

7-12-2016

Scientific eventuality or science fiction: The future of people with different abilities

DeeDee M. Bennett

University of Nebraska at Omaha, dmbennett@unomaha.edu

Follow this and additional works at: <https://digitalcommons.unomaha.edu/pubadfacpub>

 Part of the [Public Affairs, Public Policy and Public Administration Commons](#)

Recommended Citation

Bennett, DeeDee M., "Scientific eventuality or science fiction: The future of people with different abilities" (2016). *Public Administration Faculty Publications*. 84.

<https://digitalcommons.unomaha.edu/pubadfacpub/84>

This Article is brought to you for free and open access by the School of Public Administration at DigitalCommons@UNO. It has been accepted for inclusion in Public Administration Faculty Publications by an authorized administrator of DigitalCommons@UNO. For more information, please contact unodigitalcommons@unomaha.edu.



SCIENTIFIC EVENTUALITY OR SCIENCE FICTION¹: THE FUTURE OF PEOPLE WITH DIFFERENT ABILITIES

“This is not science fiction...its science eventuality”
– Steven Spielberg on his film *Jurassic Park* in 1993

1. INTRODUCTION

Wireless Technology has long been defined synonymously with mobile phones. In the last 5-10 years, the definition has expanded slightly to include tablets, laptops, and smartphones. However, current wireless technology encompasses so much more! Today, in 2015, we include technologies that communicate wirelessly not just to the user but to each other and the environment, as well. Medical wireless technology has grown to include implantable devices that communicate to each other and signals information back to the doctor. Automobile-based wireless technology now includes sensors and radars that signal drivers for blind spots, nearby vehicles, and parallel parking. Aviation-based wireless technology has advanced to include commercial and personal use drones for videography and deliveries. Similarly other industries have metamorphosed due to various wireless technologies including banking, employment, education, and broadcast television, to name a few. While our lifestyles, education, community participation, and environments are quickly transforming with the help of wireless technologies, the change has been slower for many people with disabilities. Very few of these aforementioned wireless technologies were actively designed with the considerations of people with disabilities in mind. However, many of these wireless technologies were designed with inspiration from science fiction. This paper conceptualizes how to influence our current innovators to universally design the wireless technologies of the future, thirty (or more) years into the future. Since we currently use science fiction as guides to design for the widest possible number of users, perhaps we can increase the number of inclusively designed, innovative concepts depicted science fiction to encourage the development of more universally

¹ Presented at the Envisioning Inclusive FUTURES: A State of Technology Summit, Rehabilitation Engineering Center for Wireless Technologies, Georgia Institute of Technology May 14-15, 2015, Atlanta Georgia

designed wireless technologies in the real-life future. Furthermore, the influence on the science fiction genre might also help to culturally transform the perception of disability. Therefore, this paper also visualizes how the perception of disability may be culturally transformed from disabilities to just recognizing that each of us have differing abilities. To conceptualize universally design, wireless technologies 30 years into the future, this paper is based on two current well-established assumptions, (1) there is an undeniable lack of wireless technology products accessible for people with disabilities – those that are accessible were retrofitted in hindsight to be more inclusive or build as assistive technology specifically for people with disabilities and not considered mainstream products and (2) many of our most pervasive wireless technologies (designed for the mainstream) were inspired by science fiction works of our past.

2. DISABILITY

In the U.S. people with disabilities are a heterogeneous group of people with varying types of disabilities or multiple disabilities. Disability in the United States is a spectrum of differing types, including those that readily apparent, not apparent, constantly recurring, suddenly appear or disabilities with which individuals have had their entire life. A snapshot of disabilities in the U.S., as reported in the 2010 census, estimated that nearly one in five Americans (approximately 57 Million) have at least one disability (Brault, 2012). This snapshot showed that most individuals with disabilities have mobility-related disability (nearly 31 Million) or sensory-related disability (nearly 16 Million). The self-identified census survey included 8.1 Million individuals with vision-related disabilities and 7.6 Million with hearing-related disabilities (Brault 2012). Unfortunately, the census data collected in 2010 was the last time such specific information was collected. This census data also did not include the number of people with temporary disabilities. There are other disabilities in the United States including behavioral and cognitive disabilities, however, for purpose of this scientific exploration the focus is limited to mobile and sensory disabilities, representing nearly 80% of the population of people with disabilities in the U.S., per the census data.

