Smart cities and participatory planning: A cautionary comparison

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Abstract: This paper critically explores the humanitarian promises of both smart cities and participatory planning in their various iterations, seeking to clarify a way forward for urban planning that incorporates technology in service of alleviating – rather than exacerbating – existing societal inequities. To do so, the paper will first outline a brief history of smart cities and describe the wide array of definitions that have been applied to them, then discuss points of concern regarding the past and future consequences of a smart city approach to urban planning. The paper will then propose participatory planning as a tentatively more equitable alternative to smart cities, highlighting case studies in the approach that have succeeded in centering and empowering community residents. However, in order to caution against the very real possibility of the participatory planning approach functioning in similarly exploitative ways as the smart city approach, the paper will also present participatory planning projects that have fallen short of centering and/or empowering community residents. The paper will conclude by suggesting the foundations of an urban planning framework that avoids the pitfalls of the smart city approach while maintaining the most promising aspects of the participatory planning approach.

Keywords: Smart cities, Urban planning, Infrastructure

Introduction

In the past decade, two distinct approaches to urban planning have grown in influence alongside one another: the *smart city* approach, and the *participatory planning* approach. Broadly speaking, the smart city approach relies on public-private partnerships to build – sometimes from the ground-up – urban areas which use the data collection of residents' everyday actions to drive algorithmic infrastructure processes and decisions. Also broadly speaking, the participatory planning approach integrates information and communication technologies (ICTs) into various aspects of urban life with the goal of empowering community residents (as cited in Staffans & Horelli, 2014) to collectively determine the operations and development of the places and spaces they inhabit (Gurstein, 2014). While each of these working definitions are actively contested and operationalized in a wide variety of ways, common to all interpretations of both approaches is a promise of bettering the daily lives of city residents on individual and communal levels.

This paper critically explores the humanitarian promises of the smart city and participatory planning approaches in their various iterations, seeking to clarify a way forward for urban planning that incorporates technology in service of alleviating – rather than exacerbating – existing societal inequities. To do so, the paper will first outline a brief history of smart cities and describe the array of definitions that have been applied to them, then discuss points of concern regarding the past and future consequences of a smart city approach to urban planning. The paper will then propose participatory planning as a tentatively more equitable alternative to smart cities, highlighting case studies in the approach that have succeeded in centering and empowering community residents. However, in order to caution against the very real possibility of the participatory planning approach functioning in similarly exploitative ways as the smart city approach, the paper will also present participatory planning projects that have fallen short of centering and/or empowering community residents. The paper will conclude by suggesting the foundations of an urban planning framework that

avoids the pitfalls of the smart city approach while maintaining the most promising aspects of the participatory planning approach.

Smart cities

History and definitions

Incorporating ICTs into urban planning has a long history, beginning with the "wiring" of cities during the spread of cable television and telecommunications-driven public services (Viitanen & Kingston, 2014). One of the key markers in this trajectory was the "smart growth" strategy of the 1980s' New Urbanism movement, which encouraged the use of ICT-based architecture and industry to address the economic, spatial, social, and ecological issues present in modern cities (Söderström, Paasche, & Klauser, 2014; Hollands, 2008). The conceptualization of a city run on fully networked infrastructure driven by resident data, however, did not develop until the mid-1990s when the late architect William Mitchell founded the Smart Cities research group at the MIT Media Lab (Allwinkle & Cruikshank, 2011; Sadoway & Shekar, 2014). During this period, a number of cities labeled themselves as "smart" simply for implementing ICT infrastructure, developing mechanisms of e-governance, or attracting high-tech industries to foster economic growth. Three cities, however – Adelaide, Australia, and Cyberjaya and Putrajaya, Malaysia – were either planned or re-planned as autonomous urban areas running entirely on optimized automation and machine learning (Söderström, Paasche, & Klauser, 2014).

About a decade later, the smart city approach experienced a renaissance of sorts as private IT companies increased their interventions in the public sector amidst the 2008 financial crisis. At the head of this tech sector intervention was IBM, whose then-CEO Sam Palmisano gained significant media traction by arguing that the world's cities must invest in technological infrastructure in order to gain economic efficiency and resilience. Three years later in October 2011, IBM registered the term "smarter cities" as a trademark, though that action did little to prevent other commercial players – such as General Electric, Cisco Systems, Hitachi, and Siemens – from influencing smart city approaches to urban governance (Söderström, Paasche, & Klauser, 2014). And influence they have: a 2014 report commissioned by the European Parliament shows that 240 – over half – of EU cities with over 100,000 residents have implemented or are planning to implement varying degrees of smart city infrastructure, including open data portals, e-commerce, networked transportation, and ICT-enabled energy grids (Millard, 2014). Other international examples of urban areas incorporating smart city technologies into their operations include San Diego, United States (a "City of the Future"); Toronto, Canada (in partnership with Google's sister company Sidewalk Labs); Singapore (under its IT2000 plan to create an "intelligent island"); Bangalore, India (self-proclaimed as the country's own Silicon Valley); and Brisbane, Australia (focusing on tech-driven environmental sustainability), to name a few (Hollands, 2008; Scola, 2018).

