Breaking Down the Disability Digital Divide

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Abstract

Scholarly work on digital inclusion and popular discourse commonly refer to a so-called "disability digital divide" – persons with disability, compared to the rest of the population, are less likely to use the Internet and generally engage in certain Internet activities at lower rates. However, there is little granularity in that understanding. I evaluate the validity of prior findings in the British context and challenge the prevalent frame of the "digital disability divide" with a mixed methods approach.

I use Oxford Internet Survey (OxIS) data to show that disability affects the likelihood of Internet use in 2007-2011, controlling for various demographics and socioeconomic status, but this finding does not extend to 2013. Among current Internet users, I find that those who report a disability do not engage less online than the rest of the population. This finding controls for demographics and persists along three dimensions: amount, variety, and types of Internet use. However, the OxIS data treats disability as a binary. I analyze how this is over-simplistic. To supplement these findings, I use data from a web platform that helps persons with disability find work to show that different types of disability are associated with particular flavors of online engagement. Compared with the rest of the users, those with mental health conditions are more likely to have digital contact with staff. Those with long-standing illness or health conditions are less likely to complete an online workshop.

Statistical findings are backed up with semi-structured interviews with people with a range of disabilities in two U.K. cities in the East and West Midlands. I find diverse levels of agency over technology use. At the same time, there are accounts of Internet technologies being both enabling and further disabling as well. Researchers should not cast technology in a blanket of empowerment or persons with disability in a blanket of disadvantage. The "disability digital divide" narrative reinforces a bifurcation that ignores the idiosyncrasies and nuances in how a diverse population interacts with technology. It is fruitful to move away from that frame.

Keywords: *disability, internet, Oxford Internet Survey*

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1 Introduction

"The word 'disabled' is a description, not a group of people."

– U.K. Department of Work and Pensions Office for Disability Issues Guidance Report on Inclusive Language (2014).

Does disability make someone less likely to use the Internet? A straightforward "yes" or "no" answer is imprecise. In fact, any claim about how people with disability, as a category of users, experience technologies must be assessed with a healthy dose of apprehension. Despite common references to a "disability digital divide," the notion that people with disability, solely because of their impairments, are on the whole and as a group persistently less prone to use information communication technologies (ICTs) is unnuanced and too generalized. I challenge this narrative with quantitative and qualitative evidence from Great Britain. This is not to deny that persons with disability have been historically, and continue to be, disadvantaged in access to and use of ICTs, in different ways that are closely interwoven with socioeconomic, technological, and political forces. Rather, I argue those studying disabilities and digital technologies should not categorically cast all disability in a blanket of disadvantage or all technologies in a blanket of empowerment. The originality of this essay lies in the evidence-backed argument that the current prevalent frame of a "disability digital divide" does not adequately capture nuances. The relationship between persons with disabilities and Internet technologies is varied and complicated. Discussions about disabilities and the Internet should reflect this reality.

1.1 Rethinking the disability digital divide frame

The "disability digital divide" framing is oft-used. In the strict sense of the phrase, this refers to differences between "haves" and "have-nots" as reflected by a dichotomous measure of access to Internet technologies. The disability divide frame has been adopted to cover "digital inequalities"

as well, which refer to persisting disparities in ICT use among users who already have formal access (DiMaggio and Hargittai, 2001). An example is linking disability status to not just lower levels of Internet access but also generally lower rates of use across certain online activities. Dobransky and Hargittai (2006) quantify such digital inequalities in their paper studying "the disability divide in Internet access and use." Similarly, Vicente and Lopez (2010) offer "a multidimensional analysis of the disability digital divide" on Internet use. Jaeger (2011)'s book on the topic is titled "Disabilities and the Internet: Confronting a Digital Divide." Baker et al. (2009) find a "disability divide" in web accessibility in the deployment of municipal broadband. A recent World Bank report was titled "Bridging the Disability Divide through Digital Technologies" (Raja, 2016). These five examples do not all refer to the exact same issues, but they do have this in common: the "disability (digital) divide" frame is meant to capture disadvantages that persons with disability face in the digital age. It is well-intented framing that aims to highlight discrepancies and hopefully eliminate them. Regardless of the intentions or roots of the "disability divide" frame, does it contribute to a productive understanding of how people experience disabilities in tandem with technologies? Is it accurate, first of all? Can we replicate prior findings in the British context? Separately, is it possible that the "disability digital divide" frame may sometimes reinforce perceptions of certain physical, sensory, or cognitive differences as otherness or deviations from society-articulated norms which often contribute to social distancing and exclusion? Alternatively, if there is general utility (to policymakers, technology developers, and/or people with disability) to refer to disability divides in order to close them, how do we inject nuance to the discourse so that the "disability divide" does not become an overly-encompassing and potentially unsavory umbrella term?

1.2 The connotations of divides

What are some known "digital divides"? Lower household incomes (compared to higher), lower educational attainment (compared to higher), being over 65 (compared to younger), being black or Hispanic in the U.S. (compared to other ethnicities), and living in rural areas (compared to urban) have all been persistently associated with lower levels of Internet use (e.g. NTIA, 2007;

ONS, 2015; FCC, 2016). The evidence of such disparities generally spans over 15 years, with some gaps closing over time while others persist (Raine, 2015). A demographic trait becomes a "digital divide facet" if a subgroup, relative to comparable subgroups, has lower rates of access to or use of digital technologies.

These gaps do not exist in vacuums without interaction with each other. They usually derive from a range of interrelated social, educational, technological, and political influences (e.g. Baker, 2001; Dijk and Hacker, 2003). "Digital divide" is ultimately just a collective broad term in reference to these gaps. Of course, no one term can encapsulate all complexities of the issues, but some frames are better than others in their ability to accurately inform. I focus only on the disability digital divide and why we ought to exercise caution before continually using the frame. I draw from literature discussing other divide facets where comparisons are relevant. Elements of my argument can be conjectured beyond the disability scope of this paper.

At risk of stating the obvious, we aspire to close digital divides. Common rhetoric to "bridge the digital divide" and"help those on the wrong side of the digital divide" reflects this view (e.g. OFCOM, 2005; IEEE, 2016). However, should people with disabilities strive towards matching the same levels, patterns, and trends in technology use as people without disabilities? Is that a fruitful aspiration or does the goal gloss over nuances in interactions between disability and technology? Does the divide frame risk putting certain norms on a pedestal when yearning for such mismatched (and occasionally unattainable) goals is unproductive and sometimes even damaging? How does society best advance the interests of disadvantaged population groups without lumping their idiosyncrasies into a singular rigid obstacle that implies necessary overcoming? These questions prompt an intriguing and important examination of whether the disability digital divide is the most appropriate frame to render discussion. If not, what are some solutions?

Compared to the work on digital inequalities across traditional facets like socioeconomic status, there is relatively little granularity in our understanding of how persons with disabilities interact with ICTs. Uncovering more nuance is of course illuminating in its own right, but it is an especially worthwhile endeavor as the findings will inform the underlying question of whether we should uphold or break down the disability divide narrative.

2 Literature Review

This section has three parts. The first is a primer on prevalent models to discuss disability. The second organizes key pieces of literature from Internet studies and critical disability studies into four factors. Other than maximizing cohesiveness, this structure is also motivated by the need to adjudicate when the disability divide narrative is productive or harmful. The following third part provides an overview of existing empirical evidence on how persons with disability use Internet technologies and where the gaps are. All parts combine to paint the contours of the theoretical framework through which my research questions emerge.

2.1 The main discourses on disability

Broadly conceived, there is the "medical model" to understand disability on one end, and the "social model" on the other. The medical model was the default approach for a long time. The medical model emphasizes impairment as an individual's loss and deficit. Difference is equated with inferiority. It assumes persons with disability "have deficiencies that they must compensate for, that they must adapt to the social, educational, professional, and political conceptualizations that serve to marginalize them" (Jaeger, 2011, p.10). The presumed neutrality of the professional medical judgment "takes disability out of the political area" (Adam and Kreps, 2006). The closely related charity model assumes disabled individuals are objects of pity requiring of charity instead of owning a set of rights in articulations of law and policy (Goggin and Newell, 2000). On the other hand, the social (or social construction) model brings up notions of "disabled by society and not by body." In her book *Female Forms*, Carol Thomas explain how under the social model, "disability is a form of social oppression involving the social imposition of restrictions of activity on people with impairments and the socially engendered undermining of their psycho-emotional well-being" (Thomas, 1999, p.3). Some socially-constructed marginalizations are not perpetual – they can be altered to become inclusive of people with disabilities (Stroman, 2002). All contemporary academic literature is at least partially framed by the push by advocates to move from the medical model to the social and beyond (Jaeger, 2011, p.10). Concurrent with the evolution of these models,

a climate developed where people with disabilities are believed to deserve certain fundamental rights in order to fully access society. This has been built into law in some jurisdictions (Jaeger, 2011, p.75-77). The medical model remains common in many countries and discourses (Prince, 2009; Lewis, 2003). Overviews of how global governments treat disability provide a stark reminder that rights to technology access and broader social access are all but guaranteed for persons with disability in many parts of the world (Jaeger, 2011, p.66-72).

Notably, not all discourses fit on the medical-social spectrum. Gillian Fulcher (1989) identify others discourses on disability like "lay," "rights," and "management." There is middle ground as well – for example, Adam and Kreps (2006) find the medical model too antiquated but the social model too radical and rigid. As clearly not all aspects of disability are social constructs, they propose instead a critical approach that focuses on the embodied, lived experiences of disability.

2.2 Enabling and disabling narratives

Disability is a late addition to writing on the digital divide. The digital divide discourse has paid "remarkably little attention" to disability and this has been called "the invisibility of disability" in studies of ICT (e.g. Adam and Kreps, 2006; Aitchison, 2003). The term "digital divide" is often traced to a series of reports from the U.S. Department of Commerce. Around the same time Anderson et al. (1995) highlighted for the first time how unequal access to email may limit rights and opportunities, the first "Falling Through the Net" report surveyed the "have nots" in rural and urban America (NTIA, 1995). The second report adopted and popularized the term "digital divides" (NTIA, 1998), but disability is only explicitly referenced for the first time in the fourth iteration of the reports (NTIA, 2000).

The disability digital divide framing has yielded little critical discussion. There is robust debate about if and when various digital divide frames are fruitful, but this discussion rarely includes disability. This is surprising given the thriving body of work on digital inclusion which captures a dazzling array of scholarly opinions. The digital divide has been called a "crisis," a "myth," and most things in between (e.g. Compaine, 2001). Scholars either "accept, deny, and differentiate" be-

tween various digital divides or emphasize that divides "come on top of old inequalities" (Dijk and Hacker, 2003). There are a myriad of proposed frames to discuss how technology impacts divides along traits like gender, income, employment, and education. They range from "techno-centric or economy-driven" approaches to explain divides to "more socio-cultural or policy-motivated approaches" to "complex" narratives in between (Tsatsou, 2011). There are many attempts to go "beyond the digital divide" as well – by leveling up to a "second-level digital divide" or "digital divide 2.0" (Hargittai, 2002; Vie, 2008) or proposing certain frameworks that capture more nuance such as "digital inequalities," "virtual inequalities," and "digital entitlements" (DiMaggio and Hargittai, 2001; Mossberger et al., 2003; Mansell, 2002). There have also been urges to perceive competency online beyond mere access with proposed terms like "digital readiness" and "digital preparedness" (James, 2008; Horrigan, 2014). Glaringly, disability takes a backseat or is not in the car. As examples I previously raise in the introduction show, much existing work on disability and ICTs simply accept, *prima facie*, that the "disability digital divide" is the default correct frame to conceptualize disability and digital inclusion. This does not mean the authors do not acknowledge the complexities of digital inequalities in their work. Many do, but the choice of framing does not reflect these nuances.

The lack of discussion around the appropriateness of the "disability digital divide" frame may be due to the comparatively younger focus of disability as a digital divide. There has been an "invisibility of disability" in ICT studies as previously explained. Ellis and Kent (2015) discuss how only "earlier this decade, the emerging field of disability media began to focus on the Internet and people with disabilities." It may also be due to disability serving as a "master status." Scholars have suggested that disability as a social factor has grown to be so powerful that it masks all other characteristics about a person (Albrecht and Verbugge, 2000). It "floods all statuses and identities" (Charmaz, 2000). Disability becomes the defining trait:"a Latina who owns a successful business, has two children, and happen to be visually impaired [is] most prominently perceived as blind by society" (Jaeger, 2011, p.18). When the need to discuss ICTs and disabilities arises, it is understandable why many intuitively fit disability into the "digital divide" framework. At first glance, both disability and digital divide share notions of deficiency and seem like convenient and

natural bedfellows. We should, however, examine if it is a comfortable fit.

I choose literature from Internet studies and critical disability studies to situate my inquiry of the appropriateness of the divide narrative. Why these two fields? Goggin and Newell (2003)'s seminal work *Digital Disability* championed the idea that while the Internet offers many opportunities to persons of disabilities, it also reinforces the unequal status of people with disabilities because of barriers to accessing and using the Internet. This frame is commonly adopted in later quantitative work studying disabilities and the Internet. Goggin and Newell (2003, p.8, 11) assert that technology is not neutral or autonomous but is instead "inherently social and political." Technological creations thus may contribute to the systematic positioning of people with disabilities "as 'other,' excluded or marginalized in the friction-free supposed utopia of cyberspace." This very argument harkens to a rich body of literature in critical disability studies about socially-constructed norms and otherness, as they have much in common. It is not surprising that there are suggestions for Internet studies and critical disability studies to work as allies (Marshall, 2015). However, academics studying disability and technologies often only scratch the surface of relevant insights from critical disability studies, if at all. One only need look at studies that hail technology and new media as undisputed tools to empower persons with disability (e.g. Raja, 2016). They often contain no acknowledgement or justification of why "managing" or "overcoming" disability is the right lens to adopt. Drawing from literature from Internet studies and critical disability studies, I lay out four factors to consider before adopting the "disability divide" conceptual framework. Where relevant, I interweave comparative insights from other digital divides (across socioeconomic status, gender, geographical location, and age).