Several perspectives have been offered to understand disability. The medical model focuses on the condition of the individual and their inability to perform certain tasks

(Jaeger, 2012; Neufeldt and Enns, 2003). Often, in this view technology is design for and not with people with disabilities. The outcome is that technology will be used to fix or assimilate people with disabilities to adopt features and characteristics much like the general population (Goggin and Newell, 2003). The social model asserts that disability is related to the society and the resistance to consider the needs of people with disabilities when designing technology (Ellis and Kent, 2011; Jaeger, 2012; Neufeldt and Enns, 2003). Both models tend to focus on the cultural perception of disability first and then use of technology for people with disability (Goggin and Newell, 2003; Ellis and Kent, 2011; Jaeger, 2012). Both models hint at the potential problems with using technology to assist, help, or change people with disabilities, especially when people with disabilities are not involved in the process (Goggin and Newell, 2003; Ellis and Kent, 2011). However, there are other models. The economic model considers primarily the costs and benefits of being a person with disability compared to not having a disability (Neufeldt and Enns, 2003) The postmodernist model does not consider that social structures shape individuals and instead focuses on the new freedoms people with disabilities may achieve in life, perhaps with the introduction of technology (Jaeger, 2012). Finally, in his book *Disability and the Internet*, Jaeger (2012) used an applied perspective to view disability as the intersection of human diversity and the environment in which the live, often shaped by attitudes in society. The perspective of this paper is more closely aligned with a combination of social and applied perspectives. While technology very well advance and enhance people with disabilities, it will also advance and enhance people without disabilities. Therefore the purpose this advancement is not to assimilate or fix people with disabilities outside of the potential future society norm to enhance everyone. This paper also does not consider the costs and benefits of adoption of such technology for either people with or without disability. The future universal design of wireless technologies should include people with disabilities in the initial stages of design to influence future cultural perceptions, much like the social model. However, our current laws and attitudes are shaping our perceptions and people with disabilities, as well. Therefore the paper discusses one very unique way of re-shaping societal perceptions through the inclusion of people with disabilities at every

step of the process starting with the artistic conceptualization of human technology interaction and use depicted in science fiction.

2.1 *Disabilities And Technology*

Currently, technology developed considering the needs of people with disabilities is either considered universally designed or assistive technology. The universal design process is one by which innovators create products that considers the needs all people, with and without disabilities of all age groups. Assistive technology is that which is conceptualized, designed and promoted for the sole use of people with disabilities, typically to assist them either in their physical capabilities or as accessible adaptors for mainstream technology. The adaptors are an additional component often at an extra cost.

Several disability policy and technology scholars have an appreciation for the potential of the universal design process (Field and Jette, 2007; Ostroff, 2011; Ellis and Kent, 2011; Foley and Ferri, 2012). However, researchers have also noticed that universal design is, at best, a smaller unique subset of mainstream design (Ostroff, 2011; Foley & Ferri, 2012). Ostroff (2011) noted that until the “attitudes of designers change to understand and appreciate people with disabilities,” universal design would remain merely a unique approach (Ostroff, 2011, 9). Foley and Ferri (2012) highlighted that accessible technology often “follows a reactive and retrofit model rather than being considered from the beginning (198).” In essence, the design of technology that is accessible for people with disabilities does not occur on a large scale; instead it is often an afterthought. Currently, there is not a category or market of wireless technologies that best in the design of accessible technologies. In 2016, Christopher Lu, the Deputy Secretary of the U.S. Department of Labor, stated:

“... our commitment to accessible technology is about basic civil rights, as well as the collective productivity of America’s workforce. That’s because inaccessible technology — from websites, to software applications, to online job applications — is preventing many people with disabilities from doing their jobs effectively, or even applying for jobs in the first place. On the other hand, when technologies are accessible to everyone, they

become powerful tools of productivity, enabling all of us to apply for and obtain employment and perform to our full potential on the job.”

While Lu’s statement is specific to employment, people with disabilities face similar challenges with technology in community participation, education, and entertainment (Foley and Ferri, 2012; Jaeger, 2012; Ellis and Kent, 2011). In his book *Disability and the Internet*, Jaeger (2012) mentioned limitations in the development of accessibility laws and the lack of accessible web content, which limit people with sensory disabilities from community participation via e-governance. E-governance is a term to describe the use of information and communications technology by government agencies to deliver public services, typically over wireless networks. Educational devices, such as Blackboard, also had accessibility limitations, as they were not initially built for universal design or to be fully accessible. Instead these devices are “divided into general and special education” per a two pronged approach (Foley and Ferri, 2012, 199). Ellis and Kent (2011) noted that Apple introduced their range of accessibility features, after the Hearing Loss Association of America filed a legal complaint against them in 2007 (36). Thus Apple’s inclusion of accessibility features followed a reactive model. Additionally, there were (and still is) concerns regarding digital television, which was introduced in 2009 without accessibility measures in place (Ellis and Kent, 2011; Federal Communications Commission [FCC], 2014).

