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RESEARCH ARTICLE

Navigational Mapping Practices: Contexts, Politics, Data

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Maps communicate meaning to the practices and experiences of navigation in everyday life. This is ever more the case in a world where GPS, geo-spatial and locative mapping technology has become embedded in more devices. And yet such mediations are not neutral. Rather, they are entangled with cultural and political practices, and increasingly with the accumulation of spatial big data. Put together, these elements have an impact on how our experiences and understanding of the world are formed and on how the power of maps is exercised and experienced. This paper draws from an ethnographic study of everyday map use in London to demonstrate how some of these impacts mediate and shape practices of urban navigation. The paper contends that navigational mapping practices are contextual, political and increasingly practices of data collection.

Keywords: Navigation; power of maps; politics; user data

Introduction

Maps are common objects of representation that have filtered down into the very minutiae of everyday life. This has never been truer than now, with large numbers of people owning a digital device with mapping and GPS capabilities of some kind or another. This follows a long and complex history of maps made for the state and the sovereign class being slowly distilled into maps made for public use in everyday life (see the History of Cartography Project, 1987–present: https://geography.wisc.edu/histcart/).

This article makes a contribution to studies of maps and navigation by providing evidence from an ethnographic study of everyday urban map use. I'll show how maps are used for wayfinding and how they have the capacity to evoke affective responses that emerge from these encounters. Studying how we navigate with a map offers a useful way of understanding how and why maps are used in the minutiae of everyday life, which is crucial if we are to understand the extent to which *the power of maps* is expressed, solidified, disrupted and experienced in daily practice. I will also discuss how our interactions with the map are changing as new digital mapping technologies have become popular and consider what the potential impacts of 'spatial big data' might be on navigational practices. I argue that both reproduce the intrinsic power of maps and extend its reach in new directions.

This paper adds further voice to the notion that mapping practices are not universal, but rather always-emerging (Kitchin and Dodge, 2007), co-authored (Della Dora, 2009), gendered (Kwan, 2008), embodied (Perkins, 2009) and inherently cultural (Perkins, 2008). Empirically, the paper provides ethnographic detail from a study of everyday mapping practices, something which is called for but not often done in studies of maps (Dodge et al., 2009). By highlighting the contexts of practice, I shed further light on why it is important to examine the use of maps in situ, for the reason that it puts much of the discussed theories of maps and navigation into contention with the complex and uneven realities of everyday map use.

The paper has three sections. The first outlines how maps can be conceptualised as representational and more-than-representational objects and practices of power. The purpose here is to draw attention to the diverse ways in which maps can be examined in the context of navigation, which is important if we want to understand cartography and the use of maps from a cultural perspective. The second section uses ethnographic evidence from urban navigators in London to examine the relations between the map and practices of urban navigation. This section demonstrates how a contextual reading of maps is necessary for understanding how maps mediate these daily practices. The third section focuses on how the power of maps filters down into navigational practice. In this section the politics of maps are discussed with a particular focus on the tensions between the accumulation of spatial big data and user concerns over data privacy.

Maps: representational and more-than-representational

Maps have long been studied as powerful objects of representation. Most famously, Brian Harley (1989) deconstructed the map to demonstrate how it is used as a social and political tool to influence the way we understand the world. Many have since continued to follow this line of enquiry and we now have a well-established field of critical cartography examining the various ways in which maps exert power and influence. Crampton (2010), Monmonier (1991) and Wood (1992, 2010) have looked extensively at the intricate ties between cartography and the state and how the features of maps – their signage, symbols, symbolism and colours – act as stamps of authority over space. Pickles (2004) historicised 'the cartographic gaze' by exploring the role of maps in the history of our understanding of space. Similarly, Cosgrove (1999) gave an account of how the history of maps is a history of culture; how *mappings*, as he refers to them, have long been a tool used by people to give order to their physical, social and imaginative worlds. Olsson (2007) took this a step further and offered a detailed account of how maps were bound up in the history of how people learnt to conceptualise space as an ordered reality. Whilst there is little room to unpack these here, collectively this rich body of work puts the history of cartography into contention with the history of power and scientific knowledge, and asks us to question what it means for a map to represent the world and what it means to understand the world based on a representation.

