Chapter 11
The Digital Urban Fabric: Affordances of Connectivity and Datafication

Abstract This chapter investigates the affordances that support the aspect of INTERACTION/COMMUNICATION, from which public space is performatively constructed. The connectivity, afforded by digital technologies, that supports interaction and communication, is mirrored by practices of filtering of connectivity and information, through which urban citizens curate their public presence. This theme is discussed in the context of the ascendancy of the crowd as a composite urban actor, as exemplified by protests and activism in public spaces. When mediated by digital technologies, interaction and communication generates data, that is the foundation of a new stratum of economic and political life.

Keywords Connectivity · Datafication · Networked activism · Big data · Public data

The Digital Urban Fabric

Public space is a space of interaction and communication, where we come into contact with others and co-construct a shared world. For Arendt (1998 [1958]), this performatively forging of connections is an essential aspect of the public realm. The interaction and communication afforded by digital networks brings another layer to this fabric of connectivity. From one perspective, the Internet can be linked to the rediscovery (or re-invention) of civil society, and Internet-based connections between people were incubating grounds for new forms and expectations of ways of coming together, which bleeds over into expectations and practice in the use of public spaces. Indeed, digital networks have been said to act as “trojan horses” (Obrist and Brand 2013), performing alternative possibilities of public interaction in urban space. In a Network Society, everyday life can be seen in terms of the navigation of connective networks, which is a broad conceptual base that can be used to describe physical, virtual and social contexts equally and simultaneously (Mitchell 2003).

In some senses, the ease of interaction and connectivity afforded by digital networks has been touted as a threat to physical public spatial practice. Digital connections become more reliable and frictionless, as urban space becomes more
fragmented, and navigating the physical urban realm becomes, in contrast to the increasingly frictionless, invisible pervasiveness of access to digital connectivity, often more disjointed, unpredictable and bothersome. Even as city spaces become more fragmentary, we must bodily move through the spaces in-between to pass through the city.

Digital connectivity between places, and between the people in them, creates new types of adjacencies and continuums in public space. Public spaces are “stretched” across different localities and geographies by virtue of their embeddedness in media networks, such that these places must be understood both as localities defined by their physical, material and geographic characteristics, and as nodes in networks, defined by their connections: “articulated moments” in the words of Doreen Massey (1993).

Through the Internet of Things, this distributed instantaneity of transmission applies to communication between non-human agents as well, as sensors and processors in spaces throughout the city are able to exchange information about traffic, movement and gathering of people and even the presence and behavior of specific individuals. Digital connectivity between people is a function of connectivity between the personal devices that have become integral to our cyborg selves. In this sense, the web of connections that enable digital publics relies upon the much wider web of connections between digital devices that is denoted as the “Internet of Things” (IoT). With tens of billions of devices connected to the Internet (Gartner 2013), this population of technological agents in cyborg society far outstrips that of humans. The Internet of Things relies on the connectivity (as well as datafication and locative) affordances of digital technologies.

Apologists for the ubiquitous sensors brought by the IoT era laud the potential of these sensorial arrays to “add value” to public space: “IoT allows public space to get the sensors required for data collection much closer to existing and foreseeable target elements than simply having a set of environment sensors” (Arbelaiz 2016). There are promises of the potential of the Internet of Things to import public life into places where it is currently absent or tenuous, and in many developing urban contexts digital networks have enabled connectivity between people even in cities lacking core elements of a (physical) infrastructure of public amenities. Following the idea of “Cities as Service Platforms” (Suominen 2017), mediated public space can be seen not first and foremost as a set of spaces, but as a set of affordances distributed throughout the space and time of the city, that are actualized in many cases in coordination of physical and digital affordances, leading to the blurring, morphing, recombination and decomposition of architectural typologies.

A humanist slant on the potential of the Internet of Things, which purports a clear master-servant relationship between human and technological actors, is presented in the idea of “adaptive environments,” in which the array of digital agents is mobilized to “tune” the physical environment to the needs of humans. According to Baker (2015), “Adaptive environments will be able to retrieve and use contextual, relevant, timely and accurate information to interact with us. Spaces will adapt to people, from groups to individuals, contextually and appropriately.” Digital sensorial networks can also play a service role similar to that of sentinel species in the
biological world, which are monitored because changes in their behavior or well-being may provide indicators of impending environmental risks to humans (as in the “canary in the coal mine” metaphor), be it seismic activity, meteorological factors, particulate matter or chemical traces in the air.