Despite the push for universally designed products, disability as we know it could change. The present term ‘disability’ has been seen to characterize people based on their inability to do something. Goggin and Newell (2003) noticed that some have an overall perception of people with disabilities as an isolated “other” (131). Similarly, Foley and Ferri (2012) acknowledged that the social perception of assistive technology is that of providing some sort of care for dependent individuals. This perception may lead designers to think of accessibility only in terms of assistive technology.

Perhaps the use of wireless technologies may enable a traditional person with a disability to no longer be classified in the same way. Researchers have often noted how certain technologies have the potential to create a new dimension of disability, such as where people with less visible disabilities may feel they are forced to disclose their

actual disability because of the presence of technology. Goggin and Newell (2003) noted that despite the inaccessibility of technology there is still the belief that technologies are liberating for the user, e.g. Oscar Pistorius' prosthetic legs. However, in this future-forward paper, the future is conceptualized given that the universally designed technology could be customized to give users differing abilities (those with and without disabilities). Furthermore, at each stage of development people with disabilities would be involved and Yes, this is a rather out-of-the-box idea, but with the pace of technology (especially with regards to the advancements in human and genetic engineering) the discussion is important. As Harris (1992) notes, we are at the point of considering the potential ethical and moral dilemmas, since science has advanced to where nearly every type of genetic modification is already possible (Harris, 1992).

The images portrayed in science fiction often offer evidence of wireless technologies influencing culture. One of the most popular examples is from *Star Trek* (1987), in which previously blind Lt. Geordi La Forge acquired different sight abilities with the use of a special pair of glasses called, VISOR. With the use of VISOR, Lt. La Forge is able to 'see' but not how we typically see, instead the glasses gave him the ability to detect energy wavelengths of animate and inanimate objects allowing him to effectively complete his engineering job. In effect, with the use of the VISOR, Lt. La Forge no longer has the inability to see, but instead has been given the ability to see differently. This is just one example of visualizing a wireless technology also having a role in our future. It is also no coincidence that this example is from science fiction.

3. SCIENCE FICTION: IMPACT ON TODAY AND YESTERDAY

“Life imitates art far more than art imitates life.”

- Oscar Wilde

Innovators have a long history of basing their designs on conceptual ideas presented in science fiction works. For example, the father of modern mobile wireless devices, Martin Cooper, attributes his design to communication devices he saw on *Star Trek* (Rotolo, 2015). The *Star Trek* communicators, first appeared in the early 1960s, were

handheld wireless devices that allowed starship crew members to talk to each other. The flip-phones created some time after Martin Cooper's "brick" phone looked similar to the *Star Trek* communicators. Ironically, several other ideas have been inspired from the *Star Trek* science fiction franchise, for example, lead characters used handheld computers named Personal Access Display Devices which eerily resembles modern day iPads (Rotolo, 2015). If our past is any indication, the future may lay in the conceptual and slightly implausible figments of our past science fiction-based imaginations.

Most recently, the designers of Ubi likened their ambient computing design to the starship computer controls in *Star Trek* (Cass, 2015). Additionally, other researchers have begun field-testing their design of Arguss II, which is a FDA approved ocular implant that will hopefully allow blind users to see. This technology currently conceptualized as an assistive device, may instead be designed as a universally designed technology, much like the technology depicted in *Minority Report* and *Star Trek* (Jaret, 2015).

In fact, several inventions in wireless technology attribute their work to the imaginations from science fiction books, TV shows and/or film. Lewin describes the potential for holographic displays small enough to emerge from a smart phone and relates the technology to that was depicted in *Star Wars* circa 1977 (Lewin, 2014). A recent article in CNN, described a new technology from the Swiss Federal Institute of Technology in Zurich, which enables patients to swallow microscopic robots for medical monitoring and minor internal surgery, closely resembles concepts presented in *Fantastic Voyage* circa 1966 (Prisco, 2015). Even concerns about privacy and security are somewhat based on the dystopian societies depicted in science fiction movies such as *Terminator 2: Judgment Day* (Ball, 2014).

The creative writers of past science fiction seem to have a cursory influence on our modern wireless technological designs, with close to a thirty-year conceptualization lead time. Most interesting, many of the designs are based on the "supporting technology" and not the primary concept. For instance, the computer controls from the *Star Trek* design referenced above are not necessary for the overall plot. Arguably, whether the

starship computer spoke would not significantly impact the cult-like following of the star trek franchise. The same can be said for PADDs in *Star Trek*, the holographic displays in *Star Wars*, or the ocular implants of the *Minority Report*.

