UCL

Doctoral Thesis Summary

Fixing the Gap:

an investigation into wheelchair users' shaping of London public transport

Raquel Velho, PhD

September 2017

Abstract

Public transport in London is a massive infrastructure, with over 400 kilometers of underground tracks, a fleet of 9000 buses and a rich, 153-year history that has turned it into a symbol of the English capital. Despite its size, accessibility in this infrastructure has been a source of concern for wheelchair users in London. Based on an analysis of thirty-four interviews with wheelchair users and policy-makers, observations at accessibility events, and documentary data on London transport, this research asks, "How do wheelchair users use public transport in London?"

This thesis sits at the academic intersection of science and technology studies (STS) and disability studies, and has two main arguments. The first argues that the barriers faced by wheelchair users in transport are the result of transport network having stabilized in a particular period of social segregation of disabled people (1850s-1950s). This is discussed by intersecting the history of transport in London, with that of disabled people in British society, followed by interviewees' accounts of the barriers they encounter in the infrastructure to this day. The second argument holds that, despite segregation, wheelchair users have taken an active role in the process of shaping transport in London. In this role, they have developed inclusion mechanisms on both micro- and macro-scales, through individual problem-solving on the one hand and collective and political activism on the other.

Drawing from STS concepts like 'the social shaping of technology' and 'infrastructural invisibility', and engaging with the social model of disability from disability studies, this thesis shows the impact of marginalized users' engagement. It concludes that the social perception of disabled users as 'passive' masks an active interaction with and shaping of the transport network. This thesis therefore provides insights into the paradoxical nature of infrastructure, showing places of agency where previously one saw passivity and exclusion.

The work here presented is a summary of Raquel Velho's doctoral thesis, fulfilled at the Department of Science and Technology Studies at University College London (UCL), between 2013-2017.

Introduction

Transport for London, the city's transport administrative body, oversees an iconic and recognizable transport infrastructure. Characterized by its iconic "Transport for London" signs, vermillion buses, and the quintessential "Mind the Gap" audio reminder, this network is also one of the most extensive in the world. The Underground system has 402 kilometers of tracks, with over 270 stations. London's distinct red buses comprise a fleet of over 9300, and London's Overground train network has 112 stations. In 2016, almost 4 billion journeys were made using all types of transport modes within this infrastructure.

Despite how impressive the numbers seem on paper, the *experience* of using public transport is completely different for particular demographics–among them, wheelchair users. Though the 402 kilometers of tracks remain the same, and all but the "Heritage" route of buses are, technically, 'step-free', the number of Underground and Overground stations are significantly reduced: of 270 stations on the Underground network, 71 are defined as "step-free" access. Of 112 Overground stations, 57 are step-free. While it may be tempting to limit ourselves to 'facts and figures' when discussing transport infrastructure, this gives us little idea of *how* wheelchair users experience public transport in the English capital. This is particularly true when most of the stories shared in the media about disabled people's access to public transport paint such a dire picture.

It was therefore this research's aim to explore wheelchair users' relationship with public transport, by attempting to answer a relatively straightforward question: "How do wheelchair users use public transport in London?" In other words, how does this demographic tackle such a large transport system that has limited accessibility, both due to the limited number of step-free stations and continuous debate around priority to the wheelchair area?

The work here presented is a summary of Raquel Velho's doctoral thesis – it has been heavily edited to enable easy dissemination and focuses on the key arguments developed (the original thesis has approximately 300 pages). Readers are welcome to access the original thesis either via Velho's personal webpage, or by contacting her via email (see details at the end of this document).

Framing this Research Project

A rich array of past research was used as inspiration for the framework of this research project. For brevity, the three main groups will be discussed here.

- **Stabilizing infrastructures through standards:**

There has been significant work on the process of developing 'technological systems' in the field of Science and Technology Studies (STS). Thomas Hughes argued that these technological systems are constituted of both technological artifacts and social structures that mutually shape one another. More specifically, these systems have goals and solve problems by "reordering the physical world in ways considered useful or desirable, at least by those designing or employing a technological system" (Hughes, 1987, p. 53).

However, these systems do not spring up from the ground fully formed. Rather, there is a lengthy consolidation process behind their formation. This consolidation is highly dependent on the development of *standards*, which can be seen as 'reality-shaping tools' that are used to unify systems. Indeed, standards function

as a unifying language, ensuring collaboration between different parts of the system to reach its determined goal. It is, nevertheless, important to note that while standards are important tools, they also create their own counterpart: the non-standard or the non-conventional.