The arguments made in these foundational texts can be applied to maps of many kinds and they remain key to those interested in studying maps in social life, including navigational practices (see Wilmott, 2016a). In the past two decades, scholars have largely focused their attention on how digital mapping technologies have reproduced and/or distorted the power of maps. This is no doubt due to the exponential growth of such technologies during this time. Geographic Information Systems (GIS) (Crampton, 2010), Neogeography (Wilson & Graham, 2013) and Spatial Media (Kitchin et al., 2017), for example, have been explored as digital tools of representation that can enact both top-down and bottom-up power geometries.

Most recently, data has been discussed in relation to cartographic practices. So-called 'spatial big data' – that is, 'natively geocoded content, geographical metadata, or data that itself

refers to spaces and places' (Leszczynski & Crampton, 2016: 1) – has been said to produce further top-down power geometries that are increasingly significant when we consider the many ways that locational data is harvested and used by powerful technology companies (Thatcher, 2017). This paper contributes to this body of work by continuing to focus on maps as powerful objects of representation. It does so by paying attention to the power of maps used in everyday navigational practices, which may be analogue and decidedly basic, or digital and extremely complex.

In addition to maps being deconstructed as socially produced representations, a further group of scholars has explored the possibilities of a performative and post-representational cartography, where attention is given to mapping as practice and a performance (Crampton, 2009; Gerlach, 2018). This work suggests that maps are more than just objects of representation, and instead asks that we examine maps as objects with an agency to interact with social life. This is also an area in which this study contributes, for as I'll demonstrate, navigating with the map is a practice with the capacity to evoke performances of identity and power.

In this field, maps have been said to be ontogenic: that is, always coming into being through their contexts and cultures of use (Perkins, 2008; Kitchin et al., 2013). Despite some of the ambiguities associated with the post-representational turn in map studies (see Rossetto, 2015) and notwithstanding the critical importance of the work that maps do as cartographic representations, maps should also be understood as things bound up in the complexities of the life-world (Ingold, 2010). Maps are cultural artifacts with performative properties that affect the practices of everyday life (Gerlach, 2018). Maps are not reducible to their representational form (Kitchin et al., 2013) and they have the capacity to produce a range of affects through their use in situ. At the very least, maps are useful navigational tools used to get us from A to B, but the true scale and complexity of a map's affect will depend on the complexity of the contexts of its use. Those wishing to examine how the power of maps filters down into the experiences of using maps for everyday tasks should take these dynamic forms of use into account.

I choose to use 'more-than-representational' rather than 'post-representational' or even 'non-representational' in framing my analysis of map use because it implies an interdependent connection between a map's representational properties and its performative affect. Following Lorimer, it is a useful term for exploring the 'multifarious, open encounters in the realm of practice' (2005: 84) without some of the baggage of non-representational theory or the implication of an interest in only what comes after the representational. Whilst much of the work in post-representational cartography and non-representational theory *is* concerned with the representational (Gerlach, 2018), the more-than-representational terminology is perhaps more useful for encapsulating these interdependencies of mapping practices.

As has been made clear by Ash (2015) and Rose (2015), research must continue to go beyond deconstructing representational forms as purely representational devices. Indeed, it is necessary to explore further the other ways in which representations, including maps, do work in the world. Accepting this dialectic between representational and more-than-representational practice takes us away from an understanding of maps as immutable mobiles (maps as stable in form and function across different contexts; see Latour, 1986). Instead, this understanding asks us to question maps as mutable (unstable) mobiles, open to and constitutive of the multiple possibilities and affordances of everyday practice (Kitchin and Dodge, 2007). Drawing from this body of work is useful for framing the complex realities of navigating with the map, which as I will demonstrate, is not simply a task of understanding a map in relation to one's surroundings, but rather an emergent, contextual and cultural process.

