



HAL
open science

The Multiple Layers of Information Communication Technologies and Their Use in Urban Public Space

Pierre Depaz, Nicolas Grefenstette

► **To cite this version:**

Pierre Depaz, Nicolas Grefenstette. The Multiple Layers of Information Communication Technologies and Their Use in Urban Public Space: A Case Study of New York City. EMERGENT TECHNOLOGIES: NEW MEDIA AND URBAN LIFE, Common Ground, pp.240, 2020, 978-1-86335-219-2. hal-04276876

HAL Id: hal-04276876

<https://hal.science/hal-04276876>

Submitted on 9 Nov 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial 4.0 International License

The multiple layers of information communication
technologies and their use in urban public space:
a case study of New York City

Pierre Depaz

New York University Abu Dhabi

Nicolas Grefenstette

Starr Architects

The new real estate development project at Hudson Yards has been hailed as the first ‘*quantified community*’ by planners and researchers across the NYC area, focusing on data gathering and processing in order to build ‘*the most connected, measured and technologically advanced digital district in the nation*’. As Hudson Yards also claims to have “*the smartest park in town*” (Hudson Yards NY, 2017), the connection established in the project between connected technologies and the sustainability of public space becomes apparent. The near ubiquity of *Information Communication Technologies* (or ICTs) at all levels of an urban setting, from individual charging stations to neighborhood scale mapping systems and connected power infrastructure, are now posited to have an impact on urban living at a variety of scales.

A core body of work has identified the role of ICTs in impacting the parameters that compose social sustainability, as well as questioning its very definition. At the larger scale, studies look at the relationship between ICTs and access to education, governance, health, and economic development (Farrell, 2007; Etta et al., 2005). Townsend (2013)’s review of

the advent of smart cities from the rise of digital technologies reveal a variety of impacts on factors of human development, from health to education to governance. When spatially focused on the urban environment, these studies have consistently informed conversations about smart cities and smart planning (Caragliu et al., 2011), observing ways in which they have transpired into everyday life, from monitoring the quality and status of infrastructure and services (Eckoff et al., 2017) to engaging civic participation, but few initiatives have been developed specifically regarding how ICTs have systematically influenced the transformation of urban public spaces (Trindade et al., 2017).

Public space can be defined as a spatial framework within which civic, social and economic life can happen at any time of the day, and without obstruction, for members of any community. Its construction as a realm depends first and foremost on the interaction between physical components —e.g. qualities of the space or types of space— and social components —e.g. relating to contacts, relations, and collective uses (Rapoport, 2002). Concerns over the erosion of existing systems of traditional public spaces (the square, the park, the sidewalk) whose core purpose is to connect people from various social groups for political, civic, social or economic transactions, have lead some researchers to consider there is a ‘crisis’ of public space (Graham and Aurigi, 1997). Another set of studies, drawing from academia in urban design and planning, have evaluated the different forms in which public space is manifested (Carmona, 2010a). These both reflect the impact geographical processes such as globalization have had on a variety of socio-cultural and political-economic factors, as well as the decisions that policy-makers, institutions and citizens make regarding what they expect from public space, and thus how they intend to design, manage and sustain it. A successful public space is then one which maintains its usability and inclusiveness through the design and implementation of specific physical and

digital infrastructures. While there is a dearth of fine-grained definitions of what are the features of a such a space, we will start from the different transformations of public space as explicated in Carmona's (2010a, 2010b) overview and assess the extent to which ICTs are reinforcing or subverting them.

Usership of ICTs and dependence on them for access to and broadcast of data is rapidly growing across the world. Across cities, they've transpired in mostly invisible ways (Batty, 1990) in how we use and perceive public space. By looking at a set of technologies which directly relate to the use of public space, and specifically those which are currently deployed in it, we will study how certain features or characteristics of new implementations of ICTs affect New York City's public space. As a result, we will see that concerns such as access to facilities, quality of living space and health, the degree of social interaction, as well as the amount of civic engagement can be profoundly modified by the introduction of seamless and personal networked computing technologies.

I. The advent of digital technologies in the public realm

The concept of *smart* and *mediated* cities is far from being new. Shannon Mattern (2017) argues that throughout history, city dwellers have developed means of information and communication that have made use of the urban environment, shaped that very environment, and was one of the main drivers in social development and sustainability. Up until the development of our modern ICTs, however, most of those communicative events relied on the use of public space. The call to prayer from the *muezzin*, the gathering of greek cities' citizens in the *agora*, the display of theater programs on *Litfaßsäule* all

represent instances in which technical infrastructure was developed in public space in order to blend public and private use. Public space has been intrinsically linked to the development of a media ecosystem intended to better our living together.

