomics, usability concepts and user experience with a specific focus on vulnerable generations and to facilitate progress towards the modernization of design education. This report presents the results of Work Package 4.3 (WP4.3), the aim of which is to identify and describe exemplars of 'good practice' in design for vulnerable generations, for inclusion in the DEVICE database. Specifically, the purpose of WP4.3 was to investigate the transferability and scalability of the DEVICE project to (i) extra-European countries by determining which findings of similar projects carried out in other areas of the world might be applicable in Europe and under what conditions; and (ii) design for individuals with disabilities (including exemplars from within and outside Europe).

**The approach:** A three-stage project was designed. Stage 1 involved a targeted literature search using the internet and focusing on DEVICE-related projects undertaken in the period 2010 to 2013. Keywords used in the search were derived from WP1 documents and were compiled in consultation with all DEVICE project partners. Results (organisations of demonstrating good practice of DEVICE ideals) were described and classified by their applicability to each of the transferability target groups: elderly, children and people with disability. Organisations/projects were selected based on criteria for good DEVICE practice developed in previous WPs, namely:

- Contribution to the development of design for vulnerable generations
- Involvement of vulnerable generations in the design process
- Use of innovative and explorative approaches towards materials/methods
- The connection between the vulnerable generations and their context
- Contribution to improving or adding to facilities, products or services for vulnerable generations
- Contribution to method development for vulnerable generations design

Stage 2 involved a ranking process by all DEVICE members, to identify exemplary organisation/s identified in Stage 1, for the purpose of engagement in translation activities and for potential sustained collaborations beyond the life of the current project. Stage 3 involved an interview with organisation/s identified in Stage 2 for the purpose of knowledge translation of design vision and ideas relevant to DEVICE.

**Results:** The search yielded 46 results for projects relating to children, the elderly and individuals with disabilities. For completeness, projects from WP1 and WP3 which matched the WP4.3 search criteria but which were not identified in the internet search were also included providing a total of 62 results. Fifteen projects were shortlisted by the WP4.3 lead partner and subjected to a further ranking process by all DEVICE partners using a 5-point scale [1 (low) to 5 (high)] to rate each of the criteria identified above. Ratings were summed across all categories and the two highest ranked projects/organisations were:

- The Helen Hamlyn Centre for Design: Age and Ability Research Lab, Royal College of Art, UK
- Georgia Tech: Center for Assistive Technology and Environmental Access, USA

Follow up activities included contact with selected organisations by email and participation in an interview to elicit more detailed information on their design vision, philosophy and activities relevant to DEVICE.

**Summary and Conclusions:** Results of the WP4.3 review task described here have provided broader insights into the scope of DEVICE-related design activities for young and elderly conducted by organisations outside Europe as well as activities for people with disabilities globally. There were some limitations with the review process; specifically, the search was limited to English language and relied on a Google scholar search conducted from one site (Australia) and therefore was not exhaustive. Notwithstanding these limitations, the review highlighted a large number of exemplary design activities, globally. A significant outcome was the identification of two high-profile organisations, and the commencement of engagement in knowledge translation and dissemination activities which has rich potential for expanding the current reach and impact of the DEVICE project.

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# 1. Background

DEVICE is an Erasmus Multilateral Project funded by the European Commission within the Lifelong Learning Program. DEVICE was launched to respond to the European Commission's call to help companies and academic research centres to appropriately address DSign for Vulnerable generations: Children and Elderly. Its overarching aim is to improve the quality of life of future generations by developing training resources for designers which will support them in including the specific needs of children and elderly people within their designs. A holistic approach to design has been adopted based on user-centred design. The project aspires to bridge traditional industrial design programs with ergonomics, usability concepts and user experience with a specific focus on vulnerable generations and to become a milestone towards the modernization of design education.

## 1.1. Aims

This report presents the results of Work Package 4.3 (WP4.3), the aim of which is to identify and describe exemplars of 'good practice' for inclusion in the DEVICE database. The purpose of this is to investigate the transferability and scalability of the DEVICE project to extra-European countries by determining which findings of similar projects carried out in other areas of the world might be applicable in Europe and under what conditions. The focus for projects relating to elderly and/or children was concentrated on activities outside of Europe (see section 3.1, transferability to extra-European countries) while exemplars for projects relating to the other target group of interest, namely individuals with disabilities, were elicited from both inside and outside Europe (see section 3.2, transferability to other target groups). As part of WP4.3, a key outcome was to identify key exemplary projects for further collaboration.

## 2. Methods

The approach comprised three stages: Stage 1 involved a targeted literature search, focusing on current and recent projects (2010 to 2013) using the internet. Details of the search methods are described below and the Results are presented in Section 3. Stage 2 involved a ranking process to identify exemplary organisation/s identified in Stage 1, for the purpose of engagement in translation activities and for potential sustained collaborations beyond the life of the current project. Stage 3 involved an interview with organisation/s identified in Stage 2 for the purpose of knowledge translation of design vision and ideas relevant to DEVICE. Details of Stage 2 and 3 protocols are summarised in Section 4.

Literature Search: Projects focused on children and/or elderly were restricted to those outside of Europe while those addressing the needs of individuals with disabilities included projects/organisations from within and outside Europe. Keywords used in the search were derived from WP1 as illustrated in Table 1.

Table 1 Keywords for literature search

WP1 Key Points	Keywords
The overall aim of DEVICE - DESign 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.	Design Children Elderly Vulnerable Ergonomic Usability User experience Industrial design Program
Exemplifying results of countries that have a strong policy model that encourages innovation driven by societal and user needs.	User needs Societal needs Innovation
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.	Participatory Co creation User centred Aspirations

Synonyms were identified for keywords in Table 1 and included in the search phrase (Table 2), for example: elder, old, retired and senior. To limit the search to project types most relevant to DEVICE, one of the following keywords was also required in each result: method, course, program, workshop, product or service.

A Boolean search phrase was created using OR to form words into related groups joined by AND operators. These phrases were input to Google and Google Scholar searches using the verbatim search tool. Google searches are limited to a 32 word maximum so separate phrases were created for both young, elderly and other target groups as illustrated in Table 2. An example of a possible search result would be a document

which contained the words design, user centred, young, learn and course. The document may or may not contain other keywords from the search phrase.

**Table 2 Boolean search summary**

Children	Elderly	Other Target Groups
design AND (ergonomic OR usability OR ((user OR human) AND (centred OR focused OR experience OR factors)) OR participatory OR (co AND (create OR design OR develop OR operate)) AND ( <b>child OR young OR teen OR vulnerable</b> ) AND (research OR program OR educate OR learn OR study OR teach) AND (project OR method OR course OR program OR workshop OR product OR service)	design AND (ergonomic OR usability OR ((user OR human) AND (centred OR focused OR experience OR factors)) OR participatory OR (co AND (create OR design OR develop OR operate)) AND ( <b>elder OR old OR retired OR senior</b> ) AND (research OR program OR educate OR learn OR study OR teach) AND (project OR method OR course OR program OR workshop OR product OR service)	design AND (ergonomic OR usability OR ((user OR human) AND (centred OR focused OR experience OR factors)) OR participatory OR (co AND (create OR design OR develop OR operate)) AND ( <b>disable OR impair OR disorder OR 'special needs'</b> ) AND (research OR program OR educate OR learn OR study OR teach) AND (project OR method OR course OR program OR workshop OR product OR service)

As Google Scholar primarily provides abstracts, relevant databases were accessed separately to obtain full text versions. It was assumed that if the database contained one relevant document that there was an increased likelihood that it would contain additional relevant documents, so a search similar to that outlined above was performed within each of these. The reference lists in relevant papers were also checked for additional documents. Finally, the search took place in English and so is totally biased towards institutes which maintain an up-to-date online presence and/or publish in English.

