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Disability and mobile Internet

by Gerard Goggin

Abstract

As the World Wide Web turns 25, it is an appropriate time to ask: where are we are now with disability and the Internet? A good place to look is in the burgeoning area of Internet and mobile technology. Accordingly, this paper explores the issues and prospect for disability and mobile Internet. It provides a brief history of the entwined nature of the rise of disability and the Internet, discusses the emergence of mobile Internets, and then turns to a discussion of mobile Web accessibility. It concludes by noting the limits of mobile Web accessibility, for its struggle to adopt an expanded concept of disability — but also because of growing complexity of mobile Internets.

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Introduction

2014 has been proclaimed as the twenty-fifth anniversary of the World Wide Web. It is also the year in which the World Wide Web Consortium (W3C), the custodian of the Web, turns 20. In its twentieth anniversary colloquium on "The Future of the Web", held in October 2014, the W3C declared:

> The Web is for everyone. It is our virtual "Commons" — shared and made stronger by all. And we need you to make it better. [1]

Overarching questions on the agenda included how to:

- Extend the Web to the many devices people use to improve their lives ...
- Empower all people to use and contribute to the Web, including support for diverse languages and accessibility. [2]

This focus is not surprising given that a vital part of the contemporary Internet — as well as the Internet of the future — involves mobile technology. This is an idea that has been around for a while. Speaking at a 2007 conference, the iconic Sir Tim Berners-Lee, founder of the World Wide Web, famously declared:

> A mobile phone — or whatever device we carry around which uses GSM technology and its successors — is going to be everywhere, and everyone will have one. It has do be designed to be universal. So that everyone can use it. So that you can do anything with it ... I personally believe that it is important to humanity to connect peoples across the world as widely as possible. (Berners-Lee, 2007)

Key to this initial vision was the mobile Web. In describing this, Berners-Lee strongly advocated for the "open Web", a "low-cost open platform which will have a much great penetration in what we currently call the developing world" (Berners-Lee, 2007). He saw this scenario as involving multiple devices, and the "Ubiquitous Web":

> The innovations which will really count are the things which I can't imagine now ... [T]he abstract task you are doing can really rise above individual devices. Imagine that my phone or my wristwatch has details of a flight I am booking, and I walk into a room where it negotiates to project a map on the wall. And so on. Imagine yourself. Innovate on the mobile Web platform. (Berners-Lee, 2007)

Now the spirit of what Berners-Lee was evoking in his 2007 talk on the mobile Web has come to pass — it is the material reality of our Internet lives.

Of course, it turns out that this mobile Web, and the broader Internet, is much messy than envisioned (Herman, *et al.*, 2015). The mobile Internet is often not well interconnected. Typically it involves more disconnections, blackspots, and cost than the glossy advertising suggests. There is also the major questions of considerable social exclusion, involving new forms and gradations of access (Donner, 2015). Nonetheless, we live in a time where there are the makings of widespread mobile Internet.

In 2014, on best estimates, roughly three billion people use the Internet. Compare this with the figure for mobile phone subscriptions — some seven billion people.

How many people around the world use mobile Internet is unclear. Rigorous figures tend to be gathered at a national level, but data collection methodologies are not settled — especially because the mobile Internet itself is tricky to define. (To start with, not only people use the mobile Internet, objects, animals, and environments do also — as revealed by reference to technologies such as the Internet of things, RFID chips, and sensors).

One indicator is that available figures indicating 2.3 mobile broadband subscriptions globally in 2014, with 55 percent of these subscriptions in developing countries (International Telecommunications Union (ITU), 2014).

For other aspects of mobile Internet subscription, use, or consumption, we do not have any reliable figures. Consider, for example, that mobile Internet conceivably includes diverse media modalities and practices, such as: accessing WiFi via a mobile or tablet device, game console, or laptop; consumption of smartphone apps; use of social networking, and social media applications via mobile; or downloading and viewing of television, film, and audiovisual content.

Market research estimates vary on these different forms, but there is growing evidence that mobile Internet is a growing part of the experience of Internet in people's everyday lives. This is established in national surveys, in the anglophone world, for instance, through the Pew Research Center studies of U.S. mobile Internet use. For example, in 2013 the Pew survey found that 78 percent of U.S. teens 12–17 years surveyed accessed the Internet on mobile phones, tablets, and other mobile devices at least occasionally (Madden, *et al.*, 2013). More recently, some robust cross-national studies have emerged. For instance, a 2014 Pew Internet Research Center study of 24,263 people in 24 nations found that: texting remains the most popular use of mobile phones (a median of 78 percent of users across all countries send texts); taking pictures and photos was the second most popular use, with 54 percent of users; accessing a social networking service ranked third with 25 percent of all users; and getting political news was the fourth top use, with 18 percent (Pew Research Center, 2014a). Of course, these figures belie a complex story, whereby the actual experience of mobile Internet takes different forms across different countries and places (Goggin and McLelland, 2009; 2016) — something that a growing body of scholarship is highlighting, including work on the uneven geographies of digital information and technologies (Graham and Zook, 2013).