These ICTs as we understand them today are characterized by three main components: the ability to store, process and transmit information virtually anywhere on the planet at a near instantaneous speed (Dodge and Kitchin, 2001). Originally exclusively used by private institutions, ICTs now manifest themselves, through miniaturization, in most aspects of our lives, through personal computing devices, embedded systems and the set of affordable, multiple-purpose computers referred to as the Internet of Things. What we've seen since the 1980s, then, is the progression of a set of technologies transitioning from more private to public uses, insofar as their locus of action is no longer restrained to specific domains, and from a logic of quality to quantity, as this is a requirement for digital data processing. The computer being restricted to exclusively processing discrete information, it is both the manifestation and the symptom of a societal shift in which data becomes the principal means to manage and control (Foucault, 1975; Deleuze, 1992). While the open-source movement has been remarked through some achievements (the Linux kernel, the Wikipedia encyclopedia), ICTs are now mainly privately developed and owned, and have therefore sparked a debate about the merits of closed versus open technologies (Lessig, 2006) mirroring the debates in openness and closedness in urban spaces.

Today, the organization of data becomes a new sort of space in which individuals can inhabit and strive, sometimes referred to as virtual spaces, or cyberspace, which are sometimes included in discussions of new types of public spaces. (Barlowe, 1996;

Carmona, 2010a, 2010b). Moving from private applications to public use, and exclusive processing to mass communications, ICTs, in and of themselves, have radically changed social life, by virtue of their improving our ability to exchange information across time and space, at unprecedented scales. The ICTs that are being designed specifically to improve the use of public spaces therefore come from a triple tradition: they are (1) data-focused, if not data-exclusive, they are (2) privately-owned, and therefore answer to logics of private property, competition and sustainability, and (3) they generate spaces.

With this shift of ICTs towards public space, and their near-ubiquitous presence at the societal level, their introduction has impacted the way people interact with the built environment. Mobility has been influenced using real-time mapping capacities, as mobile technology has redefined the concept of the physical landmark as meeting point, instead allowing early-adopting populations such as the youth to ‘flock’ using “loosely [coordinated] movements and meetings through constant communications via mobile phone” (Townsend, 2000 in Zook et al., 2004: 167). The constant, highly decentralized, and primarily invisible flow of information as described by Dan Hill in his essay on ‘The Street as Platform’ (2015) exemplifies streets immersed in clouds of data (open and closed, aggregate and isolated), some of which enable users of public space to micro-coordinate everyday activities, and as such, have greater agency on defining which spaces are most and better used.

A study in 2011 by Microsoft looking at a variety of developed countries (US, UK, Japan, Germany, Canada) also found that “everyday place negotiation” was the key object of the majority of location-based services which can be broken down into the following

categories: “GPS (70 percent), weather alerts (46 percent), traffic updates (38 percent), restaurants information and reviews (38 percent), and locating the nearest convenience stores (36 percent)” while “social networking (18 percent), gaming (10 percent), geotagging photos (6 percent) lagged behind, alongside enhanced 911 (9 percent).” (Wilken et al. 2013: 204). A Pew Internet research survey conducted in 2010 estimated that 4% of adults used location-based services (e.g. *Foursquare*), with 1% of internet users using these platforms on any given day. While at the time of these studies social networking was still a growing trend, Internet-based wayfinding abilities (today often integrated in social networking platform, with live location updates) constitute a large part of how we navigate public space in 2019. Newer applications in the realm of Augmented-Reality Games, such as *Pokemon Go* (2016), *Ingress* (2013) or *Minecraft AR* (2019) provide additional ways for users to explore and interact with physical space.

However, while technology plays a key role in changing human behavior in urban settings, larger societal and political trends are also held responsible for the way urban public space has been managed, which also impacts usership. In his overview of critiques of trends in public space, Carmona (2010a) attributes excess and deficiency of management to patterns of use, exclusion, and homogeneity in public space. Using this framework to categorize public space, certain critiques emerge as particularly salient to the increasing influence of ICTs.

II. The transformation of public spaces: towards new management typologies

Independently of technology, there are parallel debates about ownership of space in society. First, Carmona speaks of *exclusionary spaces* as a type of undermanaged space that suffer from a decline in physical quality or in “*opportunities and activities it offers*,” (Carmona 2010a) leading to cycles of underutilization. Of these types of spaces, some are designed to exclude certain populations such as the physically disabled or the elderly, when accessibility, for instance, isn’t considered; they may also be *parochial* or prescriptive by nature, dictating who is welcome and who isn’t based on categories such as class, ethnicity, race, age, type of occupation (Carmona 2010a). In distinguishing itself programmatically, urban public space can also lead to spatial segregation: skateparks built in the outskirts of town force the youth into liminal spaces, or smoking bans and anti-sleeping hand rests on benches may exclude undesirables from high visibility plazas and streets. The fear of crime being almost as impactful as crime itself, leads to increasingly *segregated spaces*, allowing certain users to retreat from public space altogether, where the perceived threat of lawlessness and crime prevails. Other 20th century urbanists such as Whyte (1980) and Jacobs (1961) cite anonymity as a key component to the feeling of safety in public spaces, which is directly challenged by the increasing presence of centralized surveillance systems.