The number of cities describing themselves as smart is almost as large as the number of definitions for the smart city. Hollands (2008) contends that a city's "smartness" must be based on something more than its incorporation of ICTs into urban planning processes, for such incorporation has been standard practice in cities for nearly four decades now. Yet, an adequate definition of the smart city phenomenon cannot exist solely in negative terms. Hollands continues on to argue that the key element of a smart city is its use of digitally networked urban infrastructure – including transportation, housing, public services, and business services – as a means to enable socioeconomic development and environmental sustainability. Similarly, Komnino's (2008) oft-cited definition of the smart city focuses on the embedding of ICTs in urban areas in order to transform life and work to facilitate the bringing together of residents for purposes of "innovation" and "problem-solving" (as cited in Allwinkle & Cruikshank, 2011). Another definition formulated by Harrison et al (2010)

proposes three pillars of the smart city: *instrumentation*, enabling the collection of resident-generated live data through a variety of inconspicuous electronic devices; *interconnection*, meaning the integration of those data into computing platforms across city services; and *intelligence*, referring to the analysis and optimization of these data in order to inform urban operational decisions (as cited in Chourabi et al, 2012). Washburn et al (2010) and Dirks and Keeling (2009) put forth narrower definitions, understanding the smart city respectively as a collection of computing technologies applied to critical urban infrastructure, and as the organic integration of digital systems across urban sectors (as cited in Chourabi et al, 2012). Finally, offering definitions that are shorter, vaguer, and not necessarily dependent on the technological networking of urban areas, the Natural Resource Defense Council (n.d.) and Toppetta (2010) contend that smart cities are those which improve the efficiency, sustainability, equitability, and livability of urban settings (as cited in Chourabi et al, 2012).

It is this paper's contention – in line with the work of Greenfield (2013); Gurstein (2014); Hollands (2008); Sadoway & Shekar (2014); Söderström, Paasche, & Klauser (2014); Staffans & Horelli (2014); and Vanolo (2014) – that embedded in this multiplicity of smart city definitions is a set of common assumptions about the nature of the problems that modern cities face (Hollands, 2008). Further, this paper contends that these assumptions primarily serve not the residents of cities, but the "limited political agenda of high-tech urban entrepreneurialism" (Sadoway & Shekar, 2014). In other words, while the ontological specificities of smart cities vary between definitions, these definitions all share a promise of neoliberal "solutions" to deep-seated systemic inequities that offer the most rewards – in the form of influence and profit – for the IT companies at the helm of smart city initiatives. This framework of tech-driven neoliberal urban planning can have profound consequences for city residents and the inequities under which they already live.

Concerns: The exacerbation of existing inequities

Integral to the rhetoric and mobilization of smart cities is an assertion that alleviating the poverty, polarization, and ecological crises that the residents of modern cities face is simply a matter of perfecting urban design and management (Gibbs, Krueger, & MacLeod, 2013). This type of "silver bullet" strategy towards addressing societal inequities is common amongst the self-proclaimed philanthropists of the tech industry's upper echelon.

For example, in July 2018 Elon Musk – co-founder and CEO of SpaceX, Tesla, and Neuralink – tweeted his "commitment that [he] will fund fixing the water in any house in Flint that has water contamination above FDA levels" (Barrett, 2018). Musk, of course, was referring to the water crisis that the residents of Flint, Michigan have been experiencing since 2014 when insufficient water treatment led to the leaching of lead from water pipes into the drinking water, exposing over 100,000 residents of the 57-percent Black population to toxic lead levels (Flint water crisis, n.d.). With a net worth of $20.8 billion (Elon Musk, n.d.), Musk could easily provide the city of Flint with the estimated $55 million it will need to replace all of its old lead water pipes (Milman, 2018). However, even this hypothetical charitable action would not address the much more deeply rooted economic consequences of racism, which many (The Editorial Board, 2016; Egan, 2017; Merchant, 2017) contend led to the federal and state governments' decision to change Flint's water source from Lake Huron and the Detroit River to the cheaper Flint River (Flint water crisis, n.d.).

Musk's approach to the Flint water crisis is but one of innumerable cases where – in the neoliberal era, spearheaded politically in the early 1980s by U.S. President Ronald Reagan and UK Prime Minister Margaret Thatcher – services that have historically been public through federal government funding (such as access to clean water) are becoming increasingly privatized, and issues that require systemic solutions are taken up by for-profit interests. One key aspect of this privatization that pervades smart city discourse is the deregulation of corporations that purport to tackle social problems and improve ordinary people's lives, with talk of "removing legal and regulatory barriers" due to the importance of the "smooth implementation of smart city initiatives" (Chourabi et al, 2010). And yet, such deregulation often exacerbates the very problems that private actors attempt to solve, or

creates new problems altogether. For example, between January and May 2018, five taxi drivers in New York City took their own lives out of self-proclaimed despair from the demoralization and economic hardship they faced as ICT-based ride-hailing companies like Uber and Lyft have pushed out competition from the 91-percent immigrant population making up the city's professional driving workforce (Salam, 2018). A deregulatory measure largely responsible for this high-tech monopolization of NYC's driving industry is the legal permission given by the city's Mayor Office and Governor Andrew Cuomo to ride-hailing companies to put an unlimited number of vehicles on the roads, whereas the number of taxi medallions granted each year remains regulated (Kadirgamar, 2018). As such, though ride-hailing companies purport to "help transform cities into safer, more efficient, and more beautiful places" (Uber, 2019) and "deliver significant environmental benefits" (Lyft, 2019), the influx of Uber and Lyft vehicles in NYC and elsewhere is not only progressing in the opposite direction of the latter goal (Kerber, 2019) but has created a new problem of financial difficulties and severe hopelessness for taxi drivers.

Uber's response to the U.S.' first legal regulation of ridesharing companies clarifies the industry's prioritization of maintaining its free-agent status over the wellbeing of real people living in urban areas. In September 2019, California legislators approved a bill known as AB5, which requires ridesharing companies to treat contract workers as employees and consequently grant them access to basic worker protections like a minimum wage and unemployment insurance (Conger and Scheiber, 2019). Uber responded to the new law by not only flat-out refusing to abide by it, but by arguing that the work of drivers is "outside the usual course of Uber's business" – which it went onto define as "a technology platform for several different types of digital marketplaces" (West, 2019). In essence, Uber was denying the role of actual people in its business operations, and attempting to absolve itself of responsibility in exacerbating systemic poverty and worker exploitation. This misanthropic response does not inspire confidence in the company's claims of bettering cities for the benefit of the people living in them, or of alleviating the structural challenges of urban life.

