**Technology Inaccessibility Creates Workplace Disabilities, Graduate Thesis**

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**Introduction**

 In a work setting coworkers depend on each other to perform tasks, both essential and nonessential. When someone asks me to make document copies on a copying machine I cannot. When I am handed a stack of envelopes to be electronically stamped I am unable to do the favor. When a hospital employee phones to ask if release forms be fax to them per policy I must ask a coworker to do the task. It is because the technologies used commonly in employment settings are mostly inaccessible.

 The Americans with Disabilities Act’s language should be updated to reflect the availability of accessible technology; mandate manufacturers to create accessible products; and provide financial and other resources to support such mandates. Because the Americans with Disabilities Act (ADA) of 1990 was crafted in the late eighties and took affect during the early nineties it does not accurately reflect the availability of accessible technology that gives disabled employees increased independence. Title I of the ADA places the burden of accessibility on employers who are not in control of technology accessibility and who rely on their own financial resources to provide workplace accommodations. By shifting partial burden to tech companies to make products accessible disabled employees have a chance of increased productivity for employers. Through Federal funding tech companies can kickstart efforts of broadening the market by including product accessibility features, which will in turn, increase marketability of products, and as a result, will increase employability of employees with disabilities.

 Scholars specializing in the matter of disability equity has drawn similar conclusions about the lack of government funding via the ADA and the need for improved technology accessibility in the workforce. They have found that employment has gone down despite the ADA’s efforts in setting out guidelines for employers to follow and because the accommodation mandate is unfunded. As businesses move to online applications and other digital platforms disabled employees are left behind. As a result, inaccessible technology is creating workplace disabilities.

 When it comes to the ADA and discussing its pitfalls most conversations centers around employers and their needing to provide accommodations. Other ADA employment studies has shown that, under the ADA, disabled employees lose more lawsuits than they win. Instead of focusing on employers my research centers around technology and the need for updating the ADA’s language regarding technology accessibility. So little has been discussed on this topic that it is my hope to add fuel to the conversation on technology accessibility issues. Until standardizing accessibility of technology, both hardware and digital, becomes reality employers will continue to deal with certain impossibilities of making workplace accommodations and disabled employees will continue experiencing limited productivity.

 First, you and I will examine the purpose of the Americans with Disabilities Act as a civil rights law. Secondly, we will examine the arcade nature of language the law has that stands in the way of increased employment. Third, we will learn issues of inaccessibility of workplace technologies. The second to last section will provide solutions to the problems presented and the conclusion will give a summary of the findings. To help better understand the impacts of the issues stories and scenarios will be sprinkled throughout. As you read this keep in mind that these issues are real to the disabled population. Here is a statistic to ponder as you begin reading. 17% of disabled people are employed nationwide as of 2020. Why?

**The Purpose of the Americans with Disabilities Act**

 The passage of the Americans with Disabilities Act of 1990 was to improve access to public and private spaces. It also was meant to set out guidelines for employers to follow in workplace accommodations. It was viewed as a civil right law of protection against discrimination. Then President George H. W. Bush, standing on the lawn of the White House on a sunny July 26, 1990, famously declared “let the shameful walls of exclusion come tumbling down”.[[1]](#footnote-1)

 Title I prohibit discrimination of disabled people by private employers, local and state governments, labor unions and employment agencies.[[2]](#footnote-2) It took several decades of effort to craft the bill and convince Congress to pass it. Up to this point millions of disabled Americans were unable to gain access into buildings, public transportation, education, and employment easily. The ADA applied to other areas and settings of life and covered more than employment. Altogether the ADA has five titles, each one setting out guidelines for area where discrimination would be most likely to occurred. The language was crafted based on the 1964 Civil Rights Act as well as the 1973 Rehabilitation Act.[[3]](#footnote-3) As exciting as the passage was for millions of disabled Americans it took a few years for the law to go into effect. Despite this, most of the population celebrated the passage. It was a sign of recognition that severe discrimination almost in every aspect of life existed.[[4]](#footnote-4)

**Title I Opposition**

 Businesses strongly opposed the ADA’s requirement of mandating accommodations. The simple reason for the opposition came down to funding for the accommodations. The ADA is an unfunded law that places the costs of making places of businesses and employment accessible squarely on the shoulders of businesses.[[5]](#footnote-5) The ADA is the only civil rights law that imposes such high costs on businesses to conform to the law. Small business owners find that employing a disabled person causes them financial hardships due to the size of the business and its budget.[[6]](#footnote-6) In this respect the ADA fails the business’s efforts to diversify the workforce. It also places the business at higher risk of being sued on grounds of disability discrimination if the costly accommodations are not met.