If the conceptual ideas of minor supporting technologies from science fiction works are inspiring our innovators, engineers, and researchers: How could these designs change what it means to be a person with disability in the future? Could we influence the creative process to change the designs or our future in the long-term?

4. BACKGROUND

Several compelling articles have been written to compare, discuss and forecast our progress in technology and how that will impact our perception with regards to gender, multiculturalism, geography and disability (Nixon, 1992; McCallum, 2000; Kitchin & Kneale, 2001; Chilcoat, 2004; Moser 2010). With regards to geography, McCallum (2000) reviewed several science fiction works to examine geography only to find that science fiction does not provide a futuristic model of geographic spaces, as assumed. Kitchin and Kneale (2001) suggested that critical review of cyber fiction (a sub-genre of science fiction) is important as it may provide visualizations of our future, or derivations of it, with regards to geography of urban areas. For example, urban planners have used science fiction as a model for future geographical spaces. Kitchin and Kneale (2001) cited a public lecture by urban planners in 1990 who would have liked to model future Los Angeles based on the visual representations presented in the cyberpunk, science fiction film *Blade Runner* (1982).

A couple of authors discuss the role of gender in science fiction; Nixon (1992) concluded that cyberpunk (a sub-genre of science fiction) does not provide revolutionary ideas with regard to gender politics. Similarly, Chilcoat (2004) reviewed cyberpunk cinema and the constraints on traditional gender roles, feminism and gender finding that the traditional roles remain.

Moser (2010), attempted to define what it means to be human, able-bodied or disabled. In one section, she reviews the cyberpunk cult classic “The Neuromancer” by William

Gibson and concluded that cyber culture does not negate disability, however, it provides augmentations and extensions to human ability. These enhancements still did not challenge or change what it means to have a disability.

While Moser (2010) examined the concept of disability through science fiction by reviewing “The Neuromancer,” this paper reviews the prospective evolution of technology that directly connects to humans as presented in several science fiction works to determine the future tech enabled human abilities that may facilitate better community living, increased employment and/or improved health for people with present day disabilities. While there are several instances of geography, building construction, industrial design and consumer product design that would greatly assist people with disabilities, this conceptual paper singularly focuses on the direct interaction of technology with human functions.

4.1 Science Fiction

For this conceptual paper, the exploration is limited to science fiction works set in relatively near future fictional time periods that incorporate wireless technologies into the story and have the potential to influence our perception of human ability, thus change our perception of disability. Therefore, the only focus of this paper is on the science fiction sub-genre cyberpunk. As a genre, science fiction is segmented into multiple sub-genres, such as space exploration, time travel, fantasy, supernatural, superhero, or military, and there are several more. Not all of the sub-genres showcase the use of wireless technologies for a near-term future. Cyberpunk is a term used to define the sub-genre of science fiction that is set in the near future and often includes advances in technology (Nixon, 1992; McCallum, 2000; Kitchin and Kneale, 2001). The overall setting for many cyberpunk books or film is that of dystopian rather than utopian societies (McCallum, 2000). Often in cyberpunk, the manipulation, implementation or enforcement of wireless technologies precipitated cause for the apocalypse or the means to utopia.

Many popular films fit into this category including *Robocop* (1987), *Minority Report* (2002), and *I, Robot* (2004). In the last ten years, this genre has continued with

Surrogates (2009), *Elysium* (2013), and most recent *Automata* (2014). Additionally, TV series have been developed that fit this category, such as *Caprica* (2010) and *Continuum* (2013- present). Several novels have been written in this category; however, “Snow Crash” by Neal Stephenson (2000) and “The Neuromancer” by William Gibson (1986) are on most top cyberpunk books lists. Wireless technologies are an integral part of the plot in each of these cyberpunk works. *Robocop* (1987) introduced the idea of implantable computers in humans. *Minority Report* (2002) showed how the progressive use of wireless technology in society could enable an authoritarian state. In fact, this is one instance in the artists enlisted the creative support of an engineer and gesture technology was designed (Kanowitz, 2015). Gesture technology is now seen in many movies often as a means to move and swipe images, documents and other data much like a maestro conducts music in an orchestra. It has also been adopted in real life by law enforcement and public safety organizations (Kanowitz, 2015).

I, Robot (2004) challenged the intelligence of assistance robots and help us visualize transportation with autonomous vehicles. *Surrogates* (2009) proposed a society in which robots are used as avatars. *Elysium* (2013) suggested a new type of society where most poor live on earth and the elite live in orbit.