We can see how this literature might be useful in studying the public transport infrastructure: it is an old system, consolidated over more than 150 years through the implementation of engineering and policy standards, whose primary goal is to provide a service (transportation) to the London population. Indeed, it can be argue to be a *consolidated* system in many ways, such as the fact that it is overseen by a single authority: Transport for London. Using the lens of standards (and particularly non-standards) to frame this research is particularly enriching.

Susan Leigh Star and many of her co-authors have developed the idea of standards in infrastructures further: they often argue that the main goal of standards in a system is to make this system *invisible*. In other words, a network such as public transport should eventually blend into the background–we should not be able to be fully aware of what goes on within it. While this is an interesting argument, this thesis will complicate it further and provide another suggestion for analyzing infrastructures (Lampland & Star, 2009).

One last point made by authors studying networks (or, indeed, technological artifacts), is that *users* are important in the process of their development. Authors have argued since the early 2000s that designers are not the only ones responsible for the shape a technology takes, but that users often interfere in the process of technological development (Oudshoorn & Pinch, 2003). The thesis

therefore also draws from this area of research, and amplifies upon it to discuss how (arguably) excluded users *also* impact on the shaping of technical systems.

- **Theories of exclusion in sociology and beyond:**
To discuss 'excluded' users, it is important to acknowledge the rich literature that discusses mechanisms of social exclusion more generally. Among the most prominent authors are Howard Becker and Erving Goffman, both American sociologists who developed intricate theories about "deviance". Most relevant here is Goffman's work on *stigma*, or "an attribute that makes [an individual] different from others in the category of persons available for him to be, and of a less desirable kind" (Goffman, 1963, p. 2).

It should, of course, be noted that Goffman was writing a half-decade ago, and that many of the terms used then would not be considered socially acceptable today, specially if our goal is to write socially nuanced and respectful research. As such, the term 'deviance' has been banished from this project, to be replaced by *exclusion* or *social exclusion*. Nevertheless, Goffman's research highlighted the significant amount of work that people who carry markers of difference have to do in their daily lives to *pass* or *perform* in society. This is particularly the case for disabled people with visible impairments, often the topic of (unwelcome) conversation in social situations.

STS has also developed some interesting work on exclusion, particularly influenced by philosopher Michel Foucault's concept of *biopower*, or, "the force that constitutes the materiality of any human subject; it forms, secures, and normalizes human subjects through a process of

'subjection'" (Siebers, 2001, p. 173). Michel de Certeau, a French sociologist, also draws heavily on this work to demonstrate how biopower plays a role in our daily lives, demanding conformity from individuals while imposing order from an institutional level (De Certeau, 2011 [1974]). That isn't to say that De Certeau doesn't believe that there is room for resistance. On the contrary, he argues that individuals are often resisting the *strategies* imposed by the powerful through a series of personal *tactics*. *Tactics*, he argues, are an "art of the weak", used to appropriate the spaces organized by the powerful's strategies at opportune moments. Both *strategies* and *tactics* will play an important role in this research.

- **The importance of disability studies:**
It would be unjustifiable to embark on any type of research on disability and disability rights without drawing from the remarkable work done by Disability Studies (DS) scholars. Indeed, this project intended to bring together DS and STS, using the former to inform the project's framework and to draw from its strengths in researching social exclusion and power relations.

Importantly, this research is heavily influenced by the *social model of disability*, which stands in contrast with the previous *medical model of disability*. The latter characterizes disability as an individual, biological and physical characteristic. As such, disability was framed as something to be 'dealt with', the act and weight of care of a disabled person being left to to the family or person themselves if the medical profession was unable to 'fix the problem'. However, with the rise of the Disability Rights Movement in the 1960s-70s, this model began to be rejected by DS researchers. In 1972, the Union of the Physically Impaired Against

Segregation (UPIAS) was founded, which defined disability as "the disadvantage or restriction of activity caused by a contemporary social organization which takes no or little account of people who have physical impairments and thus excludes them from participation in the mainstream of social activities" (UPIAS, 1976). The social model therefore recognizes the significance of *social, disabling barriers* as an *additional* layer, imposed upon people with impairments. In other words, a person with an impairment would not be considered *disabled* if their physical requirements were socially and materially catered to.