The cases above exemplify Vanolo's (2014) assertion that market-based approaches to the systemic inequities that materialize in cities often "mask other perspectives, such as the possibility to rethink the capitalist system in entirely different ways." As Gibbs, Krueger, & MacLeod (2013) note, while the 2008 sub-prime mortgage crisis and subsequent global recession could have prompted a "fundamental questioning of market-based approaches" to alleviating urban issues, it instead led to the intensification of neoliberal urban planning frameworks – such as that of the smart city – dependent on corporation-driven privatization and deregulation at the expense of resident wellbeing. Of course, given the massive profits – over $300 billion in global investments by 2030, according to the UK's Technology Strategy Board (Viitanen & Kingston, 2014) – that multinational tech corporations stand to gain from smart cities, it's not difficult to see why these entities are exerting their power to not only shield their preferred market-driven strategies from mainstream criticism, but to present them as the most effective solutions to the inequities wrought by financial crisis. The specific dimensions and consequences of this neoliberal smart city model are discussed below.

Manufacturing crisis

One explanation for the aforementioned variety of smart city definitions is that, without a "well-defined conceptual core," the smart city allows its proponents to "use the term in ways that support their own agendas" (Vanolo, 2014). With this ontological flexibility, not only can corporate stakeholders craft a model of urban planning that offers them optimal influence and profit, they can also present the problems of cities in ways that urgently mandate ICT industry solutions (Söderström, Paasche, & Klauser, 2014). Söderström, Paasche, & Klauser invoke Callon's (1986) seminal paper on "obligatory passage points" ("OPPs," hereafter) to lend theoretical basis to this corporate problematization of cities. Starting from the notion of an OPP as a place, institution, practice, or procedure that – through various material and conceptual constructions – becomes unavoidable, Callon describes the creation of OPPs

happening through "the definition of the problem that needs to be solved" by "actors [who] will be in a position to solve the problem."

To demonstrate the ways ICT firms have discursively constructed themselves as "key actors in the development and implementation of […] urban management solutions" through smart cities, Söderström, Paasche, & Klauser use IBM's Smarter Cities campaign as an example. As these scholars argue, IBM's website presents its Smarter Cities as "utopian mirror images" of traditional urban landscapes through a "before-after demonstration" of urban problems where such issues as traffic, crime, poverty, and waste are portrayed as old photos in an exhibition called "Before the City Got Smart." The effect of this demonstration is twofold: to depict the current status of cities as "grim" and "close to a fatal breakdown," and to imply that – in the fictitious present of the ubiquitous smart city – the supposed breakdown has been reversed. To continue the IBM example: the company commissioned a series of studies released in 2009 and 2010 which – unsurprisingly – identified business as a "core system" of smart cities, the capacity for which included the inclusion of ICT firms and a strong networked technology sector (Chourabi et al, 2010). IBM's marketing strategy for their Smarter Cities campaign offers a clear picture of how major players in the ICT industry have problematized the city and positioned themselves as key players in developing solutions for their own influence and profit.

Myths of neutrality and infallibility

IBM's commissioning of studies to support its own business ventures raises another dimension of concern regarding the smart city: the mythological positioning of smart city proponents as neutral and, relatedly, their solutions as infallible. Behind the ICT industry's broad motivations is a desire to eradicate human error, with a dichotomous assertion of technology as reliable and people as the cause of uncertainty (Viitanen & Kingston, 2014). Implicit in this assertion of the messy and chaotic nature of cities is an anxiety regarding the types of people who have historically lived in urban centers – namely, poor people of color. This racist desire to "tame" disproportionately Black and brown city residents is clear in such existing urban policies as NYC's "broken windows" policing, which targets low-level offenses like marijuana possession for arrest with the aim of "cleaning up" disorderly behavior to prevent more serious crimes (Chen, 2018). As highlighted through the examples below, the racial bias implicit in existing non-ICT-based urban policies like broken windows is unlikely to disappear after algorithms have been integrated into them. However, this very argument that algorithms can make unbiased decisions free of human error is key to the growth of smart cities, which attempt to base urban infrastructural processes on algorithms due to their perceived superiority over planning methods directly involving humans.

Greenfield (2013) employs a statement by Siemens – a major vendor working on smart cities – to elucidate the urban technological determinism invoked by the ICT industry: "Several decades from now cities will have countless autonomous, intelligently functioning IT systems that will have perfect knowledge of users' habits and energy consumption, and provide optimum service." As Greenfield notes, Siemens' statement implies three fallacious assertions: that the world is "perfectly knowable" through technical systems, that one technological solution can be universally applied to each individual and collective human need, and that this ICT-based solution can be implemented without bias or distortion. Greenfield continues on to correctly identify that, "[h]owever thoroughly Siemens may deploy their sensors," the company will only ever be able to capture and algorithmically operationalize those qualities of human existence that are numerically quantifiable or amenable to modeling. Additionally, Greenfield points out that it's wholly unreasonable to assume that even those limited quantifiable qualities could be technologically sensed with perfect accuracy, seeing as the same humans whom ICT firms hold responsible for making the world an undesirably uncertain place are those not only generating the data, but those creating the algorithms and hardware that will be used to do the sensing.