In our current society, wireless technology has had a significant impact on our culture. The widespread use of social media and the Internet has assisted to introduce virtual presences (e.g. second life), as well as government transparency and interaction (Jaeger, 2012; Ellis and Kent 2011). The ubiquitous use of the mobile phone influences our communication and introduced a new tradition of texting; expectations of privacy; new methods of banking; the intermingle of work and personal life; and for the deaf and hard-of-hearing it increased community participation (Goggin, 2006). Similarly, the Internet has impacted our social interactions and psychological well being (Bargh and McKenna, 2003; Shaw and Gant, 2002).

Using the cyberpunk sub-genre as a basis upon which to explore, this paper examines the potential future of wireless technologies that can be used to challenge our current perceptions of human abilities and introduces the potential merger of the cultural

perception of disability and the dominant view on the use of technology by people with disabilities.

5. SCIENCE FICTION: SHIFTING CULTURAL VIEWS IN THE FUTURE

Relatively recent science fiction works showcase several creative conceptual ideas that could benefit the disability community. *iRobot* (2004) introduced a visual description of humanoid robots used to assist elderly individuals within their homes; similar depiction in *Automata* (2014). *iRobot* (2004) also showed autonomous vehicles, which may benefit people with variety of people with disabilities. *After Earth* (2013) conceptualized how wearable technology could inform wearers about their environment, emotional well being, and illness. *Elysium* (2013) presented the use of wearable technology in a different light. In the movie, an evasive, surgically implanted exoskeleton allowed one of the characters to walk without traditional walking aids.

Very few of the ideas listed above consider the usefulness of wireless technology for people with disabilities. Their potential uses are obvious. Perhaps, if we could influence the inspirations for the wireless technologies depicted in science fiction, we may be able to impact the way future technologies are developed.

5.1 CHANGE IN CREATIVE PROCESS

There are a few theories that discuss the steps to influence change, however, the theories do not discuss change as a form of a cultural shift. Lewin's (1947) change theory is specific organizational management and requires the presence of two opposing forces (Kritsonis, 2005). In his theory, one force drives the change and another opposes the change (Kritsonis, 2005). However, the way in which change is presented in this paper, the opposing force is cultural perception and the driving force are people with disabilities and advocacy groups. One side seems to be more quantifiable than the other and it is hard to compare the two. Within Lewin's change theory (1947), he developed a three-stage process for change; unfreeze, movement and refreeze (Kritsonis, 2005). This process is straightforward for tangible changes. Lippitt, Watson, and Westley's (1958) change theory extended Lewin's process and could be adapted for this paper. They focus on the change agent and less on the

evolution, which is similar to what is proposed in this paper. Their seven-step process is highlighted below with ideas on how it may be adapted to a cultural shift in how disabilities are perceived using science fiction creators as the change agent.

1. Diagnose the problem:

Current wireless technology designs are rarely created considering the needs of people with disability. This is most likely based on perceived market conditions (and profitability). Universal designs are only considered when economically profitable. Similarly, assistive technologies are manufactured only when the market is known (and large enough to be profitable).

2. Assess motivation/Capacity for change:

As discussed in previous sections, many of the wireless technological designs are motivated by science fiction film, TV, or literature. One single motivation for change may be to influence the wireless technological designs based on science fiction art.

3. Assess resources and motivation of change agent:

Determine a way to influence or motivate the creative artists, writers, and set designers such that they consider the needs of people with disabilities. There are at least two avenues for motivating this change: (1) encourage and seek out suggestions from people with disabilities and (2) hire people with disabilities as creative artists, writers, and set designers.

4. Chose progressive change objects:

Focus our attention on the artists who ultimately influence the innovators.

5. Role of change agents:

Their role is to become catalyst for new ways of thinking about technology and human ability. These change agents may be internal or external to the artistic process.

6. Maintain change:

Continue to challenge the views and inspirations of the innovators, such that considering people with disabilities in their designs become second nature.

7. Gradually terminate from helping relationship:

Perhaps the relationship does not formally terminate, instead it becomes less explicit over time.

Other theories may also be applied to this conceptual paper. Rogers' (1983) diffusion of innovation theory discusses the process by which an innovative idea may be rapidly diffused to an organization (Rogers, 1983). However, the idea of designing for and with the consideration of people with disabilities is heavily entwined with our societal culture. Furthermore, the diffusion would need to reach beyond just an organization.

Finally, social cognitive theory proposes that behavioral change is affected by environmental influences, personal factors and attributes of the behavior itself. This theory discusses behavioral change at an individual level. As presented in this paper, science fiction has influenced many of the wireless technologies developed. At least one researcher has used the social cognitive theory to describe the cultural effects of mass media (Bandura, 2001). Bandura examined the ubiquity of mass media manipulation as a means to diffuse innovative ideas (2001). He used television evangelists, mass marketing advertisements, and political power structures as examples of using mass media to influence individual behavior (Bandura, 2001). Similarly, the attributes of the behavioral change proposed in this paper lend to an attractive, targeted model that relates to what the innovators have already proven they care about; the science fiction genre. According to the social cognitive theory these attributes are described as most likely to produce behavior change.

