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The Design and Public Imaginaries of Smart Street Furniture

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Introduction

Design is dependent on an imaginary future object or outcome. In smart cities, this imaginary is frequently framed as an efficient and connected city for smart citizens. This city is underpinned by smart and connected infrastructure – city services, transport and street furniture – are connected, Wi-Fi enabled and embedded with sensors (Kitchin and Dodge 2011). The smart citizen is enabled by this connectivity. As critics note, however, the imagined smart public lacks inclusivity and the emergence and operation of the smart city is rarely seamless. There is a discrepancy between design imaginaries and lived reality.

In this chapter we engage with this disconnect through a focus on the design and public imaginaries of smart street furniture with respect to smart kiosk and smart bench projects. We look at the kinds of publics and audiences imagined in the marketing and design of smart street furniture, exploring the tensions and alignments between these imaginaries alongside the actual groups who most use these devices. In doing so we ask whether and how any social justice goals can be met when these imaginations are disconnected from the realities of street life

and the communication needs of citizens (and non-citizens) with unequal levels of access to resources and capital.

We do this by using textual and framing analysis of the representations of street furniture on websites, signage, promotional material and technical documentation and combine this with interviews and observations of the design and use of the objects *in situ*, drawing upon fieldwork conducted in Glasgow on InLink kiosks and in London on Strawberry Energy benches. Combining these allows us to identify the similarities and differences between the imaginaries and realities of smart street furniture. In revealing these tensions, we identify a middle-ground imaginary, a compromise, which can help us better understand the intersection between smart imaginaries and lived realities, and that in turn can help us to design inclusive smart infrastructure.

This chapter proceeds as follows. First, we explain the research conducted and methods used as well as the analytical framework adopted for this chapter. We discuss how the public has been framed in the smart city through the different types of smart citizen imaginaries as variously absent, active or passive. Next we describe smart street furniture with particular reference to the smart kiosks and benches that form the basis of this study, before providing an overview of methods and our analysis. We show that there is a discrepancy between the corporate-led public imaginaries and the actual users of the street furniture – as well as more gradations within the actual active and passive users. The absence of marginalized users in representing these devices suggests they will be taken up among more well-connected, mobile, urban citizens. However, we found these not to be the main users of these kiosks and benches, and instead these played an important role for people who were precariously connected – the homeless and gig workers. While the findings can help to develop more inclusive furniture that addresses actually existing publics, there is also an opportunity to question the model or understandings of the public and connect these with more expansive imaginations and goals that go beyond the instrumental uses of the public for the purposes of their data value.

Smart citizens: Imaginaries of the smart citizen

Smart cities, it is generally envisioned, are inhabited by smart citizens. Debate about where and how the public is incorporated into the smart city has been persistent since the early smart cities emerged, and has continued through new iterations of smart cities. Early critiques of the smart city pointed out the absence of people in the city at all. Smart cities it seemed, were for technology, and citizens were an afterthought (Greenfield 2013). Responding to this critique, cities adopting smart city policy and practices made efforts to highlight the role of citizens, with technology reframed not as the priority but as an enabler (Barns et al.

2017). In this reframing, citizens were envisioned either as active or passive in relation to the technology, but critically data – its generation and analysis – underpins both.

Gabrys (2014) has written on the citizen as sensor as she discusses how the intersection of the city and computational technologies have produced a new modality of citizenship. In the smart city, citizenship becomes operationalized through generating, analysing and managing data, rather than existing as a fixed subject (Gabrys 2014: 34). But the extent to which people purposely engage or are even able to engage in these practices varies.

Framings of active citizenship reference users who purposely generate their own data or make use of city data to shape and manage urban life. Since 2000, open data initiatives, crowdsourcing and events such as hackathons have become central tools of citizen engagement, with smart citizens frequently portrayed as actively participating in urban problem solving and entrepreneurial activities, through local government and industry events (Hollands 2008). The extent to which these events reflect citizen agency is open to critique (Cardullo and Kitchin 2019a, 2019b; Joss et al. 2017). As Perng (2019: 420–21) notes, such events encourage 'entrepreneurial citizenship and civic paternalism […] what is engineered tends to be neoliberal citizenship'. However, such events have the potential for citizens to engage with shaping urban futures and, as Perng (2019: 432) goes on to explain, they can disrupt neoliberal co-optation, by repurposing state and privatized resources, and build civic infrastructure.

Although this reframing placed people back into the smart city, it was not a vision inclusive of a diverse citizenship. Those who were not technologically savvy, or who were unable to comfortably access events were unaccounted for. Hackathons, for example, have been critiqued for their predominance of White, middle-class, non-disabled, male participants, excluding others along the lines of gender, socio-economic class, disability and race. This resulted in bias in selecting which problems were addressed through such events, as they reflected the problems experienced by this narrow group of participants and were therefore not broadly inclusive (Gabrys 2014; Maalsen and Perng 2016, 2017; Mattern 2014).