First, the disability divide frame implies the need for emulation of "ideal" social norms that do not exist. There is a long line of work in critical disability studies that urges a focus not so much on the construction of disability but on the construction of normalcy. This is because often "the 'problem' is not the person with disabilities; the problem is the way that normalcy is constructed to create the 'problem' of the disabled person" (Davis, 2013, p.1). Lennard Davis brings this up in his 1995 book *Enforcing Normalcy* and hammers this point home in the introduction to *The Disabilities Studies Reader*. "The concept of a norm, unlike that of an ideal, implies that the

Table 1: Enabling and disabling narratives: Application to disability

	A divide narrative is potentially enabling if...	A divide narrative is potentially disabling if...	Implications on conceptualizing disability and ICT use
Equalizing versus emulation?	The goal of highlighting the discrepancy is to enable access to equal opportunities among groups.	The goal of highlighting the discrepancy is to encourage matching/ emulation of use rates and patterns of other groups.	People with disability should have equal opportunities as the rest of the population. However, suggesting that they need to emulate societal norms in technology use established by persons without disabilities may be problematic, especially when the very notion of normalcy ought to be challenged (Davis, 1995).
Condition that uniformly impacts the subgroup?	There are infrastructural constraints that uniformly impact the subgroup in ways that alter ICT adoption and use.	There are many idiosyncrasies in the subgroup. Access barriers are heavily constructed and informed by social circumstance.	Disability is not unified by a defining common characteristic. It is more fluid than, e.g., age or gender. Only 15% of persons with disabilities are born with them and conditions are also not constant throughout life for most (Jaeger, 2011, p.18).
User agency?	There is lower agency in technology use among the disadvantaged subgroup, but there are political or social means through which this can change.	Members of subgroup have more user agency in technology use than often given credit for.	Some disabilities do not impact user agency as much as others, and in varying ways and extents. E.g. Physical impairments in the leg versus the fingers impact technology use very differently. Severity and duration of conditions are also determinants in user agency that are not constant over time (Baldwin, 1997).
Incorporation versus overcoming?	Overcoming particular technical barriers (usually addressing access) will positively impact ICT usability and user experience.	There are specific, legitimate reasons of non-use or reduced usage, e.g. relative advantages and situation relevance, that do not necessitate overcoming.	Overcoming these technological barriers (such as inaccessibility), rather than the disability identity itself, can positively impact how people with disability experience technologies.

majority of the population must or should somehow be part of the norm" (Davis, 2013, p.3). He traces the lexical and statistical roots of the notion of norms and outlines how it has concretely harmed persons with disabilities. "The application of the idea of a norm to the human body creates the idea of deviance or a 'deviant' body. [The] idea of a norm pushes the normal variation of the body through a stricter template guiding the way the body 'should' be" (Davis, 2013, p.5). Such ideologies of ability and normalcy are "imbricated [...] in our thinking and practices" so much so that we may easily fail to notice their "patterns, authority, contradictions, and influence" (Siebers, 2008, p.9).

According to this line of thought, as the ideological screen of normality is a façade, the universality assumption of norms should be be challenged. This can and has been applied to assumptions made of norms in digital technology use. Technology often creates "new dimensions of disability" (Goggin and Newell, 2003, p.11). By enforcing normalcy, even assistive technologies can result in new "unexpected and under-critiqued" forms of social exclusion for disabled people (Foley and Ferri, 2012). For example, Moser (2006, p.375) argues that "notwithstanding their generative and transformative power, technologies working within an order of the normal are implicated in the (re)production of the asymmetries that they and it seek to undo." Rather than questioning why persons with disability are deviating from commonly observed norms of technology use, perhaps a better focus is making ICTs compatible with the physical and social needs of persons with disabilities, and accepting that this may require stepping outside conventional orders of normalcy.

There is a familiar echo of this discussion in the "grey"/ elderly digital divide. Research has found that relative lack of digital skills lead some potential elderly users to think ICTs are just for the young (Millward, 2003). In discussing the implications of such findings, it is common to find very technologically deterministic views of how non-ICT using older adults should normatively behave. For example, Kiel (2005, p.22) wrote that "older adults can learn to use the computer, and learning can positively impact their lives." The idea that the elderly should match or emulate usage patterns of younger user has been criticized. It implies old age is an impediment to be overcome, and that older adults automatically need to be re-skilled and re-educated. It ignores the fact that technology is socially shaped and determined (e.g. Edge and Williams, 1996; Woolgar, 1996; DiMaggio et al.,

2001; MacKenzie and Wajcman, 1999). The reasons for non-use or reduced usage such as low relevance and "relative advantage" (Selwyn et al., 2003), can both be considered legitimate in light of life circumstances (e.g. being retired and hence having less need to be connected) as well as socially constructed (e.g. majority of ICTs do not necessarily target older adults). For example, Selwyn (2004) attributed older adults' ambivalence toward ICT to the limited relevance of new technologies to their day-to-day lives. "Rather than trying to change older adults, older adults should be involved in changing ICT" (Selwyn, 2004). This is similar to the argument that persons with disability need not be changed and need not pursue a fantasy of "normal" ICT usage patterns.

Second, disability is a unique identity category capturing a subgroup that is highly idiosyncratic. Even the same type of disability can vary by "severity, visibility, stability, age of onset, type of onset, levels of accompanying pain, and extent of impacts" (Vash and Crewe, 2003). However, lower-income individuals, rural dwellers, the unemployed, etc are highly idiosyncratic as well and scholars seem quite ready to accept that those idiosyncracies should not get in the way of quantitative generalizations. If it is misguided to say there is a *group* disability identity, suggesting there is a *group* "unemployed identity," "rural identity" "low-income identity" etc is equally so. To spell it out, if we are comfortable with looking at data which says, e.g., "lower-income black and Hispanic households with children trail comparable white households with children by about 10%" (Horrigan, 2015) and saying there is an ethnic digital divide despite idiosyncracies in black and Hispanic households, why might disability not be the same?

Is there something unique about disability's idiosyncracies that requires specific consideration? Let us examine the traditional demographic facets that are widely included in analysis of ICT use. These are variables commonly controlled for in digital divide literature (age, gender, ethnicity, geographical location, marital status, lifestage or employment status, educational attainment, and income). For most, gender and ethnicity are constant identity categories. They are not universally rigid (e.g. being transgender, multi-ethnic) but are widely accepted to be consistent categories of personal identity. Then there is age where progression through stages is out of our control. Then there are the facets where movement between categories is more fluid (i.e. moving to a rural area, getting married, getting laid off, getting more education, moving between income brackets,

etc), though there are obviously various constraints and costs. These capture life circumstances. Disability is unlike any of these identity categories. "Not only is disability the only minority group that people can join, [...] it is also one that people do not want to join but lack a choice in the matter" (Jaeger, 2011, p.15). "In nearly no other sphere of existence [...] do people risk waking up one morning having become the person whom they hated the day before" (Siebers, 2008, p.26). It is possible to acquire a disability (usually without intent) and for some, it is possible to become less or even not disabled over time. As mentioned, there are also various unique forces through which society constructs and shapes disability (Wendell, 1996; Shakespeare, 2003) and broader digital inequalities (DiMaggio et al., 2001). Disability has also been significantly associated with being older, unemployed, and having lower educational attainment (Fox, 2011). These digital divide lines/ demographic traits do not subsist in independent silos: disability is a unique identity but it also interacts with other demographics, too. Perhaps more so than other identity categories, however, there is a higher degree of complexity and range of issues with disability that cannot be cleanly captured in categories, let alone a binary.

Given the above, we must critically consider population-level categorical claims about ICT use and persons with disability before making them and caveat statistical findings accordingly. This is especially important since research findings inform more than just policy. There is a wide audience with potential agency to propel productive change. Goggin and Newell (2007) argue that law and regulations have been "frustratingly slow" in bringing about inclusiveness of information technology, which has in turn given rise to "the business of digital disability." (The authors remain skeptical of the new turn from state to business.) Oliver (1998, p.1448) also talk of disability as a big business, "a commodity and a source of income for doctors, lawyers, rehabilitation professionals and disability activists." We need accurate, nuanced, and consistently replicable findings to construct a cogent and persuasive case about the different needs of different persons with disabilities. The "disability digital divide" frame as it exists now may not adequately do so.

Third, the issue of agency among people with disabilities is varied and complicated. A comparison with the contested urban-rural digital divide helps demonstrates this. Telephone companies deploying DSL do not target rural areas first (Strover, 2001). However, despite such physical, in-

frastructural constraints, one's income, age, and education are more closely associated with ICT use than geographical location (Hindman, 2000). Moreover, there are social or political means through which user agency can be boosted despite infrastructural constraints. Rural users in Tanzania are able to match access rates with those living in urban areas by using Internet cafés (Furuholt and Kristiansen, 2007). The issue of agency is, however, much more complex and unpredictable for disability than that of living in a rural area. There is no uniform condition that drives ICT use one way or another among persons with disability and raising user agency for disabled Internet users is also more complicated than laying a T1 line. What are some of the complexities?

The Internet and ICTs (e.g. social media) and digitally-enabled assistive technologies (e.g. cochlear implants, video relay services, augmentative communication) have potential to boost user agency greatly. There are fascinating anecdotal accounts of technology empowering persons with disability: for example, a woman with chronic illnesses built an entire thriving virtual Unitarian Universalist congregation on Second Life (Sutton, 2007). Virtual reality and gaming can positively impact those with disabilities, not just as a method of distraction but potentially even as therapy for those in chronic pain (Trost and Parsons, 2004; Lange et al., 2010). Assistive technologies both directly affect the extent and amount of conventional ICT use (by changing levels of accessibility) and indirectly via altering perceptions and attitudes towards digital technologies generally. Analogously, an electric wheelchair gives a disabled person more than just mobility, but the ability to "be spontaneous and make unexpected moves," which is another level of active and independent agency (Moser, 2006, p.379).

However, not all persons with disability find technology empowering. There are high rates of assistive technology discontinuance and abandonment, with reasons like "lack of consideration of user opinion in selection, ease of device procurement, poor device performance, and change in user needs or priorities" (Phillips and Zhao, 1993; Riemer-Reiss and Wacker, 2000). Assistive technologies sometimes symbolize restriction, difference and dependency (Soderstrom and Ytterhus, 2010), and is associated with social stigma (Parette and Scherer, 2004). Themes of empowerment by the Internet and traditional ICTs are also tempered by research findings on vast web inaccessibility (Slatin and Rush, 2002; Ritchie and Blanck, 2003). Beyond web (in)accessibility, technology is not

always associated with access and integration, it can also "isolate" and enforce "subtle" forms of social exclusion by "privileging particular ways of being" (Foley and Ferri, 2012). These competing narratives on how ICTs enable or further disable persons with disability are legitimate in their own right. Both demand thorough consideration before assertions of any "disability divides."

Fourth, there are tensions regarding overcoming various aspects of disability. Some disability studies scholars find the idea of managing and potentially conquering or overcoming disability unpalatable. For example, Garland-Thomson (2003, p.348) use the example of disabled fashion models to "counter the insistent narrative that one must overcome an impairment rather than incorporating it into one's life and self, even perhaps as a benefit." There are similar ideas in discussions about the gender digital divide (Huyer and Sikoska, 2003, p.4). Obviously, not all disability can be seamlessly incorporated into one's life and self, and technology play an interesting mediating role. The literature on presentation of "the disabled self" online is relevant here. Through their qualitative work, Bowker and Tuffin (2002, p.334) identify a "choice to disclose" repertoire used by disabled persons online. In discussing the disability digital divide, we ought to be mindful that the disabled self may not require overcoming. On the other hand, it is relatively palatable to suggest overcoming ex vivo technological barriers to access. In fact, boosting web assessibility has been likened to installing "cyber ramps" which help persons with disability access more of the web while creating positive externalities for the non-disabled as well (Ritchie and Blanck, 2003).

All in all, drawing from Internet studies and critical disability studies literature, I propose and explain four dimensions of complexities that help us critically re-consider the "disability digital divide." One, consider if it is desirable to aim for not merely equal opportunities, but also equal outcomes. Should we suggest matching or emulation of ICT use of other subgroups? Two, consider if there are defining common characteristics that sum up the digitally disadvantaged group. Can we articulate these characteristics in ways that do not excessively generalize the idiosyncratic sub-population? Three, consider the complexities of user agency. What is the relationship between members of the subgroup and the ICT dimension under study? Are there coherent themes of empowerment or disempowerment? Four, consider any implications of overcoming personal identities. Are there legitimate reason for non- or reduced use that do not require overcoming?

2.3 Existing empirical findings

"Statistics reflecting access to the internet and use of computers by people with disabilities is sparse" (Baker et al., 2009, p.49). This quote accurately sums up the state of the research field. There is not a lot of work, and the rigorous studies disagree with each other on certain findings.

2.3.1 Disability and status of Internet use

The U.S. and Europe

Two robust studies using American and European data find that people with disabilities are less likely to be Internet users, after controlling for socioeconomic factors. Dobransky and Hargittai (2006) find that persons with disability are 17.3% less likely to be an Internet user, whereas Vicente and Lopez (2010) find that persons with disability are 15.8% less likely to be an Internet user, holding other variables constant. The former uses 2003 U.S. data whereas the latter uses 2005 European data.[1] Both findings control for age, gender, education, and income.[2]

This is reflected in analyses that do not control for all socioeconomic factors, too. Fox (2011) at Pew Research Center found a disability gap of 27% in Internet access in the U.S. (disabled: 54%, non-disabled: 81%) in 2010, but socioeconomic factors are not controlled for. Kaye (2000) analyzed an older iteration (1998) of the same data used by Dobransky and Hargittai (2006). He found a persistent disability gap after controlling, one by one, factors that may interact with disability. Being non-elderly (aged 15-64), employed, and more educated help to close the disability gap a bit, but not by much. The disability gap is worse for African-Americans. The main methodological deficiency for Fox (2011) and Kaye (2000) is that when comparisons are made between users with and without disability, only one socioeconomic factor is controlled for at a time.

Great Britain

In the British context, there is a persistent gap in Internet access between people with and

[1] The Computer and Internet Use Supplement (CIUS) of the Current Population Survey (CPS) and the European Commission's Information Society Technology eUser survey of 10 European countries, including the U.K.

[2] Dobransky and Hargittai (2006) control for ethnicity, geographical locaton, and employment status as well.

without disabilities that may be slowing closing. It broadly ranges from 20-30%. OFCOM (2015) found a gap in Internet access in 2014 between disabled and non-disabled consumers (disabled 65%; non-disabled 88%).[3] ONS (2016) reported a persistent but closing gap in recent Internet access (defined as within the last 3 months) between those who are Equality Act disabled and those who are not (2014: 65% and 91%; 2015: 68% and 92%; 2016: 71% and 93% for persons with disability and persons without respectively)[4]. With Oxford Internet Survey (OxIS) data, Blank (2013a) shows a similar gap from 2007-2013 between persons with disability and persons without (2007: 36% and 72%; 2009: 41% and 75%; 2011: 40% and 78%; 2013: 51% and 84% for persons with disability and persons without respectively).[5]

Importantly, while some of these studies present significance from tests of independence between disability status (a binary) and use of the Internet (a binary), e.g. a χ^2 statistic in OFCOM (2015), none of them control for all relevant socioeconomic factors like Dobransky and Hargittai (2006) and Vicente and Lopez (2010). Until now, there is no known published study comparing Internet access between persons with and without disabilities in Britain that controls for all relevant socioeconomic factors. Part of my study of dataset I (OxIS; looking at computer and Internet use) addresses this.

