

Journal of  
• Virtual Worlds Research

jvwresearch.org ISSN: 1941-8477



**Assembled**

**May, 2012**

**Volume 5, No. 1**

Art by: Elif Ayiter

# Volume 5, Number 1

## Assembled

### May 2012

#### Managing Editor

Yesha Sivan,  
Tel Aviv-Yaffo Academic College, Israel

#### Guest Editors

David Kurt Herold,  
The Hong-Kong Polytechnic University,  
Hong-Kong

Shailey Minocha,  
The Open University, UK

Natalia Rybas,  
Indiana University East, USA

#### Coordinating Editor

Tzafnat Shpak



The JVWR is an academic journal. As such, it is dedicated to the open exchange of information. For this reason, JVWR is freely available to individuals and institutions. Copies of this journal or articles in this journal may be distributed for research or educational purposes only free of charge and without permission. However, the JVWR does not grant permission for use of any content in advertisements or advertising supplements or in any manner that would imply an endorsement of any product or service. All uses beyond research or educational purposes require the written permission of the JVWR. Authors who publish in the Journal of Virtual Worlds Research will release their articles under the Creative Commons Attribution No Derivative Works 3.0 United States (cc-by-nd) license. The Journal of Virtual Worlds Research is funded by its sponsors and contributions from readers.



**Volume 5, Number 1**  
**Assembled 2012**  
**May 2012**

# **How do People with Disability Use and Experience Virtual Worlds and ICT: A Literature Review**

**Karen Stendal**

Molde University College / University of Agder, Norway

## **Abstract**

There is wide agreement that information and communication technology (ICT) is a valuable tool for people with disability. Several research disciplines have focused on how people with disability can take advantage of the technology available for social, educational and personal purposes. Virtual worlds represent the latest addition to the technologies available, yet there is little research on how people with disability use and experience virtual worlds. A review of research conducted in different disciplines on the affordances and challenges of virtual worlds and ICT for people with disability is presented here. The main objective was to highlight areas that lack sufficient research in the field of virtual worlds for people with disability. Understanding how use of ICT influences people with disability is important to identify the possibilities and challenges virtual worlds offer to this group. Findings from this study indicate that there is little empirical research exploring the social aspects, work opportunities and personal value virtual worlds may offer people with disability. The research reviewed points to the importance of bringing research disciplines together to accelerate knowledge about the potential and promises of virtual worlds for people with disability.

## 1. Introduction

Self-care, mobility, transportation and housing are issues that are taken for granted by most individuals. However, for those with a disability these issues can be challenging (Greenwood, 1987). People with disability may experience problems both with access to a range of community activities and in gaining acceptance within the general community (Ballin and Balandin, 2007). Challenges include being treated differently and not being perceived as equal to non-disabled peers. Societies may treat people with disability as though an impairment in one area of functioning invalidates their abilities and opportunities in others (Hammel et al., 2008).

Information and communication technology (ICT) holds great promise for people with disability because it can reduce or eliminate many barriers, which under other circumstances might impair or prevent people with disability from participating in day to day activities (D'Aubin, 2007). ICT support for people with disability has been a well-researched topic, however, there is limited research on the affordances and challenges of specific technology such as virtual worlds (VWs) for this group (Stendal, Balandin and Molka-Danielsen, 2011).

This paper synthesizes findings from different research disciplines focusing on the use and experience of ICT and virtual worlds (VWs) for people with disability. By understanding the opportunities and challenges of ICT for people with disability, we can build a broader understanding of the possible impact virtual worlds may have on people with disability. The author reviewed 54 articles, extending earlier reviews in specific areas such as VWs for rehabilitation (Standen and Brown, 2005), ICT to support caregivers of people with disability (Mattila et al., 2007), and the use of virtual reality by children with disability (McComas, Pivik and Laflamme, 1998).

The aims of this paper are to (1) present an overview of the research specific to the opportunities and challenges people with disability experience with ICT and VWs, (2) illustrate the status of research in this area, and (3) identify gaps that warrant further exploration. It can be argued that highlighting the primary research topics in this review will encourage cross-disciplinary research efforts in the future.

First, this paper presents the concepts of ICT, VWs and disability. Next, the research method is described followed by an overview of the reviewed papers and the findings from the review process. Finally, a discussion of the key findings and recommendations for future research are presented along with implications for practice and research.

## 2. Concepts

### 2.1 Disability

People with disability have been defined by the United Nations (UN) Convention as follows:

Persons with disabilities include those who have long-term physical, mental, intellectual, or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others (Leonardi et al., 2006, p. 1220).

People with disabilities often encounter difficulties such as accessibility and mobility in their day-to-day life. Accessibility and mobility are key difficulties for people with physical disability and communication impairment is often a problem (Morgan and Balandin, 1997). Many adults with lifelong disability have communication impairment. This impacts on the individual's ability to interact with others, to initiate or maintain friendships and to participate as a member of a community or society

(Jackson, 2006). Challenges related to communication (e.g., hearing, speech and/or language disorders), visual and other sensory impairments can lead to isolation (Greenwood, 1987).

## **2.2 ICT and Disability**

ICT opens new opportunities for people with disability. Technology promises to enable and empower people with disability to the same degree as their non-disabled peers (Anderberg and Jönsson, 2005). ICT, in the context of this paper, includes computer games, assistive technology (e.g., voice augmentation systems), and online communication tools (e.g., internet, e-mail, and instant messaging). Due to the main goal of this paper, virtual worlds are discussed separately in the next section.

