Disabled entrepreneurship and self-employment: The role of technology and policy building

Vaziri, D., Schreiber, D., Wieching, R. and Wulf, V.

Background Paper for the OECD Project on Inclusive Entrepreneurship

OECD
BETTER POLICIES FOR BETTER LIVES

LEED
BUILDING MORE & BETTER JOBS

Authorised for publication by Sergio Arzeni, Director, Centre for Entrepreneurship, SMEs, Tourism and Local Development

1 Introduction

The risk of poverty in the EU is significantly higher for disabled people than for people without disabilities. 21.1 per cent of disabled people face that risk, compared to 14.9 per cent of people without disabilities (Hauben et al. 2012). A main reason for this disparity can be found in the low employment rates of disabled people, which are a cause for and/or a consequence of their social exclusion (Greve 2009; Hauben et al. 2012). Labor market integration of disabled people through employment is still a major problem in European countries. Employment rates of disabled people are approximately 20 per cent lower than for non-disabled people (Eichhorst et al. 2010). Private and public institutions across Europe in many cases do not even fulfill quota-obligations for disabled people (Greve 2009). Therefore, workforce of people with disabilities is a severely underutilized resource in Europe. In the context of this background paper disability will be defined as:

> *Disability: An outcome of complex interactions between the functional limitations of an individual and the social and physical environment. Functional limitations can arise from a person's physical, intellectual or mental conditions* (British Government department for international development 2000).

Approximately 16 per cent of Europe's working-age population is afflicted with such a long-standing health problem or a disability (European commission 2007) Due to the ongoing ageing of citizens of industrialized countries and the associated increased susceptibility to mental and physical disorders this figure is likely to increase within the next decades (Lutz et al. 2011; Pascarelli et al. 2001). To escape poverty and social exclusion disabled people attempt to take an alternative pathway towards labor market integration. Self-employment or entrepreneurship seems to be a viable opportunity for disabled people in parts of Europe as well as in the United States of America (Eichhorst et al. 2010; Bureau of Labor Statistics 2013). As both terms are closely connected (Bell 2003), a clear differentiation is not appropriate for the content of this paper. Therefore the author refers to following definitions and will use both terms synonymously in further progress:

> *Self-employment: "Those who work for profit or fees in their own business, profession, trade or operate a farm"* (Becker 1984).

> *Entrepreneurship: A combination of the activities discovery, evaluation and exploitation of opportunities to introduce e. g. goods and services, processes and organisation structures that were not existent before* (Shane 2003).

Current data from the U.S. Bureau of Labor illustrates that in the U.S. almost twice as many people with disabilities are self-employed compared to people with no disabilities (Bureau of Labor Statistics 2013). Data material from the European Union Statistics on Income and Living Conditions (EU-SILC) shows that the self-employment rates of disabled people in southern European countries like Greece, Portugal and Romania are significantly higher (average of 31.7%) than self-employment rates of people without disabilities (average of 20.51%) in these countries (Eichhorst et al. 2010).[1] The average of the southern European countries even lies above the EU-15 average (28.11%), excluding France (Eichhorst et al. 2010). However, high self-employment rates do not equal low poverty risk. Referring to an analysis of the Czech statistical office, the at-risk-of-poverty rate in Greece is about 40.8 per cent. Portugal has a poverty risk rate of 64.5 per cent. Romania's at-risk-of-poverty rate hits approximately 65.1 per cent (Dvornáková 2012). The defined at-risk-of-poverty threshold for these inquiries refers to the Eurostat methodology and is at 60 per cent of the median equalized national

[1] See annex 1 for more detailed data.

household income (Dvornáková 2012; Eurostat 2010). States that had their national risk of poverty threshold above the EU 15 poverty threshold had a lower at-risk-of-poverty rate and vice versa. In fact, the high poverty risk rates in southern Europe are a result of economic and political circumstances, which are not in the focus of this background paper. Instead, the leading question is how self-employment rates of disabled people in European countries can be sustainably increased through technology. Therefore, this background paper will illustrate current barriers for disabled people aiming to become an entrepreneur and provide best practice policy examples that support the elimination of these barriers through the application of technology. To conclude, this paper will make recommendations for required policy actions dealing with technology, which will promote disabled people to approach the pathway into self-employment.

2 Principles

2.1 The role of technology

An individual's decision for the path of self-employment is influenced by different factors. One factor is simply put the calculation of opportunity costs (Arum and Müller 2004). For example, if the benefits of being unemployed or being employed are higher than benefits of self-employment, a decision towards self-employment will probably not be made. Another factor is the degree of independence which positively correlates with the likelihood of self-employment (Shane, A. S. 2003). But the most important factor for becoming self-employed might be self-motivation, as it is the driver which results from factors like opportunity costs or independence (Wickham 2006). Referring to Csikszentmihalyi's flow theory, motivation can be achieved or maintained if a person's capabilities are sufficient to cope with the demands of a specific situation. If a person's capabilities are insufficient for the task, the individual is more likely to abandon it (Csikszentmihalyi 1992). Disabled people are often disadvantaged to handle a complex situation like self-employment. The task is much more difficult for disabled people and in some cases even impossible compared to people without disabilities. Due to their disability they lack specific capabilities e.g. visual or mobile capabilities which aggravates self-employment. In many cases disabled people don't possess the required skills for self-employment as their education is substandard (National organisation on disability 2004). This handicap can easily decline self-motivation and further lead to damaged self-esteem. Under these conditions self-employment experience is much more unlikely. To increase the self-employment of disabled people it is therefore necessary to preserve self-motivation and self-esteem by diminishing disadvantages for people with disabilities. Technology is an important factor for disabled people to achieve and maintain self-motivation and self-esteem and to participate in social environment (Sans-Bobi, M. A. et al. 2012). Assistive technologies (AT), accessible websites and accessible applications enable disabled people to be part of the society (Seelman, K. D. 2008). For example, artificial limbs, retina implants or screen readers, which enhance inclusion and self-esteem, establish important conditions for disabled people to start a business. Moreover, technology is a crucial factor for starting a business today. Using state-of-the-art technologies like computer systems, including software and hardware, or manufacturing processes is essential to compete in today's global landscape.

Regarding the self-employment of disabled people this paper will consider technology from an **individual person** perspective, an **information society** perspective and a **business organisational** perspective. The individual person perspective refers to the basic attitude, e. g. self-esteem and self-confidence, of disabled entrepreneurs. The information society perspective concentrates on the access to data materials, which are necessary to start a successful business. At last, the business organisational perspective regards the necessity and opportunity for disabled people to structure business processes and apply appropriate leadership styles.

Technology supports an individual to efficiently manage all three perspectives to become self-employed. However, specific capabilities are required to utilize ordinary technology in an efficient and successful way subject to the context. Exemplarily requirements are the capability to perceive technology, the capability to operate with technology or the capability to understand technology. Generally, a higher education level would imply more distinct capabilities to use technology (Pick and Azari 2007). Yet people with disabilities like physical or cognitive impairments often are limited regarding these capabilities, even if they have a high education. In most cases this is due to inappropriate technologies that do not meet the requirements of people with disabilities. Therefore, the efficient utilization of technology is often not possible for disabled people. This means people with disabilities have disadvantages to obtain independent individuality (individual person perspective) as well as necessary information for self-employment (information society perspective) and to vanquish barriers to organise their business in a competitive manner (business organisational perspective).

To strengthen the self-employment of disabled people it is therefore indispensable to provide AT to them.