2.3.2 Disability and other dimensions (e.g. types) of Internet use

Previous research shows that, compared to the rest of the population, people with impairments are less likely to engage in online activities and do so at lower rates across many activities, with some exceptions. However, there is disagreement in this finding and there has not been a rigorous update since the last study using 2005 data.

Generally, there is little understanding in how persons with disabilities compare to persons without disabilities across various dimensions of Internet use, among those who do go online. OFCOM (2015) presents findings on the frequency of Internet use via different means (PCs, tablets,

[3]OFCOM difference: 23% in 2014.

[4]ONS difference: 26%, 24%, and 24% in 2014, 2015, and 2016 respectively.

[5]OxIS difference: 36%, 34%, 38%, 33% in 2007, 2009, 2011, and 2013 respectively. Note the larger magnitude compared to ONS and OFCOM data is likely due to the more expansive definition of disability used ("health problem or disability").

mobile) for the mobility, visually, and hearing-impaired compared to the non-disabled, but it does not focus on Internet use beyond the frequency metric. There is also very little done on the types of Internet usage comparing disabled and non-disabled Internet users, save for two already-highlighted studies (Dobransky and Hargittai, 2006; Vicente and Lopez, 2010). However, the former findings using 2003 U.S. data has later been invalidated in the latter study using 2005 European data.

Dobransky and Hargittai (2006, p.328) found that people with disabilities generally use the Internet less across various online activities, with the largest percentage differences for purchasing products and services (disabled: 50.5%; non-disabled: 58.0%) and banking online (disabled: 25.7%; non-disabled: 32.3%). It appears people with disabilities are also less likely to get news, take courses, or search for jobs online. On the other hand, they find people with disabilities are *more* likely to look for health information (disabled: 57.3%; non-disabled: 48.3%), search for information about government services (disabled: 46.8%; non-disabled: 42.3%), and play games (disabled: 37.8%; non-disabled: 33.6%) compared to people without disabilities.

Contrary to this finding, Vicente and Lopez (2010) find that there are no significant differences in Internet use applications between people with disabilities and the rest of Internet users; "they use pretty much the same service as others" (p.59). Examining similar activities as Dobransky and Hargittai (2006), they find disabled users do not inquire more about government services or play online games more frequently compared to the rest of the online population. The only exception is obtaining information on a specific disease or medication (disabled: 89%; non-disabled: 85%). Importantly, for these findings on types of Internet activities, both papers only present a two-way table and χ^2 test of independence. There is no analysis on whether these findings persist after controlling for demographics. Since disability covaries with many demographics, we are therefore not certain if these findings can be fully attributed to disability due to potential confounding.

Another reason for reexamining these findings is that data on Internet use has generally become more granular. We no longer need to look at singular, piecemeal activities but can instead analyze by "clusters" or "buckets" of online activities that share commonalities. Blank and Groselj (2014) examined 10 previous studies that studied particular dimensions of Internet use. They isolated three prevailing dimensions of Internet use: i) amount, ii) variety, and ii) types. With 2011 OxIS

data, they identify 10 distinctive types of Internet activities. (An 11th type, political activities, is later added with the 2013 data.) The activity types (e.g. information-seeking, entertainment, etc) are obtained via principal components analysis. These dimensions can be productively applied to advance our understanding of Internet use beyond mere access or singular activities towards a more holistic view of how online disabled users spend their time.

All the above depicts a research gap. Given the conflicting evidence on types of Internet use between prior robust studies, we need to settle the score with i) newer data (by roughly a decade), ii) more complex data (with more informative dimensions like amounts, variety, and types of use), and iii) for the first time focusing only on Britain and controlling for all demographics. Part of my study of dataset I (OxIS; looking at dimensions of use) addresses this. My study of dataset II (Remploy; looking at types of online engagement by people with different disabilities) attempts to complement these efforts.[6]

2.3.3 Disability and social exclusion

It is well-documented that people with disabilities feel socially excluded (e.g. Thomas, 1982; Siebers, 2008; Campbell, 2009; Barnes and Mercer, 2010). However, there has not been a sufficient focus on social exclusion in studying how disability and Internet technologies interact. This is important because of two reasons. One, sadly, much of society still do not regard persons with disabilities as an integral part of society, but instead treat them with "stereotyping, sentimentality, oppression, feigned concern, indifference, and even hostility" (Jaeger, 2011, p.19). These sentiments often form structural disadvantages for persons with disability in various domains of life. There is quantified evidence of employment discrimination against candidates with disability (e.g. Gouvier et al., 2003; Goldman et al., 2006). However, it is important to caution against blanket claims that all persons of disability are victims of social discrimination. For example, an experiment where supervisors reviewed resumés varying only in disability status found a negative bias for having a history of mental illness but a positive bias for being paraplegic, compared to being non-disabled (Drehmer and Bordieri, 1985). Despite the social significance of the topic, large-scale survey data

[6]The value-added of the Remploy dataset is methodological as well, which I explain in the next section.

is usually not used to study disability and social exclusion. Second, it helps inform a line of debate about whether the relationship between digital technologies and persons with disability is one of empowerment or extension of existing inequalities. As explained earlier, there are conflicting accounts of when ICTs and assistive technologies may boost user agency (e.g. Jaeger, 2011; Moser, 2006) and when it may reinforce traditional inequalities or even create new ones through isolation, reliance, and dependency (e.g. Foley and Ferri, 2012; Soderstrom and Ytterhus, 2010). It is useful to study if feelings of social exclusion persist after controlling for Internet use. If yes, claims that Internet technologies serve as a powerful tool of social inclusion for persons with disabilities will be undercut. Part of my study of dataset I (OxIS; looking at social exclusion indicators) addresses this.

2.4 Research Questions

Based on literature lacunae above, my research questions and hypotheses are as follows.

RQ_1. How do persons with disabilities use Internet technologies, compared to persons without disabilities?

> **H1A:** (**OxIS**) Disability status is significantly associated with Internet use and/or computer use, ceteris paribus.
>
> **H1B:** (**OxIS**) Among Internet users, disability status is significantly associated with various dimensions of Internet use (amount, variety, and types), ceteris paribus.

RQ_2. What is the relationship between persons with disability and Internet technologies? Specifically, how is technology enabling (e.g. through empowerment) or further disabling (e.g. through fostering inequalities)?

> **H2A:** (**OxIS**) Disability is significantly associated with social exclusion indicators after controlling for Internet use and other factors.
>
> **H2B:** (**Remploy**) Specific disabilities are significantly associated with particular types of online engagement, ceteris paribus.

3 Methodology

3.1 Quantitative data

3.1.1 Dataset I: Oxford Internet Survey (OxIS)

OxIS is a series of biennial surveys starting in 2003. It randomly samples over 2,000 individuals from Great Britain for every cross-sectional survey. It includes standard demographics and asks a wide range of questions about Internet use, attitudes, skills for on and offline contexts. The interviews occur in person. Researchers use a two-stage random sampling design to select primary sampling units: first randomly selecting "Output Areas" and then randomly selecting 20 addresses. The 2013 survey includes a "rural booster sample" (OXIS, 2013). To ensure the resulting sample matches population characteristics, all observations are weighted (Dutton and Blank, 2013). I do so following instructions from the survey researchers (Blank, 2015). Weighting changes the applicability of certain statistical and diagnostics tests (or requires corrections), e.g. Pearson's χ^2 statistic is converted to a design-based F-statistic with second-order correction from Rao and Scott (1984); collinearity diagnostics are run without weighting. This is appropriately reflected in all output tables below.

I use four waves of OxIS data containing data on disability (2007, 2009, 2011, 2013). Disability is identified through the question (Q.D16) "Do you have a health problem or disability?" which allows for a "yes" or "no" answer. Those who refused or answered "do not know" are excluded from analysis. The databases were provided by the Oxford Internet Institute on June 10, 2016 after agreement with terms and conditions. A script generating the dimension variables (amount, variety, and 11 types) of Internet activity was obtained from the authors of Blank and Groselj (2014) as well. I use three types of regressions for OxIS: logisitic, ordinal logistic, and ordinary least squares (OLS) regressions, which is indicated clearly in the tables.

Table 2: Number of reported disabilities among users on Remploy Online

Number	N	Percentage
No disability	381	17.8%
1 disability	1218	56.8%
2 disabilities	389	18.3%
3+ disabilities	158	7.1%
Total	2146	100%

Table 3: Type(s) of disabilities that Remploy Online users report having

Type	N	Percentage (of all users)	Mean age
Hearing and/or speech impairment	186	8.7%	41.7
Visual and/or sight impairment	86	4.0 %	39.4
Physical impairment	364	17.0%	43.5
Mental health condition	600	28.0%	37.5
Learning difficulty (e.g. dyslexia, dyspraxia)	407	19.0%	37.4
Learning disability (e.g. Down's syndrome)	105	4.9%	28.4
Neurological conditions	178	8.3%	37.7
Long-standing illness or health condition	584	27.4%	43.2
At least 1 impairment	1765	82.3%	38.3

3.1.2 Dataset II: Remploy Online

Remploy Ltd is an organization in the U.K. which provides employment placement services for disabled people. They operate an online platform called Remploy Online (`remploy.co.uk`) where anyone can sign up for a free account. The website provides resources related to job-seeking and allows for interaction with Remploy staff. Users are asked to voluntarily identify any disabilities when they sign up. The breakdown is recorded in Tables 2 and 3.

The platform collects user behavioral data, such as logins, the number of times the user interacted online with a Remploy staff (e.g. an online advisor or branch-based employment advisor), the number of specific activities completed (e.g. doing a mock interview, completing a group-style online workshop or a private workshop), and a progress tracker that tallies how many profile tasks the user has completed.[7] Examples of the platform interface are included in Figures 3 and 4. I obtained the database from Remploy on July 7, 2016 after signing a confidentiality agreement and

[7]These tasks include completing a skills checker, profile information, chatting to an online advisor, writing a to-do list, accessing resources on the job-search process, writing and uploading a CV, searching for and getting a job.

Table 4: Treating disability and ICT use as binaries: Some examples

	ICT use as binary	**ICT use not as binary**
Disability as binary	Fox (2011), ONS (2016)	Vicente and Lopez (2010), Dataset I (OxIS)
Disability not as binary	Internet use findings of Dobransky and Hargittai (2006)	Dobransky and Hargittai (2006), Lathouwers et al. (2009), Dataset II (Remploy Online)

non-disclosure agreement. The database captures user activity from July 2015 to July 2016. To predict preferences of online engagement by users with different disability types, I conduct logistic regressions with a subset of the data (N=2,146) of users who have logged in at least once and completed at least one profile task.

3.1.3 Selection of datasets

Table 4 contextualizes my selection of OxIS and Remploy datasets. Most of the cited studies in Section 2.3, with the exception of Dobransky and Hargittai (2006) and OFCOM (2015), treat disability as a binary. The survey used by Fox (2011) has data on disability types, but no findings on Internet use are presented. OFCOM (2015) data contained 3 types of disabilities (hearing, visual, mobility or learning disabilities). Dobransky and Hargittai (2006) use data containing 5 types of "disability categories" (blindness, sight difficulty, deafness/ hearing difficulty, limited walking ability, difficult typing, and difficult leaving home). For both studies, the granularity in disability types allowed them to obtain valuable insights. To meaningfully advance our understanding of how persons with disability interact with digital technologies, we ought to go beyond treating either disability or technology use as binaries. Therefore, I include datasets that treat disability as a binary (OxIS) and as 8 categories (Remploy Online). The former is helpful in studying status and dimensions of Internet use (amount, variety, and types).[8] The latter is more narrow – it allows only for inference about a particular platform geared for a particular purpose, but it importantly

[8]Middleton (2013, p.135) identify "the lack of spatially and temporally comparable data" as a recurring theme in the literature on ICT access and usage for people with disabilities. The 4 OxIS cross-sections adeptly address this.

provide insights about people with different disabilities engage online. They constructively combine to help answer my RQs.

3.2 Qualitative interviews

Since numbers alone cannot sum up the nuanced relationship between persons with disability and digital technologies, I conduct supplementary qualitative work to help answer RQ_2. Given the sensitive nature of the topic, and my goal of interviewing persons with a range of disabilities, including cognitive impairments, I obtained ethical clearance from the Central University Research Ethics Committee (CUREC), University of Oxford on June 29, 2016 (`SSH_OII_C1A_16_058`).

I carried out semi-structured interviews with 15 persons with disabilities in two U.K. cities in the East and West Midlands. This includes 10 Remploy employees and 5 Remploy service users (job-seekers), who all have a range of impairments with varying levels of severity. Table 5 gives a breakdown. The interviews were conducted face-to-face over two days in July 2016 at two Remploy sites. Interviews with Remploy employees were conducted in groups of 3 or 4, whereas the interviews with job-seekers were one-on-one. The average duration for the group interviews was 70 minutes and 35 minutes for the one-on-one interviews.

Work-site managers at the two locations were first provided with a document explaining my research goals as well as an ethics document and participant information sheet. They then recruited participants based on my outlined goals as well as participant availability on my days of visit. The outlined goals include obtaining a sample with diversity in types of disabilities and conditions, comfort with technology, use of assistive technologies, and use of carers or proxy users. The participant pool was ultimately dependent on what Remploy could facilitate. I did not have control over recruitment and sampling, though my input was taken into consideration.

I acknowledge the following limitations of my qualitative data. The Remploy employees interviewed work at a call center that use digital technologies to help other disabled people find jobs. They may be skewed towards having higher-than-average technical aptitude or more positive views of technology. Given Remploy's focus to help disabled users locate employment, their pool of service

Table 5: Types of disabilities among interviewed users

Type	N	Disability/ conditions (as defined by participant)
Physical impairment	2	Cerebral palsy
Mental health condition	4	Anxiety disorder, depression
Learning difficulty	5	Dyslexia, dyspraxia, autistic spectrum, Asperger's
Neurological conditions	2	Early-stage multiple sclerosis, hemipelgia (affects physical movement as well)
Long-standing illness or health condition	4	Arthritis, chronic kidney disease, chronic back pain, chronic fatigue (ME), sleep apnea

users will not include disabled people who are not working or not seeking work. Accordingly, I do not make claims of it being a representative sample of all persons with disability (if such a sample exists), nor do I imply that the themes I find can be generalized to other disabled sub-populations.