What this emerging research suggests is that the Internet's mobile forms and identities are much more than just the mobile Web. What do we know about disability and the mobile Internet? Not a lot, as it turns out.

As yet there is little research that provides a good picture of disability and mobile Internet — indeed there is still little reliable, comprehensive research on disability and Internet in general (Jaeger, 2012). A thorough discussion of available research is outside the scope of this paper. However, brief indications can be found in the well publicized U.S. Pew Research Center surveys. A 2012 Pew survey found the 27 percent of U.S. adults living with disability were significantly less likely than adults without a disability to go online (54 percent vs. 81 percent), and that two percent of adults surveyed found it difficult or impossible to go online due to their disability or illness (as Pew put it) (Zickuhr and Smith, 2012; *cf.*, Dobransky and Hargittai, 2006). The survey noted that the:

> the rise of mobile is changing the story. Groups that have traditionally been on the other side of the digital divide in basic Internet access are using wireless connections to go online. (Zickuhr and Smith, 2012)

However, while the survey investigated differences in mobile Internet adoption and use across ethnical and racial groups, it did not do so with respect to disability. Disability crops up in more recent Pew surveys, such as an April 2014 survey of older adults and technology, which, unsurprisingly identified significant disability among this group as a barrier to digital technology use. The report also adoption levels of smartphones among older adults surveyed were only 18 percent compared to more than half of all Americans. Interestingly, tablets and e-book readers were just as popular — also each at 18 percent (Pew Research Center, 2014b). Again, while these pieces of data are fascinating, and suggestive, we await comprehensive research on disability and mobile Internet.

So this picture of emerging importance of mobile Internet for disability, yet lack of clarity of exactly how, provides a backdrop for my paper here. Before proceeding, it is important to say clearly that while I will focus upon accessibility issues here, disability and the Internet is not simply a matter to do with accessibility narrowly defined. Indeed this is likely just a small part of social life and technology, given that the "social and cultural construction of disability on the internet is a rich area of enquiry which deserves to be taken seriously in internet theory and scholarship" [3]. Things have improved with exciting new work emerging, and new conceptualizations of equality, participation, disability, and access (for instance, Titchkovsky, 2011). However much discussions and research on disability and the Internet still revolves around older, unchallenged notions of accessibility.

In urging a broader, critical approach to disability and Internet that takes seriously social, cultural, and political dimensions, scholars, activists, and those designing, making, and putting technology into practice, have argued that accessibility discussions have tended to be too narrow in their nature (Goggin and Newell, 2003; Ellis and Kent, 2011). Others have critiqued the Web accessibility movement, arguing that disability activists have not been adequately included in its agenda and processes (Adam and Kreps, 2009). Further, scholars have suggest that that accessibility, including the way Web accessibility has evolved (Ellcessor, 2014), has been a poor substitute for the necessary, fundamental discussion of disability's relation to Internet. That is, we need to understand Web accessibility in a broader, more imaginative framework predicated on technology's integral role in achieving goals of full participation in society for all, especially delivering transformative justice for people with disabilities.

It is with this expansive account in mind that I take up the theme of this special issue and ask: where are we now with disability and mobile Internet?

The entwined careers of disability and the Internet

The 1960s was decisive decade for the Internet. After all, it was the 1969 launch of the Internet that often comes to mind as its moment of origin. In actual fact, the history of the Internet is richer and more complex that this — as emerging work in Internet histories shows (Goggin and McLelland, 2016). Disability is an important aspect of these histories of the Internet.

As yet we do not know a great deal about how ideas of disability featured in the design and shaping of early Internet — especially in the 1960s, 1970s, and 1980s. To generalize, it seems that there was much more work explicitly focusing on disability in the telecommunications field, and in communication engineering and sciences in general. It is important to consider this, because there are many ways in which such work can now be seen to feed into the Internet of today — and into the forms it will take into the future.

Disability really gained wider visibility outside of specialized endeavours and settings in the 1990s. Broadly, we can point to three developments that became entwined in a socio-technical way: the emergence of disability as a social and political issue; the dawning awareness of information and communication technology as important aspects of societal functioning and everyday life; the creation of the Internet as a mass medium.