2.2 The role of policy

Providing accessible technology for disabled entrepreneurs is a multifarious endeavor. Three important roles for policy can be identified. First, policy has to expedite research, development and dissemination of e. g. AT. Secondly, policy has to ascertain that disabled entrepreneurs are able to afford that technology or know how to apply for public sponsorships. Third, policy has to ensure that once disabled entrepreneurs own AT, they are able to use these technologies to successfully manage processes that are necessary and obligatory for starting and maintaining a business. The first two roles are of rather great importance according to several studies, which investigated positive impacts of AT on education, employment and independence of disabled people (O'Day and Corcoran 1994; Yeager et al. 2006; Stumbo, N. J. 2009). The third role is a significant challenge for policy, as it requires committing involved public and private institutions to accessibility.

In more general, policy is an important factor of influence to promote the development and deployment of accessible technologies like AT and information technology (IT)-accessibility. However, compared to the whole market, accessibility refers to a rather small target group which in fact easily leads to negligence and/or oblivion of this topic. The role of policy has to be in supporting and announcing research and development projects with a focus on accessibility and giving incentives to developers for creating accessible technologies. Facing the ongoing demographic reality, Europe's population evolves towards an ageing society (European commission 2012). Regarding technology, requirements of disabled and elderly people are overlapping (Abou-Zahra S. et al. 2008). Moreover ageing increases the susceptibility to disabilities (Dominguez et al. 2012). So, by increasing efforts into e.g. ambient assisted living and accessible technologies, this would support both, the self-employment of disabled and elderly people, which will be an important factor for people with disabilities in future.

3 Accessible technology

3.1 History and development of accessible technologies

Subject to one's disability, many different variants of accessible technology can be found. Basically accessible technology can be distinguished into AT and IT-accessibility. Each of them either supports one perspective of self-employment, for instance the individual person perspective, or all three perspectives. The history of AT dates back into the early 1890's when the first hearing aid was patented (Miltimore 1892). In 1936 the first artificial speech synthesizer was developed by H. W.

Dudley for Bell Laboratories (Green and Blair 2011). Bell Laboratories also developed the first speech recognition system. In 1975 Kurzweil Technology invented the first optical character recognition (OCR) technology, which allows the translation of written text into digital language (Green and Blair 2011). IT-accessibility became an important topic in the late 1990's, when the U.S. Government amended section 508 of the Rehabilitation Act of 1973 (Thatcher 2006; Kline 2011). Thenceforward section 508 requires all IT purchased by the U.S. Government to comply with specific accessibility standards. After section 508 came into effect, governments of other countries started to consider and adopt similar laws and regulations (Kline 2011). For example, the German government passed an equality act in 2002, which summons the public sector to provide only accessible websites and software applications (German Federal Ministry of Justice 2007).

To evaluate whether IT is accessible or not several IT-accessibility standards has been defined over the last years. To implement these standards European countries pursue the strategy of third party IT-accessibility certifications (Kline 2011; European Commission 2008).

To date, these technologies have been drastically improved and extended to enhance the inclusion of disabled people. Current research on AT concentrates for example on gesture-based input devices for the interaction with information systems (Vatavu et al. 2009; Christiansen et al. 2011), cloud-based AT like screen readers or screen magnifiers that allow disabled people a location-independent access to computer systems (Hill 2011; Caldwell 2011) and brain-computer interfaces that allow the operation of computer systems or the control of artificial limbs with one's mind (McCullagh et al. 2010; Wolpaw and Wolpaw 2012; Carmena 2012). While the first two technologies already have been successfully commercialized the latter is still to be explored extensively. Efforts on IT-accessibility focus on the generation and acknowledgement of common international standards like web content accessibility guidelines 2.0 (WCAG 2008; Kline 2011). Even though, EU policies were able to embody laws that compel and standards that support public institutions to provide IT-accessibility (United Nations 2008; The National Archives 1995; German Federal Ministry of Justice 2007; WCAG 2008; Kline 2011; W3C 2006), a study on web accessibility in European countries conducted by the European commission came to the result that not a single public website fulfills the requirements of the international standard WCAG (Cullen et al. 2009). The study was conducted in 2009 and tested the conformance level of 102 public websites referring to the WCAG 1.0 and 2.0. A similar study conducted by the disability rights commission in 2004 investigated 1.000 private and public websites referring to the guidelines of the World Wide Web consortium. The study found that 81 per cent of the investigated websites fail to fulfil basic accessibility requirements (Disability rights commission 2004).

These results have a major impact on the **individual person**, **information society** and **business organisational** perspective for disabled people. They illustrate that the current IT-accessibility is insufficient and thereby does not support the inclusion of people with disabilities.

The development of current and future accessible technologies can significantly support disabled people in one or more self-employment perspectives, respectively. To clarify this argument the next paragraph will provide important barriers for disabled people regarding the perspectives of self-employment.

3.2 Barriers for disabled people regarding self-employment perspectives

As mentioned in section 2 AT like retina implants or artificial limbs on the one side improve inclusion, but on the other side they enhance self-esteem of disabled people. From an **individual person** perspective self-esteem is an important factor for self-employment. It increases a person's belief in its

capabilities and thereby strengthens a person's confidence that with his own abilities significant contributions to society can be realized.

However, self-esteem is only one facet of successful self-employment. To start a prosperous business a person has to analyze the market, find a demand and generate a concept how to satisfy this demand. For all these steps the most valuable resource is information. In today's **information society** gathering information is most efficient with computer systems. To enable people with different kinds of disabilities access to computer systems various AT has been developed. Blind people can use braille keyboards or touch screens to scan digital information. The latter requires the application of screen reader software that is capable to read out loud all the information displayed on the screen. Physically disabled people, who are not able to operate computer systems by mouse and keyboard devices, can use wands and sticks to simulate keyboard functionalities or trackballs to simulate mouse functionalities. Sip-and-puff systems allow them to communicate with computer systems by using air pressure on a straw, tube or wand (Microsoft Accessibility 2013). A promising technology, especially for physically disabled people, is the execution of computer actions and commands by speech or eye tracking. This allows a more convenient and efficient way to scan and gather information for people with certain disabilities. Research is continuously evolving these techniques to provide more accurate solutions to end users (Paek et al. 2007; Beelders and Blignaut 2010). A major prerequisite for the operation of these AT are websites and applications that fulfill accessibility standards like WCAG 2.0.

A successful business requires a specific degree of organisation, depending on business size (Singla 2011). **Business organisation** includes strategy, technology to carry out this strategy and an entrepreneur or employers who work towards the achievement of business objectives (Medina 2008). To generate a business strategy and make a decision for a technology entrepreneurs need information. Nowadays most information is available in digital form. Regarding blind people, the information has to be perceivable, for instance information on a website. Regarding physically disabled people the information needs to be embedded in an operable structure. By applying web accessibility standards like WCAG 2.0 the accessibility of information on the web can be assured. Further, the achievement of business objectives needs continuous planning and monitoring. To enable disabled entrepreneurs in these activities accessible business applications like business process management or enterprise resource planning systems have to be provided or developed (Vaziri and De Oliveira 2012; Vaziri and De Oliveira 2013). Finally, employers need appropriate leadership to be directed towards business objectives. As leadership style significantly depends on self-confidence and self-esteem, AT have a major influence in providing these characteristics to people with disabilities (Mourier 2012; Pech 2013).

To provide a more specific overview of barriers for disabled people who intend to start their own business section 3.3 will illustrate examples of barriers in key elements of entrepreneurship.