Despite all these constraints, I find a range of user attitudes on whether technology is empowering or fosters inequalities. There were compelling personal narratives both about using the Internet to be productive in creative and therapeutic ways, as well as accounts of cyber-bullying and exacerbating anxieties. These coherent themes and tensions from the interviews are therefore discussed in tandem with my quantitative OxIS findings on RQ_2. These supplementary insights are crucial in constructing a well-rounded understanding of the relationship between people with disabilities and the Internet. The interviews are coded with the framework included in Table 6. I use structural, in vivo, evaluation, and emotion coding (Saldana, 2009, p.66-89).

3.3 Ethical considerations

As specified in my CUREC application, I limit my recruitment pool to those who can give free and informed consent, which rules out severe cognitive impairments. Since my questions touch on participants' personal health information and potentially specific and private experiences, I pseudonymize all participant quotes. The Remploy branches and the situated cities are not identified; only the official regions of England. This is done to prevent any possibility of re-identification of interview participants, since some have particular combinations of disabilities and experiences that may be revealing. Research notes were encrypted. Ample time was given to

participants for questions and reviewing of the information sheet before signing the informed consent form. As required, scanned copies of the 15 signed forms will be kept electronically for a year before deletion.

For both quantitative datasets, no personally-identifiable information is presented. The Remploy Online dataset was anonymized to first names and password-protected. Since access to the research dataset was subject to a non-disclosure agreement, findings from that datatset will not be made public without prior consultation with Remploy.

4 Findings

4.1 Disability and Internet use

Predicting disability:

First, in Table 7, I find out what socioeconomic factors are strongest predictors of disability across over four waves of OxIS. This informs our understanding of the British disability context, which is helpful for later model-building. I use a logistic regression with disability (dichotomous) as the DV. Age, gender, ethnicity, geographical location, education, marital status, lifestage, and income are included as IVs (henceforth "eight standard demographics"). Note that this reveals statistical association only, not causation. I first interpret unstandardized odds ratios as percent change (i.e. $100*(e^{b_x}-1)$), following guidance from Menard (2009, p.93-96). Holding other variables constant, the odds of being disabled are:

- 2.1% higher for someone who is a year older compared to a year younger in 2007 (4.8% in 2009, 4.8% in 2011, and 2.4% in 2013).
- 6.6 times higher for the unemployed compared to the employed in 2007 (4.4 times in 2009, 6.6 in 2011, and 4.1 times in 2013).
- 6 times higher for retirees than the employed in 2007 (2.6 times in 2009, 2.1 in 2011, and 3.2 times in 2013).

Since my models include a continuous IV (age), in order to compare coefficients, I standardize the odds ratios ($e^{b_x*SD_x}$) which are presented in Table 7. I find:

- Age and lifestage are the most persistent and influential predictors of disability. Adding lifestage to the model decreases BIC by 24-66 across the 4 waves. This exceeds the threshold of 10 for "very strong evidence" that fit is decreasing more quickly than complexity is increasing, indicating a much better-fitted model (Raftery, 1999, p.99).
- Income predicts disability, too. The significance of income decreases upon controlling for lifestage, though being in a higher income bracket (household income at £30,000 or more) is

associated with lower likelihood to be disabled compared to being in a lower bracket (below £12,500) in 3 full models from 2009-2013.

- Contrary to findings in the U.S. (e.g. Fox, 2011), education is not a great predictor of disability in the British context when more influential variables are present. Education is only significant in the 2011 full model.

Disability and Internet/ computer use:

In Table 8, I find out if disability is associated with a lower likelihood to be Internet and computer users, holding other variables constant. This was the finding in Dobransky and Hargittai (2006) and Vicente and Lopez (2010). Using OxIS 2007-2013, I conduct 4 logistic regressions with Internet use as the dependent variables (DV) and another 4 with computer use as DV. The independent variables (IV) are eight standard demographics plus disability. Ethnicity is simplified to white and non-white, following convention of how ethnicity is coded in OxIS studies (Blank, 2013b). Students are dropped from all models as there are very few students with disability in the data.[9] Again, interpreting the unstandardized odds ratios:

- The odds of Internet use for a person with a health problem or disability is 34.9% lower than that of a person without a health problem or disability in 2007, ceteris paribus.[10] The finding is 38.3% in 2009 and 53.5% in 2011, in the same direction. However, the finding is not significant at $p<0.05$ in 2013.

- The odds of computer use for a person with a health problem or disability is 31.5% lower than that of a person without a health problem or disability in 2007, ceteris paribus. The finding is 35.9% in 2009, in the same direction. However, the finding does not extend to 2011 or 2013.

- McFadden's R^2 for all models where disability is significant range from 0.20 to 0.47, which exceeds the 0.2 threshold for an "excellent fit" for logistic regressions (McFadden, 1978, footnote on p.309).

[9]The numbers are 5, 5, 2, and 3 in 2007, 2009, 2011, and 2013 respectively.
[10]Ex-users are dropped to avoid confounding with non-users.

All models confirm previous findings that age, education, and income matter a lot for Internet and computer use (e.g. Dutton and Blank, 2011; Dobransky and Hargittai, 2006). From the standardized odds ratios, we can also discern that the effect of disability on both Internet and computer use is clearly much eclipsed by the same effect exerted by age, education, and income. Unlike disability, the significance for age, education, and income generally extend throughout OxIS 2007-2013.

Disability and dimensions of Internet use:

I test the conflicting prior findings on types of Internet use by Dobransky and Hargittai (2006, p.328) and Vicente and Lopez (2010, p.59). The former said people with disabilities use the Internet more than the rest of the population to play games and search for information about health and government services; the latter directly contradicted this, saying health information is the only exception. I first isolate variables capturing similar specific usages among current Internet users from OxIS 2013. They are all dichotomous: having never done the online activity and having engaged in it at any level of frequency. I present a cross-tabulation with a χ^2 test of independence in Table 9. Rao-Scott corrected Pearson χ^2 is presented instead given the weighting issue discussed. I find persons with disability are less likely to have accessed (both on and offline) government resources than persons without disabilities. Persons with disability are also more likely to have never played mobile games than persons without disability. However, logistic models with these "specific use" variables as DVs yield poor fits, as Table 10 documents. This is because the singular variables capture very specific uses, so the IVs (standard demographics plus disability) do not capture much variance in the DV. To compensate, I look at "buckets" of Internet activities aided by principal components analysis (PCA).

I generate variables capturing the 3 dimensions of Internet use (amount, variety, and types) isolated by Blank and Groselj (2014). Amount is a total sum of engaging in 48 different Internet activities (originally measured on a 6-point Likert scale) and ranges from 0 to 240. Variety is the number of activities the user has engaged in out of the 48, and ranges from 0 to 48. All activities are distilled into 11 orthogonal factors using PCA. Varimax rotation is used and the last factor extracted (vice) has an eigenvalue of 1.55, which is considerably higher than 1, the average variance

captured by one factor and also the threshold in Kaiser's rule. The amount, variety variables and the factor scores from PCA are used as DVs in OLS regressions, presented in Table 11. Note that standardized beta coefficients are presented for the regressions on amount and variety. I find, holding other variables constant:

- Disability is negatively associated with variety of use, but this effect disappears after education and income are controlled for as well.
- Disability is not significantly associated with amount of use or 9 types of Internet activities.
- Having a disability is, however, associated with a 33.1% increase and 37.6% increase in factor scores for information-seeking and creative production respectively, significant at $p<0.05$.[11]
- Information-seeking captures activities like looking up definitions, investigating topics of personal interest, and finding facts. Creative productive encompasses activities like posting, re-posting, and sharing videos and writings.

4.2 Disability and social exclusion

Persistent feelings of being left out, lonely, and lacking companionship

In Table 12, I investigate how disability and Internet use are associated with feelings of isolation and social exclusion. I use three variables from OxIS: two Likert scale variables measuring how often the respondent feels left out or that he/she lacks companionship, and a binary variable that measures if the respondent reports a high degree of loneliness (out of low, medium, and high). I carry out ordinal logistic regressions with the first two variables and logistic regressions with the third. I use OxIS 2009-2013 as the questions are not available in 2007. The IVs include the eight standard demographics, disability, and Internet use (coded as current or non-current user). Standardized odds ratios are reported. I find:

- Persons with disability are more likely to feel left out, lonely, and that they lack companionship than persons without disability. The effect is strong and persists over time. Disability

[11] The two significant models have adjusted R^2 values above 0.14.

is significant in all but 2 models.

- Internet users, on the contrary, are less likely to feel isolated or excluded than Internet non-users. This is significant in 4 models.

- For the 3 models where both disability and Internet use are significant, the magnitudes of their standardized odds ratios are similar. E.g. In 2013, holding other variables constant, persons with disability are 16.3% more likely to report a high loneliness score whereas Internet users are 18.5% less likely to do the same. In the same year, persons with disability are 19.2% more likely to report they always lack companionship (versus the rest of the categories. i.e. "never" to "almost always" combined) where Internet users are 17.9% less likely to do so.

- I do not multiply the odds ratios to get the cumulative effect of the two categorical predictors (i.e. comparing Internet users with disabilities with non-users without disabilities) because there is an interaction effect between disability and Internet use (Menard, 2009, p.96).

- This finding persists after controlling for factors that negate feelings of isolation and loneliness, e.g. marital status (significant across all models).

4.3 Type of disability and method of online engagement

In Table 13, I find out if type of disability predicts particular types of online engagement on Remploy's job resource platform. The 2 binary DVs are having completed an online workshop and having had digital contact with Remploy staff. The former refers to conference-style interactive workshops in small groups on 6-7 topics like interview confidence and digital skills. The latter refers to purely online interaction with a Remploy online or branch employment advisor, who then logs each contact in the system as Figure 3 shows. This does not include telephone calls or face-to-face interactions. I control for age, gender, and activeness (a variable I constructed with logins and profile activities completed; see Figure 6). I present standardized odds ratios for the logistic regressions. Holding other variables constant, I find:

- Users with chronic illness or health conditions are 37.5% less likely to complete an online workshop.
- Users with a mental health condition are 27.1% more likely to have online contact with Remploy staff.
- Note the baseline for the comparisons is the Remploy Online user-base, not the general population. As Table 3 shows, 82.3% of the platform user-base have at least 1 disability.
- Both of these findings are not revealed when only a disability binary IV is used.
- McFadden's R^2 for both full models are above 0.18. ROC curves and outlier diagnostics are presented in Figures 7 and 8.

4.4 Complicated enabling-disabling tensions

I highlight one interesting recurring motif from the interviews to help make sense of quantitative findings for RQ_2: while there are accounts of Internet technologies being enabling (source of information and peer support, means of escape, preferred mode of contact, and substituting manual labor), there is the recurring theme of technologies being disabling as well (inaccessibility, fostering reliance, facilitating cyber-bullying, and worsening anxiety).

Anecdotal evidence from interview participants show that many hold conflicting opinions on whether technology aids or worsens life for a person with disability. After I ask the participants to define their disabilities (if they consider themselves to be disabled), I start off each interview by asking if they find technology empowering: whether they feel technology makes life easier or hard for someone with disability. Some gave immediate answers while others were not sure. At the end of the interview, after discussing how they use the Internet and aspects of Internet use that they like and dislike, I ask the question of empowerment again. Many who started with a definitive opinion ended up with variations of "a mixture of both" and "it is complicated." Mia,[12] who has

[12]Pseudonyms are used to protect participant anonymity.

mild hemiplegia which affects mobility on one side of her body, was one of them. She first brought up using technology as a means to find social support among those with similar impairments:

> "Oh yes, I find technology empowering. I am part of this Facebook group called 'Hemi Help' that was originally managed by a charity but now it has taken off. I first went to a meet up in London and now I go around twice a year and 20 to 30 people show up each time! I have made some lifelong friends from that."

At this point, David, another participant in the group interview interjected with a more skeptical account of sharing on social media, saying that "it is not a need." In explaining why he is less enthused about social media, David says,

> "I see why some people think I prefer social media. This whole idea of people on the Internet not knowing I have cerebral palsy, but really I only use social media to connect with people I already know well. And my condition is not something I can or want to hide in real life anyway. [...] I just do not like over-sharing on social media because of trust and privacy concerns".

Mia concurred partially, expressing that she does have complicated feelings about online sharing:

> "I do think my disability affects how I share online. 'Hemi Help' is private so I am more forthcoming, but in general, I do not always bring up my condition on the Internet even though sometimes I want to raise awareness of it among my friends. You just don't know who on Facebook knows you have a disability. So I don't broadcast it."

Both Mia and David ended the interview by saying technology affords "a mix of both" empowerment and disempowerment. Catherine, a single mother who suffers from depression and restricted mobility articulate some of these tensions as well:

> "I don't know if technology makes life better or worse. I am scared of learning new technologies. I want to learn but things are always upgrading themselves and it makes me really anxious and embarrassed if I can't use it in front of people. (Later in the interview) [I do] like using the Internet to get food and shop for things. It is really helpful when my anxiety flares up or I don't want to get out of the house."

Finally, not everyone is ambivalent about technology's role in improving life for the disabled. Charlotte, who had myalgic encephalomyelitis (chronic fatigue) for two years when she was wheelchair-bound, gave an account of unrelenting, strong optimism about technology:

> "Back when it was really bad and I was too tired to get out of the house, I still wanted to talk to people. There're only so many of my dad's war and cowboy films I can watch. So I would put my headphones on and play World of Warcraft (WoW). It gave me so much freedom. Something about building things and fighting. I no longer think of how tired I was. [...] You can be anything in the game. In WoW, you are not disabled. [...] I was playing mostly in these family guilds where you can chat with people. I don't usually talk about my disability unless it triggers interest. But one time I found out that this guild leader was actually a chronically-disabled Norwegian woman! So we talked about that."

In Charlotte's own words, she "cannot survive without [her] technology." The ability to communicate and engage socially without leaving home opened up new avenues of participation for her. It also serves as an effective means of escape and source of peer support. I delve more deeply into the themes raised here in the next section.

5 Discussion

5.1 RQ_1: Some evidence of a divide in Internet use, but not among those online

A waning divide

The findings in Section 4.1 provide a nuanced answer to RQ_1: there is strong evidence in OxIS for a "disability digital divide" in Great Britain prior to 2011. Having a health problem or disability is significantly associated with a lower likelihood to use the Internet or computer, even after controlling for much stronger predictors of Internet use. However, from 2013 onwards, the evidence is more muddled but it is clear that any "disability divide" does *not* extend to those who do go online. Internet users with disability use the Internet pretty much similarly as the rest of the online population, even engaging in certain categories of activities more actively.

Why does the finding that disability affects Internet and computer use not extend to 2013? At first glance, this may seem surprising as persons with disability are less and less likely to be Internet users from 2007 to 2009 to 2011, all significant at $p<0.05$, but the effect then dissipates in 2013. It is worth noting that while my models in Table 8 dropped non-users and students as explained, I test with various alternative models (e.g. not dropping either, combining non-users and ex-users, etc) and disability always remains insignificant in 2013. What is at play here?