## **2.3 Virtual Worlds**

Compared to traditional two-dimensional web environments, a three-dimensional VW environment adds a dimension in which the users are represented visually as avatars and can move around in the environment (Baker, Wentz and Woods, 2009; Minocha, Tran and Reeves, 2010). There are multiple reasons why people engage in VWs. These include seeking information, socializing and enjoying entertainment. VWs facilitate escape from real world constraints and allow participants to pursue unique activities through which they can meet and interact with others (Jung and Kang, 2010). VWs offer an interactive and unique place to engage in various activities, consequently, some people spend large amounts of time immersed in VWs (Lim, 2009).

## **3. Research Method**

The goal of a literature review is to collect and structure the large amount of accumulated knowledge in a specific area (Bryman, 2008; vom Brocke et al., 2009), and to identify the research gaps or unanswered research questions in an area (Bryman, 2008). In an effort to ensure a comprehensive and systematic method, the search procedure used here was based on that of Haddara and Zack (2011). The search was conducted between March and April 2011.

1. An initial search was conducted through EbscoHost and Web of Science. The search, limited to title and abstract, used combinations of the following keywords: ICT, virtual worlds, disability, disabilities, information communication technology, and support. This search returned 373 articles.
2. Next, a search through Google Scholar was conducted. The search procedure was restricted to the same keywords used in the previous step but limited to title only. This resulted in 63 additional articles.
3. The abstracts for the selected articles were read to ensure their relevance to the review. Only journal articles directly addressing how people with disability used and experienced ICT or VWs were selected. 45 articles were selected based on these criteria.
4. Finally, backward and forward searches were conducted based on the identified articles (vom Brocke et al., 2009). Through this search, 9 additional articles were selected, resulting in a total sample of 54 articles for this review.

## **4. Literature Review**

The 54 articles reviewed were published in 39 different outlets. Four main research disciplines were represented by the reviewed literature: Disability Studies, Information Systems (IS)/ICT research, Rehabilitation research, and Education research. There was some overlap between research disciplines.

All articles were classified into a concept matrix (Table 1) which includes research method, type of VW/ICT, and main themes of the research, as suggested by Webster and Watson (2002). Webster and Watson (2002) explained that a literature review needs to be concept-centric to succeed in synthesizing the literature. They indicated that a concept matrix provides a structure to the literature review, but also helps in clarifying the concepts from the literature review for the reader. Table 1 shows the concept matrix of the literature of this paper. The main themes identified in the review were: (1) Access to technology, (2) Inclusion, Exclusion and Empowerment, and (3) Training and Rehabilitation. Access to technology implies that how likely people with disability will have access to computers and the Internet. Inclusion, Exclusion and Empowerment, covers the outcomes of access to technology experienced by people with disability. Training and Rehabilitation, discuss how technology can be facilitate training for real life situations or experiences.

Table 1 also shows the type of VW/ICT on which the reviewed literature focuses. The “Assistive technology” category includes visual aids or technology to help individuals function in daily life. The “Other ICT” category includes e-mail, computer games, cell phones, and text handling systems. The “Custom-designed VW” category represent VWs which have a set context and not necessarily available for all, while the “Open Access Multi-user VW” category describes VWs, such as Second Life or other VWs, in principle available to all.

In addition, Table 1 shows the main research methods used by the reviewed literature. The “Other Method” category reflects articles that did not explicitly state the research method, articles based on multiple studies using multiple research methods, and articles not based on primary empirical data (i.e. editorials and conceptual papers).

These categories were not mutually exclusive and some articles were categorized within several technology and/or theme categories.

Article	Theme		Type VW/ICT					Research Method						
	Access to Technology	Inclusion, Exclusion, Empowerment Training and Rehabilitation	We-based	eLearning Tool	Assistive Technology	Other ICT	Custom-designed VW	Open Access Multi-user VW	Experiment	Case Study	Interview/Observation	Survey	Review	Other Method
Babiss (2009)	X							X						X
Banes and Walter (1997)	X		X						X					
Bowker and Tuffin (2002)	X		X							X				
Bradley and Poppen (2003)	X		X								X			
Bricout and Baker (2010)	X		X											X
Brodin (2010)	X		X								X			
Brodin and Lindstrand (2003)	X			X							X			
Brodin and Lindstrand (2004)	X		X									X		

Article	Theme		Type VW/ICT					Research Method						
	Access to Technology	Inclusion, Exclusion, Empowerment Training and Rehabilitation	We-based	eLearning Tool	Assistive Technology	Other ICT	Custom-designed VW	Open Access Multi-user VW	Experiment	Case Study	Interview/Observation	Survey	Review	Other Method
Bunning, Heath and Minnion (2009)		X	X	X						X				
Bunning, Heath and Minnion (2010)	X		X	X										X
Burstin and Brown (2010)			X				X					X		
Carr (2010)		X					X			X				
Coles, Strickland, Padgett and Bellmoff (2007)			X			X		X						
Davidson (2008)		X	X									X		
Davies, Stock and Wehmeyer (2001)		X	X											X
Dobransky and Hargittai (2006)	X		X								X			
Douglas (2001)		X		X	X				X					
Drigas, Koukianakis and Glentzes (2009)		X	X											X
Elleven, Wircenski, Wircenski and Nimon (2006)			X				X							X
Finn (1999)		X	X						X					
Ford (2001)		X					X							X
Grimaldi and Goette (1999)		X	X								X			
Guo, Bricout and Huang (2005)	X		X								X			
Gutierrez and Martorell (2011)	X	X	X			X					X			
Johnson and Hegarty (2003)		X	X							X	X			
Jones (1998)			X				X							X
Kenway (2009)		X	X											X
Lathouwers, de Moor and Didden (2009)	X		X								X			
Lewis, Trushell and Woods (2005)		X				X				X	X			
Li-Tsang, Lee, Yeung, Siu and Lam (2007)			X	X										X
Lidström, Ahlsten and Hemmingsson (2011)	X		X								X			
McClimens and Gordon (2009)		X	X						X					
McComas, Pivik and Laflamme (1998)			X				X					X		
Michailakis (2001)		X				X			X					
Moisey (2007)		X			X				X					
Moser (2006)		X	X		X									X
Myhill (2002)		X	X			X			X					
Parsons, Daniels, Porter and Robertson (2006)		X	X							X				