The social model of disability has an important political role as an 'oppositional device' (Beckett & Campbell, 2015). It has functioned as a rallying call for the disability rights movement, and it is particularly important for this research to recognize this as it also draws from a more recent wave in disability research called *ableism studies*. This approach not only studies the barriers that disabled people face in society–it also questions and investigates the *origins* of these barriers. How, and why, are the boundaries between disabled and non-disabled drawn?

The term *ableism* is defined by scholars as a social preference for certain "species-typical normative abilities" over other types of abilities, potentially resulting in policies that "[lead] to the focus on 'fixing' the person or preventing more of such people being born" (Wolbring, 2008, p. 253). It is argued that there is a compulsory able-bodiedness that is expected from citizens of Western, neoliberal societies, such as the UK. Ableism studies argues that ableism is embedded in the very fabric of society, from legal institutions to communication technologies. This

research will show that infrastructures are no exception.

In essence, this research is framed by the work of scholars in *infrastructure studies* and the ways that they understand and define large systems (and the importance of standards within them). Nevertheless, the transport infrastructure is here studied *from the perspective of* disabled people, drawing from significant work on exclusion and, importantly, on *ableism* and how it shapes society. This provides novel insights into both the field of STS and that of DS.

Methods

This research was undertaken by using qualitative research methods. With the aim of exploring wheelchair users' experiences of public transport, it was believed to be of central importance to place the voices of these actors at the forefront of the project. This is the result of having drawn inspiration from the work of emancipatory action researchers, such as Paulo Freire (Brazilian pedagogue) and Mike Oliver (British disability studies scholar). As the guiding question of the project, "How do wheelchair users use public transport in London?", is concerned with actors' experiences and narratives, it seemed clear that the best source material would originate from the users themselves. Hence, interviews were chosen as the primary form of data collection. The aim was to ensure that the voices of wheelchair users would be present throughout the thesis, quoting interviews heavily to ensure that wheelchair users' experiences are read by readers. However, as this summary heavily reduces the thesis, the number of quotations used is also correspondingly reduced (but not omitted!).

Three sources of data were used, and each will be discussed in turn below:

- **Interviews:**
A total of thirty-four people were interviewed, of which twenty-seven were wheelchair users. The other seven were either partners or carers, or non-disabled people involved with the world of transport. Interviews were 'semistructured'–in other words, the aim was to cover the same topics in all interviews, without intervening in the specific narrative of each interviewee. Interviews were recorded and transcribed in their entirety. The majority of interviewees have been anonymized (using a pseudonym of their choice, or one picked at random if no choice was communicated). Some interviewees waived anonymity. This process is discussed in detail in the methods chapter of the full thesis.

- **Observations:**
Three observations were undertaken, when the opportunity arose. One was at a 'Disability Roadshow', hosted at a garage of a London transport provider. The second was an afternoon spent traveling with an interviewee, Alan. The last was a wheelchair skills training session, organized by a disability charity. The observation notes were used as supplementary data to support interviewees' quotes and as illustrations for analysis.

- **Documentary collection:**
Two types of documentary data were collected. The first is a collection of official documentary records produced by the English Government and its departments and committees, such as the Disability Discrimination Act 1995, or the reports produced by Select Committees of both Houses of Parliament. Over 60 official documents were collected. The second group of documents are commercial media accounts, such as newspaper articles on disabled people's access to transport, public-facing websites such as

Transport for London (and its subpages on accessibility and transport), among others. This group of documents is more difficult to quantify, but can be estimated to be over one hundred press clippings, news articles, blog posts, and website subsections.

Analysis for this corpus of data was undertaken in two waves: the first was 'grounded'. In other words, no specific hypothesis was assumed to frame the approach. Rather, thematic groups were identified throughout the interviews, grouping quotes in each theme. Once these initial themes were produced, a second wave of analysis began. This structured revision of the pre-themes then allowed for reassembly of narratives, identifying a broader thematic structure on the topics of using, subverting and shaping public transport by wheelchair users. The next sections are a summary of the result of this rich empirical work.