Through our embeddedness in the Internet of Things, we as individuals are always already immersed in computation. We exist in and move through computational environments just as we exist in and move through physical environments. The origin of the concept of “ubiquitous computing” is attributed to Xerox PARC (Palo Alto Research Centre) Chief Scientist Mark Weiser (1991: 94). Computers become invisible and embedded in the environment rather than existing as discreet objects, and interactivity becomes a pervasive quality of the environment rather than something requiring intentional interaction with a computer-as-object. Weiser’s cited paper begins with the statement, “the most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it” (p. 1). McCullough (2004) gives a patently architectural point of view on ubiquitous computing and argues for the use of this technology for a deepening of sense of place, in design for interaction of people with places, as well as with each other within places. Dourish and Bell (2007) argue that ubiquitous computing raises the relevance of studies on the relationships between technology and place, referring to technological “infrastructures” by which humans interact with and within space, consisting as much in social negotiations as in technological applications. Recent advances in ubiquitous computing have been afforded by developments in cloud computing, which enables localized, mobile, personalized and distributed devices to seamlessly access computational capacity and data storage of remote servers.

Filtering

As explored in Chap. 8 of this book, the experience of public space, and the staging of public life that takes place within it, is grounded in visibility. Our public experience is circumscribed by what and who we can see/sense, and what and who we cannot see/sense. A corollary of connectivity, and an essential part of maintaining a public persona, is the filtering of the connections that one maintains. In LBMGs (location-based mobile games), for instance, one can filter the individuals with whom one wants to interact and “play.” This is another way of selecting one’s public, not by deciding which place to go to, but by selecting those individuals and groups with which one remains connected (and often, also with whom one shares one’s data). One is co-present with others not only by virtue of inhabiting the same spatial enclosure, but also by choosing to including certain people within the network of moving landmarks in space and time with which one coordinates. Filtering is and always has been a part of the construction of public space. Ways of filtering out undesirables at the institutional level are now practiced at the individual level. Such “curatorship” of connecting and filtering is the way that we parse and craft a public for ourselves.
This curatorship is supported by a wide range of location-based social networks (LBSNs) such as Foursquare, Snapchat’s “Snap Map” function, and many location-based mobile games, which facilitate the visualization of the physical location of those with whom one decides to connect. Such applications enable one to “browse” public space, like a search engine browses the Internet, and to identify those people, places and information that one perceives as relevant to oneself (de Souza e Silva and Frith 2015: 169).

Unequal Connectivity

Of course, connectivity is restricted not only by choice, but in many cases also by circumstances such as physical location, social status and economic wherewithal. In the case of commercialized communications networks and broadband providers, less lucrative localities will as a matter of course be neglected in the provision of these services (Fountain 2014: 31), and individuals of lesser means or without literacy in digital technologies will be marginalized in this dimension of public space. This becomes all the more apparent when one regards access to digital networks as fundamental in facilitating the use of public space, access to services and information, coordination of physical spatial practice using digital communications links and inclusion in public life in cities.

Those with greater command of, and higher incidence of use of, social platforms, tend to be those who in general possess a higher level of “social capital” (Lu and Hampton 2017), likely also increasing their awareness of the affordances, options and possibilities of public space. For instance, the actual number of citizens with access to the Internet or Facebook in Egypt and Tunisia is tiny compared to the quite widespread reach in Western countries, meaning that the proportion of the population potentially involved in, or privy to, the digitally mediated orchestration of the Arab Spring revolutions in those countries represented a privileged elite, young and educated, more reminiscent of Habermas’ normative public sphere than the connective digital publics of contemporary developed contexts (Mahlouly 2013).

Like the Internet before it, GIS (geographic information system) functionality was originally intended for governmental and institutional uses but has become accessible to the general public to an increasing extent, playing a role in supporting practices of “citizen media,” the uses of media to perform essential elements of citizenship (Rodríguez 2011; Stephansen 2016: 35). Google Maps “mash-ups,” which afford the augmentation of the Google Maps app with data drawn from other applications and datasets to enable customized spatialized visualizations, are a baseline example. Google Earth, the so-called “people’s GIS,” is now accessible as a matter of course in many parts of the world, while others explicitly exclude it, which in itself is an indication of different parameters of formation of the possibilities of the public realm.
Networked Activism in Public Space

Citizen media present baseline examples of the role of digital technologies in empowering urban citizens, and these technologies have also played a significant role in the enabling citizens to inform, mobilize and manifest in urban public space. Street protests are instances in which the activation of technological affordances has played a role in facilitating massive and effective collective citizen action.