Firstly, disability emerged during the 1980s as a vital yet neglected issue internationally. The U.N. General Assembly's 1975 *Declaration on the Rights of Disabled Persons* was followed by the United Nations International Year of Disabled Persons in 1981. The following decade, 1982–1993, was designated as the U.N. Decade of Disabled Persons. This international consensus and action by governments to acknowledge and address issues of justice, rights, and equality concerning disability was shaped by a wide variety of ways in which notions of disability, personhood, and society themselves were being significantly reshaped. These epochal

transformations in disability occurred in different ways involving distinctive cultural identities around the world, engaging national, regional, gender, sexuality race, class, and caste dynamics.

Secondly, bound up in these historical changes to disability was the role of information and communication technologies, especially the digital technologies that emerged in the late 1980s and 1990s (Goggin and Newell, 2003). Over time people increasingly desired, appropriated, consumed and use, and relied upon such digital technologies. People with disabilities often took particular interest in digital technologies, because they promised access to information, communication, and, increasingly goods, services, relationship, power, and social and political networks, tools, and opportunities, not easy to reach otherwise. Digital technology became a key part of how social and political participation would be achieved.

At the same time, digital technology was deeply involved in an altering of the nature and terms of societal participation. Thus without access to such digital technology new kinds of exclusion were being experienced. Technology providers slowly saw people with disabilities as forming an important market. The disability movement advocated in a sophisticated and tough manner for accessible technologies — through, for instance, the movement centering on universal design (Goggin and Newell, 2003; Ellis and Kent, 2011). Legislators and regulators were persuaded of the importance to fair, affordable access for people with disabilities to necessary technology, so provisions were included in many national laws. Internationally the highwater mark of the acceptance of accessibility and disability came in the 2006 U.N. Convention on the Rights of Persons with Disabilities, with its many provisions requiring accessible digital technology, in order for the fundamental aims of the treaty to be achieved.

Thirdly, in the 1990s the Internet moved from being a research network to being a mass medium — and eventually the great medium of the age. By the end of the 1990s, the Internet had become a distinctive medium, adopted by billions of users worldwide. Not only this, but the Internet was the platform by which many (if not most) media interacted and interconnected. Today, for instance, television remains a distinctive medium, yet for most users watching television involves use of the Internet — whether for program or other viewer information, fan sites, social media, catch-up television, accessing television. We now speak of ecologies of television, which made possible by the Internet. When it comes to disability, the rise of the Internet in the 1990s meant that more people with disabilities used and relied upon the Internet. Further, that the Internet provided an excellent way for them to voice their frustrations, give feedback, and exercise influence if the technology was inaccessible, poorly designed, or in other ways did not meet expectations or satisfy needs (Ellis and Kent, 2011; Ellis, 2015).

By the close of the century, the World Wide Web was the face of the Internet, for many of its users — and in large part credited with making the Internet easy-to-use, cementing its popularity. The Web also was associated with the great technical breakthrough for people with disabilities. As discussed in other papers in this special issue, the Web Accessibility Initiative (WAI) was established by the World Wide Web Consortium (W3C) — and personally endorsed and promoted by Berners-Lee. How the Web accessibility guidelines were developed is a fascinating lesson in its own right (Blanck, 2014). However, the implementation of Web accessibility has proven frustratingly slow, despite the great wealth of resources for its achievement. Web accessibility is enshrined in much legislation around the world, but for the most part goverments, corporations, and other organizations alike have tended to prefer slow progress — rather than commit the substantial resources, commitment, and enforcement needed to provide the break-through needed (see, for instance, Conway, 2014).

The rise of mobile Internets

With the dawning of the twenty-first century, Internet for many users in the wealthy countries had become a broadband experience. Dial-up Internet access faded into insignificance in favour of broadband Internet. Countries in the Organisation for Economic Co-operation and Development (OECD), especially, agonized about the diffusion, availability, and speed of broadband in their economies, compared to their competitors. Yet in many respects the national policy fixation of many countries with broadband networks failed to grapple with the other major emergent technology: mobiles.

In 2000, cellular mobile phones were already well established in some countries, but only very much a fledging technology in others. This changed dramatically in the intervening years.

Consider, for instance, these comparison figures in Table 1 non-mobile subscriptions for 2000 and 2013. The sample is drawn from a selection of OECD countries, plus one of the countries with the most mobile phone penetration — Hong Kong.

Table 1: Mobile phone subscriptions 2000 vs. 2013, selected OECD countries plus Hong Hong.
Note: Drawn from International Telecommunications Union (ITU), 2014.