Article	Theme			Type VW/ICT					Research Method						
	Access to Technology	Inclusion, Exclusion, Empowerment	Training and Rehabilitation	We-based	eLearning Tool	Assistive Technology	Other ICT	Custom-designed VW	Open Access Multi-user VW	Experiment	Case Study	Interview/Observation	Survey	Review	Other Method
Parsons, Daniels, Porter and Robertson (2008)	X						X								X
Passerino and Santarosa (2008)		X			X						X				
Renblad (2003)		X		X			X					X			
Seymour (2005)		X		X							X				
Seymour and Lupton (2004)		X		X											
Smedley and Higgins (2005)			X					X			X				X
Sohlberg, Fickas, Ehlhardt and Todis (2005)		X					X				X				
Standen and Brown (2005)			X					X						X	
Standen and Brown (2006)			X					X							X
Stewart, Hansen and Carey (2010)		X							X		X				
Söderström (2009a)		X		X							X				
Söderström (2009b)		X		X		X					X				
Söderström and Ytterhus (2010)		X		X		X					X				
Taylor (2005)		X					X								X
Williams, Russell, Rattray and Grimes (2007)		X		X											X
Wilson, Foreman and Stanton (1997)			X					X						X	

**Table 1: Concept Matrix of the Literature Review**

In the following section the main research findings in each theme are presented, and representative studies are cited.

**4.1 Theme 1: Access to Technology**

Seven studies focused on the people with disability’s access to technology and related opportunities and challenges.

A common theme emerging from these studies was whether it is likely that people with disability have ready access to ICT. A survey study in China indicated that a minority of people with disability have access to the internet; this represents a digital divide (Guo, Bricout and Huang, 2005). People with disability who have access experience a significant increase in frequency of social interactions and reduction of existing barriers in the physical and social environment. The authors suggested researchers focus on how ICT can be more accessible for people with disability. This recommendation is supported by a U.S. study (Dobransky and Hargittai, 2006). Based on nationally representative data about

America's internet use, the authors concluded that people with disability are less likely to live in a household with computers, and thus are less likely to use computers or engage in online activities.

In addition to reduced access to computers and ICT, there are other barriers for people with disability. One barrier relates to the environment, such as near family or support staff. A Spanish exploratory study indicated that support staff and other close relations often make choices for people with disability, and deny them the opportunity to access a computer or the internet (Gutierrez and Martorell, 2011). The authors also concluded that there is no reason why people with a mild to moderate intellectual disability should not be able to use the internet. Care givers may not trust people with disability to use ICT or may not understand the importance of such use, and so make decisions on behalf of people with disability. Parsons et al. (2008) also pointed to the need to understand the relevance and usefulness for people with a disability when introducing communication technology. In contrast, a Swedish study based on interviews with children with physical disability demonstrated that the children were more likely to be engaged in ICT activities in their spare time, compared to their non-disabled peers, who were engaged in a broader range of activities outside of school (Lidström, Ahlsten and Hemmingsson, 2011). Unable to participate in after school activities with their non-disabled peers, the children with disability turned to technology in their leisure time.

#### **4.2 Theme 2: Inclusion, Exclusion and Empowerment**

Thirty eight studies focused on the outcomes of use of VVs and ICT. Within this theme, the main topics identified were inclusion, exclusion and empowerment.

Although access to ICT and VVs is a challenge for people with disability, ICT can be positive for those who have access. Access and use of ICT provide an opportunity for people with disability to communicate and interact with others and gain a sense of equality and inclusion. Bowker and Tuffin (2002) interviewed people with disability from New Zealand to explore the meaning of "choice to disclose" in online media. They found the flexibility of online media provided control over people with disability's disclosure of impairment, an opportunity not typically available in real world social interactions. The affordance of "normalization" enables people with disability to be included and treated as equal by their non-disabled peers. Online communities have showed a success for those with a disability (Bradley and Poppen, 2003). Based on a one-year follow up questionnaire, their study indicated that those communicating with the help of ICT discovered a new sense of friendship and show significantly reduced isolation.

ICT in special education settings gives students the tools to follow and participate more fully in the educational environment (Lewis, Trushell and Woods, 2005). The authors noted that children with Asperger's syndrome had a moderately increased ability to interact with their non-disabled classmates with the help of ICT. This applied in both social and educational settings. VVs may also be valuable in improving inclusion. The use of an avatar may help remove prejudices created by stereotypes found in real life, and thus provide a greater sense of inclusion for people with disability (Ford, 2001).

People with disability find online self-help groups and blogging important for feelings of inclusion. McClimens and Gordon (2009) conducted a study in which people with intellectual disability were introduced and trained in writing blogs over six meetings. The authors stated that the participants experienced a new form of inclusion and empowerment when able to express and share their thoughts and feelings online. However, while this study showed people with disability experienced enjoyment from the use of blogs, the authors called for additional research exploring the value of blogging.

Access to information and services through websites, which in other contexts are hard to obtain or are unavailable, gives people with disability a sense of inclusion in society as a whole (Parsons et al., 2006). Closely related to access to information and inclusion is a sense of empowerment. For people with disability, empowerment can be provided by the use of ICT (Renblad, 2003), which facilitates them to make their own decisions. With the help of ICT, people with disability can have access to information needed to make decisions. VWs may also be a means of empowerment for people with disability because they can move around in the virtual environment unconstrained by physical disability (Babiss, 2009). VWs may enrich the overall quality of life for people with disability and enhance their physical, emotional and social adjustment, through social interactions, employment and volunteer work opportunities (Stewart, Hansen and Carey, 2010).