Two Histories Brought Together

A recurring theme that emerged in interviews was the *age* of London's public transport system. Carl, for example, described the system as:

> *a Victorian network and obviously, back then, people with disabilities weren't really considered that important.*

He was not alone in referring to public transport's long history in London, and the general historical lack of concern for disabled people's access requirements. It is therefore important to contextualize this argument. Very briefly, the next sections will provide an overview of the history of transport in London, the history of disabled people's positions in British society, and propose an intersection between the two.

- **A (very) abridged history of London transport:**

The development of public transport in London began in earnest in the 1800s, at a time of a demographic boom with the population rising from just under a million in 1801 to over 7 million in 1911. Roads were already heavily congested in the 1820s, with horse-drawn omnibuses attempting to relieve some of the congestion between London's main points of interest (particularly between the new train stations and the City). However, they were not enough. Parliament quickly approved the construction of underground railways, the first one being built under today's Euston Road using a cut-and-cover method. The Metropolitan Railway was inaugurated in 1863, and the concept was a huge success.

As a result, more and more lines proliferated with nine lines being operated by mostly separate private companies by 1911. These companies would slowly begin to be unified under a single public corporation in 1933, with the founding of the London Passenger Transport Board, which also acquired the largest bus company operating in London. The Board began a strong process of standardization across the system, particularly aiming for unified brand recognition (this was the rise of the famous Transport for London roundel, for example).

The wars had a significant impact on the development of transport in the capital, and by the end of the second World War, public transport in London was in disarray. Very little money was injected into the system, and it competed with the advent of personal cars. One significant investment would be the famous London Routemasters (buses that would be inaccessible to wheelchair users as they had steps at the entrance). Even this

modernization did not help with passenger numbers.

The story of transport in London does not improve until the 1990s, after the King's Cross fire, a tragedy that claimed 31 lives and injured over 100 people, largely caused by lack of maintenance. As a result, the government began to re-inject money into the system, an attempt to ensure smooth operation across the network. After having become a public corporation in 1933, London Transport had exchanged hands within government back and forth between London administrative bodies and the Ministry of Transport. It finally settled in 2000 as Transport for London, under the purview of the (then recently created) Greater London Authority and the Mayor of London. In 2005, Routemasters were phased out and replaced with low-floor, accessible buses. Now, Londoners are looking forward to the inauguration of the Crossrail, or the Elizabeth line, set to open its central stations in May 2018.

The 'essence' of transport history in London is relatively straightforward: it is *old*, it is *big*, it is *complicated*, and it is still being revisited, constructed, revised. That will not stop anytime soon. Nevertheless, accessibility only features in this history relatively recently. It is only in 1985 that the Disabled Persons' Transport Advisory Committee is set up and, with their input, the Docklands Light Railway was inaugurated as step-free from the outset. That is already well over one hundred years since the inauguration of the first Underground line. The recent nature of these changes to transport make more sense in the light of the places that disabled people have occupied in British society over the past centuries.

- An (also very) abridged history of disabled people in British society:

This brief analysis of disabled people in British society has been drawn from British disability studies scholars. As discussed by Vic Finkelstein and Colin Barnes, the segregation of disabled people in the UK has been established for many centuries. For the sake of brevity, our story here will begin in the Elizabethan era and quickly work up to today.

In 1601, the Act for the Relief of the Poor was passed and, with it, the distinction between the "deserving" and "undeserving poor". The "deserving" or "impotent" poor were defined as the infirm, the elderly, and children, and were to be cared for by the state. Alms were collected and distributed at the local parish level. Colin Barnes argues that this act legitimized the, already existent, social perception that disabled people are "passive" members of society, not only deserving, but *requiring* charity.

Vic Finkelstein argues that a more marked segregation of disabled people occurred with the rise of industrialization and the demand for increased production. Being largely unable to operate the types of machinery being designed, disabled people continued to be labelled as passive and unproductive – this is also reflected in the arguments developed by ableism studies scholars discussed above. Furthermore, as factories were erected, the place of work and the place of home became distinguished spheres that required movement from one to another. This distinction is very important to our story, as the gap between the public and the private spheres is precisely what public transport is meant to bridge. See, for example, the very notion of "commuting".

Jumping ahead to the World Wars, some changes would start to come about as veterans returned home with physical and mental impairments. But it was with the rise of the civil rights movements in the 1960s that disabled people began to take to the streets and self-organize in earnest. Larger numbers of disabled people felt enabled intervene and speak to their personal experiences. It is in this period that our stories of transport and disabled people begin to intersect.