The framing of passive smart citizenship also relies on data. Unlike the user-generated data of active participation, this data is often unconsciously generated by an individual's everyday digital footprint as they interact and move through urban spaces. Citizen profiles begin to build through, for example, use of a smart transport card, free Wi-Fi connections, electronic purchases and geolocation services. Data traces create data bodies – a fragmentation of the individual into discrete data units characteristic of systems of modulatory control. However, as Iveson and Maalsen (2019) argue, in networked cities, citizenship exists on a spectrum between modulatory and disciplinary control, and individuals can be reassembled

from their 'dividual' data bodies (Deleuze 1992: 5). Willingly or not, citizens of the smart city generate data that can then be used by public and private interests to manage, shape and control the city.

A smart citizen therefore is variously portrayed as actively engaged or passive (Cardullo and Kitchin 2019a; Shelton and Lodato 2019). The smart citizen either intentionally uses smart city apps and infrastructure producing and interacting with data; or at other times the citizen is a passive user, a citizen sensor unknowingly generating data as they go about their daily lives. Regardless of whether active or passive, moves to make smart cities 'citizen-centric' remain grounded in 'pragmatic, instrumental and paternalistic discourses and practices rather than those of social rights, political citizenship, and the common good' (Cardullo and Kitchin 2019b: 813).

Notably, despite a shift to the 'citizen-centric' smart city (Cowley et al. 2018), this discourse is largely divorced from the long history of literature and debates about the public, public space and the public sphere. McGuire (2008) notes that intellectual scholarship on the value of the public emerged in part as a result of the massive transformations wrought by media and urban change in the twentieth century, corresponding with a withdrawal from public life into the privatized space of the suburban home. Modern urban life was a focus of narratives of loss as well as renewal, with the street a site and motif for the political potential of the public (Habermas 1993; Jacobs 1961; Lefebvre [1967] 1996; Sennett 1977). Central to these accounts was a shared optimism in the idea that bringing together strangers in common space would bring about healthier, more vibrant, inclusive places, as well as a radicalized social consciousness. As many have pointed out, however, there is an inherent contradiction in the structuring of the public that has historically excluded groups on the basis of gender, class and race. This has led to struggles for the widening of representation (Mitchell 1995) and underscored the important relation between the political agency of citizens and the design of urban spaces.

How does this 'citizen-centric' vision translate to the infrastructure of the actually existing smart city? Smart street furniture offers a valuable opportunity to look further into interpretations and imaginaries of who is a citizen of the smart city. This is because street furniture is always imagined with civics in mind. It is necessarily public and provides a public service, whether that is a place to sit or a place to communicate, or in the provision of public connectivity or information. Critically analysing the design, policies and use of smart street furniture provides insights into the types of smart city public imaginaries embedded in the furniture. It also reveals the disconnects, tensions and materialization of this public in its actual use. In this chapter we look at how smart citizens are envisioned in smart street furniture through the lens of their design and marketing. We analyse these

imaginaries alongside observations and vox pops with members of the public carried out on Strawberry Energy benches in London and InLink kiosks in Glasgow.

Seeing public imaginaries through smart street furniture

Street furniture is designed with certain publics in mind and is an often contested public resource. The use and users of public benches, for example, are subject to informal reprobation or formal strategies of discouragement or prohibition. Some cities are notorious for installing 'bumproof benches' (Davis 2006: 233) that intervene in the benches' affordances by making them too short, curved, diagonally angled or obstructed by handrails and are therefore unsuitable to lie down upon (Bergamaschi et al. 2014). Another population that is subject to regulation is teenagers, who also like to 'sit up high with their feet propped, they lean and they huddle' (Owens 2007: 161). In many American cities, planners deliberately space out benches along a walkway to discourage groups of teens assembling. Teens have responded by gathering at night on play equipment that is used by younger people. In many places, loitering, curfews and vagrancy laws have been applied specifically to target these public bench users.

The distinctive attribute of the smart bench, as opposed to other smart infrastructures, is that it displaces only another bench. It does not necessarily make a new claim on public space that kiosks, wayfinders and new advertising hoardings might. Unlike smart city command and control systems such as artificially intelligent public surveillance systems, or digital advertising space, the smart bench offers a public amenity that provides charging and connectivity for mobile communication devices, which itself displaced the public phone. It can serve particularly those who lack access to these resources and are not necessarily rate payers, such as people experiencing homelessness and budget travellers. It continues to offer that basic affordance of sitting, and fosters the etiquette of sharing a public resource.