Maps have a common association with the practices of navigation yet this association is all too often thought about in simplistic terms as a straightforward mimetic process of finding

one's way based on guidance from the map (Brown and Laurier, 2005; Ingold, 2000, 2010; November et al., 2010). As Griffin (2018) describes, the modern field of scientific cartography has focused its efforts on this assumption, whereby successful navigations have been determined to be those where the form and function of the map are most effectively communicated to the user. The following will complicate this by demonstrating that navigation is a practice emerging from complex mapping encounters dependent on the multiple maps available, the routing options available, the landmarks in view, the people around us and the spatial knowledge one has accumulated of an area. I show how navigation is a process whereby references to the map – how well its form is communicated – must be understood as part of a contextually bound practice with many social and spatial considerations.

Methods

I draw from fieldwork primarily conducted between May and December 2014 (with additional fieldwork in June 2016) with a small group of 'navigational map users' collected through a process of snowball sampling. I provide evidence from semi-structured interviews and ethnographic 'go-along' observations from my time with three individuals navigating in London (UK). The interviews took place before and after each go-along, in the homes, workplaces or pubs/cafés chosen by the participants. The aim of having two interviews in one study session was to give participants the opportunity to respond to and reflect upon what I (and they) observed during each go-along. Each go-along was an exercise designed to test the participant's spatial knowledge of the city, their navigational skills and how they used different maps in this process. This included asking participants to navigate themselves to and from unknown points in the city using the maps available to them. On occasion I asked participants not to use a map at all in order to test how other spatial clues could guide their wayfinding. Participants were both familiar and unfamiliar with certain areas of the city owing to the spatial knowledge of the city they had built up over time. Though this was somewhat inevitable as many of the routes required participants to travel through well-known and popular areas of the city, the majority of these exercises unfolded along streets in relatively unknown areas.

The combination of interview-go-along-interview was useful for corroborating how participants said they used maps in an interview setting with how they used maps in a practice-based setting. Moreover, this methodology gave focus to mapping as a spatial practice which, as Kusenbach (2003) suggests, is one of the key uses for the ethnographic 'go-along'. To rely solely on reflexive interviews would draw attention away from the way that navigational practices are full of nuances that often remain unsaid. Although these research sessions cannot be described as wholly 'naturalistic' due to their loose design, the presence of a researcher and their focus on walking-based navigations during only daylight hours, they do go some way to examining maps outside of the simulated laboratory setting, where the use of maps is all too often studied (Dodge et al., 2009; van Elzakker & Ooms, 2018).

The three participants in my study, Tom, Harry and Sally, were all in their mid-to-late 20s, British born, and residents of London and the South-East of England. I met with each of them 3–4 times over the study period. Each had a different approach to navigation, and each used maps in different ways. In the following sections, I explore these dynamics to illustrate how navigation is a practice that emerges and is mediated in diverse ways using a variety of mappings. Admittedly, the sample size is small and not representative of all map users, but it is nonetheless illustrative as a case study of how diverse navigation can be. My intention, rather than attempting to claim this data is generalisable, is to provide a detailed snapshot of everyday practice that can be used to complement existing and future research examining how and why we use maps in this common practice of urban navigation.

Tom

For Tom, a regular visitor to London, everyday navigations through London were a process that emerged from his use of street maps, street signs, city landmarks, directions given to him and his spatial knowledge of the city. It was a process where navigating the city required different maps at different times. Street maps were more useful than smartphone maps in some cases, as were the directions given by strangers. At other times it was landmarks and his accumulated spatial knowledge that were the most important factors in gauging where to go and how to get there.

Accompanying Tom on various walks through London, it was surprising how little he used his smartphone to look at the map. He consulted street maps far more often (see **Figure 1**), saying that:

> 'They're just easier... I don't have to get out my phone and type in the address or whatever... I just have to look at the [street] map and I know within a few seconds which way I'm meant to be going. Plus those walking time circle things are useful... I use them all the time... Obviously if I can't find a map or it's not on my route like outside of town I'll check my phone, or if I need to check an exact address then of course.'

Figure 1: Tom using a street map.

Tom suggested it was more convenient for him to use street maps and landmarks. Heading East on one occasion, Tom had been looking out for landmarks that he knew to be in the East of London. These included the 'Gherkin' building and the NatWest Tower. From early on in the exercise these landmarks had been visible, and Tom used them to give him a general sense of direction, with the street maps being used to determine the finer details of the route. Nevertheless, it must be noted that London is particularly well equipped with street maps and landmarks, and this practice might not be the same in other areas or contexts.