It is easy to focus on the positive aspects of ICT for people with disability but there are obstacles which are important to note. Researchers note there are challenges when utilizing ICT and VWs. Access to the available technology is an important factor, however, if individuals cannot use the ICT provided people with disability may be neglected or excluded by their peers (Söderström, 2009b). Söderström stated that the use of ICT has become a social phenomenon, and without the right training and access, people with disability may experience exclusion rather than the promised inclusion.

Standen and Brown (2006) stated that VWs are a valuable tool for people with an intellectual disability, and virtual environments which are less complex to use are needed. The complexity of using VWs may discourage use, and lead to potential opportunities not being utilized. VWs may present potential harm for people with disability if programs fail to provide users the option to conceal disability (Ford, 2001). Some functionality offered by the VWs may reconstruct a disability (Carr, 2010). As an example, with the introduction of the voice feature to the VW Second Life, deaf students are potentially excluded. Educators lecturing in VWs need to be aware of the challenges the voice feature creates. Carr also called for further exploration of the possibilities and challenges people with disability experience in VWs.

### **4.3 Theme 3: Training and Rehabilitation**

Ten of the studies in this review were mainly focused on social training and rehabilitation with the help of ICT and VWs. This research focuses on the promises of VWs and ICT for people with disability.

Experiments using computer games for training people with disability or the use of community based ICT for teaching people with disability computer skills, demonstrate some success. For example, custom designed computer games which train children with disability what to do in case of a fire, showed an increase in their knowledge about such situations outside the gaming environment (Coles et al., 2007). In this study, children with fetal alcohol disorder played a computer game where they encountered situations incorporating street and fire hazards until mastery. After finishing the game, the children answered questions about what to do in such situations. The children were able to generalize the knowledge they had learned from the computer games into real world situations. This indicated that computer games may be a valuable tool to teach children with disability to avoid injuries and to learn important skills needed in the community.

Custom designed VWs have been in focus in rehabilitation research. In the early rehabilitation research there are few reports based on empirical studies. In a conceptual paper, Jones (1998) concluded that individuals engaging in virtual realities are showing real life improvement, but pointed to the costs and noted the minimal research at that time was a limitation. In a review, Wilson, Foreman and Stanton (1997) stated the main benefit of virtual reality for people with disability is the ability for them to

engage in a range of activities relatively free from the limitations imposed on them by their disability. The research by Wilson, Foreman and Stanton (1997) was based on mostly custom designed VWs (e.g., simulated environments), which were not open for all like the open access multi-user environment we see in VWs these days, such as Second Life.

Custom designed VWs are of value for people with disability in rehabilitation and in educational settings. While field trips may be a difficult task in special education, Smedley and Higgins (2005) suggested that virtual field trips may be a good alternative for children with a disability to visit different locations around the world. They pointed to the importance of teachers familiarizing themselves with the technology to fully utilize the potential of VWs in education. They also noted that teachers would have better control when the students are on a field trip in the VW. Another benefit of bringing virtual field trips into the special education classroom is as preparation for a real world experience (Elleven et al., 2006). The authors stated it is possible that students with a disability can learn about real-life work demands through the VW, and such experience can be a part of a successful career exploration. Also, this paper discusses custom designed VWs as a tool for educating people with disability, where the contexts of the virtual field trips are set up front.

Virtual realities have potential to reduce the effects of a disability and may prove to enhance training and skills development. Custom designed virtual realities are proving to be beneficial for people with intellectual disability to learn social skills, skills for independent living, and manufacturing skills (Standen and Brown, 2005). The skills learned in a virtual environment can be transferred to real life settings, for some but not all people with disability. People with Asperger's syndrome, for example, tend to have communication and social understanding difficulties and experience difficulties in generalization from one setting to another.

#### **4.4 Summary of Research to Date**

This review identifies how a range of ICT and VW applications are used by people with disability for enjoyment, employment, communication, friendship, education and discussion. Individuals using ICT experience independence and empowerment. Being able to participate in education, workforce and social settings using ICT, provides experiences of inclusion and may reduce feelings of isolation. Nevertheless, ICT can work against these positive outcomes for people with disability and result in increased feelings of exclusion. Low level of access to ICT, due to the cost of acquiring a computer, or care givers' lack of ICT experience can represent barriers, and are examples of people with disability not being able to take advantage of the promises offered by technology. Exclusion when using ICT has also been reported when people with disability are not accepted as equals by their peers. Lack of computer skills and incompatible technical support are also reasons for exclusion and may lead to under-use.

People with disability have experienced success in developing social skills and skills for independent living through training in custom designed VWs. Inclusion by their peers and escaping prejudice, through use of VWs, is of value for people with disability. In the special education classroom, VWs offer an opportunity to visit locations throughout the world using virtual field trips. Individuals could also participate in classroom activities from their own homes. However, technology is complex; this may be a barrier for people with disability wishing to engage in VWs.

### **5. Implications and Questions for Future Research**

In this paper, the review shows how technology can offer people with disability a wide range of opportunities and challenges. While there is high focus on ICT for people with disability, there are gaps in the research about the opportunities and challenges that VWs offer to people with disability. The

insights gained from the role of ICT in supporting people with disabilities provide a valid and a very strong starting point when considering opportunities and challenges offered by VWs for people with disability. Based on the literature review, the following challenges and research gaps were identified.