3.3 Barriers for disabled people in key elements of self-employment

As indicated so far, people with disabilities face plenty of barriers that impede or even prevent them to start their own business. This section will illustrate most important barriers for disabled people in key elements of entrepreneurship that can be diminished or even eliminated through technology. The regarded elements are business resources, general conditions, organisational structures and customer relationship (Kuratko 2012; Bygrave and Zacharakis 2011; Morris et al. 2011; Schaper et al. 2011).

3.3.1 Business resources

A successful business requires resources like public relations, funding, suppliers or employees. To acquire these resources and build networks it is essential for entrepreneurs to be able to communicate with business partners (Gopal 2009). In business world, communication can be distinguished into

different communication channels. The most disseminated channels are e-mail, phone call or voice mail, face-to-face conversation, fax and letter (Guffey and Loewy 2008). Depending on one's disability, a person will prefer one channel to the other. For instance, a physically disabled entrepreneur using a wheelchair will prefer e-mail, phone call and letter to face-to-face conversation, if it requires the disabled entrepreneur to visit the business partner in an unknown and maybe inaccessible area or building. For some groups of disabled people, for example blind people, communication channels like paper-based fax or letters are completely inaccessible. These groups require digital communication channels like e-mail or phone call. Even though, most parts of business to business communication is channeled through e-mails and phone calls nowadays, important fragments like the negotiation of terms and conditions or the conclusion of contracts still require paper-based communication or face-to-face conversation.

Besides communication channels, it is essential to have access to information about business resources, e. g. bank conditions, supplier proposals or recruiting platforms. Up to a certain level this information can be most efficiently gathered on the World Wide Web. As mentioned before, the information on the web has to be accessible for people with disabilities. It must be anticipated that currently, a blind entrepreneur or an entrepreneur who is not able to operate keyboard and mouse devices would have major disadvantages to find appropriate proposals from suppliers, necessary information about bank conditions or suitable employees from recruiting platforms, as the web lacks accessibility.

3.3.2 General conditions

Starting a business requires the entrepreneur to fulfill general conditions before and after business formation. Basically, the fulfillment of these conditions is an exhausting process, which demands the entrepreneur to overcome certain bureaucracies.

Before starting a business the entrepreneur has to register the business to the authorities. Depending on the authorities' organisation, the entrepreneur whether has to physically visit the authorities or alternatively can print the necessary form and send it per post. Generally, wheelchairs and artificial limbs enable physically disabled people a certain degree of mobility that facilitates them to choose the first alternative. Be that as it may, for many disabled people as well as people without disabilities it is more convenient to fill out the requested form and send it per post. This in turn presupposes specific requirements to the form. The form has to be self-explaining, so entrepreneurs with low literacy are able to fill it out. To consider the demands of blind entrepreneurs the form has to meet specific accessibility standards to ensure that it can be perceived and operated by those people.

After starting a business the entrepreneur needs to submit its tax declaration annually. To do so, most EU countries provide a paper-based and an electronic form. While a paper-based form is sufficient for most people with disabilities, blind people and people who cannot use their hands require an electronic form, so that a screen reader can read out loud the content for the blind and/or data entries can be executed by e. g. voice commands for the physical impaired. However, most tax return forms from EU authorities do not fulfill the necessary accessibility requirements. A short test, conducted by the author, evaluated electronic tax return forms from Germany, Spain and United Kingdom (Elsterweb 2013; Agencia Tributaria 2013; HM Revenue & Customs 2013) with the open source screen reader Non Visual Desktop Access (NVDA). The applied screen reader was only capable to read the Spanish tax return form.

In addition to personal tax declaration, the entrepreneur has to close the yearly accounts in a properly way. A properly annual closure requires a sound accounting. Generally, specific software applications are applied to implement appropriate accounting standards. These software applications require the

user to operate with keyboard and mouse devices. If a physically disabled person is not capable of using such devices, he would need to employ or assign someone for the job. Even though, this would raise additional costs and therefore discriminate the person against an entrepreneur without disabilities, who is capable of handling accounting by itself, the physically disabled entrepreneur could at least monitor the accounting. Different from blind users, who are not able to operate accounting software due to a lack of accessibility and have to completely depend on someone hired for the job. The incapacity of monitoring accounting can have legal consequences for the blind entrepreneur, since the entrepreneur is liable for accounting errors.

In fact, there are many more important business systems such as asset management tools, supply chain management tools or customer relationship management tools. Some of these tools do have a direct relation to law and therefore have a different importance for disabled entrepreneurs than tools that are not directly related to law.

3.3.3 Organisational structures

An entrepreneur is demanded to establish an appropriate organisational structure to be able to act and react in the marketplace (Dressler 2004; Dany 2012). Technology plays major significance for e. g. workplace operations, business operations, business accounting or business marketing (Langer 2005). So, being not capable to apply such technologies would result in competitive disadvantages for the entrepreneur. Regarding people with disabilities, one must assume that certain groups of disabled entrepreneurs would not be able to apply these technologies for establishing organisational structures, due to accessibility issues of technology.

For example, the organisation of workplace operations requires the entrepreneur to delegate tasks among the employees. Depending on the amount of employees, task delegation should be realized through electronic communication channels, as mentioned before, to maintain productivity.

The management of business operations includes the planning, governing and monitoring of processes and resources. These are essentials to allocate budgets to necessary and promising business areas and thereby maintain competiveness. Entrepreneurs apply specific software applications to increase efficiency of such business operations.

Nowadays, every single function referring to the establishment of organisational structures is deeply intermeshed with technology, in particular IT. It is inevitable for disabled entrepreneurs to apply such IT, if they seek to build necessary structures to successfully compete in the global landscape. However, most IT including these functionalities do not meet the requirements of disabled people and thereby cannot be applied by many disabled entrepreneurs.

3.3.4 Customer relationship

The three aforementioned key elements of entrepreneurship are meaningless, if there are no customers to sell the products or services to. It is the challenge of every entrepreneur to transform the customer from an abstract, unknown construct into a concrete individual, whose needs, wants and buying patterns are revealed to the entrepreneur (Jha 2008; Raab et al. 2012). To learn about one’s customers an entrepreneur can make use of communication channels explained in section 5.1.

Regarding startup businesses with a small customer base, face-to-face communication is a viable and effective method. Certainly this requires a specific degree of mobility from the entrepreneur to visit its customers. Physically disabled people sitting in a wheelchair or missing a limb are often not able to undertake such field services. Be it of mobility lack or missing self-esteem and -confidence. Technology can provide solutions and support to those people. Modified automobiles enable people in a wheelchair the level of mobility that is required to efficiently manage customer relationships through

field services. Artificial limbs can vanquish shame and return self-esteem to people with missing limbs, which supports them to appear with self-confidence to the customer.

Regarding an established business with a big customer base, face-to face communication quickly loses viability and efficiency. Other methods and technologies are required to gather customer intelligence. Again, information and communication technologies provide efficient and effective solutions. Customer relationship management (CRM) software applications are capable to track and store information about every customer. The data contains order information, support information, requests, complaints, interviews and survey responses (Jha 2008). These are valuable information enabling an entrepreneur to expand its competitive advantage. Nevertheless, the entrepreneur needs access to these information. Blind entrepreneurs and those who are not able to use keyboard and mouse devices most likely won't be able to access these information. This raises competitive disadvantages for them.

Section 5 illustrated barriers for disabled people in key elements of entrepreneurship. To this point it is shown that most barriers for successful entrepreneurship emerge from constraints referring to physical impairments and the inaccessibility of information and communication technology. The next section will provide exemplarily projects and policies from European member countries aiming to diminish or eliminate these barriers.