As I've demonstrated elsewhere (Duggan, 2018), when Tom was involved in navigation whilst driving, he was far more reliant on the phone map (used as a sat-nav) and road signs for understanding his surroundings. He cited the technological affordances available to him in this practice as the reason for this. These included real-time information on traffic flows, his travel/arrival time and the availability of his music library. Collectively Tom used these affordances to help curate a comfortable driving environment for himself. This suggests that the context of navigation is an important consideration for understanding the use and effectiveness of maps; something which is echoed by Wilmott (2016a) in her study of mobile maps and navigation. Both studies suggest that there is no universal way in which maps are used; rather, it is more a case of making-do with what we've got in the moment. Studying these contexts, however, is difficult in practice due to the variety of factors that might contribute meaningfully to a 'navigational context'. As researchers we must draw the line somewhere if we are to conduct a useful analysis. Indeed, in the case of Tom, it is clearly not just maps or technologies that produce his navigational experiences, but rather it is a culmination of many factors, including but not limited to the social situation, environmental surroundings, biological and corporeal embodiments as well as the technologies being used.

Walking down High Holborn with Tom highlighted how navigational practices are decidedly social. Approaching an intersection, Tom had a decision to make about where to go next; he was looking for a street map to help as he often did. We stopped and began discussing the route to our destination. A passer-by overheard us and suddenly interjected with 'Leather Lane? Nah mate. It's up there on the left' to correct Tom's initial soundings that it had been on his right. Not used to this kind of public assistance on the busy streets of London, we both looked at each other, and then Tom to the man as if to offer a silent thanks. We then crossed the road following his direction without saying a word. A trust in this stranger's interjection was built in that moment, and proven when we did find Leather Lane where advertised. It was only when another decision point was reached that Tom went looking for a map again.

Following Tim Ingold's (2000, 2010) assertion that spatial knowledge is accumulated through a process of *knowing as we go* rather than as something necessarily predetermined by the scientific study of maps, Tom's navigation skills can be said to be processual. He made sense of the world as he moved through it, rather than making sense of the world based purely on the maps he used. The various maps that he did use acted as intermittent signposts that gradually guided him from point A to B. It can be said that each use of a map slightly reconfigures the communication processes that unfold between Tom and the territory. Maps were helpful in determining his next steps, but the processes of his navigation regularly involved far more than the map. This similarly follows Brown and Laurier's (2005, 2012) studies, which found that map reading is a step by step process that emerges in the moment from the complex social realities of everyday practice rather than necessarily a purely psychological process of cognitive map recall.

Harry

Harry had different practices of navigation that made use of maps in different ways. He was much more inclined to use the digital map on his phone. In many cases he admitted he relied on it a little too much, even when he didn't really need it:

> In other places, like on holiday, I don't really use my phone [maps] that much, it's much more fun just to figure it out... Here [London] though, I always end up just using my phone because it's easy and I need to get somewhere usually quickly.

This was proved to some extent in his persistent checking of his phone on our walks together through London. 'I don't even need to check it all the time. I mean, I know where I am obviously but it helps to keep an eye on it', he said. Similar to Tom's use of street maps, Harry guided himself from point A to point B intermittently checking the map. The difference was that Harry could do this from wherever he was by reaching into his pocket to retrieve his phone rather than preferring to find and consult a street map. The speed and ease with which Harry could do this meant that there were fewer pauses in our movements.

The blue locational dot, the number of routes presented, the accuracy of GPS position, the integrated real-time public transport options and numerous scale options make up just some of the features that persuaded Harry to use digital maps over others. 'It [Google Maps] makes getting across town much easier than trawling the travel information elsewhere.' he said. 'It's just better [than other rival mapping applications]. I know how it works, what colours mean what, and it's easy to use isn't it?'