### **5.1 Access to All**

One of the challenges for people with disability is access to technology, which is found in the cross-section between VWs and ICT. A digital divide is present in some countries, and affects people with disability. Access to technology is proving to be of value for people with disability, but lack of access may mean this group is not being able to take advantage of the values technology offer. Ways to ensure access and availability of technology for people with disability warrants research. The statistics on world internet use show only 30.2% of the world population use the internet (InternetWorldStats, 2011). Only 54 % of Americans living with a disability use the internet and only 41% of the same group have broadband at home (Fox, 2011). Such figures indicate there is still a way to go in this area.

### **5.2 Open Access Multi-User Virtual Worlds**

In the twelve articles concerning VWs included in this review (ref. Table 1), eight focused on custom designed VWs where few individuals have access, three articles focused on the VW Second Life, and one focused on another open access multi-user VW. Custom designed virtual environments are designed for a special purpose and do not necessarily give users the opportunity to create content in the VW. However, open access multi-user VWs, such as Second Life, have to date not been in great focus in any research within this field. Open access multi-user VWs offer a venue where people with disability have the opportunity to be a participant and a member of a community. These are challenges people with disability experience in real life, which may be overcome or reduced by the use of VWs. Empirical research focusing on open access multi-user VWs, where in theory, all have access, will help us understand the possibilities and opportunities implied in the technology for people with disability.

### **5.3 Universal Design**

The complexity of VWs may discourage some people with disability from using the technology. The digital divide may not only be in access to technology, but also in the design and usability of VWs. Standen and Brown (2006) stated that there is a need for less complex VWs. There is a demand for universal design to facilitate more people taking advantage of services and products (Bühler, 2001). A set of international standards for VWs were presented in 2011 (Gelissen and Sivan, 2011). These standards represented the first step towards standards within VWs and between VWs and real world contexts. However, for VWs to date there are no standards for universal design. Standards could benefit people with disability who want to take advantage of the possibilities offered by the VW technology (Krueger and Stineman, 2011).

### **5.4 Employment in Virtual Worlds**

Participating through being a part of the workforce is important to people with disability, as a way to contribute to the community. However, people with disability are less likely to be employed than their non-disabled peers (Hammel et al., 2008). VWs offer the opportunity for people with disability to find employment or contribute as volunteers (Stewart, Hansen and Carey, 2010). In the fourth quarter of 2010, the web merchandise sales volume of Second Life was 956 million USD (Linden, 2011), which indicates large sums of money are invested through transactions performed in Second Life. There is a possibility to earn an income through the VW Second Life. Currently it is not known to what extent people with disability are taking advantage of this opportunity or will choose to take this opportunity in

the future. VW employment may represent a possibility for independence and empowerment, which is important for this group.

### **5.5 Volunteering in Virtual Worlds**

On Virtual Ability Island in Second Life, run by Virtual Ability Inc., people with disability are volunteering to help one another in getting familiar with VWs (Babiss, 2009). Virtual Ability Inc. helps members of their community to integrate into the virtual society, and provides an ongoing support. The community offers members information, encouragement, training, companionship, referrals to other online resources and groups, ways to contribute back to the community, and ways to have fun (VirtualAbilityInc, 2012). This possibility to contribute and, at the same time meet new people and establish friendships, from the safety of home is one of the benefits VWs offer to enhance quality of life for people with disability.

### **5.6 Social and Leisure Activities in Virtual Worlds**

VWs, such as Second Life, offer an environment which invites people to play and engage in leisure activities, relaxing and escaping from the real world (Zhou et al., 2010). Mobility challenges or prejudices can hinder or discourage people with disability to engage in activities in the real world. Stewart et al. (2010) noted people with disability experience joy and inclusion by playing and communicating in Second Life. We know people with disability are engaging in various activities in VWs (Babiss, 2009; Stendal, Balandin and Molka-Danielsen, 2011). The possibility to meet and interact with people throughout the world, to have the possibility to choose what to disclose or how to play with identity, supplies the opportunity to socialize in ways not always available in the real world. The presented ICT research shows there is potential for inclusion and empowerment, yet this still requires further research, particularly in the case of people with disability.

### **5.7 Diversity among Disabilities using Virtual Worlds**

An important factor when considering people with disability is the variety of challenges this group encounters, depending on the disability. Challenges incurred with a physical disability may differ from those incurred with an intellectual disability. As previously discussed, universal design may help an increased number of people with disability utilize the possibilities represented by VWs. An aspect requiring attention and empirical research is how different groups of people with disability experience use of VWs. By understanding the differences and challenges met by each group, support staff aiding people with disability will be better equipped to allocate the resources appropriately. Also, it is important to ensure that support staff will not become themselves a barrier to people with disability participating in virtual communities.

### **5.8 The Multi-Disciplinary Nature of the Field**

It is important to recognize the multi-disciplinary nature of research in VWs and ICT (Carr, 2010). The research presented in this review focused on technology and people with disability. The knowledge of ICT use creates a foundation for research in VWs for people with disability, due to the closely related technical aspects and benefits promised by both ICT and VWs. Because this area is focused on both the technological and human factors, it may be of great importance to unite research forces and explore this new opportunity for people with disability across disciplinary boundaries. Researchers have previously suggested a need for an increased focus on VWs in IS research (Walsh and Pawlowski, 2002), and the IS field is viewed as a natural leader in cross-disciplinary research involving humans and technologies (Lanamäki, Stendal and Thapa, 2011). Due to the multi-disciplinary nature of technology and disability,

a strong collaboration among researchers in the fields of IS, disability studies, rehabilitation and education is needed to develop the knowledge base further.