As shown, the cultural shift conceptualized in this paper, transcends many of the established theories used to influence change. With further exploration, the ideas presented here may lead to a new adjustment to at least one of the theories above or a brand new theory on how to influence cultural change. To date, the closest theory that applies is the social cognitive theory.

5.2 FUTURE OF DISABILITY

Arguably, one of the most challenging ways to influence perceptions of disability is to change or influence the societal culture on how disability is included (or not). However, if we are able to influence the artists (creative individuals) that envision future technologies to consider the needs of people with disabilities, we may impact change in modern day and future universal designed devices. Given the current influences of science fiction on technology the cultural shift of people with disabilities can be achieved through universally designed technologies that equally assist those with and without a disability, or more likely both. This is an important concept to understand, the idea of universal design would be more prevalent if our societal culture was one of inclusion. Additionally, assistive technologies would be more transformative if they were not focused on assimilation of or 'fixing' people with disabilities and instead were designed together with potential users. Research into the power of technology to influence cultural change already exists. Daytor and colleagues (2011) reviewed how communication-based technologies influenced changes in societies.

For example, past and present day universal design has typically focused on common-good developments such as curb cuts in the road, wider doors in buildings, wider hallways, and better doorknob designs. Very few have been personal use items and most all have been influence by legislation such as the Americans with Disabilities Act (ADA) and the Rehabilitation Act, Section 508 (Field and Jette, 2007). In tandem, past and present day technology has typically focused on providing people with disabilities the same (or similar) capabilities and accessibilities possessed by people *without* disabilities. Examples of this include, prosthetic limbs that look and feel like arms and legs, wheeled chairs, hearing aids, and prescription glasses.

Re-imagine the future of innovation in this area as developing both universally designed and technology products such that the innovation seeks to expand and transform our current human capabilities. Only then will we see more inclusive futures where the 'dis' is removed from disability. Universally designed products would include wearable technology that can benefit and assist both people with and without disabilities equally. Additionally, next generation robots and drones will be more assistive to the human

experience at a more personal level for situations where people with and without disabilities are equally in need, e.g. a disaster situation. In terms of assistive technologies, instead of wheeled chairs or crutches, we may see an increased use of exoskeleton, which are currently in testing for use by our military. What was once seen as an assistive technology (as in designed specifically for people with disabilities), in the future could be defined as universally designed technology to be assistive to anyone (with or without a disability). Instead of prescription glasses, we may see ocular implants which allow people to see heat images or electromagnetic wavelengths. Finally, instead of 'normal' prosthetic limbs perhaps it may be useful to have wheels for legs, Swiss army knife capabilities for hands, etc., for both people with and without disabilities. The table below shows how these changes may influence a cultural shift on how technology is developed and disability is perceived.

	Universal Design		Assistive Technology		Cultural Shift
	Description	Examples	Description	Examples	
Past and Present Day	Innovative devices, architectures, landscapes created to be useful for both people with and without disabilities. Lead to well designed and thoughtful common good areas per ADA and relatively few personal use items.	Curb cuts, door knobs, closed captioning	Innovative devices, architectures, and landscapes created to be useful for people with specific disabilities. Often these products are for personal use and created based on a market need that is also profitable. Has led to many devices that mimic human behaviors as they are and not as they could be.	Wheelchairs, Prosthetic limbs,	Creating devices that ‘even the playing field.’ Encourages the ‘normalization’ of people with disabilities
Future	Same as above, except the purpose of the devices, architectures, and landscape will morph from just making our lives better to allowing us to have completely different abilities.	Wearable technology, assistive robots, drones, identifying implants	Innovative devices, architectures and landscapes created to be useful for people with certain limitations. These products will transform what we think of typical human behavior. These products may even make people without disabilities consider purchasing these products so that they may enjoy having a different ability beyond their current capabilities.	Exoskeleton, ocular implants, Prosthetic transportation	Creating devices that give people capabilities that are beyond what we can achieve now. ‘Assistive Technology’ is actually universally designed technology that may very well be more desirable among the entire populous not just people with disabilities.

Table 1: Cultural shift based on the migration of UD and AT technology from past and present to the future.