To the extent that the information was available, potential outcomes were assessed for relevance to DEVICE according to the DEVICE Project criteria developed for DEVICE Awards (WP4):

- Contribution to the development of design for vulnerable generations.
- Involvement of vulnerable generations in the design process.
- Use of innovative and explorative approaches towards materials/methods.
- The connection between the vulnerable generations and their context.
- Contribution to improving or adding to facilities, products or services for vulnerable generations.
- Contribution to method development for vulnerable generations design.

### 3. Results

The 46 results located and reviewed as outlined above are presented in the following section. For completeness, projects from WP1 and WP3 which matched the WP4.3 search criteria are also included (marked with an asterisk) providing a total of 62 results.

Results were classified by their applicability to each transferability target (Table 3) and summarised according to the most relevant target group in section 3.

**Table 3 Transferability target group**

Applicable to target?					
Yes	Somewhat	Possibly			
●	◉	○			
Name of organisation/activity			Children	Elderly	Other Target Groups
1.	AgeLab			●	○
2.	Creating an Age-friendly NYC			●	◉
3.	Institute of Active Aging			●	○
4.	Department of Human and Engineered Environmental Studies – Assistive Technology		◉	●	●
5.	Engineering Design & Innovation Centre		◉	●	●
6.	Difficulties Involving Older People in Design Research: A Case Study of the Stereotype Production Method for Graphical Interface Design			●	
7.	Right and Participation: Participatory Universal Design of Public Bus for Older Persons			●	
8.	A Participatory Framework for Developing Co-Robotic Technologies for Eldercare			●	
9.	Inadequate Health Literacy as a Vulnerability		◉	●	◉
10.	Designing Communication Technologies for Socially Isolated Older People: Fieldwork Reflections			●	
11.	Potential Use of Robots in Taiwanese Nursing Homes			●	
12.	Harvard i-lab		●	●	○
13.	Raising the Bar		○	●	●
14.	Hopeful Signs, University of Virginia			●	
15.	National Art Education Association IDSA Design Learning Challenge		●		○
16.	Design Minds		●		○
17.	Design thinking for Educators		●		
18.	RED lab		●		○

19. Design Learning Network	●		○
20. Young and Well Cooperative Research Centre: Participatory Design of evidence-based online youth mental health promotion, intervention and treatment	●		●
21. DesignPrep	●		○
22. OpenIDEO	●	●	●
23. SUTD-MIT	●	●	●
24. Institute for Human Centred Design	●	●	●
25. IdeA Center for Inclusive Design and Environmental Access	⊙	●	●
26. d.school	●	⊙	⊙
27. Design Human Engineering	●	●	⊙
28. Inclusive Design Research	⊙	●	●
29. Inclusive Design Institute	⊙	●	●
30. Centre for Universal Design	⊙	●	●
31. Barrier Free New Zealand	⊙	●	●
32. The Helen Hamlyn Centre for Design: Age and Ability Research Lab	●	●	●
33. Georgia Tech: Center for Assistive Technology and Environmental Access, Rehabilitation Engineering and Applied Research Lab	○	●	●
34. University of Wyoming College of Engineering and Applied Science Final Year Project	○	○	●
35. Rehabilitation Engineering Research Center on Accessible Public Transportation	○	●	●
36. Quality of Life Technology Centre	⊙	●	●
37. Rehabilitation Research Design and Disability Centre	○	●	●
38. Design for extreme poverty and disability: A social innovation project case study in rural Uganda		●	●
39. 2013 Access to Design Professions Symposium and Workshop			●
40. University of Buffalo School of Architecture and Planning Inclusive Design Graduate Research Group		●	●
41. *AEGIS – Open Accessibility Framework	⊙	●	●
42. *RHYME	●	○	●
43. *VERITAS	○	●	●
44. *Disability, ageing and inclusive design – Undergraduate and postgraduate module	●	●	●
45. *Design for all – Accessibility in indoor environments	●	●	●
46. *Universal design of ICT	●	●	●
47. *Usability and Accessibility	●	●	●

48. *Ergonomic Design for All	●	●	●
49. *Designed and Built for All	●	●	●
50. *Six Views in A Box - Dialogues on Everyday Life With Alzheimer's		●	●
51. *Certec	●	●	●
52. *HAREC – Disability and Rehabilitation Research Centre	○	○	●
53. *Design for All Italia	●	●	●
54. *Design for All Foundation	●	●	●
55. Designing technology for children with special needs: bridging perspectives through participatory design	●		●
56. Fusion of horizons: Co-designing with Cambodian children who have prosthetic legs, using generative design tools	●		●
57. Engaging children in healthcare technology design: developing rehabilitation technology for children with cerebral palsy	●		●
58. Structured approaches to participatory design for children: can targeting the needs of children with autism provide benefits for a broader child population?	●		●
59. Carroll Centre for the Blind Summer Enrichment Program	●		●
60. Co-Creating Spaces: The Tag Project	●		●
61. *SID – Sensuousness, Interaction and Participation	●		●
62. *Play-and-learn activities for children with a cochlear implant	●		●

### 3.1. Transferability to extra-European countries

The following sections list projects from outside of Europe that focus on design for elderly and/or children. Applicable year, country/institution and URL are included for each example. Only projects initiated by or based in countries outside Europe (extra-European) were included in the search.

#### 3.1.1. Elderly

##### 1. AgeLab, Current, Massachusetts Institute of Technology, USA – <http://agelab.mit.edu/>

Based within MIT's School of Engineering's Engineering Systems Division, the AgeLab has assembled a multi-disciplinary team of researchers, business partners, universities, and the aging community to design, develop and deploy innovations to invent new ideas and creatively translate technologies into practical solutions that improve people's health and enable them to "do things" throughout the lifespan. Researchers at AgeLab have extensively studied the impact of age on driving as well as typeface design, medication, residential care and interface design. Unique tools created by AgeLab include 'AGNES' a suit to be worn by designers which simulates the physical restrictions experienced by an elderly person and 'Delayed Digit Recall and (n-back) Task' which systematically increases an individual's cognitive demand for use in driver workload and distraction studies.

**2. Creating an Age-friendly New York City One Neighborhood at a Time, Current, USA –****[http://www.nyam.org/agefriendlynyc/docs/Toolkit\\_Report\\_0321-VA-new.pdf](http://www.nyam.org/agefriendlynyc/docs/Toolkit_Report_0321-VA-new.pdf)**

The initiative seeks to make New York City a better place to grow old by promoting an "age-in-everything" lens across all aspects of city life. The initiative asks the city's public agencies, businesses, cultural, educational and religious institutions, community groups, and individuals to consider how changes to policy and practice can create a city more inclusive of older adults and more sensitive to their needs.

**3. Institute of Active Aging, Current, Hong Kong Polytechnic University, China –****<http://iaa.fhss.polyu.edu.hk/>**

The institute aims to promote opportunities for older adults to advocate for and participate in the shaping of Hong Kong's greying society by delivering innovative educational programmes and conducting cross-disciplinary research with local and overseas collaborators to develop a holistic model of total wellness in active ageing. Examples of collaborations include: Active Ageing & Inclusive Design Conference and Age-Friendly Cities with Cooperation & Participation. The institute has also run events such as a 'Design for Elderly Competition' to encourage the younger generation and young engineers to show their creativity and concern for the elderly by developing innovative products or ideas.

**4. Department of Human and Engineered Environmental Studies – Assistive Technology, Current, The University of Tokyo, Japan – <http://www.h.k.u-tokyo.ac.jp/en/research/research17/>**

This department investigates human life from the point of view of quality in life and quality of life that varies in accordance with the social change such as aging, individualization, 'technologization', and globalization. The aim is to promote the progress of science and contribute to society by integrating knowledge related to human life, making policy proposals, building social systems and developing new assistive technology. Research areas are: assistive technology, system design, social participation and mobility. Research examples include: development of assistive information technology using robotics technology for patients with dementia, a survey of the 'elderly in regional cities on their attitudes toward driving and giving up driving' and product design in assistive devices.