Second, the term *third spaces*, coined by geographers and urban designers such as Banerjee (2001), define those spaces such as cafes and bars which are neither fully public, nor fully private, in which an increasing number of everyday interactions and exchanges (from interviews, to purchases, to creative production, for instance) take place, where they would have previously taken place in the public realm. Users no longer need to agree on predetermined landmarks or specific places at which to meet but can instead rely on live updating abilities provided by applications such as Google Maps or Facebook to locate one

another in a dynamic manner, which leads to “massively hypercoordinated urban civilization in the world’s cities” (Zook et al., 2004). Here, data is accessible at rates higher than ever before (increased synchronicities), with increasing access to “the potential number of places where interaction could occur”, with information on “traffic, weather, and economic conditions” demanding to adapt in terms of their everyday decision-making in cities. (Zook et al, 2004: 167). Furthermore, applications such as Yelp or *Foursquare* transform the experience one has of the city, providing further ‘pull’ factors towards certain venues or neighborhoods based on popularity ratings, creating new geographies based on consumption patterns, providing live forecasting of local economic trends (Glaeser et al., 2017): ICTs enable ways in which software can alter the “spatialities of consumption” (Kitchin et al., 2011), while different intensities of management can in parallel produce exclusionary or inclusionary public spaces, resulting in a dichotomy of open versus closed spaces, determined by the strength and fluidity of their boundaries.

Finally, overmanaged spaces are typically higher profile spaces that are subjected to a wide variety of policy and development practices which lead to privatization, commodification and homogenization, and are more or less exclusionary. What some refer to as *privatized* spaces are types of over managed public spaces (Carmona 2010a), products of new patterns in economic and political globalization: the experience of public space has changed, as people can now carry many formerly public functions in these semi-private environments using the internet (Boyer, 1996). The increased availability of internet both in private venues such as cafes and bars, as well as urban infrastructure which enhances WiFi connections increases the potential number of work environments for people who would traditionally work at home. These increasingly homogenized spaces lead to depoliticization of public space, where the public realm is increasingly transformed

into an area dedicated to personal experiences (Arendt 1994). Sennett concurs, adding that as spaces are increasingly not only areas for passive observation, they are also decidedly personal, a consequence of commodification and commercialization initiated in the 19th century (Sennett, 1992).

III. Closed vs open: the role of digital geographies

The belief that “information wants to be free” (Denning, 1996), influenced much of the development of early public internet infrastructure and standards, from the HTML specification by Tim Berners-Lee in 1993, by allowing freedom of access, retrieval, and exploration of information. The bulletin board system (BBS) was a means for all with Internet connectivity to strike conversations, ask questions and collaborate on bottom-up projects in an outwardly public fashion. One of the most successful of these projects is the Linux kernel, today the most popular operating system for mobile, IoT and embedded electronics. The point of Linux is to provide an extensive and robust API (Application Programming Interface) —a way to interact with underlying hardware. In parallel, Hill (2015) argues that an open street can be “thought of as having an API, conveying its overall behavior to the world, each aspect of it increasingly beginning to generate and recombine data;” that is, there are things you can and can’t do in the streets, which are directly correlated to how open or closed it is. One example, as shown by Whyte (1980), is the mobility of urban furniture of those spaces. A movable piece of furniture is a flexible API, while a fixed one is a closed API.

While traditionally ICTs were focused on enabling openness in public space, new trends of privatization and the public's removal from public space has reversed the trend as ICTs are now seen as reinforcing closedness of those same public spaces. Carmona (2010b) recognizes the limitations of the different critiques of public space, arguing that they may just be 'two sides of a same coin' - to draw an analogy with Dan Hill's overview of technology in the main street (Hill, 2015), whether a space is over or under managed would likely lead to a 'closed' street, where each parameter is on lockdown by a position of authority. He concludes that the 'public' in public space is not a coherent group, but instead a fragmented society of different socio-economic groups further divided by age and gender (a process exacerbated by external environmental pressures), subject to constant change. (Hill, 2015), extending Castells' (1996) argument that urban technologies such as ICTs can reinforce (rather than break down) processes of socio-spatial polarization in cities, including in public space.

While New York City does not have formal gated communities in its urban center, there is an increasing reliance on public-private apparatuses to control usership. When discussing the political-economic perspectives on control in the public realm, Carmona deconstructs controls as "power relationships of access and exclusion", leading to a subtle array of hard (e.g. CCTV monitoring) or soft (or passive) restrictions to the use of public space. The increasing presence of an industry of private security is also an indicator of this type of perception. One example of these are Business Improvement Districts (or BIDs) which use increased tax revenue from businesses and property owners in exchange for private security, cleaning services and branding to create distinctive geographical areas. Likewise, spaces which straddle public and private space (such as third spaces) or privately-operated