First, even before controlling for other demographics, the gap in Internet use between persons with and without disability (as revealed through simple crosstabulation) has indeed been closing. This is reflected in various sources (OFCOM, ONS, OxIS) earlier summarized in Section 2.3.1. This is especially clear in ONS (2016), which contains more updated data than OxIS – their most recent data shows that since 2015, the number of disabled adults who had used the internet in the last 3 months has increased by 6.8% to 8.6 million in 2016. The percentage increase was 8.4% for 2014-2015. On the other hand, the rate of increase of number of recent users among those who are not disabled was only 1.6% from 2014-2015 and 1.9% from 2015-2016. Simply, while persons with disability still lag behind in terms of percentage of Internet users, the gap is closing because

persons with disability are becoming users at quicker rates than the rest of the population. It is thus certainly plausible that no effect was detected in 2013 because disability is indeed no longer a significant predictor of Internet use.

Second, even when disability significantly impacted Internet use (2007-2009), its effect had always been eclipsed by more influential predictors of Internet use. In 2011, when disability had the strongest significance, the standardized odds ratios show that the negative effect on Internet use exerted by age is still 2-3 times greater than of disability. Even before the the waning of the "disability digital divide" in recent years, its extent had always been smaller than that of stronger predictors of Internet/ computer use, such as age, income, and education.[13]

Importantly, the non-significance of disability in more recent data does not mean persons with disability no longer face structural disadvantages that impact their ICT access. Web (in)accessibility and social discrimination (e.g. on employment practices) remain concerning. Non-significance of disability also in no way diminishes the importance of studying ICT non-usage as it pertains to disability. Around when the digital divide narrative was injected in policy discourse, Wyatt et al. (2002) challenged the idea that every person is a potential user in "They Came, They Surfed, They Went Back to the Beach." They attribute this erroneous implication to a "technocratic vision of the centrality of technology," which does not accommodate for legitimate reasons of ICT non-usage.

Similarly, in the disability context, policymakers must acknowledge that matching the usage patterns by persons without disability should not be the default, unchallenged end-goal. While I talk of "closing gaps" and the existence of a waning "divide" (partially driven by conventional vernacular and for ease of conceptualizing statistics), we must acknowledge that this language still heavily implies that the mission is accomplished when persons with and without disabilities have equal percentages of Internet users (or when differences are negligible). There is a distinction between equal opportunities and equal outcomes. We should strive for the former but not necessarily the latter. A framework that emphasizes equal outcomes may be too rigid and risk masking the lived realities of persons with disability. Dobransky and Hargittai (2006, p.317) mention that "it

[13]These stronger predictors are not all waning: OxIS shows some digital divide facets (age) have been declining from 2007-2013 while others persist (income, education).

may be that some people may not want to go online." They, however, still mostly chalk this up to people not realizing yet the medium's benefits and "opportunities offered by the system." Applying the argument made by Wyatt et al. (2002), we should challenge the idea that every non-user with disability is a potential user awaiting the life-changing benefits of the Internet. By accepting that non-use and reduced-use among persons of disability can be voluntary and volitional, we accept that many persons of disability are autonomous, independent agents of power who are not victims awaiting charitable assistance. As discussed, this aligns with the movement away from the medical and charity model of disability which will hopefully allow for more accurate and realistic accounts of living life with disability.

Any potential divide appears not to extend to online users

I set out to reconcile the inconsistencies between Vicente and Lopez (2010) and Dobransky and Hargittai (2006) in their findings regarding a disability divide in types of Internet use. My findings overall are more closely aligned with Vicente and Lopez (2010). By going beyond both papers and controlling for socioeconomic factors as well as using PCA, I arrive at additional insights as well. Disability is *not* negatively associated with use across any of the three dimensions of Internet use (amount, variety, and types). There is no "divide" in the way persons with disability use the Internet compared to the rest of the population, once greater predictors of these Internet use dimensions (e.g. age, gender, education) are controlled for.

While the finding on amount, variety, and types of Internet use only relies on OxIS 2013 and not previous cross-sections, it does reasonably line up with prior research. At least three datasets (2003 CIUS, 2005 eUser, 2013 OxIS) have now shown that persons with disability use the Internet more for information-seeking (Dobransky and Hargittai, 2006; Vicente and Lopez, 2010).

How do I reconcile the finding that disability is *not* negatively associated with use across any of the three dimensions of Internet use (amount, variety, and types) and the vast literature on web inaccessibility (e.g. Baker et al., 2009)? On one hand, my finding seems to suggest that disabled online users act just like the rest of the online population. On the other, accessibility remains a major concern for disability rights activists who continually call for better "cyber ramps" and "universal design" (Ellis and Kent, 2011; Ritchie and Blanck, 2003). My finding generally weakens

claims that there is a "disability divide" between online persons of disability and the rest of the online population – specific to amount, variety, and types of Internet use. It does not contradict claims of a "disability divide" along accessibility lines. The way disability affects amount, variety, and types of Internet use (as reflected in Table 11) is not unidirectional for persons with all sorts of impairments. It may be that visual impairments do negatively impact amount, variety, and types of Internet use, but this is blurred since the dichotomous disability variable lump those with visual impairments together with other impairments. Thus, there are dynamics that cannot be teased out unless we supplement or link the data to more granular information on disability types. This limitation and possible improvements are discussed further in Section 5.3.

Finally, the finding that persons with disability more actively engage in certain categories of online activities (information-seeking and creative production) may be indicative of higher levels of user agency, which may further challenge the notion that there is a "disability divide" among online users, but this requires further unpacking in future research. I suggest how in Section 5.3.

5.2 RQ_2: Varied and complicated relationships between persons with disability and technology

The findings concerning persistent feelings of social exclusion among persons with disability despite Internet use (OxIS), reported tensions in evaluating the enabling and disabling forces of technology (interviews), and associations between types of disability and particular ways of online engagement (Remploy) combine to yield a perhaps surprisingly simple answer to RQ_2: the relationship between persons with disability and technology is varied and complicated. Here, I discuss these findings as they pertain to themes raised in Section 2, especially those from critical disability studies.

Varied

The interviews show a diverse range of user agency and idiosyncrasies that may not be easily captured by percentages and p-values. While all my interview participants are current Internet users and may be skewed towards greater affinity to technology as explained, the quotes still reflect

diversity in both positive and negative attitudes towards the Internet. The interviews supports as well the idea that disability may be more fluid than other demographics usually included in digital divide discourses. As the examples of doing more online shopping when anxiety flares up or when arthritis gets worse show, there are different points of onset and fluctuating levels of severity which all impact the way persons with disability use ICTs.

The findings from the Remploy dataset reflect the varied nature of how persons with different disability interact with technology as well. Users with chronic illness or health conditions are less likely to complete an online workshop. This may reflect different priorities in their online engagement and job-search. Workshops focusing on digital skills may be less relevant for or helpful to those with long-term health conditions. The finding that users with a mental health condition are more likely to have digital contact with Remploy staff is not surprising as well. Since the DV does not capture face-to-face interactions or phone calls, this may reflect preference for more "removed" forms of online interaction. The latter finding aligns with intuitions from conversations with Remploy staff as well as psychiatric research on anxiety disorders (e.g. Leon et al., 1995).

On a methodological note, we need to be cognizant of potential collinearity issues when breaking down users by disability types. While the largest condition indices for all models do not exceed the threshold of 15 where collinearity becomes damaging, many users in the dataset have multiple conditions. To tease out such relations, I produce two network graphs with Gephi. Figure 1 is a directed graph of all users (reflecting disability-user ties). Figure 2 is a undirected graph of all users with multiple disabilities (reflecting disability-disability ties). Chronic illness is heavily linked to physical and mental impairments; users who identify learning difficulties (dyslexia and dyspraxia) often report having mental health conditions as well.

Complicated

Section 4.4 laid out how many interview participants directly spoke to tensions in whether they feel Internet technologies make life easier or harder. In addition to the participant-revealed tensions, I discuss another more subtle aspect of the complicated relationship between persons with disability and technologies: the issue of reconciling i) practical ways through which impairment impacts ICT use with ii) notions that persons with disability are agents of power, not victims.

Recalling the literature on how access barriers are heavily constructed and informed by social circumstance, it is often said that Internet access alone is not a panacea. Robinson (2014), for example, show how recalcitrant certain structural disadvantages are for low-income youth who already have full access to the Internet. This is partially reflected in my OxIS finding that persons with disability persistently feel isolated and excluded, even after controlling for demographics and Internet use. As explained, social exclusion just forms one blotch on a much broader canvass of structural stereotyping and discrimination (Jaeger, 2011, p.19). A disability divide narrative that zones in on equalizing rates of Internet access between persons with and without disability risk losing sight of the forest. The danger of a purely techno-centric frame that casts technology as always-empowering is that it contradicts the reality that gaining Internet access does not solve broader, potentially more recalcitrant structural inequalities.

The interviews similarly reflect complicated structural inequalities that influence how a person with disability uses ICTs. Take, for example, interview participant John, who has dyslexia, dyspraxia, undiagnosed Asperger's, and a previous spell of depression:

> *"There are things I don't like about technology. I stay away from Facebook because it makes me socially anxious. I think this is related to what I just told you about that [cyberbully from school] who used to send me nasty, threatening messages. But generally I can focus on things that do not worsen my anxiety, like using I.T. to learn about graphics for my apprenticeship [...] and also Minecraft which helps me switch off. Learning in general is easier with I.T. I really think it is easier to express myself with technology and computers, especially with my condition."*

He attributes both elements of his disability and a personal experience of being cyberbullied as reasons for his reduced usage of social media. There are two nuances here worth highlighting that we cannot detect with just quantitative data: i) John's ICT use and preferences are influenced by both impairments and social circumstances; his reasons for reduced usage of social media reflect both physical and socially constructed disability, ii) he clearly possesses high user agency over his own ICT use and articulated strategies to use the Internet in ways that are compatible with his needs. He does not express the desire to emulate or match usage patterns of someone without learning disabilities.

How might we reconcile the former (a physical and socially-constructed structural disadvantage) with the latter (individual norms of use that do not necessitate overcoming)? Communications scholar Dawn O' Braithwaite (1994) famously suggested that we view persons of disability as a culture. She warns against an "ethnocentric bias" in research, arguing it is not fruitful to default to studying disability from the perspective of the non-disabled majority. She raises vivid examples of how, for many, disability is incorporated into part of self identity – for example, someone with a prosthetic limb playing a game called "which is my good leg?" with children where he prompts them to consider that the artificial leg is not nearly as old as the other one; or a wheelchair-bound student with limited mobility who is puzzled by why people assume she will automatically take offense at figures of speech like "we've got to be running along now." Perhaps one helpful way is to acknowledge both the *structural disadvantages* and the *cultural norms* that affect how a person with disability engages with ICTs. I demonstrate this by returning to David's example. He finds it hard to type with cerebral palsy affecting his mobility (a structural, physical disadvantage), but he also eloquently points to trust and privacy concerns to justify why he dislikes sharing on social media and rejects the applicability of "no one knows you're disabled on the Internet" in his case (a cultural norm). Even Charlotte, who found online anonymity liberating ("you are not disabled in WoW") still asserts that "[she] did not shy away from talking about [her] condition online" as it is "part of who [she] was at the time." Acknowledging cultural norms of ICT recognizes that disabled users can have very high user agency; they do not need to be re-skilled or given charitable assistance.

Overall, while there may be an intuitive, natural draw to emphasize the structural disadvantages, scholars should accept, acknowledge, and portray any "cultural norms" of ICT use by persons of disability as well in a respectful manner that does not imply a need for overcoming.

5.3 Limitations and future work

OxIS treats disability as a binary which limits the mileage we can get out of the data. Disability is not a binary but a range of very diverse experiences (Sherry, 2008). The wide range of disabilities

had led to varying ways to conceptualize disability: as a process, an interaction, a binary, or a continuum of abilities (Jaeger, 2011; Baldwin, 1997). There are many ways to not treat disability as a binary. Breaking it down into disability categories is one option, which is the case in the Remploy dataset. Similar to Dobransky and Hargittai (2006), some scholars instead focus on the practical circumstances that potentially apply to multiple disabilities. For example, Kapteyn et al. (2007) make the distinction between work disability with pain and without pain. It is intuitive but nonetheless worth stating: granularity in disability (broken down into categories of disability or practical impacts on daily life) can be very illuminating when studying Internet use, for the simple reason that persons with disabilities are not all the same.

Concepts of ICT use are complex and multidimensional as well. They should not be viewed only from a binary perspective. Future work should refrain from asking research questions or collecting data in ways that reinforce that simplistic bifurcation shown in Table 4. In particular, reasons for non-use are nuanced and understudied (Selwyn et al., 2005; Helsper and Reisdorf, 2013). Qualitative work will shed light on whether situation relevance and relative advantages theories apply to persons with disabilities who remain offline or choose to limit their engagement online.

I may be guilty of ethnocentric biases since the data I rely on, as well as the dimensions of Internet use I investigate, are informed by prior research that generally focus on non-disabled Internet users. I attempt to counter this by including the voices of persons with disability and caveating my statistical findings accordingly. However, there is much potential for future work to eliminate ethnocentric biases. Future surveys should i) not treat disability as a binary and ii) include people with disabilities in survey design if possible. We can discern and even uncover helpful themes with PCA if there are well-constructed disability-specific questions in large-scale surveys.

In a related vein, it is important not to assume persons with disability view their ICT use primarily through the lens of their impairments. Future work may be especially productive if they consider both structural disadvantages and cultural norms of ICT use by persons with disability.

Finally, my findings on greater likelihood to engage in not just information-seeking but also creative production prompts intriguing research questions. Ellis and Goggin (2015) lay out the many

problematic ways through which disability is portrayed in the media and argue that a profound transformation is needed. Can disability arts act as an agent of change? There is room here for future research on creative works by persons with disability, through qualitative research, content analysis of texts posted online,[14] or other means. This is a productive avenue to further break down unrefined aspects of the disability divide.

[14]E.g. content analysis has been done with a disability focus for mailing lists and online support forums (e.g. Deetjen and Powell, 2016; Lasker et al., 2005).

6 Conclusion

Statistical inference generally necessitates some level of generalization and abstraction. For example, as I do in Section 4, regressions are interpreted in a way that inherently suggest i) "persons with disability" is a valid unit or subgroup to make claims about, despite what my essay's opening quote suggests, and ii) potentially complex ideas can be sufficiently captured in percentages and significance values. Hopefully, my mixed methods inquiry has injected helpful critical insights as to why that is not the case. This is not a critique of statistical methods – the field stands to benefit greatly from more granular quantitative insights. Yet, precisely because numbers are very informative, sometimes it is easy to let numbers do all the talking, at the expense of importance complexities.[15] This may have contributed to the prevalent "disability divide" frame which may be problematic and unpalatable, as it emphasizes a rigid understanding of a nuanced issue.