**5. Engineering Design & Innovation Centre, Current, National University of Singapore, Singapore –****<http://www.eng.nus.edu.sg/edic/index.html>**

The 'design-centric' program serves as a unique learning pathway at the Faculty of Engineering. The program covers three broad themes with Engineering in Medicine being the most relevant to DEVICE. Past projects include: 'exoskeleton robots for human augmentation, assistance, and rehabilitation' and 'smart assisted living for the elderly with ambient intelligence'. The 2013 theme for the centre's 'Design Summer Programme' was 'Designing for Active Ageing: An Engineering Perspective' brought together students from around the world to brainstorm how engineers can contribute to solving issues faced by the aged.

**6. Difficulties Involving Older People in Design Research: A Case Study of the Stereotype Production Method for Graphical Interface Design, 2011, Hong Kong Polytechnic University, China –****<http://ijg.cgpublisher.com/product/pub.154/prod.599>**

This study researches the effectiveness of the 'stereotype production method' for graphical interface design with older people. It reports a design research project in which older people were invited to participate in graphical interface design using the stereotype production method. Based on the project findings and experience, the paper discusses the difficulties and attempts to provide insights and recommendations into involving older people in the conceptual design process. The recommendations relate to 7 key areas:

- Participant recruitment
- Location
- Environment
- Day and time
- Briefing
- Design process
- Unstructured interview

**7. Right and Participation: Participatory Universal Design of Public Bus for Older Persons, 2011, Hong Kong Polytechnic University, China – <http://ijg.cgpublisher.com/product/pub.154/prod.587>**

Taking Hong Kong buses as a case study, the paper reviews the key difficulties and restrictions for the elderly when accessing public buses. It identifies the directions for design improvement and then reports the process of a participatory design project that involved older people as active participants in the each design stage. The paper explains how the project team members facilitated the participatory design process and concludes that user participation in the design process is the best way to obtain universal design.

**8. A Participatory Framework for Developing Co-Robotic Technologies for Eldercare, 2013, USA – <http://di.ncl.ac.uk/vulnerability/papers/>**

This workshop position paper presents some implications drawn from a robotics project for human-computer interaction thinking about older adults as a vulnerable group. While seniors are a popular population for robotics researchers to design for, there are problems in how engineers tend to treat their vulnerability. In addition to being at risk of institutionalization, they are also seen as not being technically savvy or capable, and thus “doubly disabled.” This project treats older adults as having solid understandings of disability which, through participatory design, can be mobilized to help meet the challenges of co-robot design.

**9. Inadequate Health Literacy as a Vulnerability, 2013, USA – <http://di.ncl.ac.uk/vulnerability/papers/>**

People with inadequate health literacy have difficulty in following medical instructions, are more likely to be hospitalized and have poor health outcomes. The paper argues that very little has been done to address this and that low health literacy represents a significant vulnerability that demands technological remediation.

**10. Designing Communication Technologies for Socially Isolated Older People: Fieldwork Reflections, 2013 Australia – <http://di.ncl.ac.uk/vulnerability/papers/>**

This paper reflects on the challenges encountered when conducting research with socially isolated older people. It examines how participants’ vulnerabilities affected their conceptualisation of social isolation and altered the project team’s approach to investigating it. The vulnerability of participants and complexities of social isolation created fieldwork challenges around methodological and ethical issues to be considered in the future work. The field study informs the ongoing development and evaluation of a socio-technical system that aims to help ameliorate older people’s experience of social isolation.

**11. Potential Use of Robots in Taiwanese Nursing Homes, 2013, Taiwan/USA – <http://homes.soic.indiana.edu/selmas/ChangSabanovic-HRI2013-2.pdf>**

Explores the potential uses of emerging robotic technologies in nursing homes by applying a user-centred design approach involving field study and focus groups to understand the type of robot design which would

be suitable in the nursing home context. It was found that instead of a robot which completely replaces human labour, nursing home staff would prefer robot assistants who fit into their working process by helping with minor tasks and encouraging social interaction among residents. Interviewing staff and managers who the robots would potentially be aiding makes the study somewhat inclusive; however input was not sought from the residents themselves. Although there are plans to conduct the study in the US to understand the possible effects of cultural differences, there is no suggestion that the scope will be broadened to include residents.

#### **12. Harvard i-lab, Current, USA – [ilab.harvard.edu](http://ilab.harvard.edu)**

The Harvard Innovation Lab (i-lab) serves as a resource for students from across Harvard interested in entrepreneurship and innovation. The programming offered by the i-lab is designed to help students grow their ventures at any stage of development and covers a wide range of disciplines. In 2013/2014 the i-lab is hosting the 'Deans' Design Challenge' for students to create cross-disciplinary teams to tackle social and health of which 'aging in place' is one of the focuses.

#### **13. Raising the Bar, 2010, City College of New York, USA – <http://www.metropolismag.com/March-2010/Raising-the-Bar>**

Under the tutelage of vice president of the Brooklyn-based bathroom-hardware company Watermark Designs, 18 mechanical-engineering majors attempted to re-design the grab bar. Their task was to create fixtures that not only met the code of the Americans with Disabilities Act (ADA) but would also appeal to architects. Over a 14-week semester, students researched, designed, and tested six models of which the majority were subsequently manufactured and sold through Watermark.

#### **14. Hopeful Signs, 2011, University of Virginia, USA – <http://www.metropolismag.com/February-2011/Hopeful-Signs>**

EcoMOD studio at the University of Virginia School of Architecture tasked students with designing a small accessory home where elderly people could 'age in place'. The designs needed to work for different climates meaning that studies of local environmental conditions were crucial to all the proposals.

### **3.1.2. Children**

#### **15. National Art Education Association IDSA Design Learning Challenge, Current, USA – <http://www.arteducators.org/news/idsa-dlc>**

The primary purpose is to expose young students (K-12) to design thinking and create an active awareness of the discipline of industrial design and the design process by having them collaborate with college art students. This is achieved through a collaborative learning process grounded in creativity, problem solving, and innovative thinking. The goal is for students to explore creative ideas and tackle a problem "worth solving" within their classroom, school, neighbourhood or community.

#### **16. Design Minds, Current, Australia – <http://designminds.org.au>**

Run by the Queensland State Library this programme provides tools to educators to teach primary school students design thinking in order to develop the capabilities of successful and creative 21st century citizens within existing education and learning benchmarks. Examples of toolkits include 'Saving Humpty' in which children are required limit damage to an egg through design in the context of safer transport, roads and road behaviour and 'Grid + Web' where students explore urban futures through inquiry into the dynamics of cities, especially the sustainability of their transport networks

**17. Design thinking for Educators, 2013, USA – <http://designthinkingforeducators.com>**

A toolkit which contains the process and methods of design along with the ‘Designer’s Workbook’, adapted specifically for the context of K-12 education. The toolkit “offers new ways to be intentional and collaborative when designing, and empowers educators to create impactful solutions”.

**18. RED lab, Current, Stanford University, USA – <http://www.k12lab.org/>**

The RED lab was founded in 2009 to study the impact of design thinking in education. It grew from the ‘Taking Design Thinking to Schools Project’, which was funded by Stanford’s K-12 Initiative. The goal is to partner with local schools to explore the feasibility of incorporating design thinking into the curriculum as a new way to teach and learn.

**19. Design Learning Network, Current, USA – <http://www.designlearning.us>**

The ultimate goal of the Design Learning Network is to collaborate with members and international partners to create effective and sustainable design learning links between primary, secondary, and higher education students and teachers on a global scale.

**20. Young and Well Cooperative Research Centre: Participatory Design of evidence-based online youth mental health promotion, intervention and treatment, 2012, Australia – [http://www.yawcrc.org.au/document/ec72493f526cdb54a08990\\_a5ed5b0561/Young\\_and\\_Well\\_CR\\_C\\_IM\\_PD\\_Guide.pdf](http://www.yawcrc.org.au/document/ec72493f526cdb54a08990_a5ed5b0561/Young_and_Well_CR_C_IM_PD_Guide.pdf)**

A guide designed to assist ‘Young and Well Cooperative Research Centre’ partners to involve young people in the design of online services and activities. The guide provides a framework which, through a case study, demonstrates how participatory design can be integrated when designing mental health promotion interventions. The step-by-step tools, methods and resources the guide offers are transferrable to participatory design projects beyond the area of mental health.