	2000	2013
United Kingdom	73.71	123.77
Hong Kong	72.03	171.72
Finland	72.03	171.72
France	49.06	98.50
Australia	44.46	106.84
United States	38.47	95.53

Such increases in mobile subscriptions offer compelling evidence for the idea that mobile technology is now a "social fact", as Rich Ling argues, using Emile Durkheim's classic concept (Ling, 2012). While mobile communication research has provided many insights into the takeup and adoption of mobiles, we still lack a full picture of mobile technology's place in everyday life. If the picture from the global north is one of social worlds populated by mobiles, then the picture from the global south is even more striking.

Consider these comparative figures in Table 2 on the 2000–2013 diffusion of mobile phones, taken from a wide range of emerging market countries and geopolitical powers (as emphasized in the BRICs discourse; see instance, Nordenstreng and Thussu, 2015).

Table 2: Mobile phone subscriptions 2000 vs. 2013, selected emerging market countries.
Note: Drawn from International Telecommunications Union (ITU), 2014.

	2000	2013
South Africa	18.59	147.46
Mexico	13.55	85.84
Brazil	13.29	135.31
China	6.66	88.71
Egypt	2.06	121.51
Ghana	0.69	108.19
India	0.34	70.78

So, if for much of the world, telecommunications is now a mobile experience, as these figures suggest, what of internet?

Here the definitions are more complex, the phenomenon of mobile Internet is multifaceted and in its relatively infancy, the statistics are not as robust, and our understanding of the kinds of infrastructure, affordances, and uses leave much to be desired. As foreshadowed, thus far, the research literatures on mobile Internet are relatively underdeveloped, especially concerning its social, cultural, and political dimensions (Donner, 2015; Herman, *et al.*, 2015; Goggin, 2011).

A preliminary conceptualization of mobile Internet would start with six key moments.

The first movement is the emergence of new modes of accessing the Internet via mobile phones. The capacity to access Internet from mobile phones has a long genealogy. A key early moment involves the Web — via the development of the Wireless Access Protocol (WAP). The breakthrough of WAP was bound up with the rise of the Web in the 1990s. The idea was to provide a way for Web sites to be coded to be more easily and efficiently accessed on, and designed for, mobile phones. The inventors and promoters of WAP only experienced limited success. However, WAP represents the beginning of the trajectory of making Web browsers, Web pages, and Web content fit mobile phones. Now browsing via mobile phones is a feature of everyday mobile use in many countries where bandwidth, affordability, and legibility concerns can be met.

The second key moment in the development of mobile Internet occurs with the rapid diffusion of mobile broadband. Mobile broadband devices become a popular way to access Internet via the mobile cellular network. Initially they are plugged into laptop computers, and used with software to access the Internet via a mobile cellular network. Before long, mobile broadband devices became stand-alone pieces of technology to access the mobile network, providing Internet via Wi-Fi to laptops, tablets, phones, and other Wi-Fi-equipped devices.

In this sense, mobile broadband's role in providing Wi-Fi is related to the third key moment in mobile Internet — which involves the consumer equipment. Take, for instance, the dual function capacity of mobile phones to access WiFi (or wireless Internet). Once WiFi chips were included in mobile handsets, users gained another mode of accessing the Internet. This has proven especially important for users who face affordability problems, or do not wish to incur charges from their mobile providers. The blurring between cellular mobile and Internet networks occurs with the incorporation of WiFi in the handset.

The third moment is the advent of the smartphones, which have come down significantly in price — though are still very expensive for many. With smartphones, the Internet becomes much easily to access — not just through browsers or mobile e-mail, but especially through apps. The apps ecosystem provides a very wide range of mobile software that uses the Internet, often without the user being aware of this. With many apps, the Internet is so easy to access, that it is the background. Rather than access many Web sites, applications, or services through browsers, instead users download apps to access these. Obvious examples are social media services, such as Facebook or Twitter, which provide apps — as do apps developers to offer extra functionality for such services (if the provider allows their API to do so).

The fourth key moment revolves around the infrastructures, and the new ways in which they combine. Here convergence is not an especially helpful term. In a helpful overview, Spanish mobiles and policy expert, Claudio Feijóo, notes that next generation mobile networks are "regarded as the future — almost present — platform for ubiquitous broadband" [4]. Feijóo explains that:

> From a strict technological perspective NGMN encompasses fourth generation (4G) mobile technologies such as Long Term Evolution (LTE) and Mobile Worldwide Interoperability for Microwave Access (WiMax; explained below), convergent technologies1 such as femtocells and Wi-Fi, and short-range wireless data technologies such as near-field communications (NFC) completing a network of sensors and tags located on surrounding objects. In addition, new types of mobile devices, from smartphones to tablets, complement the infrastructures from the consumer equipment side. [5]

It also occurs in the networks themselves as, especially post-third-generation (3G) networks, network design involves the combining of the next generations of wireless Internet networks with their mobile counterparts. This occurs as the discussions on next-generational broadband Internet networks are typically premised on IP networks, rather than the traditional circuit switched telecommunications networks.