Using mixed methods, I set off to question and break down the "disability digital divide." I examine two datasets and interviewed a group of disabled Internet users. With OxIS data, I find a disability digital divide (as most commonly interpreted) that has waned in recent years. I question whether there is a disability divide at all between Internet users with and without disabilities by looking at their amount, variety, and types of use. The Remploy data reveals granular insights to how we understand different types of disability and Internet use. The interviews paint the picture of varied and complicated relationships between persons with disability and technologies. There are at least two aspects of complexities that supplement the quantitative findings: i) persons with disability may themselves have conflicted views over the whether technology makes life easier or harder; researchers should not gloss over this by casting technology in a blanket of empowerment, ii) persons with disability face structural disadvantages that practically impact their ICT use but also demonstrate high user agency through coherent cultural norms of use; researchers should not gloss over this by casting disability in a blanket of victimhood.

Finally, how should disability continue to be integrated into discourse on digital inequalities? First, give thoughtful justifications for using the "disability divide" framework. Studies claiming

[15] One relevant theory here may be that of the "theory of agnostic statistics," which minimizes assumptions and emphasizes credible inference (Aronow and Tiller, 2015).

the existence of disability divides may benefit from acknowledging at least some of the four factors laid out in Section 2. Second, be specific in the "packaging" and interpretation of findings and implications. Do not assume persons with disability have reduced agency or are victims in need of charitable help. Third, refrain from discussing technologies as a unilateral tool of empowerment for persons with disability. In the World Bank paper, Raja (2016, p.13-19) eloquently discusses how ICTs have successfully lowered barriers to education, labor market participation, emergency services, and financial inclusion. The paper ends on an assertive call for action, suggesting various policy, legal, or regulatory actions (p.24-28). There is, however, no single mention of how technologies may be disabling for persons with disability, too. Calls for policy change (including, e.g., more accessibility funding) and recognition that technology is not all-empowering are not mutually exclusive. In the digital age, persons with disability face both structural disadvantages that should be addressed and cultural norms of use that should be respected. Writers who do not recognize the structural and cultural risk coming off as callous or condescending, and often both.

Henry, who has highly-functioning autism, was the only interview participant who does not consider himself disabled.

> *"I did not go to a special school. I can get by without most people noticing, so I avoid disclosing my condition because I do not want a special tag. I just want to be treated like someone normal. (Follow up question about he means by normal) Normal is maybe the wrong word. I meant I want to be treated like everybody else. [...] What is normal anyway? There is no such thing as normal, I think."*

This quote shows precisely why the way we talk about disability and the Internet is important. The terminology that we adopt and the vernacular we reinforce have real impacts beyond academia. Jaeger (2011, p.155) makes the point that language affects social distancing. Depending on the context and interpretation, some elements of the "disability divide" frame are unpalatable and inadequate in capturing the realities of living with disability. We would do well to be critical of and potentially move away from the "disability digital divide" frame, only using it in specific and well-defined circumstances.

Appendix

Table 6: Qualitative interviews coding framework

Structural
- ▶ Dyslexia
- ▶ Dyspraxia
- ▶ Anxiety
- ▶ Cerebral palsy
- ▶ MS
- ▶ Dialysis
- ▶ Arthritis
- ▶ Autistic spectrum
- ▶ Templegia
- ▶ Asperger's
- ▶ Back problem
- ▶ Sleep apnea
- ▶ Young people grew up with technology
- ▶ Hard to use
- ▶ Want to learn
- ▶ Restricted mobility
- ▶ Carer
- ▶ Remploy
- ▶ Maximus
- ▶ Web accessibility
- ▶ Social media
- ▶ Revealing disability
- ▶ Trust
- ▶ Privacy
- ▶ Normal
- ▶ Online dating
- ▶ Employment
- ▶ Gaming
- ▶ New inventions

In vivo
- ▶ "Slacking of the internet"
- ▶ "Boogie mobility scooter"
- ▶ "You can only have so much data"
- ▶ "I don't want a special tag"
- ▶ "I couldn't survive without my technology"
- ▶ "My confidence is from a community of support"
- ▶ "There is no such thing as normal"
- ▶ "Learning with IT is easier for people like me"
- ▶ "You don't know who on FB knows your disability"
- ▶ "You can be anyone you want to be online"
- ▶ "I'd rather people just ask instead of guess"
- ▶ "In WoW, you are not disabled"

Evaluation
- ▷ Positive comments about technology
  - ▶ Get groceries
  - ▶ Confidence building
  - ▶ Knowledge empowers
  - ▶ Seek health information
  - ▶ Entertainment
  - ▶ Online support group
  - ▶ Real life support group
  - ▶ Help bedbound
  - ▶ Distraction/ switch off
  - ▶ Feel normal
- ▷ Negative comments about technology
  - ▶ Bombardment of awful news
  - ▶ Too much, too early
  - ▶ Porn
  - ▶ Taking away jobs
  - ▶ Limited battery
  - ▶ Website text too dense
  - ▶ Over-sharing
  - ▶ Cyber-bullying
  - ▶ No checks for DOB for kids
  - ▶ Following the crowd
  - ▶ Don't know what is safe
- ▷ Neutral/ mixed
  - ▶ Can't avoid future
  - ▶ Focus on how it is used
  - ▶ Both empowered & made reliant
- ▷ Not sure
- ▷ Changed opinion over interview

Emotion
- ▶ Excitement
- ▶ Scared
- ▶ Anxious
- ▶ Withdrawn
- ▶ Embarrassed

Table 7: Logistic regression predicting disability over 4 waves of OxIS data (2007-2013)

	Standardized odds ratios from logistic regressions Dependent variable: disability							
	2007		2009		2011		2013	
	Omit lifestage	Full	Omit lifestage	Full	Omit lifestage	Full	Omit lifestage	Full
Age	1.755***	1.434*	2.352***	2.228***	2.058***	2.319***	1.756***	1.473*
Female	0.857	0.780**	1.021	1.009	1.043	0.981	1.029	0.987
Ethnicity								
Black	1.042	0.975	1.280	1.324	1.101	1.144	0.981	1.070
White	1.259	1.127	1.543	1.571	1.031	1.086	1.088	1.165
Other	1.074	1.016	1.192	1.176	0.870	0.885	0.947	0.932
Urban	1.001	0.968	1.139	1.132	1.126	1.060	1.157	1.153
Marital Status								
Married	0.973	0.962	0.745*	0.769	0.861	0.885	1.320	1.336
Living with partner	0.871	0.919	0.941	0.936	1.005	1.033	1.103	1.095
Divorced/Separated	1.044	1.099	0.957	0.996	0.851	0.912	1.160	1.222
Widowed	1.082	1.077	0.855	0.887	0.946	0.997	1.238	1.218
Education								
Secondary ed.	0.888	0.884	0.796	0.759	0.587*	0.609*	0.624	0.666
Further ed.	0.883	0.921	0.690	0.680	0.700	0.737	0.574	0.620
Higher ed.	0.718	0.685	0.988	1.027	0.563**	0.642*	0.614	0.680
Other ed.	1.050	1.043	1.034	1.007	0.727**	0.756*	0.799	0.813
Life stage								
Retired		2.082***		1.474***		1.385**		1.584**
Unemployed		2.072***		1.874***		2.118***		1.658***
Income level								
£12,500-£30,000	0.621***	0.863	0.685***	0.677	0.678***	0.834	0.725**	0.839
£30,000 or more	0.498***	0.756	0.499***	0.837**	0.484***	0.652**	0.485***	0.604*
N	1815	1811	1444	1437	1514	1511	1113	1103
$McFadden's R^2$	0.163	0.217	0.178	0.208	0.166	0.214	0.155	0.189
χ^2 *statistic (Likelihood test)*	165.3***	195.5***	178.4***	171.2***	192.0***	178.8***	121.5***	129.7***
BIC	1306.5	1240.6	1121.6	1095.2	1182.9	1136.5	849.5	825.3
BIC difference		-65.9		-26.4		-46.4		-24.2

Source: OxIS 2007-2013. Omitted categories are male, Asian, rural, single, basic education, employed, and <£12,500. Students are dropped as they perfectly predict non-disability.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8: Logistic regression on Internet and computer use over 4 waves of OxIS (2007-2013)

	Standardized odds ratios from logistic regression							
	Dependent variable:							
	Internet use				Computer use			
	2007	2009	2011	2013	2007	2009	2011	2013
Age	0.522***	0.401***	0.339***	0.203***	0.739***	0.647***	0.456***	0.866
Female	1.002	1.045	1.210*	0.897	0.976	1.051	1.215*	1.076
Non-white	1.149	0.808*	0.698***	0.741	0.945	0.906	0.779**	0.918
Urban	0.966	0.919	0.825*	1.019	0.966	0.820*	0.866	1.048
Marital status								
Married	1.089	1.309*	1.367*	1.485	1.063	1.166	1.058	0.720
Living with partner	1.057	1.132	1.418*	1.029	1.072	0.943	1.025	0.853
Divorced/separated	1.073	1.132	1.029	1.157	1.135	1.014	0.905	0.913
Widowed	0.878	0.831	0.776*	1.058	0.881	0.895	0.709***	0.753**
Education								
Secondary ed.	1.986**	2.183*	2.498	1.618	1.718*	1.935	2.323	1.193
Further ed.	2.696***	3.919***	3.830**	3.202**	2.215***	3.292***	3.062**	1.623
Higher ed.	3.311***	4.605***	5.756***	4.128***	2.629***	3.525***	4.011***	1.798*
Other ed.	1.174*	1.311	1.505*	1.410*	1.228**	1.332*	1.427*	1.233
Lifestage								
Retired	0.734***	0.691**	1.037	0.887	0.700***	0.586***	1.002	0.797*
Unemployed	0.861*	0.808*	1.152	0.666**	0.895	0.833*	0.832*	0.832*
Income level								
£12,500-£30,000	1.833**	1.585***	1.291***	1.319*	1.740***	1.626***	1.345**	1.443***
£30,000 or more	1.876***	2.015***	2.835***	1.611*	1.656***	1.877***	2.172***	1.510**
Disability	0.864*	0.840*	0.757***	0.944	0.880*	0.851*	0.918	0.960
N	1711	1327	1422	1068	1808	1428	1489	1097
McFadden's R^2	0.291	0.435	0.466	0.409	0.204	0.333	0.326	0.147
χ^2 *statistic (Likelihood test)*	346.0***	318.9***	367.1***	241.2***	284.5***	350.5***	342.2***	173.1***

Source: OxIS 2007-2013. Omitted categories: male, white, rural, not disabled, employed, single, basic education, and <£12,500.
Students and ex-users are dropped as explained.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9: Cross-tabulation analysis: disability against i) Internet & computer use and ii) specific online activities that people with disabilities had been shown to exhibit higher rates of (from prior research) – OxIS 2013 only

	People without disabilities			People with disabilities			Total		Rao-Scott corrected	Control for demographics	
Descriptor	Unweighted N	%	Row proportion after weights	Unweighted N	%	Row proportion after weights	Unweighted N	%	Chi-square statistic (p-value)	Odds ratio for disability (p-value)	Logit model in Table 10
Next-generation usage, Internet use, computer use (Includes non-users and ex-users. Ex-users are counted as non-users in logit regressions.)											
Next-generation user	776	49.1	0.575	82	18.6	0.260	858	42.4	75.2***(0)	-	-
Not next-generation user	806	50.9	0.425	360	81.4	0.740	1166	57.6			
Total	1582	100	1	442	100	1	2024	100			
Current Internet user	1221	77.2	0.836	187	42.3	0.527	1408	69.6	132.0***(0)	See Table 8 (Column 4)	
Not current Internet user	361	22.8	0.164	255	57.7	0.473	616	30.4			
Total	1582	100	1	442	100	1	2024	100			
Use computer	1051	66.7	0.713	156	35.6	0.432	1207	59.9	66.98***(0)	See Table 8 (Column 8)	
Do not use computer	526	33.3	0.287	282	64.4	0.568	808	40.1			
Total	1577	100	1	438	100	1	2015	100			
Health (Internet users only)											
Have found information about health	857	70.6	0.692	134	71.7	0.700	991	70.7	0.0255 (0.874)	1.843 (0.103)	1
Never	357	29.4	0.308	53	28.3	0.300	410	29.3			
Total	1214	100	1	187	100	1	1401	100			
Have found information that improved health	513	42.2	0.410	80	43.2	0.425	593	42.4	0.0834 (0.773)	2.047**(0.033)	2
Never	702	57.8	0.590	105	56.8	0.576	807	57.6			
Total	1215	100	1	185	100	1	1400	100			
Government resources (including benefits) (Internet users only)											
Access of on & offline gov't services	444	36.4	0.362	49	26.2	0.259	493	35.0	5.039**(0.027)	0.912 (0.750)	3
Never	777	63.6	0.638	138	73.8	0.741	915	65.0			
Total	1221	100	1	187	100	1	1408	100			
Access offline only gov't service	349	28.6	0.263	71	38.0	0.356	420	29.8	4.284**(0.041)	1.091 (0.844)	4
Never	872	71.4	0.737	116	62.0	0.644	988	70.2			
Total	1221	100	1	187	100	1	1408	100			
Access online only gov't service	588	48.2	0.473	81	43.3	0.399	669	47.5	2.541 (0.114)	1.187 (0.457)	5
Never	633	51.8	0.527	106	56.7	0.601	739	52.5			
Total	1221	100	1	187	100	1	1408	100			
Seek information about govt service online (incl. benefits)	564	46.7	0.462	78	41.7	0.397	642	46.0	1.886 (0.173)	1.287 (0.380)	6
Never	643	53.3	0.538	109	58.3	0.603	752	54.0			
Total	1207	100	1	187	100	1	1394	100			
Playing games (Internet users only)											
Play mobile games	550	39.4	0.460	52	17.3	0.230	602	35.5	31.92***(0)	0.719 (0.365)	7
Never	847	60.6	0.540	248	82.7	0.770	1095	64.5			
Total	1397	100	1	300	100	1	1697	100			
Play Internet games	601	49.4	0.540	75	40.3	0.454	676	48.2	3.654*(0.0588)	0.952 (0.875)	8
Never	615	50.6	0.460	111	59.7	0.546	726	51.8			
Total	1216	100	1	186	100	1	1402	100			