**21. DesignPrep, Current, Smithsonian Cooper-Hewitt National Design Museum, USA – <http://www.cooperhewitt.org/education/designprep>**

The institute offers free programs including workshops, studio and college visits, focusing on all design disciplines. One program in particular ‘A City of Neighborhoods’, is a multi-week program investigating urban design and city planning that gives young people the “opportunity to explore community, identify design challenges, and propose solutions while using the latest technologies to aid in the development of hands-on designs”. Additionally, the Museum runs an ongoing ‘City of Neighbourhoods Program for Educators’ which shares with teachers how to incorporate design thinking in the classroom education.

### 3.1.3. Elderly and Children

**22. OpenIDEO, Current, USA – <http://www.openideo.com>**

IDEO is an international design firm founded in the USA. The purpose of OpenIDEO is to create an online platform in which people use design thinking in a collaborative way to solve design challenges. Two recent challenges have been: ‘How might we all maintain wellbeing and thrive as we age?’ (<http://www.openideo.com/open/mayo-clinic/brief.html>) and ‘How can we equip young people with the skills, information and opportunities to succeed in the world of work?’ (<http://www.openideo.com/open/youth-employment/realisation>). The platform is cross discipline with a large number of concepts produced for each brief, it has a strong online community delivering feedback and industry sponsors provide judges and help to develop the winning concepts.

**23. SUTD-MIT, Current, Singapore/USA – <http://idc.sutd.edu.sg>**

The goal of SUTD-MIT International Design Centre (IDC) is to become the world's premiere scholarly hub for technologically-intensive design. It is a centre based both in Singapore at SUTD, and at MIT, with academic and industrial partners from around the world. IDC faculty, researchers and students work together to design devices, products, systems, services and the built environment that address strategic needs of Singapore, the greater Asian region, the US, and the global community. Current projects include: designing and producing children-friendly health masks for haze protection, audio aid design for the disabled people and creative ageing city.

**24. Institute for human centred design, Current, USA – <http://www.adaptenv.org>**

Located in Boston, the Institute for Human Centered Design (IHCD) is an international education and design non-profit organisation committed to advancing the role of inclusive/universal design. The consulting arm of IHCD (<http://www.humancentereddesign.org/ihcd-studio>) 'provides the full spectrum of design and consulting services focused on innovative design solutions for legally required compliance and best practices in Human-Centred/Universal Design issues'. Recent IHCD projects include a year-long collaboration with a partner in Russia to transfer expertise on accessibility and universal design as part of the 'U.S.- Russia Peer to Peer Dialogue Program', the 'Access Recreation Boston Project', the inclusive design component of the Boston Architecture College renovation and the completion of the 'Americans with Disabilities Act Transition Plan' update for the city of Somerville. Another initiative of IHCD is 'Access to Design Professions' which aims to help people with disabilities enter design professions and to connect with one another. Additionally IHCD manages an exhibition space (<http://www.humancentereddesign.org/public-programming/international-exhibit-showroom>), provides a specialised inclusive design library, runs conferences, and provides training and education (<http://www.humancentereddesign.org/what-we-do>).

**25. IDEa Center for Inclusive Design and Environmental Access, Current, University at Buffalo, USA – <http://idea.ap.buffalo.edu/Home/index.asp>**

The IDEa Center practices human centred design through research, development, service dissemination and educational activities. The primary goal of the centre is to produce knowledge and tools that will increase social participation of groups including people with disabilities and the older generation, who have been marginalised by traditional design practices. Projects include accessible public transport, rural aging in place and universal design E-world. Additionally, the 'Universal Design Identity Program' was initiated to promote increased understanding, acceptance and use of universal design by a broader audience of consumers, design professionals, industry and government leaders and academics.

**26. d.school, Current, Institute of Design at Stanford University, USA – <http://dschool.stanford.edu>**

The d.school doesn't grant degrees but instead allows students enrolled in all degrees at Stanford to enrol in courses to learn how to use 'design thinking' as a way to "take on the world's messy problems together". Students learn design thinking by enrolling in a specific design project which they complete as part of an interdisciplinary team. Projects have included: 'Sparktruck: Designing Mobile Interventions for Education' and design thinking for better health.

**27. Design Human Engineering, Current, Ulsan National Institute of Science and Technology, Korea – <http://dhe-eng.unist.ac.kr/index.sko>**

In a similar way to d.school at Stanford, the school of Design & Human engineering (DHE) of UNIST combines industrial design, human factors engineering and engineering design. Related projects have included: designing a mouse for children and the wellbeing capsule (elderly healthcare).

**28. Inclusive Design Research, Current, China/UK – <http://www.inclusivedesignresearch.org>**

An interdisciplinary, international design and research network with research groups based in the UK (London) and China (Shanghai). The aim is to promote inclusive design to the largest audience possible through academic and applied research, education, public engagement and knowledge transfer to industry. Projects include: Facilitating wider uptake of inclusive design, age friendly products and services and design education for developing countries.

**29. Inclusive Design Institute, Current, Canada - <http://inclusivedesign.ca/>**

The Inclusive Design Institute (IDI) is a generative hub of applied research that addresses the challenge of designing information and communication systems so that they work for all potential users, including users with disabilities, varying language needs and diverse cultural preferences. The IDI is Canada's first research hub focused on digital inclusion.

**30. Centre for Universal Design, Current, NC State University College of Design, USA – <http://www.ncsu.edu/ncsu/design/cud/index.htm>**

Performs research and provides education and training in the field of universal design such as 'Universal by Design', an advanced undergraduate and graduate level course on universal design. This multidisciplinary course facilitates understanding of universal design concepts and their application in architecture, landscape architecture, graphic design, industrial design and art and design for the benefit of all individuals.

**31. Barrier Free New Zealand, Current, New Zealand – <http://barrierfreenz.org.nz/>**

Organisation that conduct education programmes (half to multi day courses) focusing on how to achieve universal design and why it's important.

## **3.2. Transferability to other target groups**

The following sections list projects that focus on people with disabilities and children with special needs from inside and outside of Europe. For completeness, projects from WP1 and WP3 which matched the WP4.3 search criteria are also included and marked with an asterisk.

### **3.2.1. People with disabilities**

**32. The Helen Hamlyn Centre for Design: Age and Ability Research Lab, Current, Royal College of Art, UK – [http://www.rca.ac.uk/research-innovation/helen-hamlyn-centre/research\\_lab/age\\_ability\\_research\\_lab/](http://www.rca.ac.uk/research-innovation/helen-hamlyn-centre/research_lab/age_ability_research_lab/)**

Students, new graduates, professional designers and academics work together in multidisciplinary teams to undertake inclusive design research and projects with industry that will contribute to create practical design ideas to improve the lives of people of all ages and abilities. Recent projects include 'Everyday Activities: living environments for adults with autism' which aimed to develop products which could help

people with autism undertake everyday activities in the home, 'Loud and Clear: making hearing care inclusive' which explores how the design of instructions and basic tasks can help make using a hearing aid easier and 'Rise: the connected stairlift' which investigates how a digital network of care could be built around the movements of a stairlift in the home.

**33. Georgia Tech: Center for Assistive Technology and Environmental Access, Rehabilitation Engineering and Applied (CATEA) Research Lab, Current, USA – <http://www.catea.gatech.edu/>**

Staff and graduate students at the Rehabilitation Engineering and Applied Research Lab undertake applied research and development targeting the increased health and function of persons with disabilities. Of particular relevance to DEVICE is the project 'cRE/Ate', an experientially-based design education program which exposes undergraduate engineering students to 'Rehabilitation Engineering and Assistive Technology' with the objective of building capacity by populating the field with engineers who have been exposed to disability and its impact on the design of mainstream products, services and goods.