Google Maps has significant aesthetic and functional qualities that are brought up here. Much effort goes into producing user-friendly interface designs that function well, often with ludic qualities designed to keep users engaged and coming back. This can be seen across the technology sector where addictive interface design has become incredibly profitable for software companies (see Ash, 2015; Schüll, 2012). Maps have long relied on aesthetics to engage (and persuade) the user (Monmonier, 1991; Rossetto, 2018; Wood, 1992). Such aesthetic qualities, including map symbols, icons, wording, borders, fonts and colours, help to convey the authority of maps, which contributes to a loyal following of map users. Google Maps is no different in this respect. It could be suggested that Harry's primary choice of map is Google Maps partly because of these qualities. Indeed, this was part of his reasoning for not using alternatives such as Apple Maps. He suggested that Google Maps offered much more in the way of useable navigational features, simple and familiar designs, and that it was better integrated into other services like Google Search and Google Street View. In addition to the lure of map aesthetics, this also speaks to the importance of multi-functional mapping technologies and lure of cross-platform design. Harry did not choose just one map, but rather used a range of integrated technologies to help co-produce his navigational practices.

In planning some routes to specific locations, he would use a combination of Google Maps, Google Street View and Google Search to determine where to go and what visual clues to look out for along the way. Though this was mostly successful, he would sometimes be thrown off guard when the Street View image didn't accurately correspond to what he was seeing in front of him. In one such case Harry stated:

> They must not have updated it [the Street View image] yet. Look at those blocks... they were not finished when this was taken [pointing to a housing development across the street and then to the image on his phone].

Like Tom, Harry also made use of other less obvious mappings on our walks through London. He was seen to use the numbers and destinations on the front of buses and bus stops as well as the London Underground signage indicating tube stations. On one trip, when he saw a number 35 bus with the destination *Clapham Junction* coming up behind him, he knew we were headed in the direction of Camberwell, our destination. He also made use of well-known landmarks such as The Shard and not so well-known landmarks, typically a pub, to point him in the right direction. 'I've been there [The Ring Pub] before so we must be going the right

way' he recalled as we headed down Blackfriars Road. This goes to show that navigation can also be a process that emerges as the use of the map becomes entangled with moments of encounter with transportation systems and previous experiences, which again points to navigation as a contextual mapping practice.

Sally

Walking through the suburbs of East London, Sally made more use of street signs than either Tom or Harry. She also made significantly more use of Google's Street View technology to assist in finding her way. Her usual practice when navigating to unknown places was to plan her route using Google Maps and Street View *before* she left home or wherever she may be. If she had time to do so, Sally used her laptop to examine any major changes in direction, note any key landmarks and to identify any street names that could be used to guide her en-route. On one occasion she wrote some brief instructions on her hand, which she used as an additional wayfinding guide.

R [right] Huxley Rd

L [left] Dawlish Rd

R [right] Murchison Rd -> Norlington

When the journey was relatively short, she tended to run through the entire route on Street View as a sort of practice run of what to expect. This was a cumbersome process of clicking through the many images that make up Street View and making minor adjustments to correct the view as it steered off course. As Jenkins (2003) noted, tourist experiences may shape and be shaped by photography. In this case it could be said that this Street View shapes geographical imaginations in new ways. It certainly made a difference to how Sally experienced her navigations. Frequently she would recall what she had seen on-screen and use it to guide her between points. Like Tom and Harry, Sally's navigations can be described as processual, for she went from point A to point B via a series of self-defined (and sometimes digital) guideposts that intermittently confirmed her actions along the way.

On no occasion did Sally interact with a paper map during our time together. When she did get stuck, which was relatively rare, she used her phone to check where she was on the map and tried to make sense of where to go next by walking a few metres to see in which direction the location dot moved. Sometimes this meant walking back on ourselves as she trialed a route. Incidentally, this was also something done by Harry when exiting London underground stations with multiple exits. He would climb the steps of the nearest exit, walk a few metres and use the location dot to judge which direction to head in. This particular combination is only possible using digital GPS maps. It is also another example of how movement itself is a key factor in mediating practices of navigation.