Source: OxIS 2013. As population weights are used, Pearson's chi-squared statistic is converted to a design-based F-statistic with second-order correction(Rao and Scott, 1984).
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 10: Logistic regressions on specific variables of Internet uses (health, government resources, games) – OxIS 2013 only

	Odds ratios from logistic regression							
	Health-related		Government resources & benefits				Games	
	(1) Health info	(2) Improved health	(3) On & offline resources	(4) Offline only	(5) Online only	(6) Seek gov't info	(7) Mobile games	(8) Online games
Age	0.989	0.999	0.996	1.044***	0.984	0.990	0.948***	0.969***
Female	1.770**	1.178	1.054	1.359	0.943	1.061	1.048	0.742
Non-white	1.046	1.727	1.672	1.388	0.603	1.003	1.549	0.516
Education								
Secondary education	4.080***	2.199*	2.507**	1.973*	1.872*	1.909*	1.273	1.380
Further education	6.201***	3.250**	2.390*	3.013**	2.539**	2.088*	1.053	0.877
Higher education	5.623***	3.194**	4.104***	1.198	2.946**	4.127***	1.016	1.193
Labor status								
Employed	1.945	1.287	0.729	1.258	1.408	2.257	2.594	0.589
Retired	4.161	1.347	0.654	1.309	1.628	1.756	1.623	0.373
Unemployed	2.036	1.310	0.657	1.392	0.955	1.633	2.409	0.440
Marital status								
Married	1.368	1.430	1.249	0.829	1.541	1.070	0.445**	0.716
Living with partner	0.759	0.830	1.576	0.861	1.147	0.813	0.776	0.884
Divorced/Separated	1.591	0.909	1.759	0.458	1.410	1.065	0.778	0.631
Widowed	0.772	1.147	1.177	0.428	1.074	1.204	0.405	1.584
Socioeconomic status (ISEI)								
Medium	1.027	0.889	0.760	0.913	1.395	0.943	1.717*	0.712
High	1.094	0.950	1.084	0.550*	1.781**	1.396	1.754	0.825
Income level								
£12,500-£30,000	1.369	1.256	1.166	1.282	0.858	0.900	1.286	0.886
£30,000 or above	1.472	1.924*	1.476	1.346	1.103	1.402	1.447	0.803
Disability	1.843	2.047*	0.912	1.091	1.187	1.287	0.719	0.952
Constant	0.260*	0.148**	0.232*	0.027***	0.398	0.257*	2.392	14.3***
N	892	889	896	896	896	888	1005	891
$McFadden's R^2$	0.087	0.056	0.055	0.074	0.054	0.060	0.189	0.082

Source: OxIS 2013. Omitted categories are male, white, not disabled, student, single, no qualifications, and <£12,500.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 11: Variety, amount, and types of Internet use and disability status (Among Internet users only) – OxIS 2013 only

	Coefficents from OLS regression														
	Variety (Std. β coeff.)		Amount (Std. β coeff.)		Types										
	(1)	(2)	(1)	(2)	Entertain-ment	Commerce	Classic media	Socializing	Blog	Political	Info-tainment	Info-seeking	Creative Production	School & work	Vice
Age	-0.527***	-0.455***	-0.521***	-0.457***	-0.0547***	-0.0234***	-0.0517***	-0.00883	-0.0244***	-0.00000843	-0.0243***	-0.0124*	-0.0270***	-0.0117**	-0.0127**
Female	-0.059**	-0.0518**	-0.0626**	-0.050*	-0.616***	0.201	0.476***	-0.626***	-0.232*	-0.248	0.197	-0.117	-0.264*	0.121	-0.659***
Non-white	-0.056*	-0.0466*	-0.0217	-0.0119	0.0482	-0.123	-0.153	0.358	0.0427	-0.00850	0.100	-0.382	-0.0934	0.395	-0.636***
Urban	0.0347	0.0341*	0.0279	0.0287	0.0620	0.109	0.369*	0.0909	0.259	0.0693	0.274	-0.105	0.129	-0.0264	0.156
Disability	-0.0438*	-0.000279	-0.0258	0.0195	0.173	0.0975	0.0905	0.159	0.0907	0.104	0.226	0.331*	0.376**	0.0122	0.213
Lifestage															
Employed	0.00247	0.00172	-0.0607	-0.0734	-0.144	1.150***	0.209	0.0542	-0.151	0.569*	-0.103	-1.361***	0.161	-1.681***	0.784***
Retired	-0.150**	-0.0238	-0.151*	-0.0361	0.0708	1.076**	0.435	0.276	0.0188	0.292	0.0834	-1.071**	0.675	-2.131***	0.703**
Unemployed	-0.211***	-0.0824*	-0.231***	-0.115*	-0.0933	0.656*	0.0238	-0.0393	-0.288	0.608*	-0.0165	-1.435***	-0.142	-1.635***	0.772***
Marital status															
Married	0.103**	0.0190	0.0540	-0.0315	-0.551**	0.635***	-0.605***	-0.111	-0.253	-0.332	-0.293	0.0316	-0.488**	-0.267*	-0.228
Living w/ partner	0.063*	0.0310	0.0200	0.0151	-0.470*	0.500**	-0.370*	-0.101	-0.206	-0.317	-0.413*	-0.0951	-0.461**	-0.334**	-0.167
Divorced/Separated	0.00869	0.0108	-0.0117	0.0118	-0.255	0.642***	-0.467	-0.0438	0.0681	-0.0960	-0.174	0.0998	-0.207	-0.376***	0.00560
Widowed	-0.00174	-0.00453	-0.0105	-0.0163	-0.0991	0.657*	-0.371	0.127	-0.110	-0.211	-0.0457	0.172	-0.502**	-0.333*	0.103
Education															
Secondary ed.		0.228***		0.218***	0.305	0.850***	0.341	0.609**	0.350*	0.316**	0.415*	0.677***	0.507***	0.407***	0.257*
Further ed.		0.221***		0.186***	-0.0268	1.105***	0.156	1.060***	0.248	0.553***	0.274	0.822***	0.225	0.509***	0.176
Higher ed.		0.340***		0.313***	0.376	1.308***	0.176	1.390***	0.415*	0.927***	0.364	1.249***	0.193	0.894***	-0.169
Household income															
£12.5-£20,000		0.0853***		0.0897***	0.236	0.587***	0.0962	0.278*	0.0847	0.0515	0.189	0.331**	0.335*	0.0290	0.00829
£20-£30,000		0.103***		0.103***	0.346	0.609**	0.156	0.295	0.177	0.142	0.346	0.328	0.445**	-0.119	0.0526
£30-£40,000		0.0899***		0.104**	0.323	0.752**	0.319	0.601**	0.528*	0.0720	0.208	0.469*	0.638**	-0.224	0.167
£40-£50,000		0.129***		0.114***	0.847**	1.166***	0.499	0.881**	1.227*	0.290	0.403	0.197	0.905*	-0.119	0.313
£50-£60,000		0.0961***		0.105***	0.584	1.362***	0.772**	1.345***	1.436**	0.307	0.507	-0.0210	1.467**	0.0579	-0.197
£60-£70,000		0.0803***		0.0900***	1.229**	1.508***	1.562***	1.449*	1.678*	0.205	0.598	0.535	1.846**	-0.0404	0.290
£70-£80,000		0.0156		0.0295	0.0985	0.599	0.265	0.876	0.0263	0.212	0.228	0.560	0.119	-0.205	-0.0295
Constant	–	–	–	–	2.479***	-1.983***	1.398***	-0.601	0.618	-0.797*	0.417	0.859*	0.609	1.729***	0.0823
N	1974	1875	1974	1875	1275	1275	1275	1275	1275	1275	1275	1275	1275	1275	1275
$AdjustedR^2$	0.413	0.523	0.373	0.469	0.336	0.205	0.325	0.181	0.128	0.047	0.087	0.157	0.143	0.345	0.143

Source: OxIS 2013. Omitted categories are male, white, rural, not disabled, student, single, no qualifications, and <£12,500.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 12: Persistent feelings of social exclusion: Left out, lonely, and lack compansionship in OxIS (2009-2013)

	Ordinal logit regressions (standardized odds ratios)						Logistic regressions (standardized odds ratios)		
	Model 1			Model 2			Model 3		
	How often do you feel left out? (1-5 Likert)			How often do you feel that you lack companionship? (1-5 Likert)			High loneliness score		
	2009	2011	2013	2009	2011	2013	2009	2011	2013
Age	1.163	1.253*	1.025	1.246*	1.204	1.182	1.368**	1.260	0.991
Female	1.054	1.057	1.111	1.077	1.103	1.127	1.051	0.980	1.042
Non-white	1.001	1.064	0.907	1.017	1.078	0.932	0.992	1.142*	1.002
Urban	1.011	0.986	1.028	1.028	0.982	0.957	1.014	0.965	1.092
Marital status									
Married	0.685***	0.726***	0.713**	0.585***	0.612***	0.526***	0.673***	0.647***	0.763*
Living with partner	0.818**	0.932	0.897	0.757***	0.832**	0.835*	0.782**	0.860*	0.946
Divorced/Separated	1.066	1.135*	1.012	1.013	1.213**	1.032	1.087	1.127	1.090
Widowed	0.924	1.153*	0.980	1.061	1.245**	1.014	1.064	1.142	1.169*
Education level									
Secondary ed.	0.767	1.034	0.860	0.911	0.837	0.796	0.681	0.876	0.764
Further ed.	0.907	1.157	0.949	0.987	0.925	0.909	0.814	0.851	0.702
Higher ed.	0.871	1.164	1.107	1.009	0.978	1.014	0.884	0.910	0.862
Other ed.	0.961	1.110	0.953	0.984	1.011	0.869	0.942	1.011	0.950
Lifestage									
Employed	1.077	1.040	1.167	1.103	1.216	1.151	0.999	1.266	1.196
Retired	1.012	0.772	1.054	0.989	0.942	1.028	0.947	0.963	1.267
Unemployed	1.256	1.291*	1.116	1.202	1.458**	1.136	1.324*	1.358*	1.275
Household Income									
£12,500-£20,000	0.829**	1.055	1.097	0.872*	1.060	1.115	0.871	1.073	1.025
£20,000-£30,000	0.780**	0.997	1.072	0.817**	0.989	1.094	0.880	1.014	1.006
£30,000-£40,000	0.769***	0.942	1.009	0.811**	0.863	1.107	0.764	0.934	0.987
£40,000 or more	0.880	0.677	0.846	0.904	0.892	0.892	0.829*	1.029	0.935
Disability	1.162*	1.231***	1.137	1.160*	1.253***	1.192**	1.095	1.221***	1.163*
Internet user	0.967	0.917	0.845*	0.970	0.880	0.821*	0.916	0.769***	0.815**
N	1496	1580	1130	1496	1582	1131	1501	1583	1135
$McFadden's R^2$	0.0450	0.0508	0.0264	0.0584	0.0870	0.0593	0.100	0.0993	0.0566
Chi-square statistic (Likelihood test)	110.8***	141.7***	46.48**	182.9***	254.3***	108.5***	160.3***	179.7***	83.33***

Source: OxIS 2009-2013. Questions not included in 2007. Omitted categories: male, white, rural, single, no qualifications, student, <£12,500, not disabled, not current Internet users.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 13: Engagement on Remploy web platform broken down by disability categories

	Logistic regressions (Standardized odds ratios)			
	Complete online workshops		Have online contact with staff	
	(1)	(2)	(3)	(4)
Age	0.674*	0.807	0.774**	0.808*
Male	0.744	0.734	0.974	0.990
Activeness	4.70***	4.713***	2.746***	2.762***
Disability category				
Disability (any)	1.08		1.12	
Hearing and/or speech impairment		1.049		1.015
Visual/ sight impairment		1.106		1.055
Physical impairment		1.016		0.934
Mental health condition		1.192		1.271**
Learning difficulty (e.g. dyslexia, dyspraxia)		1.292		1.115
Learning disability (e.g. Down's syndrome)		1.053		0.871
Neurological condition		1.255		1.075
Chronic illness or health condition		0.625*		0.958
N	2,146	2,146	2,146	2,146
McFadden's R^2	0.258	0.286	0.178	0.188
Largest CI	9.1	9.9	9.1	9.9

Source: Remploy Online 2015-6.
Omitted categories: female, not disabled, and no specific disability.
*p<0.05; **p<0.01; ***p<0.001

Table 14: Types of Internet use: Factor loadings from principal components analysis

	Social Networking	Entertainment	Identity politics	Commerce	Classic media	Info-seeking	Content exchange	Production	Casual browsing	Vice
Post photos	0.39									
Re-post photos	0.35							0.16		
Comment	0.30								0.24	
Share photos	0.39									
Update status	0.35									
IM	0.28						0.17			
DL music		0.33							-0.16	
DL videos		0.39								
Listen music	0.16	0.39								
Look at pics		0.28								
Watch movie		0.47								
Watch TV		0.43								
Change person info			0.34						-0.21	
Follow politician			0.49							
Join political gp			0.45							
Like/comment			0.25						0.21	
Change privacy			0.30						0.16	
Unfriend			0.30							
Bank				0.32						
Bills				0.34	0.16					
Buy				0.43						
Compare				0.33						
Food				0.38						
Purchase				0.37						
Sell				0.32						
Travel plan				0.24	0.24				-0.25	
Event					0.41					
Look for news					0.42					
Read news online					0.30					
Sport					0.39					0.15
Travel					0.39					0.15
Definition						0.39				
Dist learn						0.49			-0.23	
Fact						0.38			0.18	
Investigate						0.44			0.17	
School/work						0.48			-0.16	
Message board							0.32			
Chat							0.37			0.18
Read blog							0.42			
Maintain site							0.49			
Write blog							0.49			
Post videos								0.45		
Re-post videos								0.43		
UL writing poetry			0.16					0.34		
UL creative work								0.53		
SNS click									0.35	
SNS like	0.21								0.31	
SNS receive info			0.19		0.20				0.37	
Gambling										0.67
Adult									0.15	0.61
Eigen values	4.48	3.55	3.44	3.37	3.31	3.13	3.03	2.82	2.50	1.53