4 Projects and policies in European member countries

To overcome discrimination and increase the inclusion of vulnerable and marginalised groups the European Union follows a three-fold approach embedded within the European Disability Strategy 2010-2020 (European commission 2010; Dangelmaier 2010):

- Enhancement of access to mainstream services and opportunities,
- enforcement of legislation to overcome discrimination and
- development of targeted approaches to respond to the specific needs in each group

Within the Seventh Framework Programme (FP7) the European Union initiates different projects such as Digital Agenda for Europe to reach their goals. The project aims to ensure the full accessibility of public sector websites by 2015 (European commission 2013). FP7 announced the last project calls in July 2013 (European commission 2013c). In 2014 Europe will initiate Horizon 2020 (European commission 2013d). Horizon 2020 will combine all research provided by the Framework Programmes, the innovation related activities of the Competitiveness and Innovation Framework Programme (CIP) and the European Institute of Innovation and Technology. To provide an overview of current activities in Europe, this section will describe selected projects from European research areas that focus on technologies for disabled people that positively affect their self-employment. All listed projects are interdisciplinary and involve efforts from different European member countries.

The first project is called "**VERITAS**" and deals with virtual reality tools for developers. The VERITAS project is executed by a consortium composed of following members:

Table 1: VERITAS Consortium

Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. (Germany)	Scuola Superiore Di Studi Universitari e di Perfezionamento Sant'Anna (Italy)	Indesit Company S.p.A (Italy)	Universidad Politécnica de Madrid / Life Supporting Technologies (Spain)
Centre for Research & Technology Hellas / Informatics & Telematics Institute (Greece)	BYTE COMPUTER S.A. (Greece)	DOMOLOGIC Home Automation GmbH (Germany)	Universität Stuttgart (Germany)
Instituto de Aplicaciones de	RE:Lab (Italy)	LMS International NV	Asociación de Investigación

las Tecnologías de la Información y de las Comunicaciones Avanzadas (Spain)		(Belgium)	de la Industria de juguete, conexas y afines (Spain)
Centro Ricerche Fiat Società Consortile per Azioni (Italy)	Università degli studi di Trento (Italy)	ATOS Origin Sociedad Anónima Española (Spain)	Brunel University (UK)
Foundation for Research and Technology Hellas (Greece)	Virtual Reality & Multi Media Park S.p.A. (Italy)	Piaggio & C. S.p.A. (Italy)	Hypertech S.A. (Greece)
Continental Automotive France SAS (France)	Marie Curie Association (Bulgaria)	Smartex s.r.l. (Italy)	University of Salzburg (Austria)
University of Newcastle (UK)	Ceske Vysoke Uceni Technicke v Praze (Czech Republic)	Human Solutions GmbH (Germany)	I+ srl (Italy)
AGE Platform Europe (Belgium)	Universität Basel (Switzerland)	Bauunion 1905 GmbH (Germany)	

The second project is called "**Cloud4all**" and focusses on developing an inclusive infrastructure for disabled people. This project is conducted by following consortium:

Table 2: Cloud4all Consortium

Technosite (Spain)	Technische Universität Dresden (Germany)	LifeSTech (Spain)	Hoeft und Wessel (Germany)
Raising the floor (Switzerland)	OpenDirective (UK)	Astea Solutions (Bulgaria)	Fundación once (Spain)
Certh (Greece)	Fondazione don Carlo Gnocchi Onlus (Italy)	Enlogic (Greece)	Stiftung digitale Chancen (Germany)
TPVision (Netherlands)	bdigital (Spain)	Texthelp (USA)	Microsoft Accessibility (USA)
Hochschule der Medien (Germany)	SingularLogic (Greece)	Omnitor (Sweden)	Serotek (USA)
Fundación Vodafone España (Spain)	IESE Business School (Spain)	Code Factory (Spain)	Mozilla (USA)
Inclusive design research centre (Canada)	Fraunhofer IAO (Germany)	Emergya (Spain)	

The third project is called "**Enable**" and concentrates on how information and communication technology can support disabled people to overcome barriers to social participation, accessing education and employment. The project is executed by following partners:

Table 3: Enable Partners

University of Primorska (Slovenia)	Evangelische Stiftung Volmarstein (Germany)	Arhinet d. o. o. (Slovenia)
Hochschule für Technik und Wirtschaft Berlin (Germany)	Institute for Language and Speech Processing (Greece)	JISC TechDis (UK)
Civil Initiatives Development Centre (Poland)	University College Cork (Ireland)	Macquarie University (Australia)
University of Glasgow (UK)	CONSIGLIO NAZIONALE DELLE RICERCHE (Italy)	Sogang University (Republic of Korea)
Estonian Foundation for the Visually Impaired (Estonia)	RTVMC Lithuania (Lithuania)	University of Belgrade (Serbia)
University of Turku (Finland)	The Technical University of Košice (Slovak Republic)	

All projects will be illustrated following a template consisting of a description, the addressed problem, the approach, the impact and the conditions for success. The completed EU project templates can be found in the appendix section.

5 Policy recommendations

So far, this background paper illustrated important barriers for disabled people regarding self-employment and how these barriers could be overcome through technology. Section 4 described projects that concentrate on the development and improvement of technologies, which support disabled people in becoming entrepreneurs. However, the average of self-employed people with disabilities in northern and central European countries lies below 10 per cent (Eichhorst et al. 2010). The average of self-employed disabled people in the EU-27 (excluding Malta and France) is about 12.74 per cent compared to 12.16 per cent of self-employed people without disabilities (Eichhorst et al. 2010). Although these figures seem fairly even, one must consider that the unemployment rate of people with disabilities in Europe is approximately at 60 per cent, while the unemployment rate of people without disabilities is about 36 per cent (European commission 2007). This would imply a higher rate of self-employment among disabled people. Nevertheless disabled people still face plenty of insuperable barriers which prevent them to become self-employed. It is in the responsibility of policy to develop appropriate measures to diminish and eliminate these barriers for people with disabilities. The following paragraphs will provide recommendations for appropriate policy measures regarding technology.

5.1 Regulation of IT-accessibility laws

It was mentioned in section 3.1 that European countries made a commitment towards IT-accessibility by signing the convention on the rights of persons with disabilities (United Nations 2008). In addition to that, many European countries passed laws and policies regarding the accessibility of web sites and software applications for the public and private sector (W3C 2006). However, section 3.1 also showed the poor level of IT-accessibility in the public sector, which in many cases is compelled by law to provide IT-accessibility. IT-accessibility of the public sector is of rather great importance for disabled people to become self-employed. Many bureaucratic processes and required information, necessary to start a business, can be accessed through the web. Besides IT-accessibility in the public sector, self-employed people with disabilities also need the opportunity to communicate with private market actors like suppliers, potential employees or banks. But most of current laws do not go into IT-accessibility for the private sector. The best practice would be to make IT-accessibility obligatory for the public and private sector and harmonize the legal situation of European countries. As this probably will arise serious conflicts between government and the private sector, policy should first tighten IT-accessibility laws for European public institutions. After European public institutions obtained an appropriate level of IT-accessibility, policy may focus on how the European private sector can be convinced and supported, by e. g. subsidies, to take more responsibility for their IT-accessibility.