The fifth key moment entails mobile's increasingly involvement in, and reliant on, cloud computing. The mobile device is a crucial node in cloud computing — most notably in the role of smartphones and tablet devices accessing file hosting services such as Dropbox.

The sixth moment of mobile Internet that is important to note is locative media. That is, various forms of location based technology that relies upon the combination of mobile devices and Internet. An obvious example are "check-in", local service, and discovery programs such as Foursquare and Yelp — but there are many other forms of location technology that involve mobile Internet (Wilken and Goggin, 2014).

In this brief, preliminary conceptualization, through its six key moments, it is evident that mobile Internet is very much a complex work-in-progress. There is further complexity to mobile Internet, especially when grappling with the socio-cultural aspects of disability (*cf.*, Ellis and Goggin, 2015). We can pause at this point to consider how disability and accessibility has been addressed thus far. Unsurprising, this is a complex story indeed — which lies outside the scope of this paper. So instead, in the remainder of the paper I will consider the most focussed, developed body of work on disability and mobile Internet — the W3C WAI's work on mobile Web accessibility.

Mobile Web accessibility: Progress, challenges, relevance?

As has been widely recognized, Web accessibility has been a leading edge of accessibiity and disability on the Internet, led through the work of the W3C WAI and its widespread adoption by Web coders, developers, designers, and Web site managers. Mobiles forms a prominent part of such Web accessibility efforts.

WAI's introduction page on mobile accessibility notes:

> "Mobile accessibility" generally refers to making Web sites and applications more accessible to people with disabilities when they are using mobile phones. WAI's work in this area includes people using a broad range of devices to interact with the Web: phones, tablets, TVs, and more. (Web Accessibility Initiative (WAI), 2013b)

WAI emphasizes that:

> **There are not separate guidelines for mobile accessibility — mobile is covered in existing W3C accessibility guidelines** [WAI emphasis] ... particularly WCAG and UAAG. (Web Accessibility Initiative (WAI), 2013b)

A brief explanation is useful here. The Web Content Accessibility Guidelines (WCAG) explain how to "make Web content more accessible to people with disabilities" — where Web content generally refers to "information in a Web page or Web application" (Web Accessibility Initiative (WAI), 2012b). The User Agent Accessibility Guidelines (UAAG) provide direction for developers, managers, policy-makers, and others, on "user agents", or "any software that retrieves and renders Web content for users" such as Web browsers, media players, plug-ins, and assistive technologies (specifically relating to Web content) (Web Accessibility Initiative (WAI), 2002). The current UAAG version 1.0 was released in 2002 (Web Accessibility Initiative (WAI), 2002), and UAAG 2.0 is in mature draft stage (Web Accessibility Initiative (WAI), 2013d), and is advised for adoption (acknowledging it may change). In late 2013, W3C established a Mobile Accessibility Taskforce to develop more specific guidance related to WCAG and UAAG [6].

Across these various WAI efforts, a key premise underpinning the approach is that there exists "significant overlap between making a Web site accessible for a mobile device and for people with disabilities" (Web Accessibility Initiative (WAI), 2013a):

> With global mobile phone use at an all time high, there has been a surge of interest in developing Web sites that are accessible from a mobile device. Similarly, making Web sites accessible for people with disabilities is an integral part of high quality Web sites, and in some cases a legal requirement. Most Mobile Web specialists don't know about design issues for people with disabilities. Likewise, most Web accessibility specialists don't know Mobile Web design best practices. (Web Accessibility Initiative (WAI), 2012a)

This is a fascinating idea: namely, that in designing the Web for mobile devices, one encounters some kindred issues faced by users with disabilities. Elsewhere, the WAI outline the common barriers under four headings: perceivable, operable, understandable, and robust. To give one example, there is the issue that prompts or beeps for notification should not be given in audio only:

> Audio-only prompts (beeps) for important information (warnings, errors)
>
> User cannot operate or interact correctly with content, misses prompts, makes mistakes.
>
> **Disabilities context:** User who is deaf or hard of hearing cannot perceive content.
>
> - WCAG 2.0 Success Criteria: 1.2.1 Audio-only and Video-only (Prerecorded)
> - WCAG 1.0 checkpoint: 1.1 and 1.4.
>
> **Mobile context:** Users often cannot hear in noisy (street, nightclub) or in public places (trains, hotel lobbies).
>
> - MWBP 1.0 Best Practice: NON_TEXT_ALTERNATIVES. (Web Accessibility Initiative (WAI), 2013c)

