ASSESSING "INTELLIGENT" INVESTMENT:

The Smart City's Perpetuation of Neoliberal Urbanism

ANNA PONTING
Stanford University

While the smart city has recently emerged as a widely discussed urban planning model both in the policy and theoretical spheres, there is a remarkable lack of consensus on the term's definition, and even less on the model's implications. In general, the smart city is characterized by the extensive use of information and communications technology (ICT) infrastructure to manage urban systems through the improved delivery of city services, environmentally sustainable development, and gains in social capital. Beneath these wide-ranging benefits, however, are practical concerns regarding the smart city's unprecedented involvement of corporate actors, a worsening digital divide, business-centric urban growth, and other factors catering largely to a neoliberal agenda.

This paper is based on a comparative case analysis of three cities that have made significant efforts to integrate ICT-based initiatives into their city plans in order to become smart cities: Amsterdam, Barcelona, and New York City. This research design was motivated by a desire to examine contemporary real-life applications of the smart city framework within

focused areas in order to provide detailed accounts of the broad and complex urban planning model. This study is informed by interviews of key stakeholders, including city leaders and staff, urban planners, company executives, entrepreneurs, journalists, and academics, as well as document analysis of plans and reports produced by local government and the private sector.

Before addressing the practical implications of each city's experience with smart city policy implementation, however, it is necessary to further explain what is meant by the smart city and the global setting in which it emerged.

THE SMART CITY CONCEPT

The literature on smart cities acknowledges the lack of consensus on a single meaning for the smart city, with works often starting with a redefinition of the term (Caragliu, Del Bo, and Nijkamp 2011; Hin and Subramaniam 2012; Hollands 2008; Nam and Pardo 2011). While there are numerous applications of the smart city—government, economy, environment, transportation, people, and energy, among others—my working definition of the smart city does not focus on the separate components of a city that can be enhanced with technology, but rather on how the model operates in practice. For the purposes of this paper, the smart city is a city that, through public- and private-sector collaboration, has invested in ICT infrastructure and human capital to drive economic growth, facilitate the exchange of information between sectors, and produce resource-efficient operations that enable high-quality citizen services.

The smart city distinguishes itself from its theoretical cousins—the wired city, digital city, intelligent city, knowledge society, eco-city, etc.—in its emphasis on the specific instrumentation that will enable urban problem solving. It is defined specifically by embedded systems—sensor technology, mobile phones, smart meters, etc.—and big data—large and complex datasets used to analyze urban life (Schaffers et al. 2011). The most important ICTs that contribute to the physical smart city are widespread broadband connectivity, smart personal devices, open data infrastructures, public interfaces, and cloud computing (Institute for the Future 2010).

The smart city as a physical reality is a new phenomenon, which, in practice, has been implemented in two forms. The first is the retrofit of current cities to incorporate ICT into existing infrastructure. Referred to as "brownfield" or "urban retrofit" sites, these are the most common form of smart city emerging, especially in Europe. The second type is the "greenfield" smart city, which is built on uninhabited land and tends to be characterized by an unparalleled level of corporate involvement, which allows a unique way of funding the implementation of ICT—simply up-fronting the costs of

construction—that is not feasible in older cities. The most well-known of these developments are PlanIT Valley in Portugal, Masdar in Abu Dhabi, and Songdo in South Korea, where ICT is integrated into the fabric of everyday infrastructure. Brownfield sites are more applicable to the majority of the world's population, and thus are the focus of this paper through my examination of the smart city projects in Amsterdam, Barcelona, and New York City.

ECONOMIC RATIONALE *for* SMART CITY SERVICE MANAGEMENT

An important rationale for smart cities is the potential to achieve urban economic growth. Pike Research (2011) forecasts that between 2010 and 2020, investment in smart city infrastructure will top $108 billion; by 2020, annual expenditures in the smart city industry will reach $16 billion. In particular, the smart city is expected to "sustain the innovation economy and wealth of cities, maintain employment and fight against poverty through employment generation" (Schaffers et al. 2011). Smart city policies in existing cities are driven by a combination of local government support and private-sector tools. Rather than provide their own municipal broadband or deploy other ICT-related policies, city governments often establish public-private partnerships or simply outsource services to private companies. The most notable private corporations involved in the smart city are Cisco Systems, which provides network infrastructure, and IBM, which specializes in data management and analytics.