To concretely push back against smart cities' implicit claims of scientific objectivity, Greenfield raises a number of examples. One example is the simple fact that values for air

pollution in a given location can vary depending on the height at which a sensor is mounted by only a few feet. Another more in-depth example is that of the RAND Corporation's intervention into the management of NYC in the 1970s. Chartered with the goal of translating former U.S. Secretary of Defense Robert McNamara's "systems analysis" management strategy from the Pentagon to an urban setting, the NYC-RAND Institute was launched in 1973. Its first project was to use FDNY incident response-time data to algorithmically determine the optimal distribution of fire stations. RAND made its first methodological flaw in choosing as the basis for its model the time firefighters arrived at the scene of the fire rather than the time at which they actually began fighting the fire, then compounded that flaw by refusing to acknowledge NYC's ubiquitous traffic as a factor in response time. Compounded further by racism, RAND's recommendations led to the decommissioning of fire battalions in some of the city's most vulnerable sections, resulting in the entirety of the South Bronx – a disproportionately Black and Puerto Rican borough – as well as large swaths of Manhattan and Brooklyn burning to the ground. Though algorithmic technology has advanced considerably since the 1970s, RAND's devastating foray into urban planning serves as a lasting example of the acute fallibility of ICT-based systems that ignore the role of human behavior in both their creation and implementation.

In addition to the examples Greenfield provides, the fast-growing system of predictive policing further illustrates the consequences of an algorithm-driven model of urban policy that views itself as operating independently of existing social inequities. Predictive policing uses algorithms to inform decisions about who is likely to commit a crime, become a repeat offender, or be the victim of a crime. A significant element of predictive policing is a process known as "risk assessment," wherein an algorithm assigns to an incarcerated individual a score that purports to predict the likelihood that this individual will commit another crime. Proponents of risk assessment claim that the process can foster a less punitive legal system by "correct[ing] for the subconscious bias of police, judges and probation officers" (Barry-Jester et al, 2015). However, a 2016 analysis by ProPublica found that, through the risk assessment process, Black defendants were 77 percent more likely than white defendants to be labeled a higher risk of committing a future violent crime and 45 percent more likely than white defendants to be labeled a higher risk of committing a future crime of any kind (Angwin et al). Behind risk assessment proponents' optimistic claim is the perceived neutrality of algorithmic tools, including risk assessment software that asks such supposedly race-neutral questions as "what is your highest level of education" and "do you have a job." But as ProPublica's analysis demonstrates, because we live in a society marked by racial inequities in education and employment, and because the tools were built by people who themselves are unlikely to be free of bias, ICT-mediated predictive policing processes like risk assessments have little promise of changing a U.S. incarceration system that disproportionately affects Black people.

Clearly, the turning over of urban management to an algorithmic toolset is a decision not immune from human error or sociopolitical underpinnings, and can have profound consequences for city residents. Of these consequences, one becoming ever more ubiquitous is the surveillance-driven influence that powerful algorithmic entities are gaining over society at large.

Privacy and surveillance

In early 2018, outrage ensued when it was revealed that Cambridge Analytica – a political data firm hired by Donald Trump's 2016 presidential campaign – had gained access to the private information of over 50 million Facebook users (Granville, 2018). While Facebook's facilitation of data-based political influencing is of course egregious, it is also indicative of a fast-growing economic model that Zuboff (2019) calls "surveillance capitalism." Inherent to this model is a process by which ICT companies – led by Google and Facebook, though increasingly joined by Microsoft, Amazon, and others – claim people's experiences and inner lives as "free raw material for hidden commercial practices" like behavior prediction and advertisement targeting. Zuboff devotes a section of her 2019 theoretical tome to smart cities,

calling the city "a petri dish for the reality business of surveillance capitalism." Indeed, with their dependence on continually gathered resident data through ICT technologies that "weave themselves into the fabric of everyday life until they are indistinguishable from it" (Crang & Graham, 2007), smart cities offer the potential for immense informational knowledge and control for whomever has access to such vast swaths of data.

In addition to ICT firms, another entity that has historically been interested in the data-driven technological networking of cities is the U.S. military. Since the events of September 11, 2001 and the Islamophobic War on Terror (Kundnani, 2015) launched swiftly thereafter, the U.S. military has characterized cities and urban infrastructures as new "battlespaces" in which to identify, track, and pursue "lurking insurgents, terrorists, and other targets" in what is presented as a dual effort to "securitize homeland cities" and "counter insurgencies within war-zone cities" (Crang & Graham, 2007). A key aspect of this urban "terrorist tracking" is the development and deployment of ICT-based sensing and surveillance systems, such as the solar-powered "prototype pervasive processors" known as "smart dust" that were released in 2001 in California's Bay Area to communicate environmental data to the Pentagon. One programmatic example of the ways in which ubiquitous computing technologies in urban settings are being portrayed and deployed as key mechanisms through which to wage the War on Terror is the Combat Zones That See (CTS) project. Launched by the US Defense Advanced Research Projects Agency (DARPA) at the start of the U.S. invasion of Iraq in 2003, CTS aims to embed thousands of video cameras in urban areas in the U.S. and abroad to provide on-the-ground algorithmic sensing of individual city residents and motion-pattern analysis across whole cities for military operations. Unsurprisingly given the collaborations between the U.S. military and local law enforcement – such as the 1033 Program that allows the transfer of arms and ammunition from the Department of Defense to state agencies (Wofford, 2014) – this type of mechanistic targeting of city residents is also being employed in cities across the U.S. to the effect of exacerbating already egregiously disproportionate incarceration rates of Black people (Stein, 2018).

Harkening back to the corporate narrative of cities being problematically unpredictable, Daniel Doctoroff – chairman and CEO of Sidewalk Labs, responsible for the implementation of Toronto's smart neighborhood Quayside – responded at a roundtable series for Quayside to a question about data management by saying, "There are cameras everywhere anyway. There's chaos out there. Together we can bring order" (Scola, 2018). Indeed, cameras have become ubiquitous parts of the modern city (Holder, 2018), to the effect of facilitating the racist targeting efforts of the U.S. military and law enforcement agencies in the name of bringing "order" to the "chaos." Smart cities represent an extension of such efforts, and could provide even greater levels of control to the institutions of the U.S. state that purport to act in the interests of national security through the wholesale monitoring of entire populations.