## **6. Conclusion**

This review synthesizes the existing literature and includes suggestions for future research in the domain of VWs and people with disability. Research on ICT for people with disability shows both opportunities and challenges, yet there is little research which focuses on the role of VWs for people with disability. It is important to understand the opportunities and challenges of ICT for people with disability, in order to understand the possible impact VWs may have on people with disability. The research on virtual worlds and disability is in an early stage. Of the twelve articles on virtual worlds for people with disability identified in this review, only three are based on empirical data. The remaining articles are conceptual papers, editorials and literature reviews (ref. Table 1). This indicates a need for empirical research and rigorous analysis of the possibilities and challenges VWs may offer people with disability. Considering the multi-disciplinary nature of the field such as IS, disability studies, rehabilitation and education, multi-disciplinary research teams should work together to ensure more people with disability are able to take advantage of the opportunities offered by virtual worlds.

## **Acknowledgements**

I kindly thank Bjørn Erik Munkvold, Judith Molka-Danielsen and Susan Balandin for their valuable input and feedback during the development process of this paper. In addition, I would like to thank the reviewers and editor from JVWR for their good and constructive input for improving the paper during the review process. This work is part of a Strategic College Project funded by the Norwegian Research Council.

## References

- Anderberg, P. & Jönsson, B. (2005). Being there. *Disability & Society*, 20(7), 719-733.
- Babiss, F. (2009). Heron Sanctuary. *Occupational Therapy in Mental Health*, 25(1), 1-3.
- Baker, S. C., Wentz, R. K. & Woods, M. M. (2009). Using Virtual Worlds in Education: Second Life® as an Educational Tool. *Teaching of Psychology*, 36(1), 59-64.
- Ballin, L. & Balandin, S. (2007). An exploration of loneliness: Communication and the social networks of older people with cerebral palsy. *Journal of Intellectual & Developmental Disability*, 32(4), 315-326.
- Banes, D. & Walter, R. (1997). The Internet : a new frontier for pupils with severe learning difficulties. *British Journal of Special Education*, 24(1) 27.
- Bowker, N. & Tuffin, K. (2002). Disability Discourses for Online Identities. *Disability & Society*, 17(3), 327 - 344.
- Bradley, N. & Poppen, W. (2003). Assistive technology, computers and Internet may decrease sense of isolation for homebound elderly and disabled persons. *Technology & Disability*, 15(1), 19-25.
- Bricout, J. C. & Baker, P. M. A. (2010). Leveraging online social networks for people with disabilities in emergency communications and recovery. *International Journal of Emergency Management*, 7(1), 59-74.
- Brodin, J. (2010). Can ICT give children with disabilities equal opportunities in school? *Improving Schools*, 13(1), 99-112.
- Brodin, J. & Lindstrand, P. (2003). What about ICT in special education? Special educators evaluate Information and Communication Technology as a learning tool. *European Journal of Special Needs Education*, 18(1), 71-87.
- Brodin, J. & Lindstrand, P. (2004). Are computers the solution to support development in children in need of special support? *Technology and Disability*, 16(3), 137-145.
- Bryman, A. (2008). *Social research methods (3rd ed.)*. Oxford, England: Oxford University Press.
- Bunning, K., Heath, B. & Minnion, A. (2009). Communication and Empowerment: A Place for Rich and Multiple Media? *Journal of Applied Research in Intellectual Disabilities*, 22(4), 370-379.
- Bunning, K., Heath, B. & Minnion, A. (2010). Interaction between teachers and students with intellectual disability during computer-based activities: The role of human mediation. *Technology and Disability*, 22(1-2), 61-71.
- Burstin, A. & Brown, R. (2010). Virtual Environments for Real Treatments. *Polish Annals of Medicine / Rocznik Medyczny*, 17(1), 101-111.
- Bühler, C. (2001). Empowered participation of users with disabilities in universal design. *Universal Access in the Information Society*, 1(2), 85-90.
- Carr, D. (2010). Constructing disability in online worlds: conceptualising disability in online research. *London Review of Education*, 8(1), 51-61.

- Coles, C. D., Strickland, D. C., Padgett, L. & Bellmoff, L. (2007). Games that "work": Using computer games to teach alcohol-affected children about fire and street safety. *Research In Developmental Disabilities*, 28(5), 518-530.
- D'Aubin, A. (2007). Working for Barrier Removal in the ICT Area: Creating a More Accessible and Inclusive Canada. *The Information Society*, 23(3), 193-201.
- Davidson, J. (2008). Autistic culture online: virtual communication and cultural expression on the spectrum. *Social & Cultural Geography*, 9(7), 791-806.
- Davies, D. K., Stock, S. E. & Wehmeyer, M. L. (2001). Enhancing independent internet access for individuals with mental retardation through use of a specialized Web browser: A pilot study. *Education and Training in Mental Retardation and Developmental Disabilities*, 36(1), 107-113.
- Dobransky, K. & Hargittai, E. (2006). The disability divide in internet access and use. *Information, Communication & Society*, 9(3), 313 - 334.
- Douglas, G. (2001). ICT, Education, and visual impairment. *British Journal of Educational Technology*, 32(3), 353-364.
- Drigas, A., Koukianakis, L. and Glentzes, J. (2009). An e-culture – e-museums environment for common citizens and disabled individuals. *International Journal of Digital Culture and Electronic Tourism*, 1, 4, 267-279.
- Elleven, R., Wircenski, M., Wircenski, J. and Nimon, K. (2006). Curriculum-Based Virtual Field Trips: Career Development Opportunities for Students with Disabilities. *Journal for Vocational Special Needs Education*, 28(3), 4-11.
- Finn, J. (1999). An exploration of helping processes in an online self-help group focusing on issues of disability. *Health and Social Work*, 24(3), 220-231.
- Ford, P. J. (2001). Paralysis Lost: Impacts of Virtual Worlds on Those with Paralysis. *Social Theory & Practice*, 27(4), 661-680.
- Fox, S. (2011). Americans living with disability and their technology profile. *Pew Research Center's Internet & American Life Project*. Retrieved 12 January, 2012, from <http://pewinternet.org/Reports/2011/Disability.aspx>
- Gelissen, J. & Sivan, Y. (2011). The Metaverse1 Case: Historical Review of Making One Virtual Worlds Standard (MPEG-V). *Journal of Virtual Worlds Research*, 4(3). Retrieved January 15, 2012, from <https://journals.tdl.org/jvwr/article/view/6066>
- Greenwood, R. (1987). Expanding Community Participation by People with Disabilities: Implications for Counselors. *Journal of Counseling & Development*, 66(4), 185-187.
- Grimaldi, C. & Goette, T. (1999). The Internet and the independence of individuals with disabilities. *Internet Research*, 9(4), 272-280.
- Guo, B. R., Bricout, J. C. & Huang, J. (2005). A common open space or a digital divide? A social model perspective on the online disability community in China. *Disability & Society*, 20(1), 49-66.
- Gutierrez, P. & Martorell, A. (2011). People with Intellectual Disability and ICTs. *Comunicar Scientific Journal of Media Literacy*, 36(18), 173-180.