In a 2012 symposium on mobile accessibility, IBM accessibility expert Brian Cragun notes:

> We are seeing with mobile that there is a blurring of lines between those who have disabilities, and those who don't, because with mobile, almost everyone is experiencing at one point or another what I would term a situational disability. They get in a circumstance that is not working very well for their mobile device. It may be that they have got a little screen and small fonts, and so people are now looking for where is the setting that helps me enlarge the fonts? They will get in situations such as a noisy airport, and suddenly they can't hear their phone very well. And the assistive technologies to be able to see the text are very important. (Cragun, 2012)

If there are a fair number of issues of common ground between disabled users and all mobile users, this is positive from a "universal design" perspective. That is, by translating the goals of Web accessibility for all users to the mobile context — and thus designing for all mobile users — this effort yields advances for mobile users with disability also. In a way, this represents a fitting recognition of the achievements of the accessibility movement:

> Because the mobile platform is younger than accessibility, guidelines and best practice may at first flow into the mobile domain, thereby speeding its development. However, as the mobile platform is developed, and extended set will flow back into device and platform accessibility due to the greater research and development effort focused on the mobile domain. (Harper, *et al.*, 2014)

Of course, such guidelines are nice in principle, but it is the implementation that really matters. If implementation of Web accessibility is patchy at best, when it comes to mobile Web accessibility there are strong indications it is even worse. One of the most comprehensive studies of implementation of Web accessibility highlights this. It refers to the government's 2012 progress report which showed that none of the agencies assessed their mobile applications against WCAG 2.0, despite the fact that some 12.1 percent (or 138) Web applications were mobile-enabled (Conway, 2014; Australian Government, 2013).

The actual implementation of mobile Web accessibility is all the more important, when we consider the complexity of mobile Web and mobile Internet, from the full range of technical, industry, economic, and regulatory standpoints. For instance, the report of the WAI Symposium outlines the general problem with the mobile environment:

> The ecosystem for the accessible mobile landscape is fairly complex, involving the device, carrier, operating system, APIs, applications, and for disabled users, assistive technologies ... . The combination of these elements makes syncing the rapid changes between them often seem like a moving target. (Harper, *et al.*, 2014)

W3C suggests the need for a number of approaches: harmonization of standards; attention to ensuring that guidelines and approaches are suitable for converging technologies across mobile and desktop platforms; userface flexibility and interchangeability, "separating the program logic from the interface" (Harper, *et al.*, 2014). It also urges attention be paid to the "unified Web", and ensuring its accessibility, across the "wide variety of devices" used to access the Web which are likely to increase in the future (Harper, *et al.*, 2014).

A key difficulty lies in the intersection between the domain of mobile Internet (biddable — or at least susceptible — to the influence of W3C) and the various other domains of mobile Internet (that remain firmly in the hands of other developers and technology companies). W3C WAI seeks to address these tensions at best it can. For instance, in addition to the four key principles of the user agent being perceivable, operable, understandable, and that assistive technologies can access user controls, the UAAG 2.0 draft stipulates a fifth principle:

> Principle 5 ensures that user agents comply with other accessibility specifications (*e.g.*, WCAG) and platform conventions (*e.g.*, Windows, iOS, Linux, Blackberry) (Web Accessibility Initiative (WAI), 2013d)

An explanation is provided in the implementation guide:

> User agent user interfaces that are not Web applications need to be accessible to people with disabilities. Accessibility guidelines already exist for many platforms. Most operating systems have conventions and expectations that aid accessibility, such as

> keyboard behavior, support of an accessibility API, user interface design. User agents need to comply with the basic accessibility requirements of the platform in use. (Web Accessibility Initiative (WAI), 2013a)

In practical terms, the test is that the "user should be able to easily discover detailed information about the user agent's adherence to accessibility standards, platform standards ... without installing and testing the accessibility features" (Web Accessibility Initiative (WAI), 2013a). This provides developers with "flexibility to conform with the appropriate accessibility guidelines or legislation for their platform or markets" (Web Accessibility Initiative (WAI), 2013a).

Clearly, the UAAG guidelines seek to outline guidelines and success criteria for developers focussed on mobile Web software. The difficulty that lies well outside W3C's control — and to a very large part outside the aegis of those participating in the W3C process — is a major one. Namely, that the architecture and accessibility of the platforms of mobile technologies lie in the control of the big computer and software corporations. Those listed in the implementation documents include Apple, IBM, Novell, and Oracle, relying on their well-established efforts (*e.g.*, IBM, 2003). Clearly many other technology companies active in mobile Web are not listed, and presumably not so well engaged in accessibility implementation. Such a list would include the big technology companies across parts of Asia (especially in Japan, Korea, China, and India), the biggest region for mobile Internet use in the near future.