Gentrification

In addition to offering an important venue through which the U.S. state can ramp up its surveillance of society's most vulnerable, smart cities threaten to exacerbate existing societal inequities through gentrification – the displacement of longtime and/or low-income residents as an urban area becomes prohibitively expensive due in large part to the increased influence of business interests. While the smart city approach often highlights the economic successes, innovation, and urban regeneration of the cities that have become creative tech centers, what is obscured are the rapidly rising rents, evictions, and protests by existing residents that are also taking place in these cities (Hollis, 2014). For example, in 2012 San Francisco's late Mayor Ed Lee hailed the city as the "innovation capital of the world" due to the tech industry's prominence there, but failed to link the presence of multinational ICT firms to San Francisco's status as the U.S. city with the fastest-growing wealth gap and the highest housing cost in the country. Additionally, little has been said about the sizable secondary workforce required in urban tech centers and smart cities to service the dining, entertainment, and leisure desires of ICT professionals (Hollands, 2008). As such, while much of the discourse surrounding smart cities promises a universal raising of access to urban information

technology, education, governance, public services, and more, what has been happening in practice is the creation of "dual cities" where wealthy ICT professionals and poor "secondary" workers live in drastically different conditions (Hollis, 2014).

One clear example of the consequences of smart city-driven gentrification is the effect that the creation of the "coworking capital of the world" in Downtown Los Vegas has had on existing residents (Hollis, 2014). By spending $200 million of his own personal fortune, Zappos.com CEO Tony Hseih developed a "supposedly lifeless area" about a mile north of the Strip into an entrepreneurial tech hub. In doing so, Hseih disappeared the area's existing community—such as shopkeeper Hassan Massoumi who said of Hseih's urban creation: "My wife and I came here when no one else would. For 10 years, we worked seven days a week – not one day of vacation. Then one day, Tony Hsieh's people tell us to get out of there." Similarly, the regeneration of London's Shoreditch district into "Tech City" has displaced local residents as multinational tech corporations like Google, Cisco, McKinsey, and Intel have come to dominate the area (Agyeman & McLean, 2014). Home in the 1980s and 1990s to struggling artists and venues that catered to marginalized groups (such as a well-known jazz club and gay bar), Shoreditch since the mid-2010s has seen the consistent pricing out of its longstanding residents in large part due to tech-based commercial gentrification (Anthony, 2018).

In exploring the future of tech-augmented urban planning, it would be ahistorical and irresponsible to ignore the gentrification that has typically come with the development of urban hubs for technological innovation. Unfortunately, the way in which smart cities have been discussed in the mainstream and mobilized thus far has done little in the way of alleviating gentrification-related concerns regarding their implementation.

Green capitalism

A final way in which smart cities fall short of and often achieve the opposite of their humanitarian promises is through their outsourcing of environmental resilience to the ICT sector, thus increasing the power that corporate actors – largely responsible for the continued acceleration of global climate change – have to promote their pro-growth interests (Viitanen & Kingston, 2014). Though smart city discourse claims to use "technology to increase sustainability and to better manage natural resources" (Chourabi et al, 2010), this paper contends – in line with Viitanen & Kingston (2014) – that environmental values are incompatible with a capitalist economic paradigm that depends on the continued plundering of natural resources for unceasing profit accumulation (Williams, 2010). For example, despite claims of the inherent environmental superiority of digital technologies over "dirty" energy sources like fossil fuels, the physical data centers required of ICT firms like Facebook to store massive amounts of consumer information use more than 90 billion kilowatt-hours of electricity per year generated by roughly 34 giant coal-powered plants (Danilak, 2017). Given the dominance of data in the smart city paradigm, the amount of energy needed to store an exponentially increased amount of digital information would be vast, and such energy-heavy interests are likely to continue winning out over practices of environmentally responsible urban planning given the capitalist paradigm in which smart cities operate.

The environmental consequences of ICT infrastructure can also intersect with and exacerbate economic inequities, such as in China where in 2005 98 percent of those working in the enormous e-waste recycling industry were employed in the informal sector, where they were offered no health insurance, no unemployment or pension plans, little professional training, and very low salaries (as cited in Viitanen & Kingston, 2014). Not only is it likely that the "smarter" a city gets the more e-waste it will create, it is also likely that the inequities driven by two-tiered employment between workers who implement ICTs infrastructure in smart cities and workers who deal directly with the environmental consequences of that infrastructure will only widen.

This paper has so far argued that because of the neoliberal paradigm in which it operates, the smart city approach to urban planning both exacerbates existing societal inequities and facilitates the creation of new ones. Particular dimensions and consequences of the smart city

approach that achieve such exacerbation and facilitation include the manufacturing of urban crises that can only be solved through "silver bullet" for-profit measures, the presentation of those for-profit measures as apolitical and infallible, the increased surveillance of ordinary people to serve the corporate and military interests of the U.S. state, the tech-driven gentrification of cities, and the continued plundering of natural resources in the name of profit growth. All of these aspects of a smart city approach to urban planning serve to disprove the claims of proponents that the approach will alleviate the inequities that pervade modern urban spaces.