Milan (2015) sees the camps, placards, etc., which are the physical manifestations of protests, as the outcomes of processes of meaning-making, and the performance of joint action. However, she claims that with social media we need to see the relationship between the symbolic and the material differently, positing that while these media may afford “spectacular bursts of protest by bypassing the tedious task of organizing,” because they “enabl[e] composite flexible identities and elusive no-strings-attached actions,” they have little political efficacy and are notoriously ineffective in engendering lasting commitment or even agreement on goals. Digitally mediated public engagement can be an engagement of convenience and whim, rather than of necessity or shared long-term interest (Flichy 2010). A collective identity is not really produced because the semiotic world disseminated through media platforms is so malleable and amorphous that anyone may find anything in it, so that it becomes much more a projection of one’s own desires and narratives and increases individuality more so than collectivity.

Digital platforms are appropriated to draw-in others from outside the event into it (by tagging, linking, etc.) and to extend the time of the event by posting, forwarding and discussion through “always on” media, in contrast to a one-time dissemination by broadcast media, that then goes away (Milan 2015: 7). These protests become performances, most of whose “participants” are gathered after the events are “finished,” as recorded evidence of the protest becomes circulated via digital media. This creates “emotional spaces” in the digital ether, that engage the empathy of an audience that is distributed in space and time (Gerbaudo 2012: 5). Because such spaces are generated by emotionally charged attraction rather than delineated by brick and mortar, these spaces evade the controls brought by the architectural framing and other regimes of control that circumscribe action in physical public spaces. Accordingly, protests can be conceived as being “attended” by far many people live-streaming the event than physically on the site.

This leads to new forms of protest. The “collective plot” of protests becomes a communal construct, to which all can contribute, tactically maneuvering to represent their perception. In this type of protest, it is no longer “organizations” that are protesting but “networked individuals.” There is no leadership, no steering. The “affinity groups” enabled by the Internet did not need to meet in space, were low-commitment and short-lived. “These informal networks allowed for multiple and flexible identities, fluctuating and horizontal leadership, and temporary aggregations on the basis of affinity” (Milan 2015).
Reciprocal Relationships Between Digital and Physical Sites of Public Action and Interaction

Through digital networks, actions, presences and occurrences in concrete physical spaces are projected to much broader publics than those physically present, and are given a longevity beyond their actual temporal duration. For example, Lane (2016) demonstrated how the informal, unwritten “Code of the Street” (Anderson 1999*) of inner city African-American societies is affected by the mediation of social interactions through digital technologies. Street life is conducted both online and offline. Online forums and digital communications networks are used as venues to coordinate and complement activities in physical space by community groups, police forces and street gangs alike, all of whom also monitor the online and offline activities of the others to coordinate their own activities (Lane 2016).

Digital technologies played an essential role in spreading the “nanorevolutions:” the ironic and cynical non-revolutions that emerged after strong suspicions of falsification of the results of the Russian parliamentary elections of December 2011 (Nim 2016: 92). The first nano protest took place in the northern Russian town of Apatity on 11 December, in which toys and dolls were used to stage ersatz protests, after planned protests in public space were not granted permission by the authorities, because there is no law against the displaying of toys in public space. Images of these protests were circulated throughout Russia and abroad, first through the Russian social networking platform VKontakte and then through Twitter, LiveJournal and YouTube (Nim, in Baker & Blaagaard, 2016: 93). These stagings were intentionally mediatized in this way to create sites of maximum visibility and to attract media coverage. Social media allowed the physical and virtual replication and serialization of these events (a function of digital technologies leaked and transposed into physical space), and the archiving of “protest artifacts” that were picked up by mainstream media, bloggers and others (Nim 2016: 106).

Connective, Collective Action, the Crowd and the Cloud

The instantaneity of the mobile communication afforded by digital communications technologies means that the coordination of actions of different individuals in public space is less and less constrained by a need for collocation. This factor underlies commonplace and banal practices such as the on-the-fly making, breaking and amendment of plans and itineraries of acquaintances as they move through public space, but also more consequential acts, for good and for bad. Such functionality was as instrumental in facilitating the Arab Spring protests in public spaces across the Middle East as it was in enabling the simultaneous explosions of the 2004 Madrid train bombings. This is the principle that underlies the phenomenon of “smart mobs” (Rheingold 2003; Molnár 2014: 45).
Egyptian computer engineer and activist Wael Ghonim used the Facebook Arabic page “We Are All Khaled Said” to build a discourse and disseminate information about the tyranny of the Mubarak regime and nurture an activist stance that eventually led to public street protests of the 2011 “January 25 Revolution,” when followers were emboldened by the events of the Tunisian revolution (Alaimo 2015: 1). These “information cascades” that arise when a few people dare to express their feelings, which emboldens others to do it, are intrinsically dependent on the connectivity of digital networks, as “mass public action will not happen until ‘everyone knows that everyone knows that everyone knows’ that a government’s actions are unacceptable” (Shirky 2008).