Many academics associate smart cities with resilient economies and Richard Florida's creative class (2002). There is extensive literature on regional competitive advantage and what characteristics, beyond technological capacity, make localities like Silicon Valley more resistant to failure, including collective innovation and a culture of openness between firms and a region's institutions (Saxenian 1994). A positive correlation exists between urban wealth and the "presence of a creative class, the quality of and dedicated attention to the urban environment, the level of education, multimodal accessibility, and the use of ICTs for public administration" (Caragliu et al. 2011). These elements are seen as the basis for a new strategic agenda for European cities and align with the six-characteristics conceptualization of the smart city—smart people, smart living (lifestyle), smart economy, smart mobility, smart environment, and smart governance.

There is much skepticism regarding these economic growth possibilities, however, both from a practical and ideological point of view. At a concrete level, Lee (2011) questions the economic feasibility of ICT-driven urban growth due to institutional resistance to ICT, referring to the difficulty and cost of integrating existing tech-

nologies into a single system as a barrier to implementing smart cities. The level of government that will drive the knowledge-based economy is also in question because local government often lacks the "policy tools and jurisdictional authority to effectively manage" their new role, and federal government is often too inflexible to adapt to the dynamic economic development patterns generated by ICT (Coe, Paquet, and Roy 2010).

The concentration of creative workers expected in the smart city could exacerbate existing class divides and cater increasingly to its "smart" workers (Hollands 2008). At its most basic level, the "elitist, biopolitical choice of smart city discourse" unfairly designates connected citizens as more informed, and thus more "useful" (McFarlane 2011). Hollands (2008) sees the smart city as a neoconservative scheme that rewards entrepreneurialism at the expense of progressive policies, identifying the emphasis on business-led development as a neoliberal characteristic inherent to the smart city. Similarly, through his series on smart cities for Fast Company, Lindsay (2010a; 2010b; 2010c; 2010d) deconstructs the rhetoric behind smart city implementation in PlanIT Valley, Songdo, and several other "instant cities," revealing potential economic ambitions driving ICT companies that may not seek to achieve urban growth as much as corporate growth. Many scholars express distrust at the focus on economic development, instead favoring coherent visions that identify how new information networks can promote engagement (Coe et al. 2001). These cautionary views, particularly Hollands's (2008), are widely cited and disputed within smart city literature, but they have not been evaluated substantively through analysis of implemented policies, as I will do in this paper.

In the following section, I describe the ways in which the smart city perpetuates a neoliberal agenda from a conceptual point of view. I follow this with individual discussions of three case studies, highlighting the specific policies most demonstrative of neoliberalism. I conclude by tying together the lessons of the three cities and offer thoughts on the direction of future smart city development.

NEOLIBERALISM *and* THE SMART CITY

Smart city policies, defined as they are by sophisticated ICTs, inherently give an economic advantage to the corporate technology giants that produce them. Furthermore, the emphasis on economic growth reinforces the profit motive as the driving principle in municipal decision-making, catering to the neoliberal goal of an unrestricted, unregulated private sector. This ideological link between neoliberalism and the technology that enables the smart city is crucial and has emerged in the theoretical criticism of the model. Hollands (2008)

has made the most well-known indictment of what he sees as the neoliberal tendency of the smart city, but the literature has yet to test his claims against real cases.

Using the framework of neoliberalism, my paper builds on criticisms leveled against the smart city to reveal the capitalist tendencies of smart city development in a more tangible way, as demonstrated by three case studies. The economic and political implications of current smart city development in Amsterdam, Barcelona, and New York make this connection concrete, revealing the neoliberal ideology that is reinforced under specific policies for smart city development. In sum, the smart city, inadvertently or not, reinforces the fundamental components of neoliberalism: the privatization of public enterprise, deregulation, and profit accumulation.

Privatization

Smart city policy often involves the transfer of the operation of city services, including communications infrastructure, emergency response networks, and traffic management, to private companies. ICT corporations have responded to the demand—though it could be argued that they created the demand by essentially inventing the smart city services market—with a robust list of services that local governments can contract from them. IBM, perhaps the most significant player in the smart city market, launched its Smarter Planet initiative in 2008. In 2010, the program was expanded into the Smarter Cities Challenge with the focus of operation specifically at the city level (IBM, 2012). The program aims to help city leaders leverage data to operate effectively and proactively by providing solutions in three areas: planning and management (government and agency administration, public safety, smarter buildings, and urban planning); human services (social programs, healthcare, and education); and infrastructure (transportation, energy, and water) (IBM, 2012). The keystone service package IBM offers is their Intelligent Operations Center, an "executive dashboard" that monitors city-wide data across agencies and departments that can be purchased by cities for a yearly subscription price (IBM 2012).