Kiosks, on the other hand, are diverse in their appearance and application, with more recent iterations providing an informational role within a self-service paradigm. The term 'kiosk', with its roots in the Persion word *kūshk*, refers to a pavilion with a roof or roof struts and open walls. These flexible structures were adapted in many different cultural contexts, as a way to reach out to and interact with people in the immediate vicinity in a variety of ways. Used by the upper classes in the Ottoman Empire in their summer gardens as a servery for refreshments, and by the European monarchy to host musicians, the kiosk found a more common use in the twentieth century in a westernized context as a booth in which a vendor sells newspapers, magazines, fruit and other consumables to the public

on the street. The self-service interactive kiosk is a further adaptation that accompanies the development of computers. It is a structure that houses the equipment required to deliver an automated service with a monitor and terminal providing an interface to end users.

Methods and analysis

For the research carried out on smart street furniture, we focused on two types of furniture: InLink kiosks in Glasgow and Strawberry Energy smart benches in London. At the time of the research, InLink kiosks were being rolled out in several cities in the United Kingdom by a joint venture formed in 2017 between Intersection, a US company, and Primesight (now Global), a UK advertising agency, in partnership with British Telecom (BT).[2] Strawberry Energy is a Serbian crowd-funded start-up company created in 2011 and launched its first UK smart bench in 2015. It has now rolled out smart benches in 30 cities across 17 countries.

The selection of smart street furniture was made to explore the new types and combinations of technologies and services, and to compare the ways in which people encountered, perceived and interacted with these. A comprehensive discussion of the project methodology can be found in (Wessels et al. forthcoming) but we briefly detail them here.

In this chapter we draw upon data from InLinkUK and Strawberry Energy websites and publicly available corporate documents to identify and compare the imagined users with the users that emerge in practice. We analyse the content available with particular reference to the type of users they imagine.

We also draw upon field observations, vox pops and stakeholder interviews undertaken by the project team in Glasgow and London from July to November in 2019. A total of three InLink kiosks in Glasgow (Sauchiehall St, Buchanan St and Hope St) and three Strawberry Energy benches in Southwark borough in London (Southwark Bridge Rd, Borough Rd and Elephant Rd) were observed for our research. The observed sites were selected for the diversity of location and potential different users. Observations and vox pops were conducted at selected times to reflect a range of uses and interactions: two weekdays and one weekend day for three set periods of time – morning, lunchtime and early evening.

Researchers took field observations and conducted a series of vox pops, totalling 30 for the InLinks and 45 for the benches, to observe how people interacted with these devices, and to ascertain the public's opinions of the street furniture. Vox pop participants were recruited by engaging passers-by who were asked a series of questions to gauge their awareness of smart street furniture and its functions, their perceptions as well as their actual uses (or non-uses) of this new type of furniture.

Interview and observation data was analysed thematically in NVivo in a collaborative process involving all members of the project team with regular meetings to ensure consistency, iteratively reflect and discuss emerging themes. For this chapter we also draw on textual analysis and framing approaches to analyse the imaginaries of the smart citizen as this manifests in smart street furniture. Media frames, a development of Goffman's (1974) 'social frameworks' theory, are the means by which readers and audiences are guided towards certain ideas, values and meanings in their consumption of texts (Entman 1993). Media frames have been the subject of extensive research to ascertain how news media coverage shapes mass opinion – also known as 'agenda setting'. Extending this approach, Woolgar (1990) argued that technologies can similarly be read as texts and that designers, like authors, 'configure the user' in the way that ideas about the user's capacity and future actions are programmed into their design. Frames thus work textually, in representations and other semiotic practices, and materially, in the features and affordances of a technological artifact.

InLinkUK and Strawberry Energy's imaginaries of the end users of smart kiosks/benches

The ways in which end users are envisioned by the corporations behind smart street furniture play a crucial role in how their products are developed and designed. Indeed, corporations' imaginaries of the potential end users of their urban infrastructures are inscribed in the representations of users as well as in the functionalities and affordances these infrastructures offer. Drawing on analysis of corporate documents made publicly available by InLinkUK and Strawberry Energy (e.g. terms of use, devices specifications, press kits and blog posts as well as audiovisual and written material amassed on their websites), this section examines how the two corporations imagined the end users of their products, paying attention to the frames employed. This in turn sheds light on how their imaginaries informed the particular design and provision catered by smart kiosks and smart benches.

Young, mobile and connected

Both InLinkUK and Strawberry Energy prioritize improving the connectivity of cities (and citizens) in the design and promotional material for their smart street furniture. Potential end users of their products are represented as young, mobile and connected. End users are pictured engaging with the kiosks and benches remotely using their smartphones (connecting to Wi-Fi) and directly by making use of inbuilt facilities to sustain their existing connectivity (charging phone

facilities). On its former website, InLinkUK stated that one of the key features of the kiosks was to 'connect to ultrafast Wi-Fi using your own device' (InLinkUK 2019a: n.pag.). In its press kit, the company further explains that links connect 'the fastest available internet service to the fastest commercially available Wi-Fi equipment and opens all that bandwidth for people to use – no data caps or time-outs' (InLinkUK 2019a: n.pag.). Similarly, on the company's website, Strawberry Energy portrays a pictorial series of young professionals sitting on the benches in groups or individually to rest while using or charging their phones. Benches are presented as places of informal socialization that are enhanced by access to Wi-Fi and charging facilities. Fitting within this imaginary, benches are described as 'providing energy, connectivity and relevant local information on the go' (Strawberry Energy 2020: n.pag.).