The larger context for this work is forging a common approach to accessibility across the mobile Web is standardization. The collaborative development and elaboration of standards (Grösser, 2013), of which the W3C is a relative newcomer, is a longstanding way to coordinate markets especially in the area of technology (Waschke, 2012). The governance and political implications of standards is an evolving area of research (*e.g.*, Büthe and Mattli, 2011), of which there has been important work on disability and standards. As the International Organization for Standardization (ISO) puts it:

> International standards *make things work*. They give world-class specifications for products, services and systems, to ensure quality, safety and efficiency. They are instrumental in facilitating international trade [their emphases]. (International Organization for Standardization (ISO), 2014)

The formal standards interact with other efforts to coordinate common approaches to technology. The UAAG 2.0, for instance, refers to the ISO standard on "guidance on accessibility for human-computer interfaces." (International Organization for Standardization (ISO), 2003) This standard has subsequently be reviewed and superseded by a 2012 standard, still providing guidance, but for "software accessibility" (International Organization for Standardization (ISO), 2012).

As this brief discussion shows, there is quite some way to go before fundamental conceptualization, development, and implementation of mobile Web accessibility globally is achieved. I have spent some time discussing the W3C WAI work on mobile Web accessibility, because it provides the most salient and comprehensive approach to disability and mobile Internet. Mobile Web builds upon the vision and heritage of the Web. The Web itself has explicitly aimed to be as accessible as possible, and the mobile Web promises to radically expand the accessibility of the Internet. Such mobile Web accessibility is a vitally important process. In the young traditions of the Internet, it seeks to be open to participation, relying heavily on the goodwill and expertise of committed volunteers with adequate technical knowledge and enthusiasm. Yet both the WAI approach, and the mobile Web, as a trojan horse for mobile Internet accessibility, have their real limits — two of which I will briefly discuss before closing.

Beyond the Web: New accounts of disability and ubiquitous mobile Internet

It is important to flag major critiques of the WAI approach to Web accessibility that find their way into the mobile Web conception, process, and documents also — and doubtless into the outcomes.

For instance, It would be interesting to know, empirically, how much overlap there is with the "design Web for mobile, design for users with disability" refrain. Or indeed the contrary, which is the more familiar refrain of universal design, namely that design for users to disabilities improves useability and access for other groups of users. Doubtless, there will also be many issues for a wide range of users with disability that will not be addressed — and are not well acknowledged in the universal design movement or the push for universal standards.

Such critiques are contained in an important 2014 special issue of *Disability and Rehabilitation* on universal design (see Imrie and Luck, 2014, for overview). Sarah Lewthwaite, for instance, argues that Web accessibility involves standards to enact universal principles but instead only contributes a limited understanding of the relationship between disability and technology (Lewthwaite, 2014). In her analysis Lewthwaite notes points where WAI authors explicitly draw attention to the limitations of universal approaches. Yet, as she observes when WAI guidelines become standards (especially when used as the point of reference by government legislation), flexibility and ambiguity is lost for the worse [7].

Lewthwaite points out that this is a particular problem in relation to the "global South" where the world's majority population, as well as majority group of disabled peoples live (Soldatic and Meekosha, 2014). Here, she argues, there are very diverse contexts, users, and experiences of Web accessibility to be found, that need to find their way into, and shape, meanings, principles, practices, and artefacts of accessibility — something desirable that has not yet occurred (Lewthwaite, 2014). Lewthwaite does not discuss the case of mobile Internet, it can be added that this is even more so the case. A number of scholars have pointed to the need to understand the particular ways that mobile Internet is implemented, imagined, and socially shaped in different places, and the important role that users play in this (Goggin and McLelland, 2009; Goggin, 2011). Such mobile Internet, it is argued, is global, but its meanings, networks, affordances, and characteristics take shape in particular local and regional contexts (Goggin, 2015b) — in which we know even less about disability than other aspects of mobile Internet (Ellis and Goggin, 2015).

The second obvious problem that the WAI collaboration seeks to address is that reality that much of the environment to do with mobile Internet cannot be engaged with through the mobile Web or indeed World Wide Web platform, technologies, concepts, and processes. There are significant strides that have been achieved through the Web, mobile Web, and WAI efforts. However, as the WAI notes, in a fairly minimal reading, that ecosystem for mobiles and accessibility is complex. Much of its lies outside in the control of power technology corporations, systems, interests, and regulatory and legal systems that the WAI cannot control.