5.2 Educational framework

In general, education plays a significant role in entering and remaining self-employment (Arum and Müller 2004; Moriartry 2007; Ofiesh et al. 2002; Stodden et al. 2002; Stodden et al. 2006; Wittenburg and Maag 2002; Zwerling et al. 2002). But facts and figures from the national organisation on disability show that only 13 per cent of persons with mild and 2 per cent of persons with severe disabilities complete college degrees. In comparison, approximately 25 per cent of people without disabilities complete their college degrees (National organisation on disability 2004). Research revealed that disabled people with higher education had less difficulty in the working world than disabled people with less education and are more likely to gain financial success and improved

vocational options (Zwerling et al. 2002; Christ and Stodden 2005). At the same time research also shows that inclusion of students with disabilities on college campuses is far from being a serious and urgent topic (Stodden et al. 2006). Even though there is evidence that one of the prime barriers for disabled people to achieve higher education is the lack or inaccessibility of AT (Hanafin et al. 2007; Nochajski et al. 1999). Two studies in this field also detected a major lack of disability support providers at colleges that should help disabled people to identify and use appropriate AT for educational purposes (Christ and Stodden 2005; Stodden et al. 2006). The current research on this topic illustrates that proper education for disabled people is an important but insufficient covered issue. Policy has to focus these problems and provide solutions to ensure that disabled students get proper education tailored to their needs. For instance, this may happen through disability support providers within colleges or through external institutions which undertake this task. The major goal for policy should be to ensure equal access to education for disabled people to increase their opportunities on the labour market.

5.3 AT market standardization

To expedite the complete inclusion of disabled people it is inevitable to provide technologies that neutralize the impairments induced by diminished functions or the total loss of functions. This article already provided many examples of AT and accessible IT in section 3. To generate and disseminate appropriate accessible technologies research and development (R&D) efforts in universities as well as other public and private organisations are necessary. Common standards are needed to reduce complexity and incompatibility of accessible technologies and enable AT industry players in the European market to grow and prosper (Stack et al. 2009). Currently the European market for AT is too fragmented and distinct to allow industry players growth and prosperity. Plenty of national and regional regulations across Europe regarding AT aggravate or prevent suppliers of AT to profitably sell their products and services (Stack et al. 2009). Therefore, European policy should concentrate on single market standardization which would be obligatory to ensure compliance of industry and service providers. Experiences from the U.S. AT market have shown that obligatory standards had a vast impact on the lives of disabled people and can positively affect their self-employment (Stack et al. 2009).

5.4 Technology funding

Currently European policy mainly supports the development of accessible technologies for disabled people with a wide range of application areas such as, ambient living, accessible transport, accessible computer-interaction and many more (European Commission 2013b). In fact, many of these projects more or less affect the entrepreneurship of disabled people in some way. However, there is not a single call for projects that regard technology for disabled people from an entrepreneurial perspective. For example, there is an urgent need to initiate projects that concern with business critical software applications, such as CRM tools, accounting tools or business organisation tools for disabled entrepreneurs. In addition, it seems that public institutions, at least in Germany, do not completely understand difficulties for people with disabilities regarding e. g. business registration or tax declaration. It is necessary to identify and comprehend technology requirements of disabled entrepreneurs, as these can be different and more complex to requirements of disabled non-entrepreneurs. If the entrepreneurship of disabled people is a serious target, European policy has to advertise such projects and provide the necessary funds for implementation and uptake.

6 Summary and Conclusions

This article provides an overview of important terms and facts and figures about the self-employment of disabled people. To handle complexity of this multifarious topic, the author described three

important roles of self-employment for disabled people. Background knowledge about accessible technologies and how these technologies are able to support disabled people on their way to self-employment is illustrated. The author presented selected projects in the European environment that affect the entrepreneurship of disabled people. To promote the self-employment of people with disabilities the author gave specific recommendations for policy actions. The first implication that can be derived from this article concerns the necessity to regulate and tighten IT-accessibility laws, especially for European public institutions. Secondly, policy requires the implementation of an accessible educational framework to ensure that more students with disabilities are able to complete their college degrees and thereby build themselves a proper basis for self-employment. Thirdly, it is strongly recommended to consolidate and standardize the European AT market to ensure a high quality supply and dissemination of appropriate AT and innovative services for disabled people that help them to start their own businesses. Ultimately, policy can attract attention to and effort in the development and evaluation of accessible technologies for disabled entrepreneurs by advertising and funding such kind of R&D projects. It is a noticeable lack, that there is no European project concerning with how disabled entrepreneurs can be supported by technology.

References

Agencia Tributaria. (2013). Tax Declaration Form, available: https://www2.agenciatributaria.gob.es/es13/h/ie02100b.html?idi=ES.

Arum, R. and Müller, W. (2004). The reemergence of self-employment: comparative findings and empirical propositions. In: Arum, R. and Müller, W. (Eds.). The reemergence of self-employment: A comparative study of self-employment dynamics and social inequality, pp. 426-454.

Abou-Zahra S., Brewer, J. and Arch, A. (2008). Towards Bridging the Accessibility Needs of People with Disabilities and the Ageing Community. In: W4A '08 Proceedings of the 2008 international cross-disciplinary conference on Web accessibility (W4A), pp. 83-86.

Becker, E. (1984). Self-Employed Workers: An Update to 1983. In: Monthly Labor Review 107 (7), p. 18.

Beelders, T. R., Blignaut, P. J. (2010). Using Vision and Voice to Create a Multimodal Interface for Microsoft Word 2007. In: Association for Computing Machinery (Ed.), ETRA 2010, Austin, TX, March 22-24, pp. 173-176.

Bell, A. and La Valle, I. (2003). Combining Self-Employment and Family Life. Bristol: The Policy Press, p. 2.

Bothe, H. H., Ball, S., Evans, S., Hersh, M., Pasterny, H., Starcic, A. I., Wallbruch, R. (2013). Deliverable D2.2 - State of the art in the use of ICT to support lifelong learning by disabled people, available: http://i-enable.eu/sites/default/files/D2-2_Report_final_6.pdf.

Bureau of Labor Statistics. (2013). Persons with a disability: Labor force characteristics-2012. U. S. Department of Labor (Ed.). News release, (June 12, 2013), available: http://www.bls.gov/news.release/pdf/disabl.pdf, p. 10.

British government department for international development. (2000). Disability, poverty and development, available: http://www.handicap-international.fr/bibliographie-handicap/4PolitiqueHandicap/hand_pauvrete/DFID_disability.pdf, p. 2.

Bygrave, W. D. and Zacharakis, A. (2011). Entrepreneurship, second edition, pp. 571-580.

Caldwell, A. C. (2011). Untapped Markets in cloud computing: Perspectives and profiles for individuals with intellectual and developmental disabilities and their families. In: Stephanidis, C. (Ed.). Universal Access in HCI, Part II, HCII 2011, LNCS 6766, pp. 281-290.

Carmena, J. M. (2012). How to control a prosthesis with your mind. New brain-machine interfaces that exploit the plasticity of the brain may allow people to control prosthetic devices in a natural way. In: IEEE Spectrum, available: http://spectrum.ieee.org/biomedical/bionics/how-to-control-a-prosthesis-with-your-mind.

Christ, T. W. and Stodden, R. (2005). Advantages of developing survey constructs when comparing educational supports offered to students with disabilities in postsecondary education. In: Journal of Vocational Rehabilitation Vol. 22, pp. 23–31.

Cullen, K., Kubitschke, L., Boussios, T., Dolphin, C., and Meyer, I. (2009). Study on "Web ac-cessibility in European countries: level of compliance with latest international accessibility specifications, notably WCAG 2.0, and approaches or plans to implement those specifica-tions", European commission (Ed.), available: http://ec.europa.eu/information_society/activities/einclusion/library/studies/docs/access_comply_main.pdf.