Participatory planning

Some authors (Agyeman & McLean, 2014; Allwinkle & Cruikshank, 2011; Chourabi et al, 2012; Hollands, 2008; Staffans & Horelli, 2014) present their own valuable critiques of smart cities, suggesting methods of reforming the approach so as to alleviate their particular concerns. However, it is this paper's contention that the smart city approach is inherently neoliberal – and thus inherently exploitative – due to its dependence on public-private partnerships, its for-profit strategy of eradicating deeply embedded historical inequities without taking on the broader systems of oppression that caused them, and its fundamental operation via the constant collection and commercial mobilization of resident data. For these reasons and their particular dimensions and consequences discussed above, this paper suggests doing away with the smart city approach to urban planning in favor of an approach which employs technological means as but one tool of centering city residents in shaping the places and spaces they inhabit, and empowering those residents to collectively push back against the systems of oppression responsible for the inequities – whether economic, racial, ecological, or otherwise – that they experience on a daily basis.

One approach to tech-augmented urban planning that has the potential to achieve these goals of resident justice is that of participatory planning. Drawing from theoretical strands in information science and human geography, this paper's interpretation of participatory planning is an urban planning approach which studies, designs, and practices the application of ICTs in cities as one tool for the individual and collective empowerment of residents (as cited in Staffans & Horelli, 2014). Central to this interpretation are the fields of *community informatics*, which focuses on how communities are employing ICTs to support their "quests for well-being" (Gurstein, 2014); *neogeography*, which draws upon access-focused principles of modern librarianship and information science in an attempt to democratize geographic information systems (GIS) through a collection of "non-expert" practices, tools, and users (Byrne & Pickard, 2016); and *Public Participation GIS (PPGIS)*, which seeks to balance technical knowledge with community experience and need in the planning processes of particular urban contexts (Baibarac, 2014). These approaches all speak to an acknowledgment that has been growing in popularity among certain groups of urban planners since the 1992 meeting of the World Commission on Environment and Development and the Rio de Janeiro Earth Summit. This is the acknowledgment that – in order to foster both environmental and social sustainability in urban contexts – planning and policies must revolve broadly around dialogue between public stakeholders at various levels, and specifically around the thoughts and actions of residents who transform cities through their everyday practices.

Participatory planning alternatives to smart cities can be found in Sadoway and Shekar's (2014) proposal for "smart citizenship" and Gurstein's (2014) proposal for "smart communities." Though I disagree with the maintenance of the term "smart" in these proposals due to its framing of existing communities and residents as somehow lacking in intelligence, both alternative approaches locate non-institutionalized power in and encourage the transfer of institutionalized power to community residents. For example, smart citizenship comprises the "engage[ment] of citizens in complementary digitally mediated and face-to-face processes that respect local knowledge systems" in service of "active and critically reflective civic-cyber debates" about "ICT praxis in relation to local needs" and "technological control" (Sadoway & Shekar, 2014). Smart communities take a similar approach, outlining an

explicitly anti-neoliberal model that emphasizes citizen involvement and ICT mediation in the delivery of public services, venues for public scrutiny of municipal governance and infrastructure, and availability of transparent information regarding budgeting, housing, health services, and more (Gurstein, 2014).

The following section offers real-world case studies grounded in the fields of community informatics, neogeography, and PPGIS which provide starting points for possible models of a participatory planning approach to tech-mediated urban planning that centers and empowers residents.

Exemplary case studies

The first example of participatory planning comes from Gordon and Manosevitch (2010), who through a pilot project called Hub2 utilized the online virtual world Second Life to augment community deliberation in the planning of a neighborhood park in Boston, Massachusetts. Hub2 revolved around the process of "augmented deliberation," in which a group of people deliberates in a face-to-face setting while being simultaneously immersed in a virtual environment. In a series of 90-minute sessions, up to 15 Boston residents gathered in a local community center to collectively explore on laptops a virtual version of the neighborhood park being planned. Each participant was given a digital character that they could move around the virtual park space, and asked to verbalize their observations of how the space was set up with statements like "these paths need to be accessible," or "there needs to be sufficient foliage to act as a buffer…." For every observation the participants made, a design professional would immediately render a rough approximation to be added to the virtual space being explored. Participants were also asked to act out scenarios with their avatars as different types of people who might utilize the real-life park, such as an old man in a wheelchair, a small child, and a woman with a dog. The last 20 minutes of each session were reserved for participants to offer general commentary and notes on specific aspects of the park. All renderings, commentary, and notes were then saved as a "virtual sketch" and made available to the broader neighborhood community, including residents, architects, planners, and developers.

By "[t]ransforming plans and designs into inhabitable environments," the Hub2 project used virtual technology to empower community residents not only to evaluate proposed spaces, but have an active say in the way their urban spaces were being constructed. Indeed, in post-session interviews, participants expressed feeling that "they were not just talking, they were engaging with stakeholders in a way previously not possible," and that such stakeholders were "genuinely interested in their engagement." These testimonials suggest that, from their participation in Hub2, community residents would feel driven in the future to exert further sway on the urban processes they had previously felt were happening only around them instead of in conversation with them. However, as Gordon and Manosevitch note, though community residents felt empowered through the augmented deliberation of Hub2, the professionals involved in the park's planning expressed a common attitude of "not be[ing] prepared to yield much control to non-professionals." This challenge highlights the presence of local power structures and their ability to facilitate the continuation of systemic inequities, consequently speaking to the need for participatory planning to holistically encompass multiscalar urban phenomena in its design and implementation. Further, the challenge of the significant financial, technical, and physical resources required of the Hub2 project demonstrate the additional need for participatory planning to challenge the broader systemic oppressions that limit such resources in many urban areas (usually disproportionately along lines of race, gender, immigration status, and other dimensions of identity).