There are both hardware and software aspects of the potential of digital technologies to allow communication and collective action to circumvent centralized control of content and use. On the software side, social media provide the ability to distribute news instantaneously without the need to go through official broadcast media channels (Shirky 2008), essentially bypassing erstwhile controls, reducing costs and problems of organizing and communicating to and within big groups and eliminating need for hierarchical organisation.1 In terms of hardware, the distribution of storage on personal devices, rather than centralized servers of network providers, in “person-to-person” (P2P) networks makes them more difficult to shut down, monitor or control. Access to channels of information that could not be controlled by the government was an instrumental factor in participation in the Tahrir Square protests that sparked the “January 25 Revolution” in Egypt (Tufekci and Wilson 2012).

These affordances enable particular forms of networked collective action. Benjamin’s (2002) crowd as the new social actor, called into being by the modern metropolis, is being transfigured through the appropriation of digital technologies. Networks are leaderless, centerless, and held together by constant exchange of messages. “Action frames” are personalized as well using the affordances of personal media. Collections of people linked by digital networks are not so much coherent groups as masses of individuals linked by channels of communication. This is what is meant by “networked collective action” (Bennett and Segerberg 2012; Rainie and Wellman 2014). The mediated crowd is facilitated by the computational “cloud” that makes computation and remote social interaction ubiquitously accessible. “Cloud protesting” (Milan 2015: 2) centers on the actions, needs and bodies of individuals, bound together in collective action.

Collectivity is thus linked to connectivity, and digitally mediated public action can be understood in terms of “connective action” (Bennett and Segerberg 2012). Movements based on connective action are more fluid than typical activist networks and are able to draw in a wider variety of participants, because they are not driven by a single and simple ideology but evolve with the accruing membership, also allowing each member to gain much more public audience and to experience the

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1Web logs (blogs) and other modes of digital dissemination make available a wider range of perspectives and opinions than had previously been available to those in public space, even as the reliability and rigor with which these messages are controlled is reduced, which can be expected to inform interaction and behavior.
network as them-centered and to give each one the opportunity to contribute to the movement’s message rather than subscribing to a fixed and communal ideology. This can be compared to the evolution of branding as also facilitated by networks of digital communication. Thus, rather than seeing digital technologies as only exacerbating individualization and retreat from public life, it must also be acknowledged that they can afford the individualization and democratization of participation in collective action, increasing access and motivation for effective action in the public sphere.

The use of digital technologies to afford gathering and communal action is grounded in the affordances of these technologies that support the distributed collection and sharing of data. “Crowdsourcing” involves citizens in the gathering and producing of data that can inform decisions, letting people collectively produce information about their cities, and represents a digitally-enabled reconfiguration of urban social practices, supporting functions such as the reporting of issues in public space, participatory budgeting to determine the allocation of funds for public works and the inventorying and monitoring of natural and human-made public and common assets (Le Crosnier and Vidal 2010).

As evidence of the ascendancy of the digitally-enabled crowd as a category of urban actor, there are many examples of crowdsourcing of ideas for city improvements (www.spacehive.com, www.betterciti.es), and of using digital forums to mediate between citizens and the corporate providers of digital technology “solutions.” The New York-based non-profit advocacy organization OpenPlans (1999–2015), for instance, developed and applied open-source applications to enable citizens to become involved in transport and public space initiatives in their cities. Map Kibera (2009–present) (mapkibera.org) is a citizen-led initiative to use GPS technology to create a map of a huge slum district of Nairobi in order to allow it to be incorporated into formal urban planning processes. Other examples include multi-platform services for making available, accessing and discussing “hyperlocal” information (www.everyblock.com) and using online “serious gaming” approaches to engage citizens in thinking-through urban issues (betaville.net; Devisch et al. 2016).

Data, Data, Everywhere

Crowdsourcing is one manifestation of the importance of economies of data in urban public spatial practice. While in its original sense, data refers generally to observed facts about the world, in the context of digital technologies the word refers more specifically to the encoding of such “facts” into binary code, the processing of which is the fundamental characteristic of these technologies. Data do not simply exist: they are produced (Gitelman 2013), often through processes of “datafication,” in which various affordances of digital technology are used to record or measure things in the world and represent them in a coded form such that these representations may be processed, organized, analyzed and transmitted (Van Dijck 2014).
Data is political from the outset. Decisions as to what is measured, accepted as truth, codified and stored, as well as how it is measured, are always colored by the intentions and world-view of the measurer, and the biases and limitations of the measuring technology. A primary distinction to be made in the use of data is that between on the one hand top-down regimes by traditional planners and governments in exercises of control and regulation of public space, and on the other hand bottom-up appropriation of data (and generation of citizen data) by urban individuals to open up realms of freedom of use of public space.