public spaces (or POPS) give building management companies better control on the rules of use of public spaces directly adjacent to or within buildings, providing control on things such as photography, times of operation, or the right to convene. Low & Smith (2006) argue that the rate of privatization has accelerated, and that there has been reciprocity between the increase of privatization in everyday life and of the nature of public space itself. Ironically, while POPS seem to be historically aligned with incentive plaza program (Schmidt et al., 2011) developed in the 1980s, which were clearly giving agency to the city on the development of its public space in exchange for fewer regulations for developers, the trend is reversed today as POPS and BIDs give the upper hand to the private sector on which types of users they'd like to see in their public space. In cities such as Tel Aviv, the core values of its Smart City vision plan (2014) has built upon three-tiered models that overlay physical infrastructure, applications infrastructure and applications under the guise of providing 'safer' public environments through a variety of customized services, justifying additional controls and monitoring of urban public space while at the same time conflating the roles of customers and residents through platforms like DigiTel (Shechter, Sharon & Shmerling, 2015).

This process of design is based on the aggregated, stereotypical profile of users through sociological and quantified analysis, using the aforementioned categories. While said process is implemented as a top-down approach, a similar dynamic can be seen in the development of digital social networks. Through ICTs, social networks are both more strongly tied and more loosely bound, which reinforces social and behavioral distinction from one group to another (Lerman, 2016). When such a distinction impacts the use of public space, and when public use is no longer available to every city dweller but to a particular group, it reinforces a *closed* public space in which the user lacks agency.

This confluence between city planning and ICTs is highlighted by Hill (2015) when he argues that “a new kind of city is emerging, an algorithmic city. It promises gleaming efficiency, citizen-centered services on demand. Yet the algorithms that produce these conditions—political, economic, cultural—are similarly challenging to parse, and are quite different to those that shaped cities previously”. What is essential to recognize here is that most analyses view technology as accessory to changing behaviors towards public space, when it should be a fundamental parameter. As Bijker (1997) has shown in his work on socio-technical assemblages, technologies are, to a certain extent, developed within the scope of specific agendas of specific stakeholders —one agenda drives the features of a technology software, which impacts the environment within which it is deployed.

IV. Case Studies of ICTs in New York City

A. Wireless communications networks between open and closed

In 2014, New York’s approval of the transformation of existing payphones into WiFi hotspots (deployed in 2015 onwards), as a means of bridging the ‘*digital divide*’ — the uneven access to modern communications across geographical locations (Warschauer, 2004). The deployment of *LinkNYC* happened first as the replacement of payphones across five boroughs, for a total expected count of 7,500 at project completion. Its infrastructure, the *Links*, are developed by Intersection, a company financed by Google’s parent company Alphabet. The program is a step towards providing free city-wide WiFi and access to common city services and is considered by Intersection as a potential replacement to individual internet subscriptions, in addition to helping bridge the ‘*digital divide*’, which particularly affects lower socio-economic classes.

This extends the possibilities for people who already have good access to the internet at home, reinforcing openness in public space, but does not necessarily apply to those who lack a stable internet connection. One could argue that the use of internet at curbside, using a mobile phone, for instance, does not replace the need for more secure physical environments in which certain activities can take space (e.g. applying to jobs, filing taxes): not all uses of the internet are appropriate for a completely open public space such as the street, but has been proven a driving force for the sustainability of third spaces, such as public libraries (Mattern, 2014). The New York Civil Liberties Union also criticized the project for being unclear about the amount and types of user data that would be retained (Heilweil, 2018), which could eventually be used in cases of digital, and potentially physical, segregation, something that has raised concerns from local civic organizations such as Rethink *LinkNYC*. The presence of two built-in cameras, in addition, could also raise concerns about increased control of public space from city agencies – although the company claims not to store video information for more than a week (Woyke, 2017). Financed by advertisement revenue, *Links* are also typically concentrated in denser, higher income neighborhoods (Sinkovits et al. 2018), which erodes the argument of bridging the digital divide. The *LinkNYC* project was also involved in lawsuits from the National Federation of the Blind, arguing that accessibility for disabled and hard of sight was limited (Heilweil, 2018), reinforcing the *exclusionary* and *parochial* character of a given public space.

After an initial rolling out phase and the development of the advertising and WiFi network capabilities, *LinkNYC* aims to integrate with other Internet of Things technologies such as

augmented reality and autonomous vehicles (Woyke, 2017). *Links* would also provide platforms for the city to be more legible and responsive. Legible, in that it can reveal “flows of people, commercial activity, garbage services” (Fung, 2016), and responsive, in providing access to services such as 311, leading to increased public sector efficiency and ‘one stop shopping’ for government information, applications designed to limit environmental degradation, citizen and emergency support services, and services to support inter-community meetings, contributing to the openness of public space. Financed by advertising revenue, the presence of *Links* also solidifies the privatized nature of public space.