Similarly, Cisco Systems, the other leading smart city service provider, offers city leaders its Smart+Connected Communities platform. It is split into two programs: Communities+Connect, which delivers services to homes, businesses, hospitals, schools, and other constituencies, and Community+Exchange, which facilitates back-office daily operations and management (Cisco Systems 2010). Nic Villa, global director of Cisco's Internet Business Solutions Group, explains that Cisco launched its Connected Urban Development Program—the precursor to Smart+Connected Communities—because it saw sustainability as a business opportunity (personal communication, April 27, 2012). In other words, Cisco capitalized

on the relationship between ICT efficiency and environmental sustainability by developing technological solutions to sell to local governments under the emerging smart city model. Villa explains the three components to Cisco's role: (1) helping customers develop their vision and policy objectives, which includes free consultations to determine strategies for regulations, business models, development, and management; (2) offering its professional services division for ICT master planning and strategy; (3) putting together bundled Cisco products customized to that city. Despite Cisco's history as a technology company, not an urban planning firm, one can surmise from the interview that it has entered the smart city consulting business, similarly to IBM. According to partnerships with Amsterdam and other cities, Siemens, General Electric, and Accenture are also entering the smart city services market and are offering less comprehensive smart-city services that tend to focus on energy efficiency and carbon neutrality.

While these government contracts with ICT companies conceivably fall under the public-private partnership (PPP) model, the lack of financial and operational risk on the side of the private company places a disproportionate financial responsibility and public accountability on the city. Unlike the traditional PPP, in which the private company shares both risks and rewards in the public service or project, smart city services require the city to pay the company in exchange for the service, amounting to what appears to be little more than outsourcing. Miraftab (2004) argues that neoliberals "support PPPs as a market-enabling strategy by which the private sector's role is supported by the resources of the government, the community, and the NGOs" and that PPPs are therefore a "Trojan horse" for privatizing government responsibilities. Not only does corporate involvement in the smart city essentially privatize municipal services, but it also creates private markets in sectors that traditionally would be managed and analyzed by local government, like social programs and public safety. While complete privatization through the transfer of ownership is not achieved through IBM and Cisco's platforms, the practical effect is that of the privatization of government functions.

This pattern comes as no surprise to economist Ed Steinmueller of the University of Sussex, who argues that while the public can believe in austerity, "there is an ideological commitment to privatization in the United States and United Kingdom," especially when it comes to initial investments (personal communication, June 29, 2012). ICT infrastructure falls within this capitalist predisposition towards privatization and market solutions because of its high initial expenditures and need for technical expertise. Steinmueller's reluctance to accept that technology and the free market are the best way to solve societal problems is reiterated by Robert Hollands, Professor

of Sociology at Newcastle University, who explains that the way technology is utilized has become "corporatized" (personal communication, June 27, 2012).

Open Data as a Form of Deregulation

Deregulation often occurs alongside open markets and privatization because, according to the tenets of neoliberalism, in order for companies to compete on an even footing, government regulation should not interfere with the efficiency of the market in setting prices or producing the optimal quantity of a good. While deregulation is closely tied to the smart city because of its market-reliant and efficient nature, it is rarely labeled as such; instead it is called open, interoperable, or seamless. The effect of deregulation, whether intentional or not, is often facilitated by smart city policy and masked by the discourse of openness. To explore this case, I examine the deregulation of information, popularly called the open data movement, which has the general aim of achieving transparency and efficiency.

Open data has its origins in the Freedom of Information Act (FOIA), which seeks to disclose (non-sensitive) government data to the public. The first FOIA was passed in the United States in 1966 and applies to executive-branch government agencies; since its passing, dozens of other nations have followed, most prominently the United Kingdom, which in 2000 passed a wider-reaching version that applies to public authorities, publicly owned companies, and designated bodies performing public functions (National Archives 2000). Open data initiatives are largely synonymous with the more specific term open *government* data (OGD) because it has been almost exclusively a public sector effort. Though public sector information (PSI) has long been available, the marginal price included in its distribution is being eliminated through OGD initiatives. However, these initiatives can have a deregulating effect on data; when public information is freely released, the government is no longer able to control the reuse of its data.

Countries worldwide, from Norway to Uruguay to Australia, have launched open data initiatives, and following the recent smart city trend, there has been a surge of individual municipalities implementing these policies. Along with San Francisco, Vienna, London, and countless other cities, Amsterdam, Barcelona, and New York City have initiated aggressive open data policies that promise to engage and empower citizens. Taking stock of the winners and losers of these policies, as the rest of this section does, reveals the neoliberal impact that open data policies can have.