**34. University of Wyoming College of Engineering and Applied Science Final Year Project, Current, USA – [http://www.uwyo.edu/ceas/news/2012\\_jul\\_to\\_dec/120912/index.html](http://www.uwyo.edu/ceas/news/2012_jul_to_dec/120912/index.html)**

Beginning in 2002, the University of Wyoming has received National Science Foundation funding from the Division of Bioengineering and Environmental Systems to a joint effort between the College of Engineering and Applied Science and the Wyoming Institute for Disabilities to fund senior design students to develop assistive technology for disabled individuals in the state of Wyoming. The most recent project involved developing a working product that assists hearing and speech impaired individuals to communicate with each other.

**35. Rehabilitation Engineering Research Center on Accessible Public Transportation, Current, USA – <http://www.rercapt.org/>**

A partnership between the Robotics Institute at Carnegie Mellon University and the IDeA Center at SUNY Buffalo the mission of the centre is to "research and develop methods to empower consumers and service providers in the design and evaluation of accessible transportation equipment, information services, and physical environments". Research includes 'Human Factors of Boarding and Disembarking Vehicles' and 'Empowering the User to Improve the Travel Chain' which aims to improve public transport accessibility by engaging those with disabilities to document and assess problems and good solutions throughout the system. In 2013 the centre received funding for a further five years.

**36. Quality of Life Technology Centre, Current, USA – <http://www.cmu.edu/qolt/index.html>**

A National Science Foundation Engineering Research Center, jointly run by the University of Pittsburgh and Carnegie Mellon University and focused on the development of intelligent systems that enable older adults and people with disabilities. The centre addresses the needs and activities of everyday living by prototyping personal and assistive robots, cognitive and behavioural virtual coaches, safe mobility and driver assistance technologies and human health and wellness monitoring. Research projects include assessing the risk of vibration exposure during wheelchair propulsion, development of trust models and metrics for human-robot interaction and accessible website design for cognitive impairments such as schizophrenia.

**37. Rehabilitation Research Design and Disability Centre, Current, USA – <http://www.r2d2.uwm.edu>**

Part of the University of Wisconsin-Milwaukee the centre performs interdisciplinary basic research investigations, applied research and development, and innovative instruction related to technology and disability. Of particular relevance to DEVICE is the centre's 'Universal Design Infusion of Technology and

Evaluation for Accessible Campuses' project, with the aim of providing quality higher education for students with disabilities by promoting improved accessibility of campuses through universal design in education.

**38. Design for extreme poverty and disability: A social innovation project case study in rural Uganda, 2013, School of Industrial Design, Carleton University, Canada – [http://www.idsa.org/sites/default/files/Hallgrimsson-Paper\\_Design\\_for\\_Extreme\\_Poverty\\_and\\_Disability.pdf](http://www.idsa.org/sites/default/files/Hallgrimsson-Paper_Design_for_Extreme_Poverty_and_Disability.pdf)**

Four final year students selected to take part in the project of using co-design methods to create the next generation of hand-pedalled tricycles to be built and used in Kasese, Uganda. Initial design took place in Canada with correspondence via representatives from Uganda, email, questionnaires, social media and video-conferencing. Prototyping took place in both Canada and Uganda to help students understand local limitations. Final design, evaluation and production took place during a 16 day field trip to Uganda.

**39. 2013 Access to Design Professions Symposium and Workshop, 2013, San Francisco State University, USA – <http://creativestate.sfsu.edu/events/2013/04/11/4881>**

The purpose of the symposium and three-day workshop was to promote universal and inclusive design principles to current and future students, support the recruitment of people with disabilities into design careers and promote interaction and understanding within the design fields. The workshops were targeted especially at the university's current and prospective students currently studying or interested in studying design majors.

**40. University of Buffalo School of Architecture and Planning Inclusive Design Graduate Research Group, Current, USA – <http://idea.ap.buffalo.edu/idg/index.asp>**

One of four research groups which students can choose from to participate in to complete their masters of architecture. The curriculum includes a sequence of required courses supplemented by electives and workshops that provide both a theoretical and working knowledge of inclusive design.

**41. \*AEGIS – Open Accessibility Framework, 2011, Europe - <http://www.aegis-project.eu/>**

AEGIS is an international project, aiming to empower people with disabilities, the elderly and anyone else who is disadvantaged when using Internet services, desktop PC or mobile phones. It will produce a toolkit for developers, alongside accessible applications for end-users and their supporters, in order to make accessibility to new ICT products open, personalised and configurable, realistic and applicable in many contexts. Also, the cost of developing accessible ICT solutions for all users on a range of systems will be reduced through the new AEGIS open source developer tools. The fundamental scientific objectives of the AEGIS Open Accessibility Framework, towards the achievement of which the project will steer the Consortium's research are: to demonstrate and prove that use of 3rd generation access techniques results in equal or better end-user access experiences as compared to the existing, 2nd generation approaches; to identify and develop the right combination of developer's tools aiding in creating accessible applications which leverage sets of pre-built and accessibility enabled user interface components for desktop, mobile, and rich Internet applications; which together allow developers to comfortably and easily create accessible applications; to develop a set of embeddable assistive technologies for mobile devices that fit into this framework and deliver a satisfying experience to people with disabilities; to develop a set of user agents for desktop and mobile devices which leverage and translate a cross-platform accessibility API from the 3rd generation access techniques of the web, to the desktop and mobile accessibility APIs – in such a fashion as

to give users with disabilities the same utility and accessibility with rich Internet applications as they have with accessible desktop applications.

#### **42. RHYME, Current, Norway – <http://rhyme.no/>**

RHYME is a five year research project (2010-2015) financed by the Norwegian Research Council through the VERDIK-program. The goal of the RHYME project is to improve health and life quality for persons with severe disabilities, through use of "co-creative tangibles". These are ICT based, mobile, networked and multimodal things, which communicate following musical, narrative and communicative principles. They are interactive, social, intelligent things that motivate people to play, communicate and co-create, and thereby reduce passivity and isolation, and strengthen health and well-being.

#### **43. VERITAS, Current, Europe – <http://veritas-project.eu/>**

VERITAS is a European project whose aim is to develop, validate and assess tools for built-in accessibility support at all stages of ICT and non-ICT product development, including specification, design, development and testing. The goal is to introduce simulation based and virtual reality testing at all stages of assistive technologies product design and development into the automotive, smart living spaces, (buildings & construction, domotics), workplace and infotainment applications areas. The goal is to ensure that future products and services are being systematically designed for all people including those with disabilities and functional limitations as well as older people. Furthermore, VERITAS plans to promote its results to the appropriate standards organizations for consideration and potential adoption and also to make them available through an open framework. VERITAS' objectives are: to investigate and develop an open library of various categories of virtual user models, including VR models, covering a wide range of population groups and especially focusing on groups in risk of exclusion, e.g. older people, people with disability (vision, hearing, speech, motor), people with co-existent condition, etc., to develop an Open Simulation Platform (OSP) for virtual reality simulation and testing of new products at all stages of iterative product planning and development, i.e. specification, design, development, validation and testing, to develop an extensive list of virtual reality tools for supporting accessibility testing at all stages of development of existing applications, of partners of the VERITAS consortium, in the following domains: a) automotive, b) smart living spaces, c) workplace design, d) infotainment and e) personal healthcare and wellbeing, to research and develop methodologies for introducing the VERITAS simulation and testing framework, including the virtual user and the simulation models, to a wide variety of ICT and non-ICT applications., to research and develop a framework for immersive virtual user simulation and testing, i.e. putting the developer in the position of the user through virtual/augmented reality simulation, to define measures and metrics for evaluating software accessibility for every application scenario during design and development through VR simulation (graphs, statistics, distance metrics in general), to research and develop innovative concepts for ambient, multi-device, universally accessible and usable multimodal interfaces through VR simulation, to integrate all the above into VERITAS knowledge, which will serve as a reference to the existing ICT accessibility know how. To achieve this VERITAS will furthermore develop: the core simulation and the immersive platforms for providing support to the developers and designers at all the stages of product development and the exportable toolbox in order to export the virtual user and the simulation models to existing developer/design platforms that are already used for the design/development of mainstream ICT and non-ICT products. Achieving all these goals VERITAS is expected to operationalise and potentially revolutionise the accessibility testing at all stages of design and development of new products in five very important industrial domains.