- Intersecting these histories:

In the various books about the history of public transport in London, there were few to no mentions of accessibility in the network. However, once the intersection between these two histories was made, an interesting, if exasperating, overlap appeared.

As argued by Finkelstein, the rise of industrialization in the 1800s deepened the stigma of disabled people as passive and unproductive. Public transport in London began to develop precisely at this period, when the perception of disabled people as house-bound was already deeply embedded in social norms, unquestioned and accepted. Their access needs or requirements were therefore simply not taken into consideration in the process of technological development of transport.

As the transport system consolidated over time, none of these assumptions were questioned: disabled people were indeed in institutions or in the home. And had been for a while. There were no demands for things to be made different and, even with the return of veterans, it was not perceived that changes were required. It would not be until the intervention of the Disability Rights Movement that things begin to shift, such as the implementation of the Disabled Persons' Transport Advisory Committee in 1985, and Disability Discrimination Act in 1995. Further improvements are discussed below, particularly linked to the Disability Action Network.

Here, however, it is this negative cycle of segregation that should be made clear: Disabled people were perceived as belonging in the private sphere, therefore they would not need transport, and therefore there would be no need to design for them. But without accessibility, it becomes near-impossible for disabled people to leave the home at all, thereby reinforcing the social perception that they "belong in the home" or are "passive". The historical segregation of disabled people is then not only materialized in the transport infrastructure, it is also *reinforced* by it.

This historical segregation has left deep marks on the infrastructure to this day, as many attempts to improve access to the system are, to some extent, "add-ons" to an infrastructure that was already consolidated. The next section is dedicated to discussing some of these barriers.

The Many Barriers to Transport

Interviewees would often draw a distinction between two types of barriers or, as Marie asked when discussing her experiences of transport:

> *Are we talking about the physical barriers to accessible transport? Are we talking about attitudinal barriers?*

These two types are discussed in turn below.

- Technical barriers to transport:

Wheelchair users experience frustrations with "bits and bobs" in the network: ramps that are too steep, or various other technical artifacts that are broken.

Wheelchair users also mention the space onboard the buses, and the train carriages: they're too small, they're hard to maneuver into, there are handrails in the way. It is even harder when you travel with a friend who is also a wheelchair user, as is the case with Um Hayaa:

> *[…] either I offer [the space] to my sister, [tell her] use the bus first, and then I wait for the second one. Sometimes the journey can be very difficult.*

Her and her sister can rarely travel together on public transport.

Interviewees also pointed out problems with technology, which is wonderfully captured by this quote from Michael J.,

> *… because the wonder of technology is the wonder that it ever works.*

This captures wheelchair users' frustrations not only with broken things, such as ramps and lifts, but also frustration with bells onboard the bus, that signal to other passengers that a wheelchair user is getting on or off. A loud siren goes on, which some interviewees have pointed out as being frustrating as it calls further attention to them (often causing shame or distress).

- Social barriers to transport:

Other examples of barriers were classified by interviewees as social. Their interaction with pram users, and the debate around whose priority it is to use the wheelchair space onboard the bus, for example. Their frustrations can also be extended to transport staff, bus drivers usually being cited as the most aggravating, as described by Sophie:

> *But occasionally it's the bus driver who doesn't even give me the chance to negotiate with the parent in the space, they just say, 'No, there's somebody in the space. You can't get on, you'll*

> *have to take the next one.' My favorite phrase.*

These social barriers often carry ableist undertones, through which the historical stigma of disabled people operates through their interaction with other users on the bus. Interviewees often discussed how wheelchair users are either framed as 'scroungers' or as 'super-humans', with few considerations for, what Chiara called,

> *the average disabled person who's just kind of using their wheelchair and getting on with life.*

Negative social attitudes still keep feeding back into interviewees' experiences of public transport, and combined with the variety of physical obstacles described in the previous section, it becomes clear that accessibility for wheelchair users is challenging to say the least.

- The cumulative problem of accessibility:

An additional layer to the various barriers to accessibility experienced by wheelchair users is their *cumulative* power. In other words, these problems do not just occur once or twice, every few trips. Rather, the barriers are faced often, sometimes multiple times per trip, and even simultaneously. Some interviewees described waiting for three or four buses to come by, waiting in the rain, or the cold. One interviewee said was robbed after waiting for an hour for a bus he could board. Given this, a first possible answer to this research's guiding question of how wheelchair users use public transport would be: They do so with significant difficulties. Indeed, users experience a significant amount of personal suffering in order to use public transport, and rather than become *invisible infrastructures*, as some STS scholars would have defined it, transport is anything but invisible to wheelchair users.