Another exemplary case study is the work of Transparent Chennai (TC), a non-profit group based in Chennai, India that was launched in 2009 by a team of multidisciplinary researchers in partnership with community residents to take actions to address such urban infrastructural concerns as solid waste management, public toilet availability, and pedestrian safety (Sadoway & Shekar, 2014). Through community surveys, PPGIS efforts, and face-to-face meetings and interviews, TC works at the grassroots with lower-income residents of

Chennai to pressure public officials into addressing deficiencies in access to public toilets and urban walking routes. For example, TC has set up an online PPGIS portal in which Chennai residents can aggregate and visualize urban infrastructural datasets by building their own GIS-based maps with layers like "toilet deficiencies" and "safe/unsafe routes for walking." TC has also conducted numerous participatory interactive design workshops where Chennai residents can voice their needs and desires regarding sanitation and pedestrian issues and design, which TC then collects in reports used to pressure local public officials. Through these efforts, TC has taken a bottom-up, tech-augmented approach to participatory urban planning where Chennai residents can raise concerns and ideas to their municipal government and collectively draw awareness to the inequities that concentrate public toilets and walkable routes in wealthier neighborhoods.

The example of TC provides particular guidance regarding urban planning efforts that involve the collection of resident data. In contrast to the surveillance-driven data collection of residents' everyday movements in the smart city, TC operates on a purely opt-in model where residents can choose to provide feedback to Chennai's institutions of urban governance and in the process reveal as much or as little about themselves as they like. This model prioritizes resident autonomy and trusts their on-the-ground expertise, rather than assuming from a corporate vantage point that market drivers are better indicators of resident need than are the experiences of residents themselves. However, like the above case of Hub2, TC's complex undertaking highlights the need for more broadly systemic initiatives to address issues of funding, labor, and poverty that pressuring the Chennai municipal government for more public toilets cannot solve alone.

Cautionary case studies

In addition to the above case studies in community informatics, neogeography, and PPGIS which work to center and empower urban community residents in meaningful, tech-augmented ways, there are also examples of projects attempting to do similar work but whose methods and outcomes are more in line with the neoliberal smart city approach discussed above. Such case studies are important to highlight in order to make explicit the assumptions that can result in exploitative urban planning even amongst well-meaning parties, and clarify a way forward for participatory planning.

These cautionary case studies exemplify the concerns raised by Burrows and Ellison (2004) and Byrne and Pickard (2016) that GIS and neogeography, respectively, each have the potential to either alleviate or exacerbate existing societal inequities depending on how and by whom the practices are mobilized. As Burrows and Ellison (2004) note, though the increasing accessibility of GIS has led to such positive community outcomes as those of Hub2 and TC, it also provides the means by which groups of relatively high sociopolitical status can identify and negotiate geographic space across social dimensions with the effect of further widening gaps between rich and poor. For example, wealthy parents in urban areas like London and New York have already been using GIS-based tools to identify "good" schools for their children to attend based on racialized statistical dimensions like crime and poverty rates. Byrne and Pickard (2016) also make an important critical contribution by noting that participation rates in urban governance among community members vary with bias towards high-income residents such that access to ICTs does not guarantee participation or equity. However, the authors correctly note that access is a "precursor" for both participation and equity, "and is therefore necessary for breaking down barriers." Additionally, Byrne and Pickard's critique further highlights the need for participatory planning approaches to address issues of systemic inequity in conjunction with efforts to alleviate smaller-scale urban concerns. These critiques are important to keep in mind when evaluating and mobilizing participatory planning efforts.

One example of a PPGIS effort that falls short of centering and empowering community residents is that described by Balassiano and Seeger (2014) regarding their work with a "rural new gateway" community of primarily Latino residents in Perry, Iowa. Defining rural new gateways as U.S. communities that grew in the 1990s by more than 100 percent through

increases in immigrant populations, Balassiano and Seeger explore the possibilities of utilizing PPGIS to share knowledge about community resources among foreign-born residents in an effort to alleviate their segregation from residents born in the U.S. The specific method the researchers employ is cognitive mapping, an ICT-mediated participation tool that visually depicts how people mentally acquire, organize, and store information. Though Balassiano and Seeger draw upon previous studies which suggest that "[c]ognitive mapping can […] help people gain control over their own lives," in their findings section they make the definitive assertion that "the workshop approach empowers individuals by facilitating the sharing of community-specific information" without citing any empirical evidence – survey results or participant interviews, for example – that such an observation came directly from community residents. This seemingly ill-informed assertion is concerning given that it hints at an obscuring of resident input to uphold a research agenda. Additionally, it suggests a dictation of what mechanisms residents need to feel empowered and involved in their communities, evoking troubling similarities to assimilation rhetorics used throughout history to force marginalized residents into complicity with the local status quo. The researchers engage in a similar dictation when they argue for the necessity of their study via the assertion that, "Latinos are engaged in local affairs and are committed to community betterment, but do not regularly work to influence decisions made by elected leaders or governmental agencies." In so arguing, Balassiano and Seeger paternalistically imply that by not undertaking lobbying or electoral activities, Perry's Latino residents are not adequately participating in public life and by extension are "engage[d] in passive and active self-segregation." As such, the study takes a top-down approach to tech-augmented urban planning that falls prey to the similarly patronizing – though, admittedly, not surveillance-driven – approach of smart cities.

A second PPGIS case study which raises concerns that should be considered in future participatory planning efforts is that of the "urban spacebook" experimental co-design approach undertaken by Baibarac (2014) in Dublin, Ireland. In an attempt to "stimulat[e] greater participation in the democratic process" of Dublin's municipal governance, Baibarac employs three technospatial experiments with city residents: the creation of a written and visual diary of participant movements throughout the city over the course of one week, the creation of a digitized version of these diaries through the tracking of participant movements with a GPS smartphone app, and the creation of a collective mapping database where participants could visualize their individual and collective movements. While participant interviews indicated an at least temporarily heightened awareness of their knowledge and daily use of Dublin, as well as the formation of a common basis upon which to discuss their urban area, the constant tracking of residents' everyday movements harkens back to the ubiquitous data collection at the heart of smart cities. In this study participants *opted into* tracking their own movements, but the model of day-to-day tracking could set a dangerous precedent for similar municipal initiatives that – rife with such data – make themselves open to exploitation by entities whose interests are not in line with the empowerment of community residents. This possibility begs the question of whether it is ever appropriate for citizens' movements to be tracked on such a granular level by state – not to mention corporate – actors.