**44. Disability, ageing and inclusive design – Undergraduate and postgraduate module, Current, Loughborough University, UK – <http://www.lboro.ac.uk/departments/lds/ug/ergonomics-human-factors>**

The course comprises a number of modules. This module is optional for some students and compulsory for MSc students in the inclusive design stream. The aim of this module is for the student to develop an awareness of ageing and disability, as well as the needs of other vulnerable users, and to explore how ergonomists can play a part in the inclusive design of products, technologies, services and the built environment.

**45. Design for all – Accessibility in indoor environments, Current, Luleå University of Technology, Sweden – <http://www.ltu.se/edu/course/C00/C0002B?lasar=2011>**

University course dealing with methods and guidelines for designing environments accessible for all. Design for all as a method, disabilities, laws and regulations for buildings, methods of analysis for accessibility indoors and good example are the key content areas. The course provides an introduction to permanent or temporary obstacles that exist for individuals with disabilities and how these problems can be avoided.

**46. Universal design of ICT, Current, Oslo and Akershus University College of Applied Sciences Norway – [http://www.hioa.no/Studier/TKD/Master/Universal-Design-of-ICT/\(language\)/nor-NO](http://www.hioa.no/Studier/TKD/Master/Universal-Design-of-ICT/(language)/nor-NO)**

The Master's program provides courses targeting on specialized knowledge on universal design of ICT. In additions to the Master thesis, the program consists of compulsory subjects such as universal design of interactive systems, user diversity and ICT barriers, interaction styles and technologies for accessibility, research methods and academic writing and ethics. The program also includes specialized elective courses such as programming and API for interaction-intelligent user interfaces and globalization of technology.

**47. Usability and Accessibility, Current, IT University of Copenhagen, Denmark**

**[https://mit.itu.dk/ucs/cb\\_www/course.sml?course\\_id=1268126&mode=search&semester\\_id=1226768&lang=en&print\\_friendly\\_p=t&goto=1338456948.000](https://mit.itu.dk/ucs/cb_www/course.sml?course_id=1268126&mode=search&semester_id=1226768&lang=en&print_friendly_p=t&goto=1338456948.000)**

IT-university of Copenhagen, Denmark course where there's some focus on designing for accessibility. The course is part of a programme in Digital design and communication. Basically, it is a usability course but inclusive design and design for groups with special needs etc. are mentioned in the course description.

**48. Ergonomics design for all, Current, Chalmers University of Technology, Sweden – [https://www.student.chalmers.se/sp/course?course\\_id=18476](https://www.student.chalmers.se/sp/course?course_id=18476)**

Deliverable 1.1 Dissemination Level University course that's part of Chalmers' master's program Industrial Design Engineering The purpose of the course is to gain deeper knowledge and understanding of how human physical and mental prerequisites can vary by for example functional disorder or age, and how products and systems should be designed to interact with human characteristics and especially fit these groups of the population as well as people with functional limitations. The course includes theoretical lectures regarding human abilities related to different abilities such as age, anthropometry, biomechanics and comfort. Furthermore guest lectures are given about ergonomic design for different user groups, needs for disabled, and the latest research about elderly and common disabilities in the society. Also a computer assignment with JACK and a workshop about EMG (electromyography) are included. A number of extended exercises containing theoretical tasks as well as practical method and design tasks are given throughout the course, all related to user interaction, with focus on elderly and disabled, in a chosen product system (everyday systems such as work in kitchen, use of bathroom or working in the garden, or travelling with

public transports, car driving or grocery shopping). The outcome of the exercises are presented and discussed in seminars.

**49. Designed and Built for all , Current, Università la Sapienza, Italy –**

**<http://www.progettarepertutti.org/index.html>**

The course is running by Università la Sapienza- Roma- Facoltà di architettura and is designed to frame the correct approach to accessibility and the elimination of architectural barriers and environment, and to deepen their knowledge and application of complex legislation. The purpose is to promote and develop the culture of accessibility, also understood as a possibility for overcoming the barriers, architectural, environmental, cultural, urban planning and management for easy use and secure the widest possible area of urban spaces and man-made. Spatial planning and transport systems, the design of new buildings for work and residence, the recovery and reuse of existing ones, the arrangement of spaces and environments, external and internal, must contain all the choices, ubicazionali, distribution and technology, which prevent the creation or retention of barriers to the use easier. This is to overcome barriers physical and bureaucratic management, which are a source of discomfort for mobility, limiting or preventing anyone from comfortable or safe use of parts, components or equipment, environmental conditions which do not allow the orientation and recognition of places and situations of danger. The training is organized through lectures, tutorials, case discussions, evidence of business operators and the development of a project aimed at improving the use of public or private.

**50. Six Views in A Box - Dialogues on Everyday Life With Alzheimers, 2011, The Royal Danish Academy of Fine Arts, Denmark –**

**[http://issuu.com/danmarks\\_designskole/docs/sixviews?mode=window&backgroundColor=%23222222](http://issuu.com/danmarks_designskole/docs/sixviews?mode=window&backgroundColor=%23222222)**

Report from collaboration project with professionals within healthcare Design research and co-design.

**51. Certec, Current, Lund University, Sweden – [www.certec.lth.se/english/](http://www.certec.lth.se/english/)**

Certec is the Division of Rehabilitation Engineering Research in the Department of Design Sciences, Faculty of Engineering, Lund University. The purpose of the research and education is for people with disabilities to achieve better opportunities through more use-worthy technology, new design concepts and new individual forms of learning and searching. The work within Certec begins and ends with the person, while both the process and results are often genuinely technical in nature.

**52. HAREC – Disability and Rehabilitation Research Centre, Current, Sweden – <http://www.harec.se/in-english/>**

HAREC – Disability and Rehabilitation Research Centre was established in 1997 to promote and coordinate research within this field in the southern part of Sweden. The disability and rehabilitation research is extensive, dynamic and interesting and spans over a wide range of disciplines. HAREC is a uniting bond between different research areas as law, medicine, social science, technology and health care. HAREC is cooperation between five different universities in southern Sweden: Lund University, Malmö University, Linnaeus University, Kristianstad University and the Swedish University of Agricultural Sciences in Alnarp. Together these schools can count to 80 000 students and researchers which create fantastic possibilities for interdisciplinary research. An important task for HAREC is to co-operate with different kinds of national and international organizations to gain information and promote the results of the research.

**53. Design for all Italia, Current, Italy – <http://www.dfaitalia.it/>**

The main aims are: participate in the definition of a conscious design tools to be applied to different disciplines, to enable the use of environments, products and services to the widest variety of subjects, among them several perceptual abilities, motor and cognitive skills; make it a point of reference, a place of meeting to debate and promote initiatives and to effectively contribute to overcoming the conflict between man and environment through the project; spread an ever greater focus and awareness of inclusive design; to understand the social implications and benefits on the quality of life for all and highlight the benefits of competitive and economic. Design for All means designing environments, systems, products and services available independently by people with diverse needs and abilities involving human diversity in the design process. The DfA solutions are used in an easy, convenient and pleasant by most users without requiring any changes as a function of various physical, sensory or cognitive impairments and without having to give up a winning design.