Developing Personal Tactics to Access Public Transport

Between buggies in wheelchair priority areas, broken ramps, and surly drivers, wheelchair users have to develop a variety of techniques, ideas and tactics get around the public transport system. This section focuses on the daily tactics, processes of problem-solving that have been developed by wheelchair users in order to manage their journeys and make them as smooth as possible. The notion of *tactics* borrows from de Certeau's work discussed above, and is defined as individual actions undertaken by wheelchair users as a means of ad-hoc problem solving while traveling; they are moments of truant freedom wherein 'non-standard' users of a system (that is to say, those whose needs have not been taken into consideration by the standards that shape the network) find ways to subvert it or momentarily mould it to their needs.

A taxonomy of tactics is proposed, based on how wheelchair users identify the barriers they face in the infrastructure. Firstly, to counter the nefarious effects of physical barriers, wheelchair users redefine the infrastructure's physical boundaries. Indeed, they reinterpret the design of the infrastructure by envisioning new uses they can make of it rather than following the prescribed indications (such as facing forwards in the wheelchair space, or riding escalators). They also *hack* the system in a variety of ways, forcing doors to remain open or developing toolkits to fix things along their journey. This may even include carrying a portable ramp on the back of their wheelchair.

Secondly, wheelchair users develop three tactics to tackle the social barriers that they encounter in the system. Firstly, they become experts in managing their disability by gauging their bodily and mental integrity and abilities. They also *perform* disability, that is to say, act according to social expectations of their impairments (by not moving one's legs, for example). These performances are useful in moments where it may allow them to gain a social advantage either to enroll an ally or to avoid confrontation. Finally, wheelchair users do significant *emotional labour* by enhancing a friendly appearance to ease passengers and staff around them and to have a better control over social interactions.

Hence, in order to use the public transport system at all, wheelchair users have to engage with a series of tactical practices that allow them to subvert an infrastructure rife with neoliberal-ableist scripts (historically inherited or otherwise) and, despite their efforts, there is never a guarantee for a smooth journey. These practices require a significant amount of work (physical, emotional, or otherwise) on the part of these passengers and, given their improvised nature, are deployed in unpredictable manners to unpredictable outcomes. It is worth asking whether it is fair that this case.

Engaging with Political 'Counterstrategies'

Engaging in political activities, and the importance of social movements in the shaping of policy-making, is a well-known theme in STS. As such, it comes as little surprise to those familiar with the field that this is one of the most impactful ways that wheelchair users might shape public transport infrastructure.

Some examples of the impact of the disability rights movement on the shaping of transport are historical, such as the formation of the Disabled Persons' Transport Advisory Committee in 1985. However, this was a consultative body

and did not provide legal obligations on the part of service providers.

It wasn't until 1992 that large protests began to take place, such as the Campaign for Accessible transport organized by the Disability Action Network with other disability rights groups. Wheelchair users would handcuff themselves to Routemasters in London, causing heavy disruption in Central London. The protests were a success: from 1994, the Routemasters began to be phased out and replaced by the first low-floor buses by 2005. Then, in 1995, the first legislation was approved, the Disability Discrimination Act which was superseded in 2010 by the Equality Act.

Though the Disability Action Network no longer exists as such, other groups have been formed in its stead. The most vocal in terms of transport in London is Transport for All (TfA), who have become the principal charity concerned with accessibility for disabled and elderly passengers. Indeed, TfA have placed significant pressure on politicians and transport providers alike, and in the past three years, they have been in the limelight because of their involvement with Crossrail. The original project plans included seven inaccessible stations, and were approved post-Disability Discrimination Act despite these inaccessible stations. TfA vocally protested against this for 18 months and their arguments were simple: this is a new line, post-Disability Discrimination Act – it *should* be accessible. Plus, TfA argued, only 0.02% of the £14.5 billion budget would be required to be make all stations step-free.

Their protests were highly creative, including a Paralympic Torch Relay across London on the anniversary of the Games, in September 2013. Other actions included sending a batch of

cookies frosted with accessibility and Crossrail logos and plenty of letter-writing and lobbying, but it wouldn't be until October 2014 that they received the good news. Additional funding had been secured to make all Crossrail stations accessible from the 1st day of service. Their 0.02% estimate had been correct: it would cost £30 million.