B. Smart urban fixtures as an Internet of (optimized) Things

Smart trash receptacles, called *Big Bellies*, another example of ICTs, can monitor the amount of waste or ‘fill level’ at any given points, as well as rates of filling (measured by the ‘spike level’), frequency of collection and general data on the sensors (e.g. battery level) present in each receptacle. The data collected can then be relayed via cloud-based web services to the NYC Department of Sanitation: when 85% full, *Big Bellies* send texts to refuse collectors (Parkinson, 2015). In New York, these Big Belly receptacles have been deployed around the city since 2014, and as of 2015, 170 of these smart trashcans incorporated WiFi capabilities, providing access points for pedestrians. In addition to increasing internet connectivity and data collection, the bins also act as platforms for public service announcements or provide billboards for advertisements. Design flaws notwithstanding, the potential for smart litter receptacles to cull illegal dumping, and thus improve the aesthetic attraction of public space is high. In addition, inscribing itself in the ethos of smart cities, it would improve efficiency in pickups, further reducing the amount of vehicular traffic in and around public space. In terms of experience, this would also

mean reduced traffic, noise and congestion directly improving the quality of health and living environment in public space.

The development of ‘smart’ benches (such as those developed by *Soofa*, a spinoff of the MIT Media Lab), with WiFi, USB and phone charging stations and solar panels, further cements the move away from benches for all, not only by fragmenting the continuity of the bench itself, but also by indicating that the desired users of public space should be able to benefit from such infrastructure in the first place (inscribing itself within the greater scope of what some refer to as ‘hostile architecture’) (Petty, 2016). This is a move towards a more exclusionary city, as benches and seating arrangements are traditional ways for cities to indicate where public space starts, by providing a place of respite. The *Soofa* bench was installed in 2018 by New York City Parks during a two-year pilot program: in addition to providing charging and WiFi hotspot features, it also counts unique users nearby within a 75-meter (240 feet) radius, provided WiFi is enabled on their mobile devices.

The *Soofa* bench, according to its founder, ‘embeds’ in the community via its internet of things features allowing seamless and constant connectivity, with data collection being an asset to quantifying usership and thus informing development or design decisions. Data collected is only available to the buyer (e.g. the city) and accessed via a custom *Atlas* dashboard developed by the company (NYCParks, 2018), and the information would be gathered first before NYC Parks would decide how to analyze it (Stone, 2016). By focusing WiFi access to specific nodes instead of trying to provide it city-wide, as do *LinkNYC*’s booths, costs for cities would be limited, allowing for more flexibility on deployment since the benches are not deployed as permanent infrastructure. Here, we see

existing views of public space and private technology at work together —both through the paradigm of exclusionary planning practices via physical infrastructure, and through the need to gather data without explicit intent on how to use it or clear ownership of it.

When the Office of the Mayor of New York decided to deploy a bike sharing system in New York City in 2013, it was designed to be the most ambitious of the East Coast of the United States. With more than 730 stations and 10,000 bikes, it is the largest of the country, and has been undoubtedly successful. This success, however, has been measured essentially in terms of numbers - e.g. daily trips, numbers of stations, number of annual memberships.

C. The exclusionary connectivity of bike-sharing systems

The presentation of *Citibike* as an ideal solution to short-distance, one-way trips would indeed be suited to supporting inter-neighborhood travel, but its relative absence in the most populated boroughs of the city, as well as the fact that only 18% of all docking stations are located in neighborhoods with an average yearly income of 50,000\$ or less makes the current *Citibike* system a means of reinforcing segregation in urban space, and furthers the undermanagement of some public spaces.

The positive impact of docked bike-sharing systems, then, comes not only from economic incentives of facilitating the journey to work, but also from the positive environmental impact that increased ridership has on a city. While the success of *Citibikes* have comforted the Office of the Mayor in developing more bike lanes, the consequences in reducing noise and air pollution would indeed situate bike shares as a positive force in

providing more livable spaces. However, such a benefit would only be concretized if the mode shift of the users was away from the most polluting means of transportation – private cars –, and not from least polluting – walking. Preliminary qualitative studies do show that the main mode shift to cycling is from bus ridership and walking, (City of New York, 2014) effectively leaving the number of car riders unchanged, and showing one of the limitations of the current form of the system.

While *Citibike* at this scale relies on an incredible digital network of data transmission - in order to maintain the optimal number of bikes per docking station at all times - and storage - in order to provide memberships on the go - its main drawback is that it continues to segregate public space by operating in strictly defined spaces, often extending the commuting space of only one of the five boroughs of the city. As of 2019, however, several pilot programs have been launched throughout New York City in order to test the possibility of dockless bike shares. Dockless bike-sharing, by not relying exclusively on specific docking stations, allows for a much more fluid deployment of bikes (e.g. Washington D.C.), but has also been strongly encouraged by inhabitants' comments on the official pilot platform of the city. By being present in neighborhoods currently not targeted by the existing system, dockless bike-shares addresses some of the previous limitations, in terms of spatial equity and freedom of purpose.