Smart and sustainable

The ideal of environmental sustainability also finds a place in the marketing of these smart street furniture products. Strawberry Energy describes its mission as developing 'solar powered smart urban furniture for smart and sustainable cities' (Strawberry Energy 2020: n.pag.), locating both its infrastructures and potential end users within 'people-centric' smart city discourses and emerging ideas of smart citizenship (Cardullo and Kitchin 2019a, 2019b; Joss et al. 2019). Users of Strawberry Energy benches are portrayed as participating in and engaging with their local environment. Strawberry Energy's mission relies on the active participation of citizens who can utilize smart furniture with access to Wi-Fi and charging facilities while taking part in the collection of real-time information about their local environment (via a mobile app). The Strawberry Energy app enables 'smarter navigation through the city' (Strawberry Energy 2020: n.pag.), allowing its users to connect to the Strawberry Energy bench network while encouraging them to share local information collected from the benches' sensors on social media platforms and websites. Users here are envisioned within the framework of smart citizens who are actively engaging with smart technologies in urban environments, generating (purposely or inadvertently) data in real time, which is allegedly used to improve public spaces (and the company's services).

As shown above, both InLinkUK and Strawberry Energy's strategies and visions draw on an imaginary of young urban, mobile and already connected users. Connectivity needs are assumed to be temporary gaps in access that can be 'enhanced' to achieve the seamless ideal. In addition to the numerous limitations of this type of participation (see Cardullo and Kitchin 2019a), representations of end users exclude vulnerable populations such as low-income and poorly connected communities who rely heavily on freely accessible Wi-Fi systems. Indeed, while end

users of the kiosks and benches are understood by corporations as mobile and connected, this does not reflect the actual uses of these infrastructures and the ways in which these are adopted and reappropriated by different groups of users, such as, for example, the use of the kiosks' free call facility by the homeless population (see Halegoua and Lingel [2018] for failure to include marginalized groups in the vision of the LinkNYC). As pointed out by Halegoua and Lingel (2018: 4647), one of the issues behind this type of smart street furniture is that they 'need to adopt more inclusive imaginations of the public and imagine more varied uses of public connection'.

Essential, but for whom?

A complicating feature of these imaginaries is that, despite the absence of marginalized users represented in promotional material, the design of the InLink kiosks and Strawberry Energy benches includes features and services that are suggestive of a less connected 'public user'. This idea was also echoed in the interviews with commercial providers and local council officers. The CEO of Strawberry Energy, interviewed in September 2019, described his benches as follows: 'For the people it's just a bunch of useful services, completely free of charge, designed around their needs.' Similarly, InLinkUK identifies one of the key contributions of its InLink kiosks as providing 'essential free services to enhance the public realm' (InLinkUK 2019b). In addition to free Wi-Fi and charging facilities like the benches, these have the added features of an emergency call button, free telephone service and a social services directory accessible through the inbuilt touchscreen tablet.

Commercial providers recognize the ongoing value and business case for extending connectivity in the context of an 'infrastructural gap' (Dalakoglou 2016) and evidence of the persistence of access issues and disparities among citizens. In this sense, the offer of public connectivity is important for building support and justification for new smart urban initiatives. At the same time, this 'public user' imaginary is under-articulated, without a clear sense of for whom these services are vital or why. The framing of these connectivity services as 'essential' has performative value and is strategically deployed, reinforcing the need for such services to bolster and boost the model of connected citizenship so central to smart cities. Frames are not only rhetorical devices that guide audiences to read meanings in a particular way, they also perform a range of ideological and mediating functions, helping to bring about a certain reality (Butler 1999; Hall 2001). These tensions between the imaginaries, design and uses of smart street furniture point to a more complex process at work in the emergence of smart cities and the citizens they are designed for.

Imagined publics versus actual publics

Does the imagined public as described above translate to the actually existing city? In this section we draw upon our observations of the smart benches and kiosks to analyse the relationship between the designers' and technology providers' imaginations as represented in public documents and the behaviours of actual users. Our observations and analysis revealed multiple and sometimes contradictory public imaginaries envisioned by city planners and technology designers. These imaginaries emphasize active smart citizens as the main users characterized by the dominant frame of the young, urban, mobile and connected user. However, we found a more diverse range of user types and practices and have detailed these in relation to the imaginaries of active users and passive users. Most notably we found a disconnect between the images of young, urban, mobile and highly connected users who are prominent on the vendor websites and materials, and the observed users that predominantly included vulnerable groups such as the homeless. An additional imagined user – the public imagined by the user (or non-user) – emerged when people we interviewed reflected on who they thought would be the primary users of the smart street furniture.