With the so-called “Internet of Everything,” an increasing number of entities in the world come with embedded digital technology that generates, almost as a by-product, data about themselves, their use, and their environment, including the people who use them. As a consequence, data is being produced with intensifying rapidity and regularity, in ever-growing volume and with increasing variety. “Big Data” refers to the harvesting of a targeted subset of the vast amount of data produced about the world by the uncountable array of sensors and algorithms embedded in the world, and analyzing this dataset to reveal relationships, patterns and trends. Big Data is typically data that is not collected for a specific single analytical inquiry, but which is rather the “by-product” of automatized processes, requiring “urban analytics” to wrest sense out of it (Batty 2016: 321). The analysis of Big Data is used in day-to-day management and governance of urban environments, and also in exploratory processes seeking to discern subtle changes that presage long-term future trends (Batty 2016: 325). In urban environments, Big Data is generated by collecting data from widely distributed and unrelated urban systems such as transport systems, surveillance cameras, traffic signals and weather data stations. There is no central control for these systems.

The World as Data

The cataloguing, datafying and mapping of every part of the earth’s surface brings the whole planet into the realm of the urban, or “denature” (Luke 2004: 108). Thus, the entirety of the earth is brought into the category of the man-made, and thus the realm of the public. The suffusion of the public sphere with algorithmic actors is the co-requisite of processes of datafication. An algorithm is an automatized agent to which responsibility can be abdicated. What happens when agents are not equipped with human judgement or accountability, or more precisely, where they are the second-order effects of human choice, yet they are still carrying out the roles of public agents in making decisions, granting freedom or exercising control? These concerns are evident in current debates around autonomous vehicles, to cite one example.

Big Data is often seen as providing the potential to better apprehend and comprehend social processes. Big Data itself is a social phenomenon, with implications for how we define truth (Graham and Shelton 2013). This paradigm affords copious insight into the quantifiable aspects of humans in the city as logistical patterns. The aspects of public space and spatial practice that can be measured are the
aspects that can be codified, and processed. Meanwhile, subjective and qualitative aspects of urban life, especially from those with less involvement in or access to digital technology systems and devices, and other differentiations that are not converted into data are non-existent as a dataset, and therefore absent in any models that may be constructed on the basis of this data. The measuring of flows of data evades the more profound and constitutive question of the relationships of power and influence that set the agendas for cities and the ways in which the use and generation of data reflect and affect urban social and cultural forms, values and practices (Sassen 2012). In view of this, Murakami Wood (2014) makes a plea for a broadening of the ambitions and scope of the smart city beyond the optimizable, quantifiable views of the city as a technical infrastructure, an economic engine, and a managerial hierarchy to take on a more social perspective.

Big Data has even been described as entailing a degree of incisiveness, scope and scale that heralds the “end of theory” (Anderson 2008), in a re-emboldened manifestation of the positivist conceit that “qualitative” is just a place-holder for things we have not yet been able to quantify sufficiently.

A street in the present era is at the same time a physical and a digital infrastructure, that is suffused with data generated by the individuals that occupy the space (Wachter 2012). These data, which include locational indices, social connections, behavioral preferences and even emotions, play as large a role in forming the landscape of possibilities and proclivities in public space as does the physical, architectural framing of the space. Emotions are “datafied” and distributed through digital social platforms, affording the formation of collective protests around a multitude of individual feelings of outrage, for instance (Milan 2015). All that is datafied becomes part of this landscape and, reciprocally, all that is not captured and datafied is afforded no presence. Thus, the exercise of the right and desire to manifest oneself publicly is circumscribed by the extent to which one’s actions, opinions and emotions are datafied. Such is the tyranny of the universal medium.

Three orders of spatial data collection can be identified, which are distinguished from one another in terms of gathering device, intent, attention, etc.: (1) Data that is intentionally collected, (2) Data generated as a by-product of communication and automation, which can be mined for (locative data of smart phone usage, for instance), and (3) Data on psychological states and opinions surrendered by urban network users. These are also absorbed into different economies and encashed for different types of capital/value.

**Data, Space and Place**

Data is abstraction, and we inhabit virtual worlds as data projections of ourselves, not as bodies. The digital ether stands as a counterpart to physical space as a realm of circulation. Once something has been datafied, it can be carried through this medium and transformed without having to emerge again into physical space in its
de-datafied form. The fabric of this “other” world of digital technologies is generally inaccessible to human experience: a foreign dimension that eludes our registers of perception, as we have no perception of, or interaction with those with whom our data is sharing a server. Through the superimposition of digital networks onto physical space, and the association of data and devices with specific places and embodied individuals and groups, the realm of data becomes entangled with spatial practices and constructs such as urban public space.