The increased role of ICTs in the rapid rise of dockless bike-shares (Alta Planning, 2017) still present new challenges for the city of tomorrow. One of the main foreseeable issues of dockless bikes in regard to public space is the congestion of parked vehicles. To make sure that their bikes do not litter streets or private properties, companies can introduce more

subtle forms of coercion, specific to modern computing and communication. For dockless bikes to be unlocked, it is necessary to be logged in and identifiable in through a mobile application. One of the pilot companies, *Limebike*, uses this identifiability to establish a point-system in order to motivate users to park their bikes in designated locations (Alta Planning, 2017). Failure to comply will establish a track record of misbehavior affecting the user's ability to further use the bike sharing system. While enabling an apparent greater freedom, such a system maintains an underlying control on riders and undermines civic responsibility (Ian Kerr in Geist, 2010).

For the past decade, urban planners and decision-makers alike have taken into account the possibilities offered by new technologies in terms of reaching out to specific communities and getting their input regarding specific community-related matters. These so-called 'citizen apps' rely on the idea of citizen involvement and citizen governance - that citizens know what is best for them and their neighborhood and are able to pinpoint their own priorities. 'Citizen apps' establish a feedback system between community members, planners and decision-makers in which each member of that system influences every other member, in a cybernetic rather than hierarchical relationship.

D. The customization of public space engagement through individualized communications

This section studies the contrast in mobile applications (apps) as they are developed either from a public or a private initiative, and how they affect the inhabitants' conception of public space. On the one side, the *NYC311* app is a government initiative, using modern technologies to further the purpose of the *311* support telephone line. Citizens can request garbage removal, flag potholes and signal abandoned vehicles amongst others in order for

public services to address it - the aim being to improve public service and public infrastructure through active collaboration of both parties involved, with mobile technologies empowering both the users themselves and the broader community, within a certain geographical proximity. On the other side, the Citizen app, recently launched in NYC, is focused on communicating police reports and distress calls to a wide audience and mapping those calls on a map of the user's device. The affirmed goal of the app is to make the community safer by providing more transparency towards ongoing crime acts in the neighborhood.

The first comparison can be made in terms of actionability and empowerment. While *NYC311* relies on user activity, by signaling and commenting on potential issues, Citizen aims first at delivering information and then offers multiple ways for users to react to it – avoiding the locus of the crime, forwarding it to their communities, or starting a video-stream of the incident. These differences represent clearly the difference between the physical and the virtual world. While both apps are focused on physical incidents, *NYC311* aims at solving these incidents by a feedback loop of signaling and repairing, an action which benefits all of those who will engage with that space in the future, while Citizen relies on data broadcasting in order to affect the behaviors of individual members in that space. As such, *NYC311* presents a vision of public space as something to be maintained, while Citizen presents a vision of public space as something to be avoided (e.g. *scary spaces*).

This differentiation continues on the surface level. User interfaces and user experiences have been thoroughly known to influence and direct a user's actions and agency in order to

further an ideological belief of the organization (Laurel, 1993) developing the app. *NYC311* focuses on the report and the follow-up of localized events, and aspires to maintain public safety through active engagement, by providing follow-up reports of any action. While citizen science actively uses the citizen as a sensor, and the government as an actuator, the Citizen app is both the sensor (by broadcasting information) and asks the citizen to be the actuator (e.g. avoiding the scene of the crime) without providing any follow-up on the incident. This reversal of agency leads to a lack of choice (Friedman et al., 2013), and therefore a lack of ownership of the space in which these events are happening.

Finally, the question of social networks, now ubiquitous in ICTs and urban planning alike, is answered in very different ways by *NYC311* and Citizen. *NYC311* does not offer any ability to communicate with another user through the application. On the other side, Citizen relies heavily on “social features”, such as live media broadcasting, live discussion and the possibility to set up ‘friends’ - individuals whose safety you can monitor - and communities - a geographical location you can monitor even though you might not be present there. David Harvey talks of time-space compression (Harvey, 1990) – ICTs simultaneously expand our connection to the world and ‘shrink’ uses of space, insofar as we no longer need to exploit its full extents, only the ones that we deem important to us. What we’re seeing in these differences -an active *311NYC* and a passive Citizen- is reminiscent of the difference between civic engagement and involvement (Amna et al., 2012), in so far as *NYC311* asks citizens to be engaged while Citizen merely offers the opportunity to be loosely involved, remediating the public space as a virtual one (Bolter et al., 2000).

V. CONCLUSION

The cybernetic metaphor for the smart cities, that of input/output systems that can be regulated and optimized is one that rose into popularity alongside the development and expansion of computational and digital technologies during the second part of the twenty-first century. As a holistic approach, this has been extensively studied and documented. We have pointed out how the different aspects of ICTs have been deployed throughout New York City, and how the technical and social context for these implementations have both used ICTs to either reinforce existing notions of the transformations of public space or challenge them. The main pattern found in the technologies surveyed points to two dynamics: the public/open versus closed/private debate does not disappear because digital technologies are used, and there can exist a superimposition of physical and virtual spaces as translated by these technologies. The danger, here, is to provide too much connectivity, too much information, such that the most meaningful potential for action lies not in the physicality of a public space, but in a non-physical community through access to virtual private communities online – such as through *LinkNYC* and *Citizen-* rather than involvement and initiative through systems like *NYC311* and dockless bikeshares.