 Members of the disabled population agreed with the issue of funding for businesses to meet the ADA’s mandates. The goal of the ADA was to open opportunities for disabled workers to find and maintain employment.[[7]](#footnote-7) Other opposition stances included the language itself. The syntax found in the language is stereotypical of social views that a disabled person must not be able to work, hints the term’s usage defining disabled.[[8]](#footnote-8) These concerned members of the population were in the minority and, as reflected in the ADA’s final bill, went unheeded.

**Arcade Language Hurts Employer Perceptions**

 It is no longer the nineties. We are now living in the era of technology, especially digital technology. And before we address how the Federal government can help tech companies develop accessibility for their products it is important to be aware of how the arcade language of the Americans with Disabilities Act continues promoting old fashion views of disabled employees.

 One example of an arcade language issue is the idea that blind employees, on a business trip, need a sighted person to accompany him or her.[[9]](#footnote-9) While this may be an example of an accommodation it does not reflect the abilities of a blind traveler. Technology designed for blind people has improved independence via access to websites and apps used for travel. With the invention of global satellite positioning apps and other digital tools there is no need for an employer to pay extra for a second traveler to aid the disabled employee.

 The paragraphs that list accommodation examples should be tailored to list available tools that aid a disabled employee. Some tools are paid services and may cost an employer a subscription while others are free for use on portable smart devices. An example of an app that blind and low vision employee can use is called Aira.[[10]](#footnote-10) This digital app connects to highly trained, sighted professionals who can assist in performing a task such as traveling in a new city or navigating an airport. Aira can also help with office related tasks such as reviewing paperwork. By mentioning this as an example in an amended language of the ADA employers’ awareness of tools that enables disabled employees to work independently will be heightened. It also shows employers that not all disabled employees need accommodations that may cause hardships on the business.

 While technological advancement does help with employment independence the burden on the employer and or the employee should not be caused by inaccessible technology. Some of the tools available for disabled consumers may take up time to use, such as Aira, or poses extra work to achieve a goal. For example, if an employee forgets a password to login into an app meant to help perform a task valuable paid time is lost as the employee resets the password. And, if technology such as a copying machine is not accessible because of a flawed consideration of the manufacturer it is unreasonable for an employer to solve the issue. To lighten the burden on employers the accessibility of technology used in workplace settings should be shifted, in part, to tech manufacturers.[[11]](#footnote-11)

**The Exploration of Inaccessible Technology: what is and what is not accessible**

 It was March of 2018 when I interviewed for a caregiving position. The business was privately owned and on the smaller spectrum. During the interview there were reasonable concerns about my disabilities and meeting certain tasks in the job description. So naturally I went home without expectations of being hired but grateful for the positive experience of the interview. What happened next was unexpected.

 As it turned out the owner of the business knew my Mother and was interested in seeing me the next day. I walked in, sat down, and was informed that I was hired and what accommodations would I need. I was given the temporary position of assistant to the client coordinator. Here is where I experienced discomfort. I needed a screen reader that cost $1200 to use the computer. I tried several free alternatives but the complexity of the case managing software required a more advance screen reading program. And even then the software was barely accessible. But I was still able to do most of what was asked of me. My position remained open for a year and a few months. And to this day that $1200 software sits on the computer, unused.

 The story just told presents several issues. The first issue is the cost of Jaws for Windows, a text-to-speech product of Freedom Scientific.[[12]](#footnote-12) Understand that the business was quite small and relied on clients for income and $1200 was a lot to ask as an investment in one employee. The first solution explored was Narrator, a text-to-speech screen reader available on Windows 10, a Microsoft product.[[13]](#footnote-13) It became clear that the managing software mentioned in the story was too inaccessible for Narrator to function as I hoped. The second solution was Non-Visual Access (NVA).[[14]](#footnote-14) If it were not for the level of the inaccessibility of the core online application of the business NVA would have done the job. So, it was the $1200 solution and much experimentation on my part to find workarounds for the inaccessible portions of ClearCare.[[15]](#footnote-15)

 The move to digital platforms of business operations, especially during the pandemic, has demonstrated the disparities of employees who can use them without accommodations and employees who are unable to use them because of the lack of accommodation.[[16]](#footnote-16) This is because the code in the applications does not meet the standard set forth by Web Content Accessibility Guidelines (WCAG).[[17]](#footnote-17) These guidelines cover a wide range of disabilities – visual, hearing, learning, and limited dexterity are a few examples. The argument that the Web Accessibility Initiative makes for the efforts of following its guidelines is that the interface will be useable for public use. The public also includes disabled technology consumers.