Christiansen, L. H., Frederiksen, N. Y., Jensen, B. S., Ranch, A., Skov, M. B. and Thiruravichandran, N. (2011). Don't look at me, I'm talking to you: Investigating input and output Modalities for In-Vehicle Systems. In: Campos, P., Graham, N., Jorge, J., Nunes, N. Palanque, P. and Winckler, M. (Eds.). Human-Computer Interaction - Interact 2011. 13th IFIP TC 13 International Conference proceedings, pp. 675-691.

Cloud4all. (2013). What is Cloud4all?, available: http://www.cloud4all.info/.

Cloud4all. (2013a). Cloud4all - CLOUD PLATFORMS LEAD TO OPEN AND UNIVERSAL ACCESS FOR PEOPLE WITH DISABILITIES AND FOR ALL, available: http://www.cloud4all.info/descargas/leaflet.pdf.

Csikszentmihalyi, M. (1992). The flow experience and its significance for human psychology. In: Csikszentmihalyi, M. and Csikszentmihalyi, I. S. (Eds.). Optimal experience. Psychological studies of flow in consciousness, p. 15-35.

Dangelmaier, M. (2010). VERITAS. Project Presentation and Project Description Leaflet, Deliverable No. D4.1.3, available: http://veritas-project.eu/wp-content/uploads/2010/03/VERITAS_D4.1.3_FINAL-accessible.pdf, pp. 25-27.

Dany, C. (2012). Global Governance and NGO Participation: Shaping the information society in the United Nations, p. 45.

Dominguez, L. J. and Barbagallo, M. (2012). Antiageing strategies. In: Sinclair, A. J. Morely, J. E. and Vellas, B. (Eds.). Pathy's principles and practice of geriatric medicine, pp. 1575-1588.

Dressler, S. (2004). Strategy, Organizational Effectiveness and Performance Management: From basics to best practices, p. 85.

Dvornáková, T. (2012). At-risk-of-poverty threshold. In: Statistika Journal Vol. 2, pp. 44-61.

Disability rights commission. (2004). The Web-Access and Inclusion for Disabled People: A Formal Investigation conducted by the Disability Rights Commission, available: http://www-hcid.soi.city.ac.uk/research/DRC_Report.pdf.

Eichhorst, W., Kendzia, M. J., Knudsen, J. B., Hansen, M. O., Vandeweghe, B., Vanhoren, I., Rückert, E. and Schulte, B. (2010). The Mobility and Integration of People with Disabilities into the Labour Market. In: European Parliament (Ed.). IZA Research Report No. 29, pp. 5-78.

Elsterweb. (2013). Tax Declaration Form, available: https://www.elster.de/elfo_home.php.

Enable. (2013). About the project, available: http://i-enable.eu/?q=node/2.

European commission. (2007). Addressing the needs of people with disabilities in ESF programmes. Department of employment, social affairs and equal opportunities, available: http://ec.europa.eu/employment_social/esf/docs/peopledisabilities_en.pdf.

European commission. (2008). Consultation Workshop on web accessibility and e-accessibility, available: http://www.inst-informatica.pt/servicos/informacao-e-documentacao/biblioteca-digital/sociedade-da-informacao-1/2008/consultation-workshopon-web-accessibility-and-e.

European commission. (2010). COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS. European Disability Strategy 2010-2020: A Renewed Commitment to a Barrier-Free Europe, available: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0636:FIN:EN:PDF.

European commission. (2012). Ageing report: Europe needs to prepare for growing older, available: http://ec.europa.eu/economy_finance/articles/structural_reforms/2012-05-15_ageing_report_en.htm.

European commission (2012a). EU Research projects. Cloud4all, available: http://cordis.europa.eu/projects/rcn/101353_en.html.

European commission (2013). Digital Agenda for Europe. Digital social platforms: web-accessibility, available: https://ec.europa.eu/digital-agenda/en/content/digital-social-platforms-web-accessibility.

European commission. (2013a). Virtual and Augmented Environments and Realistic User Interactions To achieve Embedded Accessibility DesignS, available: http://cordis.europa.eu/search/index.cfm?fuseaction=proj.document&PJ_LANG=EN&PJ_RCN=11156611&pid=33&q=4CF355885539875DAF2412F379E662DD&type=sim.

European commision. (2013b). European project database, available: http://cordis.europa.eu/newsearch/index.cfm?page=simpleSearch&language=en&js=1.

European commision. (2013c). FP 7 Calls, available: http://ec.europa.eu/research/participants/portal/page/call_FP7#wlp_call_FP7.

European commision. (2013d). The EU Framework Programme for Research and Innovation, available: http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=h2020.

Eurostat (2010). Income poverty and material deprivation in European countries. 2010 edition, European Commission (Ed.), available: http://bookshop.europa.eu/en/income-poverty-and-material-deprivation-in-european-countries-pbKSRA10030/?Ca, p. 9.

German Federal Ministry of Justice. (2007). Act for the equality of people with disabilities, § 9-11 (only available in German), available: http://www.gesetze-im-internet.de/bgg/BJNR146800002.html.

Gopal, N. (2009). Business communication, pp. 3-9.

Green, R. A. and Blair, V. (2011). Keep It Simple: A Guide to Assistive Technologies, p. 6.

Greve, B. (2009). The labour market situation of disabled people in European countries and implementation of employment policies: a summary of evidence from country reports and research studies. In: Academic Network of European Disability experts (ANED)-VT/2007/005, p. 10-15.

Guffey, M. E. and Loewy, D. (2008). Essentials of Business Communication, ninth edition, p. 40.

Hanafin, J., Shevlin, M., Kenny, M. and McNeela, E. (2007). Including young people with disabilities: Assessment challenges in higher education. In: Higher Education Vol. 54, pp. 435–448.

Hauben, H., Coucheir, M., Spooren, J., McAnaney, D. and Delfosse, C. (2012). Assessing the impact of European governments' austerity plans on the rights of people with disabilities. In: European foundation centre (Ed.). European report, pp. 19-24.

Hill, E. (2011). Legal and policy implications of Cloud Computing. In: Stephanidis, C. (Ed.). Universal Access in HCI, Part I, HCII 2011, LNCS 6765, pp. 478-483.

HM Revenue & Customs. (2013). Tax Declaration Form, availbale: http://www.hmrc.gov.uk/sa/file-online.htm.

Jha, L. (2008). Customer Relationship Management: A Strategic Approach, pp. 1-10.

Kline, J. (2011). Strategic IT-Accessibility – Enabling the Organization.

Kuratko, D. F. (2012). Entrepreneurship: Theory, Process, Practice, ninth edition, pp. 76-90.

Langer, A. M. (2005). It and Organizational Learning: Managing Change through Technology and Education, pp. 31-33.

Lutz, W. et al. (2011) Demographic challenges for sustainable Development. In: International Institute for applied systems analysis (IIASA), September 30 – October 1st 2011, available: http://www.iiasa.ac.at/Research/POP/Laxenburg%20Declaration%20on%20Population%20and%20Development.html.

McCullagh, P. J., Ware, M. P. and Lightbody, G. (2010). Brain Computer Interfaces for Inclusion. In: Proceeding AH '10. Proceedings of the 1st Augmented Human International Conference Article No. 6.

Medina, R. G. (2008). Business organization and Management, p. 87.

Microsoft Accessibility. (2013). Types of assistive technology products, available: http://www.microsoft.com/enable/at/types.aspx.