The passive user

A large number of the people we spoke to and observed around the InLink kiosks in Glasgow and Strawberry Energy smart benches in London had not registered the kiosks and benches. Neither were they aware of the new kinds of functionalities these new types of furniture offered. This was illustrated in replies like this one from a person in Glasgow when asked if they had noticed the InLinks in the city before:

> Er no, I haven't […] what's it for? Is it to make free calls [laughs] to anywhere in the UK? […] I just thought it was like an advertising board, I guess! [laughs] Um what is it for? Just that I guess? […] I would think bus times, it kind of looks like a bus timetable but I don't know! [laughs]
>
> <div align="right">(Vox pop, Glasgow, Sauchiehall St, 4 July 2019)</div>

A similar sense of puzzlement was observed in London when passers-by were asked the same question about the smart benches, though in their case, the prior affordance of these as a place to sit was more readily recognized. This group conformed to aspects of the passive user of smart street furniture, in that they were characterized by a lack of use of these objects and a certain indifference to their existence, while at the same time, may also be unaware that they are using features of the street furniture:

> I haven't used them but I've seen 'em around, especially on this side of the river. I haven't seen 'em up on the north side yet. But that doesn't mean, I mean, I've not been looking for it to be honest.
>
> (Vox pop, London, Southwark Bridge Rd, 4 July 2019)

We found a number of people were unsure if they had used the Wi-Fi service of the kiosk or bench, as reflected in this participant's comment:

> I might be or I might be on data, it depends because sometimes if I'm passing by and it's a Wi-Fi thing that I don't know and hasn't logged me in, I'll just have the data instead so that I can get any messages or whatever.
>
> (Vox pop, Glasgow, Sauchiehall St, 4 July 2019)

This kind of passive use is likely to occur as a result of the automatic connectivity built-in to the Wi-Fi network. Records of users who have previously connected are created in their smartphone's automatic connection to Wi-Fi as they move through the city and pass either the InLinks or smart benches. The automatic yet passive connectivity is enabled by the user's previous actions. If they signed up to the telecommunication provider's Wi-Fi at some time in the past, their devices will continue to connect without them deliberately connecting each time. This automation also means that the user is passively generating data about their presence in the place. As we discussed above, passive smart citizenship emerges from the digital footprint that an individual produces as they move through urban spaces and this data can be used to manage and shape the city.

The InLinks have another kind of user who has varying levels of awareness of their interaction with street furniture: the consumer of advertising. It is their attention to the advertisements on the digital screens that justifies the money that advertisers spend to have their content displayed, even if most people may seem to ignore it. The InLinkUK network is funded through advertising on the devices' two 135.7 cm high-definition (HD) digital screens, which stand on either side of these free-standing structures (InLink 2019b). As highlighted in the opening quote to this section, many interviewees thought that advertising was the only purpose of these kiosks, and had not noticed the interactive service available. For example, one passer-by who took part in a vox pop in Glasgow only noticed the kiosk when it was pointed out to them and guessed one of its functionalities by reading the inscription on the screen: 'Make free calls to anywhere in the UK here'. Prior to this moment of discovery, this person thought that the kiosk was 'an advertising board'. Meanwhile, others did not notice the InLinks or advertisements until they had their attention drawn to it as shown in the following excerpt:

Interviewer: Have you noticed these around?
Respondent: Not till this very moment, yes.
<div align="right">(Vox pop, Glasgow, Buchanan St, 27 June 2019)</div>

We found that the researchers played an important role as intermediaries, drawing attention to these objects and providing an opportunity to reflect on and discover them *in situ*. In this process, many of these up-until-now passive users expressed an interest in these objects and the services they offered. They also revealed some of the reasons behind their non-use, which was related to multiple factors including sufficient data plans and internet connectivity through their smartphones, a lack of clear signage and an already existing familiarity with the city.

These passive users did not discover the kiosks and benches through need but had the potential to become more intentional active users (indeed, some of the active users described later in the chapter started using the kiosks and benches after seeing other people using them). Similarly, when given an opportunity to reflect on the possible use of their data when connected to such services, we found that individuals took a more active stance, engaging in questions and giving opinions. There is a long history of critiquing the existence of the passive mass media consumer (see, e.g., de Certeau 1984; Krajina 2014), and as such, being 'unaware' or 'indifferent' does not necessarily translate into a lack of activity or agency. These findings suggest a more complex relation than that captured in the imagined figure of the passive user.

Nevertheless, seemingly passive users still generate data and are an important audience for the city, markets and third parties who have an investment in their data trails. These are variously generated through access to data granted at the point of agreement to signing up to free Wi-Fi. Moreover, for advertisers, passive consumption of advertisements represents a potential market return. Indeed, despite the shift from traditional media to online advertising, outdoor advertising is a growing industry and in a process of global consolidation (Iveson 2012). Iveson (2012) suggests that exclusive advertising deals in city centres and new ways to monetize digital screens are the main drivers behind this growth and the emergence of new kinds of private–public street furniture partnerships. Passive users are an important factor in the success of such projects.