Despite the relative newness of the technological apparatuses investigated here, it is still possible to draw the conclusion that ICTs tend to favor the quality of life in public spaces when it encourages mode-switching in transportation technologies (such as dockless bike sharing), and when it takes into account the affordances of fast, affordable wireless data transmission to move away from specific physical landmarks. By allowing bikes and

wireless connections to be had virtually anywhere, the smart city is offering agency to its citizen by letting them decide where the use of this technology is most needed.

As such, the success of a city as a cybernetic system seems to be dependent on improving inhabitants' behavior within the built environment. The highlight on the user as a proactive initiator appears to be a richer solution to maintaining public spaces as places of social encounter, reducing segregated or exclusionary spaces altogether, rather than one which would exacerbate economic functionalism and top-down management practices.

References:

- Amnå, E., & Ekman, J. (2014). Standby citizens: diverse faces of political passivity. *European Political Science Review*, 6(2), 261-281.
- Arendt, H. (1958). *The human condition*. University of Chicago Press.
- Alta Planning + Design (2017). 'Not just Mobility: How E-bike Share Can Spark a Design Revolution.' Blog. URL: <https://blog.altaplanning.com/not-just-mobility-how-e-bike-share-can-spark-a-design-revolution-a90b87473dd9>
- Banerjee, T. (2001) The future of public space: beyond invented streets and reinvented places, *Journal of the American Planning Association*, 67(1), pp. 9–24.
- Barlow, J. P. (1996). *A cyberspace independence declaration*. URL: <https://www.eff.org/cyberspace-independence>
- Batty, M. (1990) Editorial: Invisible Cities, *Environment and Planning B: Planning and Design*, Vol. 17.
- Bijker, W. E. (1997). *Of bicycles, bakelites, and bulbs: Toward a theory of sociotechnical change*. MIT press.
- Bolter, J. D., Grusin, R., & Grusin, R. A. (2000). *Remediation: Understanding new media*. MIT Press.
- Boyer, M. C. (1996). *CyberCities: visual perception in the age of electronic communication*. Princeton Architectural Press.
- Caragliu, A., Del Bo, C., Nijkamp, P. (2011) Smart Cities in Europe, *Journal of Urban Technology*, vol. 18, no. 2, pp. 65–82, Aug. 2011.
- Carmona, M (2010a) Contemporary Public Space: Critique and Classification, Part One: Critique, *Journal of Urban Design*, 15:1, 123-148, DOI:10.1080/13574800903435651
- Carmona, M (2010b) Contemporary Public Space, Part Two: Classification, *Journal of Urban Design*, 15:2, 157-173, DOI: 10.1080/13574801003638111

- Castells, M. (1996) *The Rise of the Network Society*. Oxford, Blackwell.
- Citibike (2018) Website. URL: <https://www.citibikenyc.com/about>
- City of New York (2014) Vision Zero Action Plan, 2014. URL:
<http://www.nyc.gov/html/visionzero/pdf/nyc-vision-zero-action-plan.pdf>
- Deleuze G. (1992), Postscript on the Societies of Control, *October*, Vol. 59, MIT Press.
- Denning, D. E. (1996) Concerning hackers who break into computer systems. High noon on the electronic frontier. *Conceptual issues in cyberspace*, 137164.
- Dodge, M. and Kitchin, R. (2001) *Mapping Cyberspace*. London: Routledge.
- Eckhoff, D., Zehe, D., Ivanchev, J., & Knoll, A. (2017) Smart City-to-Vehicle—Measuring, Prediction, Influencing. *ATZelektronik worldwide*, 12(2), 60-63.
- Ellin, N. (1999) *Postmodern Urbanism*, rev. edn (Oxford: Blackwell).
- Etta, F. E. Elder, L. (2005) *At the crossroads: ICT policy making in East Africa*, East African Educational Publishers, IDRC.
- Farrell, G. Isaacs, S. (2007). *Survey of ICT and Education in Africa: A Summary Report, Based on 53 Country Surveys*. Washington, DC: infoDev / World Bank. URL:
<http://www.infodev.org/en/Publication.353.html>
- Foucault, Michel (1975). *Discipline and Punish: The Birth of the Prison*, New York: Random House.
- Friedman, B., Kahn, P. H., Borning, A., & Huldtgren, A. (2013). Value sensitive design and information systems. In *Early engagement and new technologies: Opening up the laboratory* (pp. 55-95). Springer, Dordrecht.
- Fung, B. (2016). 'The Tremendous Ambitions Behind New York City's Free WiFi.' 8 April 2016. The Washington Post.
- Glaeser, E. L., Kim, H., & Luca, M. (2017). *Nowcasting the Local Economy: Using Yelp Data to Measure Economic Activity* (No. w24010). National Bureau of Economic Research.