When Sally and I took a journey by bus, though responsibility for navigation was passed on to the driver, she still relied on her phone map to tell her where to get off. Again, she used the location icon to assist her in determining our position in relation to our destination. Commenting on how she used this feature in other ways, she said, 'I use it especially at night when I can't always tell where I am … it's also a kind of comfort thing, that feeling you know where you are.' This suggests that the use of a map is more than a practical tool. Instead this highlights how the map was bound up in the finer intricacies of Sally's wellbeing; an object of reassurance and safety that she found comfort in. To reiterate Perkins:

> Maps may reassure the lost, encourage debate, support arguments, keep the rain off, fire the imagination, help win or lose elections, sell products, win wars, catch criminals: an endless list of uses becomes possible, limited only by the imagination of its author: motivations may well be beyond science, even if most researchers investigating map use remain constrained by realist notions of scientific progress (2008: 151).

Studies of navigation should pay more attention to these factors for it is not a practice that can be separated from these social and cultural considerations. In the case of Tom, Harry and Sally, navigating with the map was a process intertwined with their identities and with the specificities of contexts in which it unfolded.

Thus far I have demonstrated, using three case studies, that both analogue and digital maps mediate and give shape to the experiences of wayfinding in the city. I have highlighted how navigation unfolds amongst the dynamic contingencies of daily practice and have shown how maps of different types can be said to affect these practices in different ways depending on their contexts of use. If other contexts were examined, even with the same participants, it is likely that further intricacies would be revealed. The point here is that maps are not stable objects of representation but rather unstable and perpetually coming into being as tools to make-do as and when they are needed. Following Kitchin et al. (2013), these findings offer a further challenge to the notion that maps are somehow neutral tools with standardised practices of use. In the following section I turn my attention to the politics of these dynamic mediations to discuss how the knowledge-power of maps is produced and maintained when analogue and digital maps are put to use in navigational practice.

Navigation, politics and spatial big data

Navigating with a map is laden with politics that matter. Though this is not always obvious, the cartographic gaze – the socially produced objective view from nowhere – is implicit in the shaping of these practices (Wilmott, 2016a, 2016b). To navigate the city using a map is to assume the city is a puzzle to be solved from above, though, as I have demonstrated, navigation is an emergent process of moving *through* the city, constituted by an assemblage of social, spatial and technical variables in addition to what's on the map (see also Wilmott, 2016a, 2016b). All of the participants of this study faithfully followed the map and never questioned its politics, what it represented and what it did not. Maps were treated as utilitarian tools used to get them from A to B rather than the socially produced texts critical cartographers and alike know them to be. As Crampton (2010) and Wood (2010) have shown, maps are particularly effective representational devices for convincing us of their scientific credentials when used in the practices of everyday life. In this case, such credentials were certainly considered proven by the way that the participants achieved their goals of navigation. Participants based the success of their wayfinding on their abilities to read and work with the map, rather than the other factors that also helped to guide them.

Furthermore these knowledge assumptions filtered down into the experiential dimension of navigation. The sense of security that Sally felt when using a map on the bus, the frequent checking of the map by Tom and the convenience and ease of use evoked by Harry are all responses derived from the assumption that the map offers a reliable representation of the world. The map has the capacity to produce a range of affects from its users (Gerlach, 2018). This relation comes to the fore all the time in navigational practices, expressed in the cases where the map doesn't reflect the territory, where the security of using sat-nav devices is questioned as users find themselves off the beaten track, in an argument, when real-time traffic information doesn't reflect the reality of the road ahead, or when the clear path indicated on the map

is closed for construction works. It is perhaps only in these moments of navigational failure, where representation meets reality, that the power-knowledges of maps are exposed as simulacra (an image or representation of someone or something). Nevertheless, such moments are often fleeting, and it doesn't take long before trust in the map is restored. Moreover, it is curious that we don't always recognise the dynamic ways in which we navigate and instead tend to attribute navigational skills to whether we read the map properly or whether the technology has worked or not. These tensions are largely similar for digital and analogue maps, and they have been explored in the literature (see, for example, Brown and Laurier, 2012, and Speake, 2015, who have examined sat-nav technologies in driving navigations), though they will have to be further explored in relation to how new and emerging geospatial technologies are affecting specific practices of navigation.