The active user

The active user intentionally interacts with the kiosk or bench. The active user is not continuously mobile but may be stationary for periods of time as they use the services provided by the street furniture, such as charging a phone or using a free call facility. In other cases, they may remain mobile but their movement

is determined by access to free Wi-Fi. However, unlike the young urban professionals envisioned by the vendors, our observations show that these users, particularly for the kiosks, are predominantly those with insecure access to internet and telecommunications. The two main groups of active users were the homeless and gig economy workers.

We frequently observed people who seemed homeless using the free call function of the InLinks. The inclusion of a free phone service in the kiosk design is a distinctive aspect of the InLinks and an important part of its business case to local councils. This function allows callers to connect to any number within the United Kingdom and can help those without other forms of communication to maintain contact with family members and connect to services. One middle-aged homeless man we spoke to explained the benefit of these over the old pay phones, since they did not cost money and did not require an unwieldy amount of change. Another elderly rough sleeper explained how he used the free phone facility to stay in touch with his brother.

The following excerpt from our field observations of the InLinks in Glasgow is illustrative of the kinds of encounters we observed:

> Three homeless people used the kiosk in the morning, two together (they had a piece of paper with a number, type it on the screen, it failed to go through and they left immediately). Half an hour later another man (who was chatting with the two previous ones earlier) also tried to make a phone call. Got really frustrated as it did not work and cursed the kiosk and left.
>
> (Fieldwork notes, Sauchiehall Street, Glasgow, 4 July 2019)

Our observations and vox pops indicated the phone facility was vital for those members of the public who were without a working mobile phone to contact family and make appointments with services such as the local job centre, but there were drawbacks. Our observations showed that the kiosks also weren't always reliable infrastructures of connectivity, with calls sometimes failing to connect. Callbacks could not be received, which limited the utility of the phone service and the open design of the kiosk (unlike the traditional phone 'booth') meant that callers had to speak loudly to be heard and lean into the kiosk to hear the phone conversation. Importantly, the kiosks provide connectivity to those who can't afford mobile phones and data. These users are rarely depicted in the designer and technology providers' visions of the smart city, but in our observations show that smart street furniture has significant benefits for them.

Platform economy workers were also regularly observed using the kiosks to charge their phones and connect to the Wi-Fi. The services offered by the InLinks

were valuable for them to do their work by being able to charge their handsets and connect when waiting for jobs:

> Respondent: Just now I was charging my phone because most of the time I go around with a power point with me, but today I forgot my power point so this was the emergency thing, to back up here! [laughs] It's very good, it's very helpful, yeah […] Er I use them when my phone is dying because I work with my phone sometimes, a lot of times it happens to me my phone dies and I forgot my power point at home, so I can use them to back up my charge, yeah.
> (Vox pop, Glasgow, Sauchiehall St, 4 July 2019)

Smart cities are interconnected with the gig economy. Both are mediated by digital platforms and the entrepreneurial aspects of platform capitalism and labour are valued by smart cities. Gig workers are, however, largely absent from the imaginaries of the product material analysed above.

While not purposely contributing data in the same way as participants in citizen science initiatives or urban data hackathons discussed earlier, these users are still actively generating data. By making use of the services, they generate a footprint similar to that of the passive user, except that in active and purposeful use, more data will be generated – for example, through records of phone and data use.

Unlike the kiosks, the smart benches were predominantly engaged with for their original and 'non-smart' function – that of providing a place to sit. These attracted a wider range of users in our observations: workers on their lunch break, daytime shoppers, tourists, students; parents with children, elderly men and women. Several people were seen using their mobile phone while seated. There were also signs that the benches had been used by people to rest for longer periods including overnight (e.g. fresh cigarette butts and bottles were seen deposited next to the bench early in the morning). This was despite the built-in bar that divided this model of bench into two smaller sections, preventing it being used to fully recline. Several people also noted the use of the benches by people who appeared to be sleeping rough, a point of contention for wider take up by some groups who saw this as problematic.

> They look very modern. Yeah, I mean they're good for, I've seen a lot of er, I don't know whether it's the right crowd, but homeless using them to charge their speakers, their phones, stuff like that because they don't really have access to charging amenities.
> (Vox pop, London, Borough Rd., 3 July 2019)

It was often difficult to determine if bench users and passers-by were using the free Wi-Fi service available through a third-party internet provider in partnership with Strawberry Energy. However, in our attempts at the three different sites, we

were only able to connect to this service at one bench. We were able to access the environmental data from the Strawberry Energy app but noted that this was only accessible from a smartphone and that the accuracy of the readings appeared to be incorrect (with types of available data also differing across the two bench models). We did observe the charging facility being used but the charging cables were observed to be often broken. Various other issues prevented us from using the environmental data via the downloadable app – slow downloads from the bench Wi-Fi, the app wouldn't open on the mobile phone and the app was only partially functional (the bench location was not visible on Google Maps at one site).