6. CONCLUSION: SCIENCE FICTION AND THE CONCEPTUAL FUTURE

There are limitations to the socially cognitive cultural shift proposed in this conceptual article. First, the article is not a comprehensive review of the cyberpunk science fiction genre. Second, the observations and explorations proposed are limited to technology that directly interacts with human beings. Several other uses for wireless technologies may influence cultural shifts indirectly. For example, building construction, geography, transportation, education and employment based wireless technologies may also significantly influence transformative cultural changes in our society. However, this article does not consider the other uses. This article is limited to the *possibility* and does not delve into affordability, which may lead to another initial divide among potential users. Finally, the ways in which policy currently influences the use and design of wireless technologies were not thoroughly discussed. The laws and regulations that guide education, employment, and community participation considering the needs of people with disability were also not explored in this article.

Future policies, however, may be influenced by the new wireless technologies. As mentioned earlier, these technologies would bring about a new way of seeing (dis)ability. With an increase in adoption from people with and without disability, the new technologies would influence how we see abilities. When people emerge with new abilities, such as fantasized in Star Trek with Geordi La Forge, new laws will undoubtedly need to be introduced.

The influx of new wireless technologies that can transform and enhance a person's abilities, will also introduce new societal concerns. This transformation is possible since many of the technologies mentioned in this paper are in development. The question going forward is: "Are we willing to allow (through laws and regulation) such innovation?" If allowed, some people (with and without disabilities) will embrace these new technologies; others will not. The ideological differences between the distinctive groups could bring about a new bias (for or against) those that use enhanced wireless technologies. This of course, would also lead to the introduction of more policies, laws, and regulations to prevent discrimination between enhanced and 'natural' people. Furthermore, this may also fuel the technology market for more wireless devices that

alter, enhance, or assist an individual's ability. This is also impossible without substantial research and conversation on the inclusion of people with disabilities at every stage of the design. Ideally, the inclusion of people should begin at the artistic level in the conceptualization of science fiction works.

Within the field of wireless technology, it seems art influences innovation, perhaps we can impact change on the perception of disability by influencing the arts. Specifically, our engineers and designers are already heavily influenced by what they see in science fiction. This paper conceptualizes a means to influence the future of wireless technology designs and the cultural perception of designing for people with disabilities by targeting the creative minds behind science fiction film, television and literature. While this idea may seem 'out of this world' – pun intended – it really isn't all that far-fetched. Several wireless technologies we currently enjoy have been attributed (by the innovator) to science fiction works created over 30 years ago.

The trend is still holding, innovations in the testing, prototype and conceptual stage today are also inspired by the imaginations of science fiction writers. Research surrounding the social cognitive theory has found similarities in how religion, politics, and commercial entities use mass media to influence our morality, values and needs. Why not conceptualize a way to use science fiction to influence how people with disabilities are perceived and what our wireless technology will enable us to do in the future? Even though Steven Spielberg was referring to Jurassic park, which is not within the cyberpunk fictional genre reviewed in this paper, he is still accurate in stating that science fiction is very much scientific eventuality.

REFERENCES

1. Bandura, A. (2001). Social Cognitive Theory of Mass Communications. In J. Bryant and D. Zillman (Eds.). *Media Effects: Advances in Theory and Research* (2nd ed., 121-153). Hillsdale, NJ: Lawrence Erlbaum.
2. Ball, P. (2014). Help, my chair has a virus! : hackers could turn your programmable matter against you. *IEEE Spectrum*. Retrieved from <http://spectrum.ieee.org/robotics/robotics-hardware/make-your-own-world-with-programmable-matter> on August 10, 2015
3. Bargh J. and K. McKenna. (2003). The Internet and Social Life. *Annual Review of Psychology* 55: 573-590
4. Bradley, G. (2006). *Social and Community Informatics-Humans on the Net*. London: Routledge.
5. Bradley, G. (2010). The Convergence Theory on ICT, Society and Human Beings – towards the Good ICT Society. *Triple C* 8(2): 183-192.
6. Brault, M. (2012). *Americans With Disabilities: 2010*. U.S. Census Bureau Retrieved from <http://www.census.gov/prod/2012pubs/p70-131.pdf> on May 17, 2016
7. Cass, S. (2015). Ubi: The Wall Computer That Gives Your Home a Star Trek Vibe. *IEEE Spectrum*
8. Chilcoat, M. (2004). Brain Sex, Cybepunk Cinema, Feminism, and the Dis/Location of Heterosexuality. *NWSA Journal* 16(2): 156-176.
9. Cox, J. (1993). A Sea of Difference Between Real World and Reel World: In Steven Spielberg's movie 'Jurassic Park,' scientists can recreate dinosaurs from dinosaur DNA. In reality, an expert says, such an event is highly unlikely. *LA Times*. June 13, 1993. Available at: http://articles.latimes.com/1993-06-13/local/me-2806_1_jurassic-park
10. Daytor, J., Sweeney, J. A., Yee, A. & Rosa, A. (2011). Communicating Power: Technological Innovation and Social Change in the Past, Present, and Futures. *Journal of Future Studies* 17(4): 117-134.
11. Ellis, K. and M. Kent (2011). *Disability and New Media*. New York, NY: Routledge.
12. Federal Communications Commission. (2014). Closed Captioning Quality Report and Order, Declaratory Ruling, and Further Notice of Proposed Rulemaking (Docket No. 05-231). Retrieved from https://apps.fcc.gov/edocs_public/attachmatch/FCC-14-12A1_Rcd.pdf
13. Field, M. and A. Jette (2007). *The Future of Disability in America*. Institute of Medicine (US) Committee on Disability in America. Washington D.C.: National Academies Press.