Key actors in mobile Internet are already acknowledged and engaged with in the WAI process, especially those global north technology companies with well-established track record in accessibility such as IBM and Apple. Less prominent, or indeed missing in action, are a wide range of players: the mobile carriers, handset, equipment vendors, and network providers; the new forces in ICTs such as the Internet services and application giants of search and social media, including Google, Twitter, and Facebook, and their various equivalents in other parts of the world, not least Baidu and Sino Weibo; and, there are many other new kinds of actors potentially involved in Internet accessibility because it is mobile (Goggin, 2011).

So the action in mobile Internet accessibility lies elsewhere. This is something grasped now especially through the disability and accessibility movement's response to the U.N. CRPD — notably in the G3ict or the Global Initiative for Inclusive Information and Communication Technologies. G3ict is an initiative established in December 2006, by the United Nations Global Alliance for ICT and Development, in cooperation with the Secretariat for the Convention on the Rights of Persons with Disabilities at U.N. DESA [8]. It works from the auspices of the U.N. system, to bring together a wide range of parties across private and public sectors, include key mobile technology players. One of its high-profile and successful initiatives has been the series of M-Enabling conferences [9]. This rubric has capitalized on the positive associations with mobiles as "enabling", and providing new opportunities for accessibility. As G3ict's Director, Axel Leblois, puts it:

> With the increased processing power of mobile devices and expanded network bandwidth many more innovative solutions are now possible. The versatility of handsets, tablets and operating systems, cloud-based applications and global economies of scale of the mobile industry all point towards a growing opportunity for developers to bring life-enhancing solutions for hundreds of millions of seniors and persons with disabilities around the world. [10]

The important role that G3ict and M-Enabling is playing is bringing together many players in mobile Internet, under the umbrella of this new global forum. The limitations here are obvious. As much as anything it generates very important conversations and potential new initiatives, with disability movements playing a pivotal role (Goggin, 2015a). Lurking behind this new discourse on the affirmative character of mobiles is the relatively untested force of the provisions of the U.N. CPRD — and ultimately the effectiveness of the U.N. system and institutions, especially as implemented at the national level (Goggin, 2015).

Conclusion

In March 2014 TED talk calling for a "Magna Carta for the Web", Tim Berners-Lee called for a redefinition of the fundamental rights associated with the Web:

> [W]e are in 2014, and 40 percent of the world are using the World Wide Web, and counting. Obviously it's increasing. ... what can we do to get the other 60 percent on board as quickly as possible? Lots of important things. Obviously it's going to be around mobile. But also, I want you to think about the 40 percent, because if you're sitting there yourself sort of with a Web-enabled life, you don't remember things anymore, you just look them up, then you may feel that it's been a success and we can all sit back ... I want us to use this 25th anniversary to think about what sort of a Web we want ... How about we do that? How about we decide, these are, in a way, becoming fundamental rights, the right to communicate with whom I want. (Berners-Lee, 2014)

Accessibility of mobile Internet is a fitting and easy item to include in this Magna Carta. However, its future achievement will be a different matter.

As I have discussed this in this paper, Berners-Lee's own organization, the W3C WAI, has made significant strides in mobile Web accessibility — a prime mover in this area. Work continues with much to be done, and excellent prospects for this to be achieved. Equally, the caveats and challenges are considerable.

Firstly, how well this important work has been actually implemented to date is unclear. Accordingly, we need greater attention to, and evaluation of, actual compliance with mobile Web accessibility.

Secondly, it is unclear to what extent the W3C WAI itself, and those who rely upon its work (such as national governments as well as numerous public and private organizations providing Web and mobile Web service) have appreciated, let alone genuinely responded to the critiques that have been made of its narrow character. Here there is a urgent need for deeper dialogue between the traditions of WAI in mobile Web accessibility, on the one hand, and the new wave of disability technology activism, research, and policy-making represented by G3ict, on the other hand.

Thirdly, what would be foundational in such a process is a clear, comprehensive account of mobile Internet accessibility. Despite the important efforts of the G3ict, and implementation of the U.N. CRPD, as yet there is no systematic account of mobile Internet accessibility. This is a practical if still challenging project which could assist in the overarching concern in our conjecture. Namely, we face vital yet complex issues at stake of the transformation of the relations of disability — ultimately to do with democracy, connection, expression, and life itself — as we enter this exciting yet perilous period of the Internet's mobile futures.

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Notes

1. http://www.w3.org/20/.

2. *Ibid.*

3. Goggin and Newell, 2002, p. 6.

4. Feijóo, 2014, p. 81.

5. *Ibid.*

6. http://www.w3.org/WAI/GL/mobile-a11y-tf/.

7. Lewthwaite, 2014, p. 1,376.

8. http://www.g3ict.org/about.

9. http://www.m-enabling.com/.

10. Leblois, quoted at http://www.m-enabling.com/about.html.

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