Active users of the benches are not exclusively the urban young professionals envisioned by the vendors, though these were among the user groups observed. However, while active users are imagined as those who interact with data services, the benches were by and large used as traditional benches rather than for their smart functions. Furthermore, even if users might try to engage in these, there were a number of barriers to use. The active user imaginary is dependent not only on alignment with the actual user but also usability of the devices and their data-generating features.

The imagined other user

The third type of user that emerged was the 'other user' imagined by the public. This user was frequently referred to in relation to an individual's use or non-use of the furniture. For example, while someone might say they have no need to use the features of the kiosk or bench, they envision it being useful for others. These 'others' are predominantly those who need the connectivity affordances of the infrastructure, for example those that don't have data on their mobile plan or who can't afford to call from their own mobile, and those that are visiting or unfamiliar with the city. The homeless, tourists and students featured in these imaginaries – groups of people who either don't have the resources to be consistently digitally connected and therefore use the benches and kiosks for their connectivity affordances, or who are unfamiliar with the area and use the wayfinding and information services provided by the furniture. For example, these two participants reflect on the benefits of the kiosks for the homeless, in particular, the ability to keep them connected whether by charging their phones or using the free call function:

> My first thought was um the individuals who are homeless need to have access to being able to call resources. It's great, I mean it will charge their phones, they don't always have access to power. So just that alone is a huge help.
>
> (Vox pop, Glasgow, Buchanan St, 27 June 2019)

> I have seen more people using the free phone calls. I mean mostly homeless people, I must admit, um but it's good for them, so at least they have access to contacting people that they need to, social security and stuff like that, whoever.
>
> (Vox pop, Glasgow, Sauchiehall St, 4 July 2019)

Similarly, a council officer in Southwark borough reflects on the positive attributes of the smart benches, in particular the benches' ability to serve a range of people from tourists to the homeless:

> I mean, the people who use them are quite varied. I've noticed a lot of tourists use them, because they're in the north of the borough, which is used as a tourist area anyway, but we get lots of tourists using them. Homeless people use them quite a lot I've noticed, and people have opinions about that, whether it's positive or negative. I think it's positive that somebody can go and charge their phone up somewhere, they're just as entitled as anybody else to use them. And you do see people kneeling, charging their phone up, and maybe they've run out of battery. I think it's all very positive.
>
> (London stakeholders interview, 11 October 2019)

Use is not always without contention, however, with some participants negatively responding to the use of the benches by the homeless, throwing into question who they think the furniture is for:

> It's a good idea, if for example I was working and I want a break, to sit on, but you can't sit on them because the homeless people are using it most of the time, so you won't be able to make use of the chair, that they lie on it or they don't want anybody to sit, they occupy the whole space.
>
> (Vox pop, London, Southwark Bridge Rd, 3 July 2019)

These respondents were reflecting on observations they had made of the benches and kiosks – the observed uses and the observed users. Drawing upon this they highlighted the benefits of the infrastructure but also positioned it as something that other people with less resources than themselves use. The provision of connectivity, information, data and free calls was seen as positive. This was predominantly seen as beneficial for the homeless, students and tourists, who they had seen make use of the furniture, groups of users that are not reflected in the technology providers and designers material. This points to the existence of a larger 'public' that is 'smart' than that envisioned by smart furniture vendors and cities, one that is more inclusive in the way the smart citizen inhabits public space and the public sphere.

These three types of user show the disconnect and fragmentation about what policy-makers and designers imagine as a smart public. There is a disconnect between active and passive use, and frequently, the main users are likely not the ones primarily imagined in the design phase or policy. Imaginaries of a smart citizen frequently conjure images of a digitally connected and mobile citizen, and rarely do we see homeless groups or precarious gig economy workers factored in this.

Discussion and conclusion

Smart cities are built on the promise that they will make cities more efficient and improved. Smart street furniture plays a role in providing these improvements, promising citizens of the smart city information and communication services in exchange for data or advertising space. While there has been debate over the smart city's vision of the smart citizen, the designs and implementation of smart street infrastructure give us some insight into the design and technology providers' imaginaries of citizens. By comparing these visions with the public use and perceptions of smart street furniture, we can see how these imaginaries translate to the reality of the city, and potentially use these insights to create a more inclusive smart city that goes beyond rhetoric and performance.

While the citizen imaginaries represented in the design and technology provider material painted a picture of young urban, mobile and connected users, our analysis revealed a more diverse group of users. We categorized these as active and passive users dependent on the intention with which they interacted with the street furniture at the time of observation; and the 'imagined other user', a user constructed by a member of the public when thinking about who the kiosk or bench would serve.