Miltimore, A. E. (1892). Magneto telephone for personal wear. US Patent 466,725.

Moriarty, M. (2007) Inclusive pedagogy: Teaching methodologies to reach diverse learners in science instruction. In: Equity & Excellence in Education Vol. 40, pp. 252–265.

Morris, M. H., Kuratko, D. F., Covin, J. G. (2011). Corporate Entrepreneurship & Innovation: Entrepreneurial Development Within Organizations, third edition, pp. 32-36.

Mourier, M. (2012). Gateway to the new leadership. Self-esteem based leadership, p. 8.

National organization on disability. (2004). Survey of Americans with Disabilities.

Nochajski, S. M., Oddo, C. and Beaver, K. (1999). Technology and transition: Tools for success. In: Technology and Disability Vol. 11, pp. 93–101.

O'Day, B. L. L. and Corcoran, P. J. (1994). Assistive technology: Problems and policy alternatives. In: Archives of Physical Medicine & Rehabilitation Vol. 75 (10), pp. 1165–1170.

Ofiesh, N. S., Rice, C. J., Long, E. M., Merchant, D. C. and Gajar, A. H. (2002). Service delivery for postsecondary students with disabilities: A survey of assistive technology use across disabilities. In: College Student Journal Vol. 36 (1), pp. 94–108.

Paek, T., Gandhe, S., Chickering, D. M., Ju, Y. C. (2007). Handling Out-of-Grammar Commands in Mobile Speech Interaction Using Backoff Filler Models. In: Proceedings of SPEECHGRAM 2007, pp. 33-40.

Pascarelli, E. F. and Hsu, Y. P. (2001). Understanding Work-Related Upper Extremity Disorders: Clinical Findings in 485 Computer Users, Musicians, and Others. In: Journal of Occupational Rehabilitation, Vol. 11 (1), pp. 1-21.

Pech, M. A. (2013). The Financial Times Guide to Leadership: How to lead effectively and get results, p. 73.

Pick, J. B., Azari, R. (2007). Worldwide Digital Divide: Influences of Education, Workforce, Economic, and Policy Factors on Information Technology. In: SIGMIS-CPR'07, April 19–21, 2007, St. Louis, Missouri, USA, pp. 78-86.

Raab, G., Ajami, R. A., Gargeya, V. B. and Goddard, G. J. (2012). Customer relationship management. A global perspective, p. 6.

Sans-Bobi, M. A., Contreras, D., Sánchez, Á. (2012). Multi-Agent Systems orientated to assist with daily activities in the homes of elderly and disabled people. In: Zacarias, M., De Oliveira, J. V. (Eds.). Human-Computer Interaction: The agency perspective, p. 145.

Schaper, M., Volery, T., Weber, P. and Lewis, K. (2011). Entrepreneurship and Small Business, third Asia-Pacific edition, pp. 5-11.

Seelman, K. D. (2008). Technology for individuals with disabilities: Government and market policies. In: Helal, S., Mokhtari, M., Abdulrazak, B. (Eds.). The engineering handbook of smart technology for ageing, disability and independence, p. 63.

Shane, S. A. (2003). A general theory of entrepreneurship. The individual-opportunity nexus. UK: Edward Elgar Publishing Limited, p. 4-107.

Singla, R. K. (2011). Business Organisation and Management. p. 38.

Stack, J., Zarate, L., Pastor, C., Mathiassen, N. E., Barberà, R., Knops, H. and Kornsten, H. (2009). Analysing and federating the European assistive technology ICT industry. European commission, information society and media (Ed.), p. 20-65.

Stodden, R. A., Conway, M. A. and Whelley, T. (2002). National Summit Proceedings: Supporting Individuals with Disabilities Across Secondary, Postsecondary Education, and Employment, Available: http://www.ncset/Hawaii.edu.

Stodden, R. A., Roberts, K. D., Picklesimer, T., Jackson, D. and Chang, C. (2006). An analysis of assistive technology supports and services offered in postsecondary educational institutions. In: Journal of Vocational Rehabilitation Vol. 24, pp. 111–120.

Stumbo, N. J., Martin, J. K., Hedrick, B. N. (2009). Assistive technology: Impact on education, employment, and independence of individuals with physical disabilities. In: Journal of Vocational Rehabilitation Vol. 30, pp. 99-110.

Thatcher, J., Rutter, R., Lauke, P. H., Waddell, C., Henry, S. L., Lawson, B., Kirkpatrick, A., Heilmann, C., Burks, M. R., Regan, B., and Urban, M. (2006). Web accessibility-Web standards and regulatory compliance, pp. 9-20.

The National Archives. (1995). Disability discrimination act 1995. Part III (currently in revision), available: http://www.legislation.gov.uk/ukpga/1995/50/contents.

United Nations. (2008). Convention on the Rights of Persons with Disabilities. Article 9, available: http://www.un.org/disabilities/default.asp?id=259.

Valkova, M. G., Van Isacker, K., Lazarov, A., Grudeva, P. and Vaisilova, S. (2010). VERITAS. Dissemination plans and materials plus leaflets and posters, Deliverable D4.3.1.a, available: http://veritas-project.eu/wp-content/uploads/2011/02/VERITAS+D4.3.1.a.rar, p. 41-44.

Vatavu, R. D., Grisoni, L. and Pentiuc, S. G. (2009). Gesture recognition based on elastic deformation energies. In: Dias, M. S., Gibet, S., Wanderley, M. M. and Bastos, R. (Eds.). Gesture-based human-computer interaction and simulation. 7th International gesture workshop, revised selected papers, pp. 1-12.

Vaziri, D. D. and De Oliveira, D. (2012). Accessible business process modeling. In: World Academy of science engineering and technology Vol. 62, pp.129-138.

Vaziri, D. D. and De Oliveira, D. (2014) Improving the Accessibility of Business Process Modelling. Will be published in: Perez-Castillo, R. and Piattini, M. (Eds.). Uncovering Essential Software Artifacts through Business Process Archaeology.

VERITAS. (2013). Vision and Objectives, available: http://veritas-project.eu/about-2/.

W3C. (2006). Policies Relating to Web Accessibility, available: http://www.w3.org/WAI/Policy/#Finland.

WCAG. (2008). Web Content Accessibility Guidelines (WCAG) 2.0. W3C (Ed.), available: http://www.w3.org/TR/WCAG/.

Wickham, P. A. (2006). Strategic Entrepreneurship, fourth edition, pp. 20-23.

Wittenburg, D. C. and Maag, E. (2002). School to where? A literature on economic outcomes of youth with disabilities. In: Journal of Vocational Rehabilitation Vol. 17, pp. 265–280.

Wolpaw, J. R. and Wolpaw, E. W. (2012). Brain-Computer Interfaces: Something new under the sun. In: Wolpaw, J. R. and Wolpaw, E. W. (Eds.). Brain-Computer Interfaces. Principles and Practice, p. 3.

Yeager, P., Kaye, H. S., Reed, M. and Doe, T. M. (2006). Assistive technology and employment: Experiences of Californians with disabilities. In: Work Vol. 27 (4), pp. 333–344.

Zwerling, C., Whitten, P. S., Sprince, N. L., Davis, C. S., Wallace, R. B., Blanck, P. and Heeringa, S. G. (2002). Workplace accommodations for people with disabilities: National Health Interview Survey Disability Supplement, 1994–1995. In: Journal of Occupational and Environmental Medicine Vol. 45 (5), pp. 517–525.