 The WCAG guidelines follow 4 basic principles.[[18]](#footnote-18) The first is perceivable. This means that no content on the platform can be invisible to a person’s sense. For example, if an employee messages another employee via an application a visual signal should accompany an audible signal of the incoming message. For a hard at hearing or deaf employee the visual signal is taking advantage of a sense the employee uses. Without a visual signal the fact that a message came in can be considered invisible for the receiver of the message because the audible sense is not used or is not the primary sense for communication. The discussion of how to support tech manufacturers in making products accessible will continue later in this paper.

 Now that we have touched upon digital platforms you deserve an explanation on why hardware technology, such as mail stamping machines, are not accessible. Browsing through office supply stores such as Staples, Home Depot, and Office Max turned up hardly any office technology that has accessibility features mentioned. Without opening every box and reading every manual it is not obvious what accessibility features are available, if any. By adding language to the Americans with Disabilities Act requiring a statement of accessibility as part of the packaging a disabled consumer can better determined which product is most suitable. The mere fact that such statements do not exist as part of the packaging is discriminatory of disabled people by fact of exclusion.

 Starting in Office Depot I looked for printers with accessibility features.[[19]](#footnote-19) I wanted a printer that had voice output and buttons with Braille lettering or symbols corresponding to the function of the button. Neither of these options were available on any printer featured on the website. Many printers are multiple purpose, possessing abilities to fax and scan. Because of the complexity of printers with extra functions built into them knowing what the screen reads is helpful while navigating the menus or checking the ink levels.

 Similarly, knowing what the buttons do is important. Not knowing which button does the copying is unhelpful for a blind or low vision employee. An argument made against this is that the employee could memorize the layout. This does not address the discrimination aspect of the product’s maker. This memorization argument is like telling a person of color to behave so that the police does not bother him or her. That does not address the problem of racial bias in the police force. Ignoring the root problem does not fix it.

 While at Office Depot I was curious about accessible mailing products such as an electronic stamping machine.[[20]](#footnote-20) One of my tasks as an office assistant was stamping envelopes. This involved sliding the envelope into a slot for stamping. In a perfect situation the task was unerupted by technical issues. However, in an imperfect situation I was unable to determine the problem or refill the machine’s bank for purchasing postage.

 The screen on the postage machine at this worksite was touchscreen. It also visually indicated what matter needed addressing. Verbal output on the machine would have allowed me to refill the postage bank, an electronically done task. Having knowledge of what was on the screen would have also allowed me to perform other tasks such as selecting postage type. Having this feature would have increased everyone’s productivity by removing the need for my asking for assistance.

 A trip to the Brother website for a fax machine was in order.[[21]](#footnote-21) Fax machines are surprisingly common. Government agencies, law firms, and medical organizations use fax machines for quickly sending and receiving printed documents.[[22]](#footnote-22) This time I was looking for a fax machine that had eye control on it. Eye control is when a person with dexterity abilities controls the machine with eye signals.[[23]](#footnote-23) Having this feature would enable an employee to use his or her eyes to control the machine’s functions without a need to touch the screen or number pad.

 Had failed to locate an accessible printer, postage machine, or fax machine I stopped by Staples to find an accessible copier.[[24]](#footnote-24) The same result. None. Copying machines can be complex its abilities. They can store copied materials digitally, print different paper sizes, offers ink coloration configurations etc. When I was looking at copiers an accessibility feature I had in mind was pictures. Individuals living with autism and dyslexia prefer pictures or icons corresponding with a setting or function of a machine.[[25]](#footnote-25) For example an ink barrel icon that shows an empty or filled ink barrel can tell someone who does not read well the status of the ink levels. The same concept can be applied to setting functions to allow an autistic employee to better comprehend how to control the copying machine.

 It was disappointing but not surprising not to find an accessible office equipment at common office supply retailers. People who live with disabilities has become accustomed to being discriminated as normal. This is unacceptable. It is also unacceptable that finding accessible office equipment requires doing business with specialized producers. For example, Lexmark International provides products with available accessibility.[[26]](#footnote-26) The machines provide easy handling for users with visual, audible, and dexterity limitations. To address accessibility not provided with the machine Lexmark provides an online platform that can be used on other devices such as computers or portable smart devices. The products allow emailing, faxing, copying, and printing in a single package. This was the most accessible multi-functioning office equipment on the market I was able to find. When I stated that I could not find an accessible equipment at places like Staples it was a purposeful statement. Because it required specialized research to determine product accessibility the accessibility of products sold in common office stores were unknown to me, leaving a consumer concerned and thinking that there are extremely few accessible products on the market.