- Haddara, M. & Zach, O. (2011). ERP Systems in SMEs: A Literature Review. *Proceedings of the 44th Hawaii International Conference on System Sciences, Kauai, Hawaii USA*.
- Hammel, J., Magasi, S., Heinemann, A., Whiteneck, G., Bogner, J. & Rodriguez, E. (2008). What does participation mean? An insider perspective from people with disabilities. *Disability & Rehabilitation*, 30(19), 1445-1460.
- Internet World Stats. (2011). *Internet Usage Statistics. The Internet Big Picture World Internet Users and Population Stats* Retrieved 2012, 2012, from <http://www.internetworldstats.com/stats.htm>
- Jackson, S. (2006). Learning to live: the relationship between lifelong learning and lifelong illness. *International Journal of Lifelong Education*, 25(1), 51-73.
- Johnson, R. & Hegarty, J. R. (2003). Websites as educational motivators for adults with learning disability. *British Journal of Educational Technology*, 34(4), 479-486.
- Jones, L. E. (1998). Does virtual reality have a place in the rehabilitation world? *Disability & Rehabilitation*, 20(3), 102-103.
- Jung, Y. & Kang, H. (2010). User goals in social virtual worlds: A means-end chain approach. *Computers in Human Behavior*, 26(2), 218-225.
- Kenway, I. (2009). Blessing or Curse? Autism and the Rise of the Internet. *Journal of Religion, Disability & Health*, 13(2), 94-103.
- Krueger, A. & Stineman, M. G. (2011). Assistive Technology Interoperability between Virtual and Real Worlds. *Journal of Virtual Worlds Research*, 4(3). Retrieved January 15, 2012, from <https://journals.tdl.org/jvwr/article/view/6125>
- Lanamäki, A., Stendal, K. & Thapa, D. (2011). Mutual Informing Between IS Academia and Practice: Insights from KIWISR-5. *Communications of the Association for Information Systems*, 29(1), 7.
- Lathouwers, K., de Moor, J. & Didden, R. (2009). Access to and use of Internet by adolescents who have a physical disability: A comparative study. *Research In Developmental Disabilities*, 30(4), 702-711.
- Leonardi, M., Bickenbach, J., Ustun, T. B., Kostanjsek, N. & Chatterji, S. (2006). The definition of disability: what is in a name? *The Lancet*, 368(9543), 1219-1221.
- Lewis, L., Trushell, J. & Woods, P. (2005). Effects of ICT group work on interactions and social acceptance of a primary pupil with Asperger's Syndrome. *British Journal of Educational Technology*, 36(5), 739-755.
- Li-Tsang, C. W. P., Lee, M. Y. F., Yeung, S. S. S., Siu, A. M. H. & Lam, C. S. (2007). A 6-month follow-up of the effects of an information and communication technology (ICT) training programme on people with intellectual disabilities. *Research In Developmental Disabilities*, 28(6), 559-566.
- Lidström, H., Ahlsten, G. & Hemmingsson, H. (2011). The influence of ICT on the activity patterns of children with physical disabilities outside school. *Child: Care, Health & Development*, 37(3), 313-321.
- Lim, H. Y. F. (2009). Who Monitors the Monitor? Virtual World Governance and the Failure of Contract Law Remedies in Virtual Worlds. *Vanderbilt Journal of Entertainment & Technology Law*, 11(4), 1053-1073.