Appendices

Annex 1: Self-employment of non-disabled and disabled people as part of the employed non-disabled and disabled in the EU, 2007

	Non-disabled			Disabled		
	%	**N**	**Pop.**	**%**	**N**	**Pop.**
Austria	10.56	839	508 998	14.98	474	303 068
Belgium	9.90	922	651 353	10.07	276	194 978
Bulgaria	8.02	633	431 138	4.00	55	42 728
Cyprus	12.11	779	62 109	24.89	423	28 564
Czech Republic	10.61	1 147	612 062	5.22	178	86 212
Germany	5.82	908	2 728 479	2.81	195	593 171
Denmark	5.65	294	112 526	2.26	44	16 978
Estonia	4.69	345	35 858	3.29	145	11 135
Spain	13.28	3 203	3 880 801	16.51	1 299	1 424 038
Finland	10.88	1 438	180 063	16.12	659	127 643
Greece	26.74	3 053	1 946 498	40.00	1 360	719 565
Hungary	8.49	861	492 752	6.08	308	144 243
Ireland	11.21	979	310 593	11.56	318	77 470
Italy	17.60	5 910	6 294 807	20.30	2 647	2 755 046
Lithuania	7.91	507	155 462	4.10	127	27 524
Luxembourg	6.97	490	20 680	10.54	188	8 147
Latvia	6.28	440	77 894	4.44	171	26 399
Netherlands	10.53	747	533 657	8.35	227	179 523
Poland	15.84	4 227	3 592 305	22.26	1 825	1 421 694
Portugal	13.78	1 029	846 744	27.27	982	722 860
Romania	21.02	3 018	3 020 092	27.79	1 142	933 316
Sweden	8.80	542	308 570	7.32	97	58 034
Slovenia	5.89	413	29 383	5.19	125	10 251
Slovakia	7.20	647	214 344	3.78	183	57 756
United Kingdom	9.46	1 322	3 666 652	8.70	323	818 147
EU	**12.16**	**34 693**	**30 713 821**	**12.74**	**13 771**	**10 788 490**

Annex 2: VERITAS project

Description

Virtual and Augmented Environments and Realistic User Interactions To achieve Embedded Accessibility DesignS (VERITAS)

This initiative aims to help groups in risk of exclusion, e. g. people with disabilities and older people by providing virtual reality simulation and testing tools to developers (VERITAS 2013). With these virtual reality tools developers are able to test the accessibility of domains such as automotive, smart living spaces, workplace design, infotainment, personal healthcare and wellbeing.

Problem addressed

The development process of accessible technologies is accompanied by uncertainty of target group requirements. In many cases major modifications occur after the product is developed and cause tremendous costs. VERITAS goal is to provide techniques that help avoiding major modifications after development by identifying and comprehending user requirements more accurately (VERITAS 2013).

Approach

The initiative applies a consortium as legal form, composed of 31 members representing various types of public and private organisations from different European countries. The project coordinator is Fraunhofer Corporation in Germany. VERITAS is an integrated project within the 7th Framework Programme, Theme FP7-ICT-2009.7.2, Accessible and Assistive ICT.

It receives funding of 8 Mio Euro from the European Commission and Information Society Technologies. The total costs of this project amount to approximately 11.7 Mio Euro (European Commission 2013a).

Impact

VERITAS provides fully and friendly access to information through information and communication technologies (ICT) and non ICT products. It concerns application areas such as: home, workplace and entertainment. By coping with the demands of these applications disabled people are enabled for independent living (Dangelmaier 2010).

VERITAS strengthens the global position of European industry in AT by providing a platform that enables developers to improve their products and build innovative services upon them. This can significantly enhance the dissemination of AT and new services across Europe. People with disabilities will benefit from larger supplies of AT and innovative services regarding their self-employment activities (Dangelmaier 2010).

Introducing VERITAS to the European Community will help to exploit and leverage current state of the art scattered over various excellent industrial and academic organisations in Europe, by integrating their R&D results in the VERITAS build-in accessibility support platform (Dangelmaier 2010).

Conditions for success and lessons learned

The success of the VERITAS project depends on the extensive dissemination of the platform across Europe. Therefore it is mandatory to tailor the platform to the targeted end user needs. The required policy framework to achieve this is already in place (Valkova et al. 2010).

Annex 3: Cloud4all project

Description

Cloud4all is an European Commission FP7 grant that will develop key parts of the Global Public Inclusive Infrastructure (GPII), building the knowledge base and algorithms needed and evaluating the ability of the concept to work across platforms, technologies and applications. Cloud4all/GPII aim at the following objectives (Cloud4all 2013):

Simple Instant accessibility for ALL.

Anywhere Any Device Access.

Supply and Demand better connected.

Affordable method to offer diversity needed.

Problem addressed

People with disabilities often require AT to interact with IT. Generally, the AT has to be downloaded or/and installed first. This can be a major barrier for disabled people, for example when interacting with a public computer. Cloud4all provides solutions to store AT and user profiles in a cloud for location-independent access (Cloud4all 2013a).

Approach

Cloud4all is an international project funded by the 7th Framework Programme of the European Union that will advance the concept of the GPII. The GPII is a project of Raising the Floor Consortium of academic, industry and non-governmental organisations and individuals. The initiative applies a consortium as legal form, composed of 27 members representing various types of public and private organisations from different European countries. The project coordinator is FUNDOSA TECHNOSITE S.A. in Spain (Cloud4all 2013).

Total costs of the project amount to approximately 13.1 Mio Euro. It receives funding of approximately 7.6 Mio Euro from the European commission (European commission 2012a).

Impact

Cloud4all will allow the development of ubiquitous inclusive designs. It provides usable and accessible interfaces for people having problems using products due to disability, literacy or age related barriers. This will help those people to use e.g. job application or job matching platforms and e-learning applications (Cloud4all 2013a).

The development of Cloud4all will also impact most actors of the accessible ICT and AT markets, by providing an accessible platform for their products and services (Cloud4all 2013a).

Annex 4: Enable project

Description

Enable is a European project that focusses on the investigation of how ICT can support lifelong learning for disabled people to overcome barriers to social participation, accessing education and employment (Enable 2013).

Problem addressed

Many people with disabilities use ICT to overcome barriers. However, ICT can be an enabler which increases access and participation and an additional source of barriers, depending on the design and implementation of ICT. The project aims to investigate how ICT could best be used to overcome barriers and increase opportunities (Enable 2013)

Approach

Enable is funded by the European commission and is composed of 14 partners and three third country partners. A developed questionnaire, consisting of 48 questions related to different ICT tools will be applied by the partners in their home countries. The questionnaire covers following issues (Bothe et al. 2013):

- The different ways in which ICT is used to support learning, particularly by disabled people, in their organisations.
- What they consider good and bad practice and how this good practice is illustrated in their organisations.
- The ways in which ICT is made accessible and useable to disabled adults. This should include the use of assistive learning solutions designed specifically for (particular groups of) disabled people and learning for all approaches.
- Pedagogical, methodological and end-user issues relating to the use of ICT to support learning by disabled adults, including the ways in which ICT can be used to increase rather than reduce the inclusion of disabled learners.

The survey encompasses a range of providers, teachers, or other professionals in adult education, including adult education centres, distance learning centres, colleges, universities, hospitals, prisons and community centres (Bothe et al. 2013).

Impact

The results of this project may lead to a better comprehension of how disabled people learn and how ICT can support this process. Further, these insights have the potential to identify and publicize good and best practices in the use of ICT to support learning by disabled people. This serves as an important basis for the development of accessible ICT Tools that are able to support lifelong learning of disabled people (Bothe et al. 2013).