**Solutions**

 Recall that Title I mandate employers to provide workplace accommodations at their own expense? Also recall that inaccessibility of technology creates workplace disabilities. And if technology is inaccessible employers cannot provide workplace accommodations. It is a vicious cycle, and one that can be broken with the right law and the right support. This is possible through amending the Americans with Disabilities Act of 1990.

 The first step is to offer support. A law that mandates accessibility and or accommodations without available funding is ridiculous. Through the lack of funding the federal government is encouraging the marginalization of disabled people. By supplying disability payments, the government is spending billions of dollars annually. Social Security Administration rules also make it difficult for a disabled person to earn income by limiting how much can be earned before losing disability benefits.[[27]](#footnote-27) An unfunded law and strict income rules are recipes for encouraging disability unemployability.

 There are 3 components of the ADA that requires amending to reduce workplace disabilities created by inaccessible technologies. Funding, wording, and rewards. There are already model companies and guidelines that can be pointed to as being successful. If written and implemented carefully my proposal will work.

**Funding and Reward**

 Funding tends to be overlooked while crafting legislation instead of being among the first questions. It takes financial investment to create ideas and put them into use. Tech companies are in the field to make money. It would make sense that accessibility of technological products will increase revenue for these businesses.[[28]](#footnote-28) Let us take a deeper dive into the funding possibilities. And, tech businesses, I apologize for using your competitors as examples of success with accessibility.

 Apple is a leader in built in accessibility on their products.[[29]](#footnote-29) Every product produced by Apple offers accessibility for dexterity, vision, hearing, motion, and other limitations.[[30]](#footnote-30) One example is the ability for the screen reader, Voiceover, to give verbal feedback on the angle of the built-in camera. And, for Apple, it took a lot of investment to become standardized technology products for disabled consumers.

 In 1985 Apple created an accessibility focused team.[[31]](#footnote-31) This decision took place prior to the passage of the Americans with Disabilities Act in 1990. Apple is known for its secrecy and finding out the investments into accessibility is unlocatable. However, Apple did pay employees with knowledge on accessibility.

 Microsoft, Google, Facebook, and Apple all claim to make accessibility a priority. For these companies they used their own budgets to implement accessible features into their products. Other tech companies such as IBM, Amazon, Adobe, has followed examples set by Apple and other companies who invested in earlier accessibility. These are large companies with deep pockets and already benefit from the disabled consumer’s market. But how can the federal government help in encouraging other tech companies to catch up?

 The language in the ADA needs to include funding for tech companies to make products accessible. The government is clearly willing to pay disability benefits amounting to billions of dollars. If money is set aside in large sums for technology accessibility purposes tech companies can have access to hiring specialists to give guidance on product accessibility, preferably specialists who themselves are disabled. By being able to afford an accessibility team tech companies can financially tap into the disability culture without risk of budget overdrafts.

 Manufacturing of accessible buttons, for example, requires upgrading the production line and machinery. For example, embossers are required to produce Brailed material at a high rate.[[32]](#footnote-32) These sorts of machineries costs upwards of six thousand dollars! A sticker shock for those wanting to make buttons or products accessible for Braille readers. Not only does the machines costs thousands of dollars there is the product training, maintenance, and possible additional product elements such as braillable plastic sheets to consider.

 Other considerations to make accessible products should be considered. For example, what additional tools are needed such as electronic pens used to control touchscreens.[[33]](#footnote-33) Specialized tools for use with technologies should be produced by companies who have the skills and knowledge of such productions. The government funding can be applied towards ensuring that common technologies recognize the specialty tools that quadriplegias use to control computers, for example. The purpose of the funding can go a step further by helping tech companies purchase add-ons from specialty producers to have available upon purchase.

 For a disabled person to have technology that is unusable because of a need for a trackball is the equivalent of paying for housing but locked out without a key. Apple already sell accessibility accessories for their products.[[34]](#footnote-34) For these efforts’ tech manufacturers should be able to deduct such accessory expenses, if purchased from another company, on tax forms. Already there exists a tax deduction for employers for hiring disabled employees.[[35]](#footnote-35)

 For example, Form 8826 (Work Opportunity Tax Credit) permits businesses to have a tax credit for creating an accessible workplace. Another example of funding the government already provides is the Architectural Barrier Removal Tax Deduction. This available tax deduction aids businesses in removing transportation or architectural mobility barriers of disabled employees. Having similar tax deductions is an incentive for tech developers to improve product accessibility options.