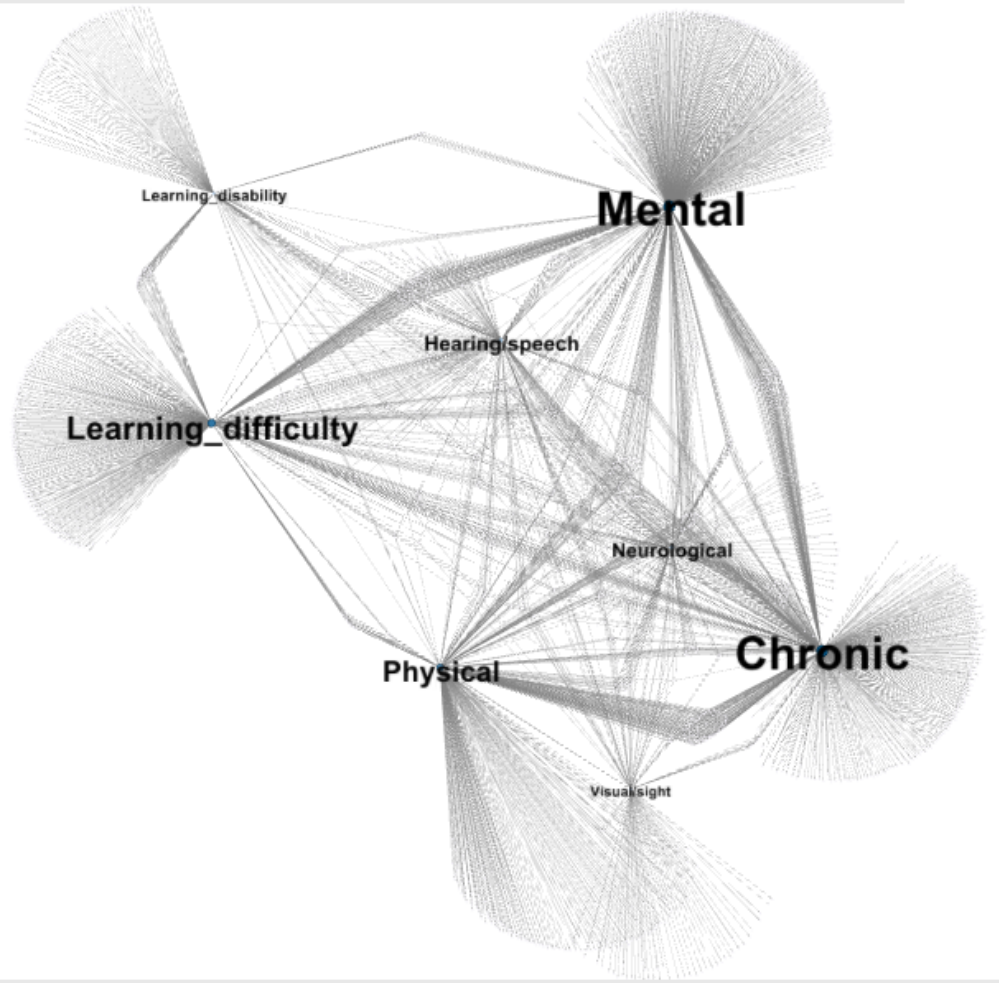

Figure 1: Directed network graph of all Remploy Online users with at least one reported disability.

Figure 2: Undirected network graph of disability coexistence ties.

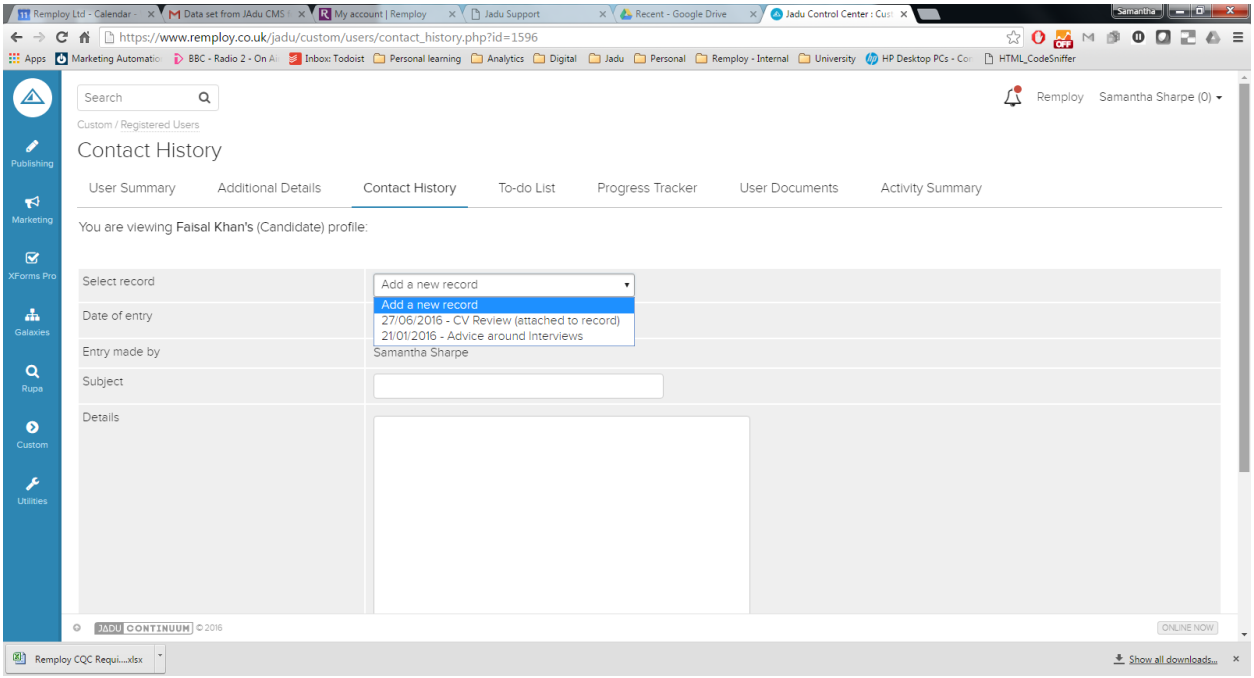

Figure 3: Remploy Platform: Interface where staff logs contact history with a user. (Credit: Samantha Sharpe)

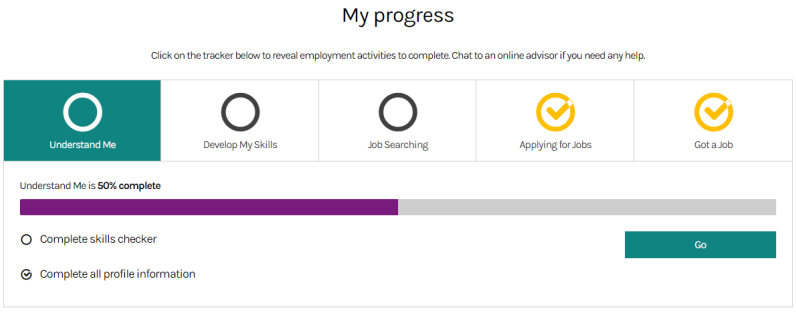

Figure 4: Remploy Platform: Progress tracker (13 tasks listed under the 5 categories) on the website. (Credit: Samantha Sharpe)

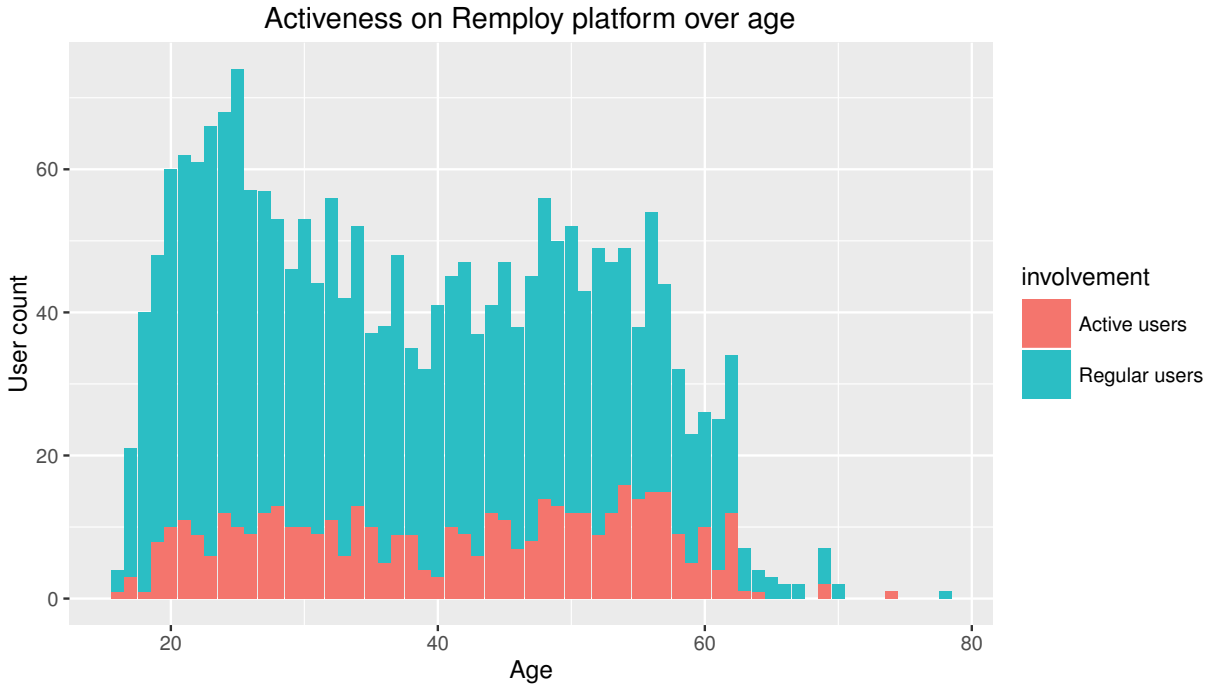

Figure 5: Activeness is measured by completing at least 3 profile tasks and logging in at least 4 times over 1 year. 20.7% (N=444) are active users.

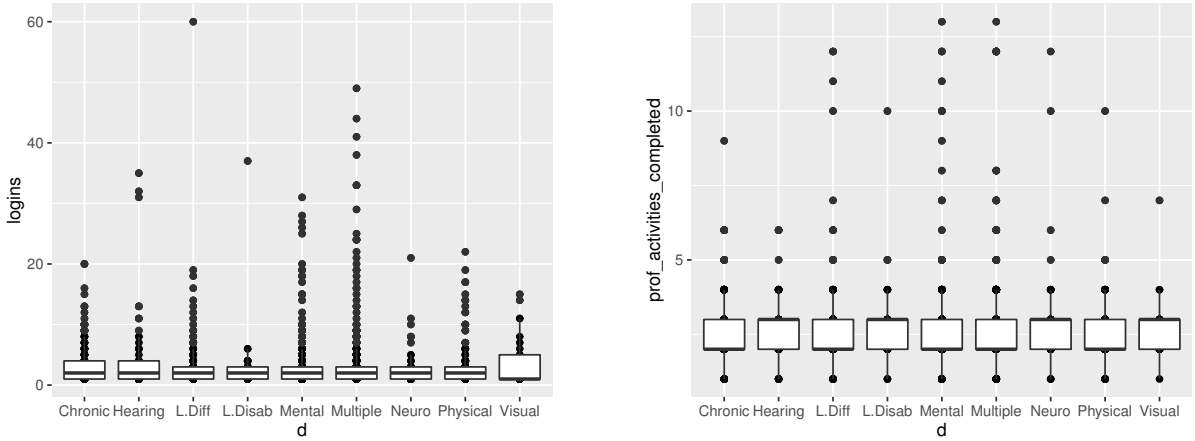

Figure 6: The constructed activeness indicator does not heavily bias any particular type of disability.

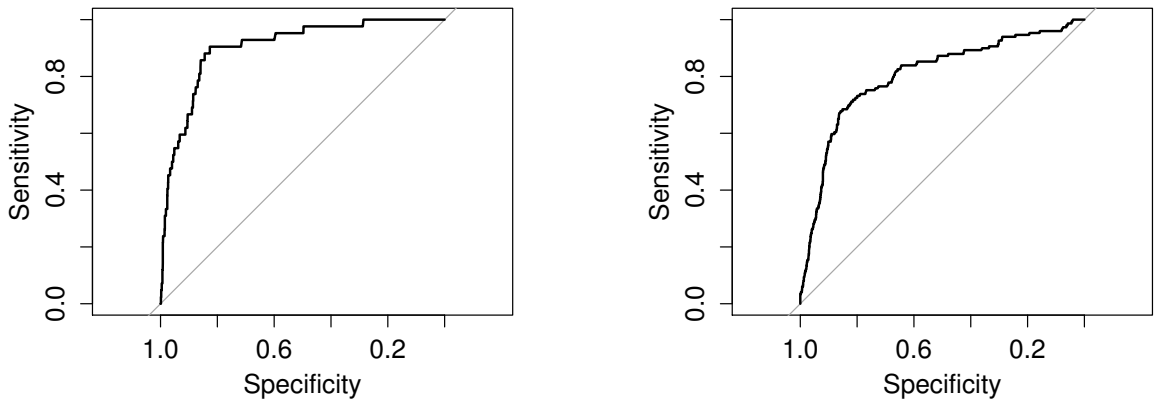

Figure 7: ROC curves for logistic regression models 2 and 4 in Table 13. Area under curve is 0.903 and 0.804 respectively, indicating decent predictions.

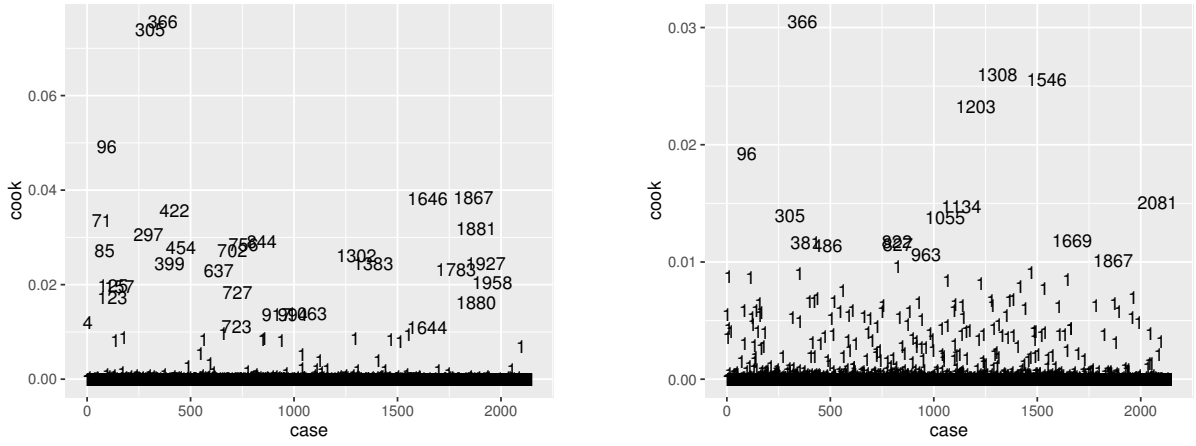

Figure 8: Outliers check for logistic regression models 2 and 4 in Table 13. Largest Cook's Distance is 0.08 and 0.03 respectively, indicating no damaging outliers.

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