- Geist, M. A. (Ed.). (2010). *From "Radical Extremism" to "Balanced Copyright": Canadian Copyright and the Digital Agenda*. Irwin Law.
- Graham, S., & Aurigi, A. (1997). Virtual cities, social polarization, and the crisis in urban public space. *Journal of Urban Technology*, 4(1), 19-52.
- Habermas, Jürgen (1989), *The Structural Transformation of the Public Sphere: An Inquiry into a Category of Bourgeois Society*, Thomas Burger, Cambridge Massachusetts: The MIT Press
- Harvey, D. (1990) *The Condition of Postmodernity*. Cambridge, MA: Blackwell.
- Heilweil, R. (2018) 'Free WiFi kiosks in NYC coming to Philly with cameras, critics and lessons learned,' *The Inquirer*, March 28th 2018, Philadelphia.
- Hill, D. (2015). The Street As Platform: How Digital Dynamics Shape the Physical City. *Architectural Design*, 85(4), 62-67.
- Hudson Yards New York (2017) *The Smartest Park in Town*. URL:
<http://www.hudsonyardsnewyork.com/content/uploads/2017/03/Smartest-Park-20160824-Horizontal.pdf>
- Jacobs, J. (1961) *The Death and Life of Great American Cities*. New York: Modern Library.
- Kitchin R. and Dodge M., 2011, *Code/Space: Software and Everyday Life* (MIT Press, Cambridge MA).
- Kilian, T. (1998) 'Public and private, power and space', in: A. Light & J. M. Smith (Eds) *Philosophy and Geography II: The Production of Public Space*, pp. 115–134 (Lanham, Md: Rowman & Littlefield).
- Laurel, B. (1993) *Computers as Theatre*. Reading, MA: Addison-Wesley.
- Lerman, K., Yan, X., Wu, X-Z, (2016) The "Majority Illusion" In Social Networks, *PLOS One*, vol 11. Issue 2.
- Lessig, L. (2006) *Code v2*.
- Low, S. & Smith, N. (Eds) (2006) *The Politics of Public Space*. New York, Routledge.
- Mattern, S. (2014) 'Library as infrastructure.' *Places Journal*.

- Mattern, S. (2017) *Code and Clay, Data and Dirt: Five Thousand Years of Urban Media*, University of Minnesota Press.
- New York City Parks Department (2018) *Solar Benches*. Website. URL:
<https://www.nycgovparks.org/facilities/benches/solar>
- Parkinson, H (2015) 'Internet of Bins: Wi-Fi to come to New York trash cans', *The Guardian*, 16 July 2015.
- Petty, J. (2016). The London spikes controversy: Homelessness, urban securitisation and the question of 'hostile architecture'. *International Journal for Crime, Justice and Social Democracy*, 5(1), 67-81.
- Rapoport, A. (2002). The role of neighborhoods in the success of cities. *Ekistics*, 69(412/413/414), 145-151.
- Sennett, R. (1992) *The Fall of Public Man*. New York. W.W. Norton.
- Schmidt, S., Nemeth, J., & Botsford, E. (2011). The evolution of privately owned public spaces in New York City. *Urban Design International*, 16(4), 270-284.
- Shechter L., Sharon Z. & Shmerling G., *Tel Aviv Smart City*, URL:
<https://www.tel-aviv.gov.il/en/WorkAndStudy/Documents/Tel-Aviv%20Smart%20City%20%28pdf%20booklet%29.pdf>
- Stone, A (2016) 'NYC's Smart Bench Pilot to Give Detailed Sense of Usage Trends in Highbridge Park', 5 August 2016, *Govtech*. URL: <http://www.govtech.com/data/NYCs-Smart-Bench-Pilot-to-Give-Detailed-Sense-of-Usage-Trends-in-Highbridge-Park.html>
- Townsend, A. M. (2000) Life in the real-time city: Mobile telephones and urban metabolism. *Journal of Urban Technology*, 7(2), 85-104.
- Townsend, A. M. (2013) *Smart cities: Big data, civic hackers, and the quest for a new utopia*. New York. W.W. Norton & Company.

Trindade, E. P., Hinnig, M. P. F., da Costa, E. M., Marques, J. S., Bastos, R. C., & Yigitcanlar, T.

(2017). Sustainable development of smart cities: A systematic review of the literature.

Journal of Open Innovation: Technology, Market, and Complexity, 3(1), 11.

Warschauer, M. (2004) *Technology and social inclusion: Rethinking the digital divide*. MIT press.

Whyte, W. H. (1980) *The Social Life of Small Urban Spaces*. Washington, DC. Conservation Foundation.

Wilken, R., & Goggin, G. (Eds.) (2013) *Mobile technology and place*. Routledge.

Woyke, E. (2017) The Startup Behind NYC's Plan to Replace Phone Booths with 7,500 Connected Kiosks, *MIT Technology Review*.

Zook, M., Dodge, M., Aoyama, Y., & Townsend, A. (2004) New digital geographies: Information, communication, and place. In *Geography and technology* (pp. 155-176). Springer, Dordrecht.