In everyday digital mapping practices there are data politics that are significantly different to those produced in analogue mapping practices. These are the same politics that boyd and Crawford (2012) and Lyon (2014) suggest emerge from a world in which computer processing power and a desire to collect the granular details of everyday life have become the default position of many technology companies. Interactions between a user and a digital map, such as those described above, produce a multiplicity of data which is used in multifarious (and it must be said often unknown) ways by a range of stakeholders including but not always limited to the proprietary owner of the mapping software in question and their affiliated partners. This 'spatial big data', commonly defined by its volume, velocity and variability, is produced from encounters with the map and is significant when we consider the power of maps and data in contemporary everyday life (Leszczynski & Crampton, 2016).

Many of our interactions with digital maps produce data. This is not true of interactions with analogue maps. Digital mapping software collects a range of personal data and metadata about its users including their location, time of use, personal preferences, search history, routing history and location history. Mapping platforms that are integrated into other services, for instance with search engines, are also likely to share data with other services to build a more comprehensive networked profile of their users. The use of digital maps can be said to have a multiplicity of affects that go beyond those experienced or known by the user in question. Following Deleuze and Guattari's suggestion that 'a map has multiple entryways' (2004: 13), that a map can be brought into being and put to use in many ways, we could now argue that a map has multiple exit ways, as data from our use flows through relational and often black-boxed channels to 'improve' products and services and produce more sophisticated profiles of users, most likely used for digital marketing or surveillance purposes. This supports Kitchin's (2014) notion that big data sets are exhaustive, granular, relational, indexical, flexible and scalable as well as determined by volume, velocity and variability.

Within the privacy policy of Google Maps, commonly cited as the most popular digital mapping application, it is heavily suggested that data is collected from a range of services and used in relational ways. To be clear, there are a number of different digital mapping platforms and each collects data from users in different ways. The policy of open-sourced mapping platform OpenStreetMap (OSM), for example, is to allow anyone (with the technical skills) to access the data that is being collected when the platform is used (OSM, 2018). Nevertheless, it can confidently be assumed that all digital mapping platforms are accumulating granular data about their users in some form or another, whether this is to improve the bottom line, to provide a better service, or both. As the participants from this study mainly used Google's mapping services, I keep the focus on Google's data collection practices to illustrate my point. The following is taken from Google's (UK) most recent UK privacy policy at the time of writing (18 December 2017):

> We use the information we collect from all of our services to provide, maintain, protect and improve them, to develop new ones and to protect Google and our users. We also use this information to offer you tailored content – like giving you more relevant search results and ads.
>
> We may combine personal information from one service with information, including personal information, from other Google services' (Google Privacy Policy, 2017).

Though Google's policy of data accumulation and use is clearly stated here, users are not made fully aware of the extent to which their mapping data may be used in conjunction with other data collected about them or other users in developing Google's overall services. As Thatcher states, 'the code and data that produce any given result [in mobile spatial applications] are never encountered directly by the end-user' (2017: 2703). Much of this data collection and processing goes on under the radar of everyday practice, where privacy policies are rarely examined or questioned, despite their availability (Manovich, 2013; Schaub et al., 2017). As Leszczynski (2015) has shown, users are more concerned about the control of data ownership than they are about the ways that spatial big data is accumulated and used.

The participants in this study had some knowledge of the kinds of data being collected from their map use in navigational contexts, with all being aware that digital maps collected location information. They were less aware of the relational ways in which the data collected from their use might be used. Much of this comes down to the now common trade-off between software developers and consumers whereby use is free in exchange for permission to use consumer data. Harry put it simply:

> Yeah, I know I'm obviously being tracked and what have you, but I don't really care to be honest... It [Google Maps] gets the job done so I'm happy with that.

Similarly, Tom, discussing his privacy practices, said:

> I should probably sign out [of Google Maps] shouldn't I? The thing is I do find the way it saves my stuff useful when I need it again... saves me some time messing around with always putting the same postcodes in [shows me his list of 'favourite' place marks].