However, one of the most innovative engagements TfA have developed is the provision of "first-hand experience" to prominent policy-makers, inviting politicians and transport managers to spend a day with a group of their members to see the reality of accessibility in London. These experiences have been described by politicians as eye-opening, and they are a very different type of engagement from letters or calls. Politicians witnessed first-hand wheelchair users being verbally abused on the bus. As a result, this strategy has a high success rate of securing political promises to make accessibility a priority.

Nevertheless, these counterstrategies are also dependent on people who work *within* the decision-making process, and it would be unfair to erase the work done by this group. Doing so would also erase the fact that disabled people work, beyond charities such as TfA, and can be found in important positions, such as the Houses of Parliament. Baroness Sal Brinton, for example, described her dedication to ensuring that accessibility and disability rights are based at the forefront of political work in the future:

> *We will just go on doing guerrilla tactics.[…] We'll just go on and they'll get bored with us and eventually they'll have to give in.*

Work is also being done from within industry itself. I met Marie, who has taken on a role created specifically for her as disability coordinator in a London bus

company. In this role, she has developed training courses for drivers, and organized disability roadshows to bring disabled people into the bus depots and discuss their access requirements directly with the drivers.

While the mechanisms and approaches used by wheelchair users in London to shape public transport are not very different from other social movements' and may be familiar to those of us within STS, it does not detract from the findings of this research. Rather, it emphasis the level of engagement of wheelchair users with transport, and that this engagement goes beyond a personal use in their daily lives. Wheelchair users are engaging with the neoliberal-ableist infrastructure of transport on a macro-scale, through political activism both as insiders and as outsiders. This shows, to some extent, an awareness or belief that engaging with individual tactics on personal trips may not suffice in order to demand extensive infrastructural change.

The Paradoxes of Infrastructure

This section turns to consider the actions of wheelchair users in public transport with a more theoretical eye, in order to consider what this project has highlighted in the scholarship about infrastructures. Particularly, what has been gained through an analysis that adopts the perspective and experiences of marginalized users to research a large system such as transport infrastructure?

Primarily, this research has highlighted how highly paradoxical and contradictory both the theory *and* the experience of infrastructures can be. In the first instance, it is argued that infrastructures can be defined as *materialized expert knowledge* that is in constant tension with their users' (particularly their marginalized users') lay knowledge of the system. In

other words, the system expects particular usages and behaviors that are not in line with that of its users. In mobilizing their lay knowledge either on an individual or collective basis, wheelchair users can gradually mould infrastructure to better suit their needs.

However, this process leads to another contradiction–that is the way in which time, rigidity and scale constrict the ways that infrastructures change, often in contest with social changes. Infrastructures do not grow overnight, nor can they be renovated entirely by a single project. It is therefore difficult to implement changes at a macro level. As a result, not only are changes to the system incremental, they are also *localized*. This means that some users may experience the benefits of renovations earlier than others. In fact, infrastructures are highly dynamic creatures that have to battle against their own rigidity and scale to account for new demands and pressures. Wheelchair users, as users whose requirements have only recently begun to be embedded in the system, find themselves sandwiched between the changes that gradually occur in the system. In response to this process, it is wheelchair users who have to become malleable, forcing upon themselves a certain amount of flexibility within the network.

Finally, there is a significant contradiction that appears regarding the in/visibility of infrastructures, that is to say, the ways in which infrastructures hover between being routinely invisible and painfully visible upon breakdown. Given that for marginalized users infrastructures are never predictable nor routine, the network takes on a permanently visible character to them. In their daily interactions, wheelchair users bring the transport infrastructure to the forefront to all who are present, serving as a reminder of the

material nature of the infrastructure that surrounds them. It is through *being* visible and *making* visible that wheelchair users also affect changes to the network.

This is possibly the strongest contribution made by this project to the field of both infrastructure studies and ableism studies: *infrastructures are paradoxical in a multitude of ways* that have the power to exclude users while still being malleable enough to allow subversive entry-points for change. The notion that infrastructures are invisible is a *privileged* perspective – indeed, it is a definition of infrastructure that can only be made by those who are fully, or even mostly, inscribed within the ableist societal structure. For all others, including, for example, women (who may fall prey to sexual harassment in enclosed spaces), parents (with their children, momentarily non-conforming members of a labour-dependent production system), and, as discussed throughout the thesis, wheelchair users (and other disabled people), there is a constant awareness of the various ways in which infrastructure demands additional work on their part in order to make traveling possible.