14. Foley A. and B. Ferri. (2012). Technology for people, not disabilities: ensuring access and inclusion. *Journal of Research in Special Educational Needs* 12(4): 192-200.
15. Goggin, G. (2006). *Cell phone culture : mobile technology in everyday life*. Abingdon, Oxon: Routledge
16. Goggin G. and C. Newell. (2003). *Digital Disability: Social construction of disability in new media*. Maryland: Rowman and Littlefield Publishers, LLC.
17. Harris J. (1992). *Wonderwoman and Superman: the ethics of human biotechnology*. Oxford University Press.
18. Jaeger, P. T. (2012). *Disability and the Internet: Confronting a digital divide*. Boulder, Colorado: Lynne Rienner Publishers, Inc.
19. Jaret, P. (2015). An End to Blindness? *AARP*. Retrieved from <http://member.aarp.org/health/conditions-treatments/info-2015/treating-blindness-vision-loss.html> on Aug, 10, 2015.
20. Kanowitz, S. (2015). Minority Report gets real with gesture tech platform. *GCN*. April 22, 2015. Available at: http://gcn.com/articles/2015/04/22/gesture-technology.aspx?s=gcntech_230415
21. Kitchin, R. & Kneale, J. (2001). Science Fiction or Future Fact? Exploring Imaginative Geographies of the New Millennium. *Progress in Human Geography* 25 (1): 19-35.
22. Kritsonis, A. (2005). Comparison of Change Theories. *International Journal of Scholarly Academic Intellectual Diversity*. 8(1).
23. Lewin, S. (2014). Holographic Displays Coming to Smartphones. *IEEE Spectrum* 51(8): 13-14.
24. Lippitt, R., Watson, J. and Westley, B. (1958). *The Dynamics of Planned Change*. New York, NY: Harcourt, Brace and World.
25. Lu, C. (2016, April 1). Accessible Workplace Technology: Signed, Sealed, and Delivered. U.S. Department of Labor Blog. Retrieved from <https://blog.dol.gov/2016/04/01/accessible-workplace-technology-signed-sealed-delivered/>
26. McCalum, E.L. (2000). Mapping the Real in Cyberfiction. *Poetics Today* 21(2): 349-377.
27. Moser, I. (2010). Against Normalisation: Subverting Norms of Ability and Disability. *Science as Culture*. 9(2): 201-240.
28. Neufeldt, A. H., and Enns, H. (2003). *In pursuit of equal participation: Canada and disability at home and abroad*. Captus Press.

29. Nixon, N. (1992). Cyberpunk: Preparing the Ground for Revolution or Keeping the Boys Satisfied? *Science Fiction Studies* 19: 219-235
30. Ostroff, E. (2011). Universal design: an evolving paradigm. *Preiser, W., Smith, HK, Universal Design Handbook, McGraw-Hill*, 3-11.
31. Prisco, J. (2015). Will Nanotechnology soon allow you to 'swallow the doctor.' *CNN*. Retrieved on <http://www.cnn.com/2015/01/29/tech/mci-nanobots-eth/> on August 10, 2015.
32. Robbins, S. (2003). *Organizational Behavior*. 10th ed. Upper Saddle River, NJ: Prentice Hall.
33. Rogers, E. M. (1983). *Diffusions of Innovation*. 3rd ed. New York, NY: The Free Press.
34. Rotolo, A. (2015). Star Trek's Glimpse Into the Future. *CNN*. Retrieved from http://www.cnn.com/2015/03/03/intl_tv/rotolo-star-trek-future/ on Aug 13, 2015.
35. Shaw L. and L. Gant (2002). In defense of the Internet: The relationship between Internet communication and depression, loneliness, self esteem, and perceived social support. *CyberPsychology & Behavior* 5(2): 157-171.