Not only do digital maps harvest great power from their cartographic form, but they now must be understood as wielding further power (and increasingly commercial value) from the vast volumes of complex and relational data that they accumulate from users. This is not necessarily a challenge to the power of the cartographic gaze – for sure, this remains firmly in place – but rather an additional data power that is exercised over users in other ways, through the steady accumulation of an increasingly granular form of knowledge-power, much of which is increasingly used as a prized commodity (Frith, 2015; Leszczynski, 2015; Thatcher, 2017). As user profiles become more comprehensive through repeated use of maps and other integrated services, the more power services have to control what users may and may not see on the map and through other services. This is linked to Zook and Graham's (2007) notion of 'DigiPlace', whereby place is increasingly layered with personalised geocoded information. The result will be an ever more egocentric map service where there is power in both the map and the data harvested from using the map. In this sense some digital maps follow the same 'filter bubble' logics produced by internet searches, whereby a narrow worldview is presented based on the search histories of individual users (Pariser, 2011). Though this will certainly have its advantages for the user, as identified above by Harry, it signals a change in the way we might think about the power of maps. At the very least it suggests a shift in the ways that

the power of maps filters down into the practices of everyday life, adding an additional layer of data complexity that is not there when using analogue maps.

As Kitchin et al. (2013) have made clear, however, the true power of a map can only be measured by examining the relational context(s) in which it was put to use. In effect, the data power of a map can only really be measured when we examine it in specific contexts of use. For the participants of this study it could be argued that the data power of maps was largely insignificant to their daily practices. Nevertheless, this does not mean that it wouldn't be significant in other cases. For example, there are significant risks to consider when mapping practices are linked with other data sets, such as web search histories, credit reports, employment history, travel history and government surveillance data (see Cheney-Lippold, 2017).

Conclusion

This paper has demonstrated that everyday urban navigational mapping practices are emergent and context-dependent encounters: that is, always situated in specific contexts of practice that are open to the complex realities of daily life and the affordances of mapping technology. In this sense the paper supports the view that mapping practices are emergent and processual rather than fixed and universal (Kitchin et al., 2013).

This paper used ethnographic evidence from three case studies of everyday navigation in London (UK) to highlight just some of the ways that maps are used to make sense of the world as we move through it. The findings from this paper support the anthropological notion that navigation is not only a cognitive process but also a cultural process of knowing as we go (see Ingold, 2000. 2010). By doing so the paper offers an alternative way of studying navigational mapping practices, whereby the navigator and map are studied in the field rather than in the usual laboratory setting (see Dodge et al., 2009; van Elzakker & Ooms, 2018).

Moreover, the paper highlights how the so-called *power of maps* (Wood, 1992; 2010) filters down to the minutiae of navigation and map use. This is important if we are to develop a better understanding of how the socially constructed knowledge-power of maps is expressed and experienced when different maps are used. The paper also brings further attention to how digital mapping and data technologies have affected the reach of this knowledge-power (see also Leszczynski, 2015), including how they are produced and what they can and may be used for.

The power of maps, recognised by critical cartographers as that embedded in the aesthetics and social circulation of maps, continues to be rethought in the contemporary context. This is already being done by scholars examining the impacts of spatial big data (see for example, Thatcher, 2017). Nevertheless, further research is needed to investigate how these new forms of knowledge-power are understood and experienced in everyday mapping practices (see also Leszczynski and Crampton, 2016). Navigation is one thing, but maps have many more uses in daily life which will affect the power-knowledges of maps and data.

It will be especially important to examine whether attitudes towards the accumulation of spatial big data will be affected by the growing awareness, evidenced in recent media events, that data equates to power (see for example, the Cambridge Analytica revelations). Certainly, when I asked participants if they would be happy to have someone record their every move from ten steps behind to gain a better sense of who they were, they offered decidedly different feelings towards location tracking. This says something about how the context of data accumulation is key for understanding how people feel about it in navigational contexts. The accumulation of spatial big data – and hence knowledge-power – is often a black-boxed process that goes on in the background of these practices, so it is not always recognised or considered in the moments where maps are used in the processes of navigation. This goes to show that navigation is not a neutral practice of getting from A to B but rather a practice laden with a (data) politics that requires better understanding from researchers and practitioners alike.

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Competing Interests
The author has no competing interests to declare.

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