 To receive financial assistance from the Federal government the tech company would have to submit plans on improving product accessibility. This would determine how much money is needed from the government. It also would provide legal protection against lawsuits against themselves by demonstrating efforts in producing accessible products. Once the accessibility standard has been met or exceeded the funding would cease. If the business can demonstrate an extension until financial returns are made via sales a request can be filed for additional assistance.

 For the funding what I am proposing are two ideas as explained above. The tax deductions and the government grants. By funding the mandate and providing financial benefits tech companies will likely consider making their products as accessible as possible. Businesses will enjoy a more secure market by not being left behind by competitors who sell accessible products.

**Language**

 While funding is part of the language this section will discuss resources for tech companies to utilize as part of the standardizing accessibility on their products. Efforts had already been made in combatting the issue of limited product accessibility through national legislation. Either the bill failed, or the legislation does not directly address technological accessibility. There are a few examples of these efforts.

 § 508 of the Rehabilitation Act (amended in 1998) requires that Federal agencies make accessible products they use.[[36]](#footnote-36) Implementing and expanding similar language in the ADA to cover public and private companies is the first step in shifting the burden of accessibility to tech companies. The reason why the current language of the Rehabilitation Act does not work because it excludes the very organizations who are producing and selling technology. It does not make sense that the Federal government must find ways of making technology accessible if the technology can already be accessible, as an employer. Employers should concern themselves with providing other accommodations without the need to troubleshoot how to make an inaccessible technology accessible. That should be the business of tech product manufacturers.

 Another strategy disabled people had sought to create an accessible workplace is through a private tax credit.[[37]](#footnote-37) This is a $2000 tax credit that a blind person can use towards purchasing access technology. The simple issue with this that it only includes the blind population. It does not include other disabilities and access technology used by various disabled population. To make the bill to work fairly for all disabilities it should be added to the ADA and it cannot be exclusive of certain members of the disabled population. Other examples are available to find but I want to draw your attention to already existing guidelines that can be used in improving the ADA.

 The Web Content Accessibility Guidelines (WCAG) was developed in response to the lack of guidance in the ADA. The WCAG provides 4 test elements of accessibility to be met. Perceivable, operable, understandable, and robust.[[38]](#footnote-38) WC3 has already done the work of coming up with criteria that the ADA can safely reference in its language. The benefits are two-fold. The first is that the organization updates methods as technology changes. The second benefit is that it is already funded by the Federal Health and Human Services department, making it a free and public source for developers to use.

 The ADA should indicate that tech product developers hire disabled people to test their products before sale. Because hiring of disabled testers as employees would be part of the Federal financial assistance program tech companies would not need to be burdened by additional costs. This move would clarify that the quality controllers are to be disabled or understand disability needs.[[39]](#footnote-39) If tech companies either refuse to produce accessible products or hire qualified, disabled quality controllers the Federal funding would be unavailable.

 A concerning factor needs consideration. The ADA must indicate that disabled people are protected consumers. As consumers disabled people are not protected under the Consumers Protection Act.[[40]](#footnote-40) Adding this language would shift discrimination lawsuits from employers to be shared with technology developers. This would act as a stick to help tech companies initiate the making of accessible products.

 The last step in regulating technological products for accessibility is to restrict the FCC’s waivers used for none-communication products. Tech companies can claim that their products are not for communicating.[[41]](#footnote-41) Most web, digital, and hardware products are used for communication. A fax machine is used for communication and so is a postage machine and copying machine. Restricting the waivers would increase the availability of products with accessibility features at the ready.

**Conclusion**

 By updating the language of the Americans with Disabilities Act technology developers can make their products accessible. Including disabled people as consumers will increase the marketing audience and eliminate another barrier of discrimination. If the technology is not accessible the employer is unable to meet the mandate of workplace accommodations. Because employers rely on technology for business operations accommodation responsibilities should be shared between employers and tech companies.

 The increased marketability of products will widen the bottleneck of employment opportunities for the disabled. An accessible cash register, for example, can bring untapped talent into the workforce. With more consumers using technology the greater the revenue of the company.

 The current ADA rules on technology accessibility is either nonexistent or vague. By offering clearer language providing guidelines and resources tech developers will be able to meet the mandate. My research has shown that guidelines already exist but are not legally enforced. Without clarity tech businesses loss money in lawsuits. Having in place a law that helps companies develop accessible products is a worthwhile investment. Tech companies would profit, employers would have more control over accommodations, disabled people would offer higher productivity, and the Social Security Administration would save billions in disability payments. It would also clear up old fashion myths that employers may have about disabled people as employees. These are the reasons why the Americans with Disabilities Act’s language should be updated to reflect the availability of accessible technology; mandate manufacturers to create accessible products; and provide financial and other resources to support such mandates.

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