Next steps

This paper has attempted to clarify a path forward for a tech-augmented urban planning approach that utilizes ICT technology as one tool in centering and empowering community residents to undertake both city-specific and broader systemic efforts to shape their urban areas and address the structural inequities that manifest themselves in particular local contexts. To do so, the paper first laid out the particular dimensions and consequences of the inherently neoliberal smart city, arguing that despite proponents' promises of alleviating urban social issues, the smart city in reality has either exacerbated existing inequities or created new ones. Presenting participatory planning as a tech-mediated urban planning framework that could serve as an alternative to the smart city approach, the paper described both exemplary and cautionary case studies regarding the promises and perils of the participatory planning approach.

To conclude, the paper will summarize facets of tech-augmented urban planning that should be either avoided or encouraged in future efforts toward a resident-centered participatory planning.

Facets that should be avoided include the turning over of municipal governance to corporate ICT interests, the fallacious assumption that urban inequities will be alleviated through "silver bullet" measures that ignore broader societal power structures, the assertion that any urban planning measures are free from bias or political influence, the constant data collection of residents' everyday lives, the pricing out of existing residents through gentrification, and the "green capitalism" model of unceasing tech growth masquerading as environmental responsibility.

In contrast, facets that should be encouraged include the following, described in turn in further detail:

- *The centering of the knowledge, experiences, needs, and desires of community residents in urban decision making*. This process depends on the creation of effective feedback loops between residents, planners, and local governmental bodies. Some of these feedback loops can be created in the electoral arena, such as with community advocates running campaigns and winning local elections, and fostering strong collaborations between governmental bodies and urban planners. More importantly, these electoral feedback loops can be fostered by governmental bodies being responsive to their communities – whether city residents voice their opinions at the ballot box or in the streets – and not to corporate interests. Beyond the electoral arena, urban planners must be trained not to think of themselves as the experts in the design and content of cities, but as those in a position to implement solutions demanded either implicitly or explicitly by city residents – especially those most marginalized. Planners must foster public/professional feedback loops not only by asking residents to come to them with suggestions, but by conceptualizing themselves as residents and embedding themselves in the very community they hope to serve.
- *The empowerment of residents to challenge systemic forms of oppression that exist within and beyond their own communities*. In many ways, cities serve as microcosms of the inequities and socioeconomic challenges that pervade society at large. The residents, planners, and local governmental bodies of any one city will not be able to do away with broader oppressive forces, but they can work together to identify where those broader forces manifest themselves in a particular city. This process of local identification is itself a step in a more liberated direction – in acknowledging where inequities exist in a city, power can be reallocated and views of what happens in a city can be shifted. For example, if a Black person gets shot and killed by a police officer and community members stage a protest in the streets, instead of telling protestors that they should be responding differently or increasing the level of policing in the city to confront protestors, city stakeholders can recognize the broader forces of racism and police brutality that are coming to play in a local context. Such a recognition can then inform a community-centered response, and an involving of community members in the decision-making process. On the urban design side, residents must be afforded ample public space in which to congregate, organize, or otherwise use as they see fit without interference from surveillance or commercial activity.
- *The acknowledgment of the inherently political, non-neutral nature of urban planning decisions*. At base, planners and others in a position to facilitate change in urban areas must ask two questions that should guide their work: "Who asked for this?" and "How will it affect the lives of residents on various scales and timelines?" These questions become especially relevant when a corporate entity is asking for a level of urban influence. Residents, planners, and governmental bodies must all do the work of reading between the lines of supposed solutions to various urban challenges, applying special wariness to entities that promise "silver bullet" measures.
- *The collection of resident information through opt-in measures that do not constantly or inconspicuously track day-to-day movement*. The collection of resident information

is important and necessary in an urban context for many reasons, such as voter registration, education enrollment, and policy influencing. However, this collection must largely be opt-in, and – especially when the collection is mandatory for public safety and health – the data collected must be treated with the utmost care. Data collection based on constant tracking as well as with the involvement of corporate entities should be avoided.

- *The regulation of ICT firms entering urban areas coupled with measures of socioeconomic sustainability like rent control and affordable housing*. Cities must be responsive to the effects of the number and type of corporate entities doing business in an urban area, then correct for disproportionate effects with regulations and policy. These corrections can target corporate entities themselves with regulations, or provide safeguards for residents who face systemic threats like gentrification.
- *Additional regulatory measures for entities involved in energy-intensive industries with a promise of livable alternative employment for any residents currently working in such industries who may be laid off due to such regulations*. As climate change becomes an ever-growing existential threat to cities and humanity at large, urban areas can be at the forefront of transitioning to an energy-efficient and climate-friendly economy.

This group of measures to be encouraged can pave the way forward for a participatory planning approach to tech-mediated urban planning that avoids the exploitative nature of smart cities while centering and empowering community residents to make their urban spaces centers of true equity and participation.

While each of the six aforementioned measures are critical in slowing, halting, and/or rolling back the consequences of smart cities, they must be viewed holistically in order to achieve their full potential. What stems from that holistic viewing is the realization that, without the replacing of neoliberal capitalism with a system that prioritizes people over profit, cities will always be at the mercy of corporate interests – whether technologically mediated or not. Many of the reforms suggested above can be accomplished, at least in part, from within our existing neoliberal system of surveillance capitalism. But for a future city where residents need not defend themselves from the colonization of their inner lives in the name of market rates, we'll need a holistic restructuring of an exploitative economic system governing our cities and our world.

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