Active users intentionally engage with the street furniture, either using its physical capabilities – charging points, free call services, places to sit or lean – or its digital services – using free Wi-Fi. While there are similarities between some of these characteristics and those of the design imaginaries – namely mobility, urban based and connectivity – there are also disconnects. Rather than young urban professionals, these active smart citizens are those who inhabit more precarious positions within the urban. They are the gig workers and the homeless, citizens who are predominantly absent from the design and technology provider material, and who are rarely discussed as citizens in the smart city literature more broadly.

Passive users are more likely to be the urban, young, connected and mobile professional envisioned by the designers and technology providers. However, because

of their mobility and connectivity they do not use the kiosks or benches in the way that is envisioned. Passive users predominantly have the privilege of their own phones and data, meaning they have less need to rely on the free services offered by the furniture. Passive users may automatically connect to Wi-Fi as they move through the city, having previously signed up to the service provider, but they don't actively use or seek out that connectivity. At the same time, passive users have the potential to become active users and have a more complex relation to advertising and data consumption than suggested in corporate-held public imaginaries.

The 'imagined other user' is interesting in that it provides insights into the smart citizen from the perspective of the existing publics. The majority of the literature on the citizen in the smart city addresses the citizen as envisioned by local government, policy-makers, designers and technology service providers. The 'imagined other user' is, however, a user that emerges from both active and passive users' reflections and imaginations of who smart street furniture is for. The publics' 'imagined other user' offers an interesting critique of the users imagined by the design and technology providers, as well as local government. As noted earlier, public space has always excluded along lines of gender, class and race, and the absence of homeless and less affluent users from the discourses and designs surrounding the smart furniture described here, highlights that exclusion exists in the imagined smart citizen. But the publics' vision of the 'imagined other user' based on their observations and reflections of the use of the kiosks and benches shows that a more inclusive vision of the smart citizen can emerge.

Charles Taylor's (2002) 'social imaginary' is suggestive of the kind of broader public imaginary captured in this third imagined user group. According to Taylor (2002: 106), these imaginaries are not the 'possession of a small minority' but 'shared by large groups of people, if not the whole society', in turn rendering possible a 'shared sense of legitimacy'. This highlights a number of contradictions with regards to the smart kiosks' and benches' imaginaries. The citizens' imaginaries upon which private corporations developed the kiosks and benches were noticeably divergent from the imaginaries portrayed by the public. Furthermore, Taylor (2002: 106) points out that the social imaginaries are deeper and broader than 'the intellectual schemes people may entertain when they think about social reality in a disengaged mode'.

We might conclude that this disengaged mode is precisely what comes about as a result of the off-the-shelf designs that prioritize the passive data user in current implementations of smart street furniture. This demonstrates some of the normative and global visions of 'smart citizens' of key providers in the private sector as well as their lack of inclusivity and imagination of different end users and contexts. This in turn feeds into a perceived lack of legitimacy (that is, it is only

for advertising) as well as controversies at the street level as seen in New York (Halegoua and Linge 2018). On the other hand, the imagined other users points to a broader and more inclusive (that is, widening access to digital facilities) social imaginary. However, it also points to some tensions between those in need of the provision and those who do not need it or only in rare cases.

These three user types – active, passive and 'imagined other' – illustrate that the affordances of smart infrastructure can serve diverse publics dependent on their needs and a refashioning of the public and public space. Reliance on the connectivity afforded by the furniture varies dependent on a users' own access to mobile technology, data and mobility. Those who have their own phones and data plans, predominantly the young, urban professionals envisioned by the providers and designers, need and use the furniture less than those who are not as materially resourced and mobile. Instead, the primary users were those who are predominantly absent in the imaginaries of the designers, providers and governments when discussing the smart city. These are the homeless and precarious gig workers who rely on the types of street furniture described here to connect to services, family and friends, to charge phones and to access data – all of which are activities that require them to stay put while they use the kiosk or bench. This is not the mobile urban professional.

The discrepancies between the imagined users and the actual users, however, are useful for informing the design of smart street furniture that can be more inclusive. Both design and policy visions of the smart citizen rarely reflect on the disadvantaged, instead framing the smart citizen as actively involved in the smart city through citizen science, participating in hackathons and generating and using data in a purposeful way. Here we have shown that the smart citizen also includes the homeless and the precarious. These observations can be used to inform a more inclusive smart city and vision of the smart citizen. Doing so can potentially help to better design smart cities to provide for diverse publics – from the most disadvantaged to the more privileged. It can also help reveal what is behind investments in public connectivity through smart street furniture. Connecting and opening up and aligning public–private partnerships with the broader, deeper, more representative existing public sphere can lead to more inclusive cities but also in a way that does not produce people as merely data citizens or individuals.

NOTES

1. Author order notes: the first four authors are the core authors and listed by contribution. The remaining authors have been listed alphabetically.
2. The InLinkUK joint venture has dissolved and the InLinks are now fully owned by BT, an arrangement that was announced in late December 2019.

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