Graham (2013) writes of the “digital shadows” of cities, consisting of data generated from and about a city. Some of this data is consciously collected to monitor the vital signs of the city and geocoded content produced by users (Hecht and Stephens 2014), but much of this data is not generated intentionally but rather is produced as a collateral effect: the “exhaust” from the interactions of humans and devices in the Internet and the IoT. This information comes to form “augmented realities” when there are channels for feedback loops for people to access this data while in the course of performing urban life, such that data informs behavior in real time (Graham and Shelton 2013).

Bowker (2014) has pointed out that the realm of data is not separate from the physical world of experience, and that the storing, processing and moving of data does things to the world. For instance, Web-based services such as search engines can impose a hierarchy on geographical locations by the priority with which they return recommendations or search results relative to places (Zook and Graham 2007). This prioritization can be influenced by factors such as user ratings of places or payments by proprietors of businesses.

The relationship between data technologies and physical space takes on different modalities. Kitchin and Dodge (2011), for instance, make a distinction between “coded” spaces, in which software functionality has been applied as an ersatz or streamlining of analog functions (such as traffic-control systems), and “code spaces” in which software is an essential dimension and where functionality, character or experience of the space would be fundamentally compromised in the absence of software (as in location-based games).

The Data-Citizen

The 2015 completion of the Human Genome project to physically and functionally map the three billion nucleotides of the human genome, by which human genetic information is encoded and passed-on, was an important milestone in the definition of humans as informational beings, and the understanding of our epigenesis as a
process of algorithmic computation. In one sense, this places data and algorithms at the foundation of what it is to be human (or at least biological), but in another sense it confronts us with the stark insufficiency of data and algorithms, because the phenotype is not determined by the genotype but by the conversation between the genotype and the environment through the evolving body itself as the object and the interface of this evolution. Each individual can viably, but not exhaustibly, be defined in terms of data processing processes and machines. This may place us in a position of better appreciating our kinship with all living matter. However, this aspect of datafication does not capture consciousness or agency.

Much of the discourse on the cyborg paradigm has drawn attention to the hardware aspect of the contemporary post-human reality in which the bodies of individuals are hybridized and extended through their increasingly intimate entanglement in physical digital devices and systems. However, a less tangible but equally profound and consequential aspect of the technological extensions of individuals lies in their production and consumption of data that is an essential facet of their being in the world. Individuals’ data projections are central to their manifestation as presences and agents in the public realm (as in the case of crowdsourcing, through which the collective public becomes a distributed sensory network in the form of a “crowd” that provides data for algorithmic agents), but these data projections also enable the quantifying of people for purposes of control or marketing, in order to harvest their attention and monitor their actions.

We are doubly datafied, pulling us in two directions. So the dichotomous nature of the urban citizen—as a member of an anonymous crowd and at the same time an individual fighting against this anonymity—is apparent par excellence in the digitally mediated urbanite, willingly offering up their data as one data-point of an “aggregate” data public, while at the same time striving for self-expression and customization of their use and experience of the city and its public spaces through their use of the same technologies.

Via their digital devices, people in public space have constant access to a surplus of data and activities that are delinked from the physical space in which they happen to be, weakening the connection between person, activity and place. However, at the same time these technologies also afford access to a higher and more incisive level of knowledge about the spaces one inhabits, as well as the formation of networks to act upon this knowledge. As stated by Evans & Saker (2017: 17), “The overlaying of ‘real’ world environments with data and information is indicative of the movement of the internet itself from the desktop to what we now understand as the ‘mobile web’, the use of internet-based services and applications through continually connected smartphones and devices.”

Different people in the same physical environment can exist in different information environments, due to differentials in their access to information that can facilitate their understanding or use of the environment. And the ways in which digital technologies are being appropriated into urban spatial practice is driving this to the extreme, allowing different people to co-inhabit the same physical space with fewer and fewer shared referents, to the extent that it is relevant to query whether physical space is any more than the necessary medium through which we need to move because we are still embodied.
Data and Power

It is in the apportioning of access to data, and to the algorithms by which the data is processed, that asymmetrical knowledge relationships are maintained. Digital affordances give individuals access to the knowledge and technology to produce and analyze data and gain insight into the consequences of courses of action. However, inequalities in political leverage and economic resources persist, meaning that governmental and commercial actors still exercise hegemony in terms of the ability to act on this knowledge to put in place enduring, tangible interventions into public space. There is an accumulation of justifications for these power asymmetries. While public space may belong nominally to the people, governmental control is justified by the need to maintain security and order, corporations are afforded influence due to their ability to mobilize resources to provide for the needs and desires of the public, and algorithmic monitoring and controls are implemented because of their ability to sense and process data at a speed and level of complexity that transcends that of unaided humans.