#### **54. Design for all foundation, Current, Spain – <http://www.designforall.org/en/dfa/dfa.php>**

The Design for All Foundation is an international foundation with the following aims: to develop, promote, research and disseminate Design for All among companies and organisations both at public and private level, administrations, educational agents and also designers and professionals who intervene with the environment, products and services; to offer advice and services on Design for All to companies, organisations and administrations at national, European and international level with the aim that the ethical values that Design for All promotes are integrated into quality processes; to organise Courses, Seminars and Congresses on Design for All, to design the methodology and the development of the appropriate tools so that companies and organisations can implement Design for All in each level of their organization, to award an added value to the administrations companies professionals, and organisations strengthening their image and competitiveness. Design for All is the intervention on environments, products and services with the aim that everyone, including future generations, regardless of age, gender, capabilities or cultural background, can enjoy participating in the construction of our society, with equal opportunities participating in economic, social, cultural, recreational and entertainment activities while also being able to access, use and understand whatever part of the environment with as much independence as possible. To apply the Design for All concepts in products and services, two simple principles should be taken into consideration: make the use of products and services easier for everyone, ensure that the needs, wishes and expectations of users are taken into consideration in the design and evaluation processes of products or services.

### **3.2.2. Children with special needs**

#### **55. Designing technology for children with special needs: bridging perspectives through participatory design, 2011, UK – <http://dx.doi.org/10.1080/15710882.2011.587013>**

Explores how the co-creation was used in the development of a technologically enhanced learning environment which aims to develop social skills of typically developing children and children with autism spectrum conditions (the 'ECHOES' project). The paper describes in detail the various experiments and activities developed to engage children in the design process. The article also discusses ethical implications, the importance of building relationships and the use of low-tech materials when prototyping. The authors conclude that although the participatory design process with special needs children presents many challenges that it is 'imbued with opportunities for enriching the design discipline'.

#### **56. Fusion of horizons: Co-designing with Cambodian children who have prosthetic legs, using generative design tools, 2012, Norway/USA – <http://dx.doi.org/10.1080/15710882.2011.637113>**

Presents a field study exploring the challenges and implications of applying a participatory design process to improving the design of prosthetic legs for children in rural Cambodia. The paper discusses the difficulties of conducting participatory design in Cambodia, for example children being hesitant to criticise the prosthetics they had received for free from NGOs and the designer conflicting with cultural norms by showing interest in the lives of disabled children with low social status. The paper discusses the tools and methods employed to overcome challenges such as using paper dolls onto which the children could illustrate the type of prosthetic they actually wanted. The authors conclude by presenting a pyramid model which describes the layers of contextual understanding that were required to understand the situation and interpret their findings.

**57. Engaging children in healthcare technology design: developing rehabilitation technology for children with cerebral palsy, 2010, UK – <http://dx.doi.org/10.1080/09544820802441092>**

This paper presents a case study of users' involvement in the design and evaluation of two devices for upper limb rehabilitation for children with cerebral palsy to use in their homes. The devices comprise a computer game and a force feedback interface, designed to stimulate children with cerebral palsy to undertake fun arm exercises that are beneficial in terms of improving overall functional use of their impaired arm. The device was developed for children using a combination of informal and formal user-centred design methods. The methods used include standard questionnaires, interviews, a modified peer tutoring process and a comparative method. To evaluate the designs, qualitative and questionnaire-based opinion was sought from these children, and their parents, at the end of the intervention.

**58. Structured approaches to participatory design for children: can targeting the needs of children with autism provide benefits for a broader child population?, 2013 – <http://link.springer.com.ezproxy.lib.monash.edu.au/article/10.1007/s11251-013-9297-y>**

Discusses how the IDEAS (Interface Design Experience for the Autistic Spectrum) method can be used to collaborate with children with Autism (ASD) in the technology design process and explores whether this method of participatory design can also be beneficial to typically developing children. The method was trialled with four design teams, two teams of which were formed of children with ASD, in a series of six, weekly design sessions focused on designing a maths game. The authors conclude that the method appears to be useful in enabling children with Autism and more challenging mainstream school children in the design process.

**59. Summer Enrichment Program, 2013, Carroll Centre for the Blind, USA – <http://carroll.org>**

In conjunction with start-up company 'Visus Technology' and with funding from the Verizon Innovation Program children attending the program were engaged to test and provide feedback on the development of mobile phone software which aims to assist people with vision impairments during its development phase.

**60. Co-Creating Spaces: The Tag Project, 2013, Emily Carr University of Art + Design, Canada – <http://current.ecuad.ca/co-creating-spaces-the-tag-project-by-beayue-louie>**

Participatory design was explored by having design students collaborate with children with special learning needs to create a textile-based product from reclaimed fabric that endorsed sustainability among both the users and the designers. The design students reported that by allowing the children to direct the project rather than merely inform it that they were compelled to design directly for their needs rather than an interpretation of their needs.

**61. SID – Sensuousness, Interaction and Participation, Current, Sweden – <http://sid.design.org/english/>**

The SID project started July 1, 2010 and is about Snoezelen. Snoezelen is a method based on the use of a multisensory experience room designed to awaken children's interests. It offers them the opportunity to discover, explore and experience at their own pace. The Snoezelen room arouses curiosity, the urge to try and act, and to communicate; but it also can offer a haven of calm and relaxation. Here you can find experiences for the senses in a stimulating and attractive setting. The room can be varied and adapted to each child's individual needs for security and a utilization that places no demands. The aim of the SID – Sensuousness, Interaction and Participation – is to further develop the Snoezelen concept to create new opportunities for children with developmental disabilities to utilize today's interactive possibilities. In the experience rooms SID aims to develop there will be new possibilities for sensuousness, interaction and participation, both as stimulation for the senses and relaxation as well as occasions for activity in fellowship and social relations with people and things. The project will be run in close cooperation with three Snoezelen organizations in Malmö, Lund och Gentoft. Approximately 25 children in compulsory school age will participate in the project. Great emphasis is placed on the formulation of design and development processes so that the children can participate and influence the results.

**62. Play-and-learn activities for children with a cochlear implant, PhD dissertation, 2010, Denmark – <http://www.dcdr.dk/uk/menu/update/webzine/articles/play-and-learning-are-closely-interrelated>**

In a strategic research project, the design researcher is part of a team that involves users, that is, parents and children, as well as experts – audiologists and speech therapists. In this interdisciplinary work, the design researcher can reconcile the different points of departure in the team by imagining and envisioning future scenarios.

**63. Lecture: Interaction Design for and with children with disabilities. DEVICE Module 4 – Capabilities; 21.2.2014. Eva Erikson, Chalmers University Sweden**

The objective of this lecture is to provide a short overview of interaction design for and with children with disabilities. List of the main content of the lecture: What is a disability? Related design work; The Inclusionary Model; Children in the Centre framework; The SID Project; STEP; What is an intellectual disability? What is special education? Exercise: *The design exercise is to design alternative ways of allowing children with intellectual disabilities to login into systems; a replacement for the traditional way of using a username and a password.*

## 4. Exemplary organisations for transferability activities

Fifteen organisations/projects were shortlisted by the WP4.3 lead partner as part of Stage 2 activities. These organisations were subjected to a further ranking process by all DEVICE partners using a 5-point scale [1 (low) to 5 (high)] to rate each of the criteria identified above. Ratings were summed across all categories and the two highest ranked organisations were:

- (No. 32) The Helen Hamlyn Centre for Design: Age and Ability Research Lab, Royal College of Art, UK
- (No. 33) Georgia Tech: Center for Assistive Technology and Environmental Access (CATEA), USA

The two organisations represented exemplary DEVICE design focused activities both within and outside Europe, specifically, the United Kingdom and the United States of America, and demonstrated high quality and range of engagement across all three domains of children, elderly and disability. Further details of the activities of the Helen Hamlyn and Georgia Tech Centres are summarised below in the table below.