- Linden, N. (2011). *The Second Life Economy in Q4 2010* Retrieved 11 June, 2011, from <http://community.secondlife.com/t5/Featured-News/The-Second-Life-Economy-in-Q4-2010/bap/674618>
- Mattila, E., Koskelo, J., Lappalainen, R., Salminen, J., Nyman, P., Lähteenmäki, J., Leino, T. & Korhonen, I. (2007). A concept for ICT assisted health promotion in the occupational healthcare. *Proceedings of the 29th Annual International Conference of the IEEE EMBS*, 1786-1789, Lyon, France.
- McClimens, A. & Gordon, F. (2009). People with intellectual disabilities as bloggers. *Journal of intellectual disabilities*, 13(1), 19-30.
- McComas, J., Pivik, P. & Laflamme, M. (1998). Current uses of virtual reality for children with disabilities. *Virtual Environments in Clinical Psychology and Neuroscience*, 161-169.
- Michailakis, D. (2001). Information and Communication Technologies and the Opportunities of Disabled Persons in the Swedish Labour Market. *Disability & Society*, 16(4), 477-500.
- Minocha, S., Tran, M. & Reeves, A. (2010). Conducting empirical research in virtual worlds: experiences from two projects in Second Life. *Journal of Virtual Worlds Research*, 3(1), Retrieved March 15, 2011, from <https://journals.tdl.org/jvwr/article/view/811>
- Moisey, S. D. (2007). The Inclusive Libraries Initiative: Enhancing the Access of Persons with Developmental Disabilities to Information and Communication Technology. *The Developmental Disabilities Bulletin*, 35(1-2), 56-71.
- Morgan, J. & Balandin, S. (1997). Adults with cerebral palsy: What's happening? *Journal of Intellectual & Developmental Disability*, 22(2), 109-124.
- Moser, I. (2006). Disability and the promises of technology: Technology, subjectivity and embodiment within an order of the normal. *Information, Communication & Society*, 9(3), 373 - 395.
- Myhill, C. E. (2002). ICT for access to information services for disabled people: an overview of projects and services at Gateshead Libraries Service. *Program: Electronic Library & Information Systems*, 36(3), 176-181.
- Parsons, S., Daniels, H., Porter, J. & Robertson, C. (2006). The use of ICT by adults with learning disabilities in day and residential services. *British Journal of Educational Technology*, 37(1), 31-44.
- Parsons, S., Daniels, H., Porter, J. & Robertson, C. (2008). Resources, Staff Beliefs and Organizational Culture: Factors in the Use of Information and Communication Technology for Adults with Intellectual Disabilities. *Journal of Applied Research in Intellectual Disabilities*, 21(1), 19-33.
- Passerino, L. M. & Santarosa, L. M. C. (2008). Autism and digital learning environments: Processes of interaction and mediation. *Computers & Education*, 51(1), 385-402.
- Renblad, K. (2003). How do people with intellectual disabilities think about empowerment and information and communication technology ( ICT ). *International Journal of Rehabilitation Research*, 26(3), 175.
- Seymour, W. (2005). ICTs and disability: Exploring the human dimensions of technological engagement. *Technology & Disability*, 17(4), 195-204.
- Seymour, W. & Lupton, D. (2004). Holding the line online: exploring wired relationships for people with disabilities. *Disability & Society*, 19(4), 291 - 305.

- Smedley, T. M. & Higgins, K. (2005). Virtual Technology: Bringing The World Into The Special Education Classroom. *Intervention in School & Clinic*, 41(2), 114-119.
- Sohlberg, M. K. M., Fickas, S., Ehlhardt, L. & Todis, B. (2005). The longitudinal effects of accessible email for individuals with severe cognitive impairments. *Aphasiology*, 19(7), 651-681.
- Standen, P. J. & Brown, D. J. (2005). Virtual Reality in the Rehabilitation of People with Intellectual Disabilities: Review. *CyberPsychology & Behavior*, 8(3), 272-282.
- Standen, P. J. & Brown, D. J. (2006). Virtual reality and its role in removing the barriers that turn cognitive impairments into intellectual disability. *Virtual Reality*, 10(3-4), 241-252.
- Stendal, K., Balandin, S. & Molka-Danielsen, J. (2011). Virtual worlds: A new opportunity for people with lifelong disability? *Journal of Intellectual & Developmental Disability*, 36(1), 80-83.
- Stewart, S., Hansen, T. S. & Carey, T. A. (2010). Opportunities for people with disabilities in the virtual world of Second Life. *Rehabilitation Nursing*, 35(6), 254-259.
- Söderström, S. (2009a). Offline social ties and online use of computers: A study of disabled youth and their use of ICT advances. *New Media & Society*, 11(5), 709-729.
- Söderström, S. (2009b). The significance of ICT in disabled youth's identity negotiations. *Scandinavian Journal of Disability Research*, 11(2), 131-144.
- Söderström, S. & Ytterhus, B. (2010). The use and non-use of assistive technologies from the world of information and communication technology by visually impaired young people: a walk on the tightrope of peer inclusion. *Disability & Society*, 25(3), 303-315.
- Taylor, M. (2005). Access and Support in the Development of a Visual Language: arts education and disabled students. *International Journal of Art & Design Education*, 24(3), 325-333.
- Virtual Ability Inc. (2012). *Virtual Ability Inc. a supportive environment*, Retrieved 10 April, 2012, from <http://www.virtualability.org/>
- vom Brocke, J., Simons, A., Niehaves, B., Riemer, K., Plattfaut, R. & Cleven, A. (2009). Reconstructing the giant: on the importance of rigour in documenting the literature search process. *Proceedings of the 17th European Conference on Information Systems, Verona, Italy*.
- Walsh, K. R. & Pawlowski, S. D. (2002). Virtual reality: A technology in need of IS research. *Communications of the Association for Information Systems*, 8(1), 20. Available at: <http://aisel.aisnet.org/cais/vol8/iss1/20>
- Webster, J. & Watson, R. T. (2002). Analyzing the past to prepare for the future: Writing a literature review. *Management Information Systems Quarterly*, 26(2), xiii-xxiii.
- Williams, R., Russell, U., Rattray, R. & Grimes, A. (2007). Online Accessibility and Information Needs of Disabled Tourists: A Three Country Hotel Sector Analysis. *Journal of Electronic Commerce Research*, 8(2), 157-171.
- Wilson, P. N., Foreman, N. & Stanton, D. (1997). Virtual reality, disability and rehabilitation. *Disability & Rehabilitation*, 19(6), 213-220.
- Zhou, Z., Jin, X.-L., Vogel, D., Gou, X. and Chen, X. (2010). Individual Motivations for Using Social Virtual Worlds: An Exploratory Investigation in Second Life. *Proceedings of the 43rd Hawaii International Conference on System Sciences, Hawaii*.