Besides enabling the provision of services, the flip side of ubiquitous computing is that it also allows for ubiquity of data collection. In discussing what makes information public, Tverdek (2008) writes that activities become public once we conduct them in a space that is public, that is where all have a right to be and to see, and that we have no right to expect that others do not observe these activities. The more aspects of our lives are mediated by this pervasive infrastructure, the more imprints are left on this universal medium. However, as any research primer will attest, the mere act of collecting data, regardless of its nature or quantity, does not lead to a better understanding of the situation being datafied. There are thus multiple layers of politicization of data: in the decision of what data to collect and how, the decision of who has access to the data, decisions as to what knowledge is being sought from the data and, accordingly, what types of analysis will be applied to it. Citizen data applies to all of these levels, in terms of citizens gathering data themselves that is not being gathered (or reported) by governments (as in the example of air quality monitoring and reporting in China), and in terms of applying different modes of analysis to existing data, to enable understanding or action not supported by the official modes of meaning-making applied to this data.

Datafication in itself can be seen as a pivotal move towards domination and control. Haraway (1991 [1985]: 303) remarks on the military’s use of technology to gather C3I (command-control-communication-intelligence) information, seeing a common foundation for communications sciences (through “cybernetic” feedback-controlled systems) and “modern biologies” (through genetic coding) in “the translation of the world into a problem of coding, a search for a common language in which all resistance to instrumental control disappears and all heterogeneity can be submitted to disassembly, reassembly, investment and exchange.”

Radio Frequency Identification (RFID) technology brings the possibility of attaching data to things and is one of the bases for ubiquitous computing and the internet of things (IoT). By extension, this technology also affords the surveillance and tracking of people as objects. RFID technology can be seen as a facilitator of social control, which can lead to “corrosive behavioral tactics, whether on the part of marketers, police, or interpersonal networks” (McCullough 2013: 128–129).
Social media platforms “push” certain types of data on users based, for instance, on the habits or preferences of others in their network, reinforcing convergence of behavior among people sharing an “echo chamber” and using online behavior and patterns to form behavior in physical space (Leszczynski 2015). Applications also “pull” data from users, both by harvesting information on people’s location and behavior and by enticing them to submit information about their preferences and activities with the promise of the added functionality and targeted offerings that can be provided based on these preferences. Both of these are aspects of “dataveillance” (Van Dijck 2013; Clarke 1988, 1996), “the systematic use of personal data systems in the investigating and monitoring of the actions or communications of one or more persons.”

It has been argued that people need to have the possibility to opt-out of ubiquitous systems (Greenfield 2006): in essence to establish a public-private distinction in data. But it is becoming more and more difficult to truly achieve this opting-out. One can be out of public space but still have one’s habits and actions being surveilled and recorded. Privacy is less achievable but also, it seems, less desirable to many people, when one’s personal data is the currency that allows one to get so much added functionality purportedly “for free.”

The Economics of Data

Since the 1990s, with the transition from cash transactions to the exchange of credit and debt in the online economy and the rise of cryptocurrencies, transactional relationships and economic activity have become increasingly consolidated within the universal medium of digital technologies (Nissenbaum and Varnelis 2012: 18). Parallel to this development, data itself has become a primary generator of economic value, and “data monetization,” the buying and selling of data, has become a pillar of the contemporary global economy and one’s own personal data becomes increasingly recognized as an asset to be guarded, controlled and monetized.

Data becomes an engine of the economy, such that social interaction is in itself a value-generating activity (by being data-generating), as in social media sites, in which social affordances are put at the disposal of members/users, because their participation in these platforms can generate data that can be monetized. A platform for social interaction becomes the bait to entice people to carry out the work to produce data that can then be turned into knowledge by others and commoditized. This does not disqualify these media from being designated as public spaces (nor does it automatically qualify them), as the data we choose to input has both a commodity value (when collected, analyzed to turn it into knowledge and then sold or applied to generate profit) and a use value (of which one facet is the establishing and maintaining of

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3 As of this writing, current apps that allow individuals to monetize their data include Worldquant / Data Exchange (data.worldquant.com) and Measurable Data Token (mdt.io)
social connections). This is inherent in data’s multivalent nature as the raw material of the digital realm. In this sense, the public and the commercial are intertwined through information in a way that may constitute the/a new public realm.