Conclusions

Wheelchair users have experienced a history of constant social segregation caused by neoliberal-ableist structures. Indeed, the assumption that wheelchair users are passive, or house-bound and are not required to leave the private sphere is one of the reasons for the transport infrastructure embedding so few of their accessibility requirements. Consequently, it is the source of many of the barriers that wheelchair users still face today. However, as seen in the two previous sections, despite these strong social assumptions that depict disabled people as passive members of society, the evidence collected in this research

shows otherwise. If anything, wheelchair users are strongly engaged in both private and public aspects of the transport infrastructure, be it in developing personal tactics in their daily travels or in using counterstrategies to shape infrastructure in the long term.

What, then, would be the response to this thesis' initial question, "How do wheelchair users use public transport in London?" The answer is, appropriately, two-fold. Firstly, they use the public transport system with some difficulty. This is the result of infrastructural stabilization during a period of social segregation, paired with the paradox of malleability and temporality of infrastructures over time. Secondly, however, in order to use the public transport system in London, wheelchair users have developed a series of inclusion mechanisms to counter the nefarious effects of historical barriers and infrastructural lethargy. These mechanisms include ad-hoc problem-solving tactics as well as engaged political work. Through these mechanisms, these excluded users have found ways of affirming their agency within the system, and taken an active role in the shaping of infrastructure.

It is worth continuing to research the world of accessibility in public transport in order to actively engage with the practices of disabled people in their daily lives, and for finding best practices for informed decision-making in the future regarding transport policy. Furthermore, continuous work in this field can help to shed a pervasive negative stereotype that frames disabled people as passive members of society. Recapturing the work they do is to publicly recognize the richness in the variety of activities and engagement undertaken by disabled people.

Bibliography

- Barnes, C. (1996). Theories of disability and the origins of the oppression of disabled people in western society. In L. Barton (Ed.), *Disability and society: Emerging issues and insights* (pp. 43-60). London: Routledge.
- Beckett, A. E., & Campbell, T. (2015). The social model of disability as an oppositional device. *Disability & Society*, *30*(2), 270-283.
- De Certeau, M. (2011 [1974]). *The Practice of Everyday Life*. Berkeley: University of California Press.
- Finkelstein, V. (1981). Disability and the helper/helped relationship: An historical view. In A. Brechin, P. Liddiard, & J. Swain (Eds.), *Handicap in a social world* (pp. 58-65). London: Hodder & Stoughton.
- Goffman, E. (1963). *Stigma: Notes on the management of spoiled identity*. New Jersey: Prentice-Hall Inc.
- Hughes, T. P. (1987). The evolution of large technological systems. In W. E. Bijker, T. P. Hughes, & T. J. Pinch (Eds.), *The social construction of technological systems: New directions in the sociology and history of technology* (pp. 51-82). Cambridge, MA: The MIT Press.
- Lampland, M., & Star, S. L. (2009). *Standards and their stories: How quantifying, classifying, and formalizing practices shape everyday life.* Ithaca, NY: Cornell University Press.
- Oliver, M. (1992). Changing the social relations of research production? *Disability, Handicap & Society*, *7*(2), 101-114.
- Oudshoorn, N., & Pinch, T. J. (2003). *How users matter: the co-construction of users and technology.* Cambridge, MA.: The MIT Press.
- Siebers, T. (2001). Disability in theory: From social constructionism to the new realism of the body. *American Literary History, 13*(4), 737-754.
- UPIAS. (1976). Fundamental principles of disability. Reprinted in edited form in M. Oliver, *Understanding Disability: From Theory to Practice*, 19-29.
- Wolbring, G. (2008). The politics of ableism. *Development, 51*(2), 252-258.

Supervisors

Professor Brian Balmer (Department of Science and Technology Studies – UCL)

Dr. Catherine Holloway (UCL Interaction Centre)

Acknowledgements

If you are interested in this study and would like further information (or even the thesis in its entirety), please feel free to contact me.

email: velhor@rpi.edu
website: www.raquelvelho.com
Twitter: @RSVelho