### 4.1.1. Case studies

Table 4 Summary description of exemplars of good practice in DEVICE-design

1. Title	<b>The Helen Hamlyn Centre for Design: Age and Ability Research Lab, Royal College of Art.</b>
2. Country	United Kingdom (UK)
3. Sector	General Transportation ICT devices Home appliances Toys Built environment Smart environment
4. Target Groups	Children Elderly Disability
5. Typology	Education and Research
6. Key Content	The Helen Hamlyn Centre for Design at the Royal College of Art undertakes design research and projects with industry that will contribute to improving people's lives. The Centre's approach is inclusive and interdisciplinary. Activities of the Age & Ability Research laboratory focus on design for a more inclusive society irrespective of age and ability
7. Delivery Mode	Web based and face-to-face: resources, design awards for students, research; development design activities; conferences and workshops
8. Innovation	The Research Lab creates practical design ideas to improve the lives of people of all ages and abilities. Projects undertaken by the Age & Ability Research Lab are organised into four research strands: The first three strands focus on projects with industry and research council projects. The fourth strand, the Business of Inclusive Design, looks at engaging with practising designers and business through knowledge transfer mechanisms such as workshops, events and the creation of tools and resources. Projects address the major challenges of daily living, drawing on techniques from design ethnography and inclusive design, to better understand needs and aspirations. Importantly, people are considered as equals in the process, and the designers work closely with diverse groups of older, younger and differently-abled people throughout their research. An example of innovative current activity at the centre is: <i>Enabling Technology : creating an inclusive approach to digital technology.</i> <a href="http://www.hhc.rca.ac.uk/5301-5317/all/1/Independence-Through-Technology-.aspx">http://www.hhc.rca.ac.uk/5301-5317/all/1/Independence-Through-Technology-.aspx</a> . Working with partners from the telecommunications and disability sectors, researchers created two families of devices: a 'Pop-up Reader' stand that allows a visually impaired person to read a letter with their smartphone; and 'Tailored Touch', a way of turning easily adapted objects, or even existing surfaces into cheap, robust and highly personalised replacements for computer interfaces.
9. Transferability	The Centre collaborates with business, academic, government and sector partners. Activities include development of innovative and empathic research methods, and knowledge exchange through education, events, publications and industrial collaboration. Two examples of the Centre's knowledge transfer activities are: their Include Conferences and Challenge Workshops.

	The Centre hosts series of biennial conferences, called <i>Include</i> , which aim to develop the theory and practice of inclusive design. A specific focus is on bringing academics and practitioners together. The most recent Include Asia 2013 was held in Hong Kong, and is an example of the Centre's capacity to reach a broad network outside the UK and Europe. Additionally, the Centre hosts the international Challenge Workshops which focuses on inclusive design practice as a tool for innovation and is aimed at designers and business organisations.
10. Institution	Royal College of Art.
11. Actors involved	The Centre engages with four design communities: students, new graduates, professional designers and academics.
12. Contact	The Helen Hamlyn Centre for Design Royal College of Art Kensington Gore London SW7 2EU +44 (0)20 7590 4242 <a href="mailto:hhcd@rca.ac.uk">hhcd@rca.ac.uk</a>
13. Web link(s)	<a href="http://www.rca.ac.uk/research-innovation/helen-hamlyn-centre/research_lab/age_ability_research_lab/">http://www.rca.ac.uk/research-innovation/helen-hamlyn-centre/research_lab/age_ability_research_lab/</a>
<b>1. Title</b>	<b>Georgia Tech: Center for Assistive Technology and Environmental Access (CATEA)</b>
2. Country	United States of America (USA)
3. Sector	General Transportation ICT devices Home appliances Toys Built environment Smart environment
4. Target Groups	Disability Elderly Children
5. Typology	Education/research Institution
6. Key Content	CATEA is a multidisciplinary engineering and design research center dedicated to enhancing the lives of people with all levels of ability and functional limitations through the development and application of assistive and universally designed technologies. Rather than focusing on disability, seeing people as "disabled," CATEA believes that the limitations of current technologies and the design of the built environment account for the difference between any individual's potential and his or her ability to perform activities and participate in society. CATEA aims to minimize those limitations.
7. Delivery Mode	Teaching, research and design development and testing activities are conducted across a number of disciplines and clustered under four laboratories: the Rehabilitation Engineering And Applied Research Laboratory (REAR Lab), the Accessible Workplace Laboratory, the Enabling Environments Laboratory (EE lab), and the Accessible Education and Information Laboratory.
8. Innovation	Strong cross disciplinary focus; broad activity brief: education, research, design development, standards testing etc. An example of innovative coursework is a graduate course: Universal Design Investigations and Applications - ID-6800 A: The Talking Playground. The Talking Playground is a design project undertaken in collaboration with the Atlanta Speech School to create inclusive play experiences for all children. Utilizing the Principles of Universal Design, the

	Talking Playground’s goal is to enable pleasurable, self-motivated, imaginative play that is free of rules imposed by adults. Most importantly, the design should promote social interaction; not only as spontaneous communications among the children, but also as formal and informal learning opportunities between teachers and students through drawing teachers into play experience.
9. Transferability	Through its teaching activities and four laboratories, CATEA creates solution to a wide variety of design briefs, with strong potential for transferability to a wide network of students, professionals, teachers and consumers (see <a href="http://www.catea.gatech.edu/For_consumers.php">http://www.catea.gatech.edu/For_consumers.php</a> )
10. Institution	Georgia Tech
11. Actors involved	CATEA brings together the diverse talents of many different types of engineers, scientists, clinicians, and other professionals, drawing them from the College of Architecture, the broader Georgia Tech community, and a wide range of other educational and research organizations across the U.S. Importantly, CATEA engages with end users, through a network of older adults and people with disabilities that test prototypes, products, and services to help improve them through focus groups, testing, and surveys.
12. Contact	Georgia Institute of Technology, College of Architecture 490 Tenth Street, NW Atlanta, Georgia 30332-0156 U.S.A. Phone 404-894-4960 (V/TTY) Fax 404-894-9320 <a href="http://catea.gatech.edu">http://catea.gatech.edu</a>
13. Web link(s)	<a href="http://www.catea.gatech.edu/">http://www.catea.gatech.edu/</a>

## 4.1.2. Interviews

Stage 3, follow up activities included contact with organisations by email to introduce the DEVICE project and invite their participation in an interview to discuss more detailed information on design philosophy and activities. This activity was important for knowledge translation and dissemination of design vision and ideas relevant to DEVICE.

At the time of writing the report, one interview had been conducted. The interviewee was a senior research scientist with architecture training and currently engaged in teaching and development of accessible and universal design at Georgia Tech CATEA.

The interview followed a similar format to those conducted with professionals/industry in WP2, including questions to elicit information on skills, methods and techniques that are considered important for successful teaching of design for vulnerable generations: children, elderly, disability. Additionally, the interview invited commentary on a vision for design for vulnerable generations. Excerpts from the interview are summarise in Table 4.2 below.

**Table 4.1 Summary of interview outcomes for Georgia Tech CATEA**

Skills and methods	<p><i>The functional limitation of a subject shall be examined within his/her daily environment and may depend on the context situation.</i></p> <p><i>The direct participation of elderly people or children to the design process may not be possible: in an ideal world they shall be included but sometimes it's easier to work with their surrogates, i.e. care specialists, expertize and also designer.</i></p>
Techniques for translation of user needs	<p><i>...understand what are the activities the users are engaged (in)...</i>  <i>By ... observation ... try to develop design criteria and ...collect enough evidence of users' needs but ... also rely on professionals with a relevant experience in the field of aging.</i></p>
Vision	<p><i>...put <b>ability</b> under examination as a continuum during life: it is an arbitrary definition, it's the environment that creates the man so it's important to understand when a physical disease can be considered a disability. As a first step, designers shall concentrate their efforts in a project to create an object that everyone can easily use, that's why we can talk about "Universal design".</i></p>

## 5. Conclusion

Results of the WP4.3 review task described here have provided broad insights into the scope of DEVICE-related design activities for young and elderly conducted by organisations outside Europe as well as activities for people with disabilities globally. Some limitations were identified with the review process. Specifically, the search was restricted to English language documents and websites and relied on a Google scholar search conducted from one site (Australia) and therefore was not exhaustive and the same output may not have been produced had the search been conducted in a different country. Notwithstanding these limitations, the review highlighted a large number of exemplary design activities, globally. A significant outcome was the identification of two high-profile organisations, and the commencement of engagement in knowledge translation and dissemination activities which has rich potential for expanding the current reach and impact of the DEVICE project.