At the basis of the data economy is the provision of “AI 2.0” knowledge as a service, based on the surrendering of one’s data to a platform provider in exchange for access to knowledge generated by the compositing of one’s own data with the data of other users and the application of analytical algorithms. Such an arrangement for example underpins the operational model of the wayfinding app Waze. Drivers allow their traffic data to be shared with and through this platform, and in exchange they received traffic information: an economy based on the exchange of individual data for composite knowledge. The calculation may be that the data that one is giving away on one’s own behavior is trivial compared to the value of the functionality of the system, which relies on other users coming to the same value-calculation conclusion.

Data Publics and Public Data

In cases such as the wayfinding app example mentioned above, platforms facilitate the formation of “data publics” around the sharing of individual data in exchange for the real-time knowledge that can emerge from analysis of the collective dataset. While the above example relies on a profit-making business model, other data publics form around data made available by public sector entities or open source communities. Many of the databases assembled by ubiquitous sensor networks are open to access from citizens who can write their own programs to query them in real time, enabling “Citizen Data Scientists” (Tapadinhas and Idoine 2016) to understand the geography of big public issues like the coronavirus epidemic, opioid addiction and sea level rise, and apply this knowledge to mobilize public responses (CityLab 2020).

The Open Source Movement is crucial to the idea of the openness of algorithms, just as the Open Data Movements are to the openness of data. Sloterdijk (1999) writes of “public knowledge,” the right to know how things work. He argues, for instance, that the discoveries made in the 25-year global Human Genome Project should by rights be made accessible to all humankind, as the control and manipulation of the human code that could be enacted has implications for the human race as a whole. Many cities are implementing “open data” frameworks to make data available to the public (Mossberger et al. 2013). Developers have created programs such

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4 The International Open Data Charter, ratified by seventeen governments in 2015, has as its first principle that governmental data should be “Open by Default,” establishing access to data as a public right. These city, state and national governments primarily represent Latin American localities. The signatories are the municipal governments of Buenos Aires in Argentina; Minatitlán, Puebla, Veracruz and Reynosa in Mexico and Veracruz in Uruguay; the Mexican states of Morelos and Xalapa; and the countries of Chile, Guatemala, France, Italy, Mexico, Philippines, South Korea, the United Kingdom and Uruguay.
as the SFpark app to track parking availability and prices in San Francisco, the Citizen Connect app to report graffiti, potholes and damaged signs in Boston, as well as the Streetbump app that does not require user action but detects bumps in streets by phone’s built-in accelerometer and GPS functions (Fountain 2014: 40–43). So, access to the public realm involves not just physical access, but also access to the knowledge of how urban systems work, and the potential of every citizen to act on such knowledge.

There is a current trend towards citizens, community organizations and NGOs appropriating smart technologies (particularly in terms of access to data and digital social platforms) to advocate for urban change and to lead public debate on urban issues (Glasmeier and Christopherson 2015: 8–9). Citizen collaboration enabled by Geographical Information Systems (GIS) has opened up possibilities in what has come to be called Public Participatory GIS (PPGIS) (Poorazizi et al. 2015). Increased ease of access to a broad spectrum of data allows urban dwellers to become better able to perceive issues and negative conditions in the city (Glasmeier and Christopherson 2015: 8). The access to rich data afforded by applications such as GIS can be very efficacious in supporting urban decision-making processes (Klosterman 1995). Large cities throughout the world maintain “311” capacity (Fountain, 2015), for non-emergency government services. Originally referring to the dial-up code for reporting issues by telephone, 311 services have to a large extent migrated to digital platforms. The Open311 platform allows apps developed for one city to be used in other cities globally (currently over 20 cities), enabling developers to access data from other cities and build tools and apps that can be transferred from one city—one urban context—to any number of others. Applications like Compstat and Citistat are used by police departments to collect and analyze crime data to support police departments. Kansas City, Chicago and other cities use social media (Twitter) to report graffiti and potholes. Other applications in this vein include Usahidi (usahidi.com), SeeClickFix and the City Sounding Board project (Fountain 2014).

The Open Data Movement evokes the promise of alternative policies of urban development, within which “new territorialized actors” would effectively appear on the local public scene. As the various chapters of this volume have demonstrated, urban sociabilities have been profoundly transformed by the use of social media, and economies of use of functionality, rather than ownership of property, become prioritized with the development of a sharing or peer-to-peer economy. Digital tools play an important part in the ability of populations to build commons, to reinvent means of protest and collaboration, to finance projects, to exchange knowhow, to get around, to find accommodation, to be entertained and lastly, to remake society.
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