It should be noted that open government and open data, while often linked in smart city rhetoric, are not mutually exclusive. In fact, "a government can provide open data on politically neutral topics even as it re-

mains deeply opaque and unaccountable" (Yu and Robinson 2012). This disconnect between the apparent motivation behind the deregulation of data and the consequences has also been noted by Bates (2012), who argues that "powerful groups within the state are attempting to shape OGD and use it to force broader agendas wrought by an ideological faith in the primacy of the markets over social provision." Though this view is somewhat alarmist, Bates (2012) identifies the group that may benefit the most from open data. She acknowledges that while independent, civic-minded programmers have taken advantage of new data, particularly in relation to transport, there is still potential for further corporate control over the infrastructural systems that urban services and utilities rely on (Bates, 2012). Thus, the great, unintended consequence of the open data initiatives may be "empowering the empowered" (Gurstein 2011).

One way to evaluate the validity of these criticisms is to determine who uses open data. Slee (2012) divides the user base into four categories that are notable for the absence of the average citizen, and still less the information-poor. First are citizen hackers, who seek pragmatic and useful data, like transit timetables, and are driven both by a desire to do good and an interest in programming (e.g., Code for America); second are civil liberties activists, who promote government transparency by releasing lobbying records, campaign funding, government operations, and legal acts (e.g., Sunlight Foundation); third are data journalists, a group made up of organizations or individuals who use data as part of their job to hold government accountable (e.g., *The Guardian* when covering WikiLeaks); finally, there is the public sector information (PSI) reuse industry, which produces commercial products or platforms using government data (e.g., Google, ESRI; Slee 2012). All four play a role, but Slee (2012) argues that the fourth group has used claims of transparency and activism to disguise their profit-oriented, neoliberal tendencies.

A review of recent PSI reuse in Europe reveals the potential for the fourth group, the PSI reuse industry, to exploit the value of government data (Vickery 2011). By using PSI as "raw material," the private sector acts as an intermediary between the public sector and the user by developing new products and services that add value to the data (Vickery 2011). Vickery gives the huge resulting profits in Europe: direct and indirect economic impacts from the PSI reuse market are estimated to be €140 billion per year. This number is likely low, given that it does not take into account more recent PSI initiatives or data distributed at no charge. It is important to note that PSI is not necessarily free data, but instead may be provided at a marginal cost by the government agency that produced it. FOIA policies and the open data movement are increasingly making this data OGD. This shift towards completely open data with no charge or

licensing restrictions, while being more democratic in nature, could be limiting the funds that governments collected from PSI reuse in the past. The Netherlands has had a particularly successful PSI reuse market, with government revenues from sales of PSI around €68 million in 2009-2010 (Vickery 2011), but open data policies may empower the private sector to capture the profits instead, through value-added products and services, especially in the areas of meteorological and geospatial data.

Undoubtedly, nonprofits make extensive use of open data, and government data portals undermine a profit-motivated structure that could be used to distribute data. However, it is crucial to recognize that the implications of open data are not inherently democratic or transparent. In theory, the transition from PSI to open data makes government data nonexcludable and nonrivalrous, but this discussion calls the nonexcludability into question; though anyone can access the information, only a select few benefiting from advanced knowledge and economies of scale can truly use it to generate profits.

Profit Accumulation

The smart city, like all economic development frameworks, supports the maximization of profits. However, given its supposed social and environmental underpinnings, the model particularly benefits multinational technology corporations, which have profited hugely from the opening up of international markets. As an economic development platform, the smart city facilitates the flow of capital, and much of the smart city's added value comes from the production of data that can be exploited for further profits. This capital accumulation, where the capitalist appropriates surplus value, mirrors David Harvey's (2003) notion of accumulation by dispossession. Harvey (2003) argues that power and wealth are centralized by dispossessing the public of their land or wealth, often through privatization; analogously, but not to Harvey's extreme, in the smart city, the private sector captures the profits in ICT infrastructure built for the public. Data is gathered through crowdsourcing or sensors, and then used to create added value for the aggregator of the data—the company that collected it and has a contract to analyze it—not the producers—the public.

A report by Accenture, Cisco, and GSMA (2011) predicts that "the managed service provider of the Urban OS is likely to extract significant value from the urban services value chain, and so we expect this to be a highly-contested market" (12), with aggressive competition expected from software vendors, like IBM and Microsoft; system integrators, like Accenture; and infrastructure providers, like Cisco. In this way, not only is it possible for multinational corporations to become part of the smart city development process, but it is very likely to happen because of the

apprehension city leaders feel when trying something new, and often a lack of internal expertise needed to successful implement ICT initiatives. According to executive director of the smart city technology company Urbiotica, Irene Compte, "cities don't like to be the first to deploy a technology" and instead prefer that other cities be used as a testing bed (personal interview, June 18, 2012). Consequently, it is logical that they are attracted to the models of ICT giants who have had significant international experience.

Journalist Greg Lindsay explains the risk of corporate dominance even with a presence of grassroots participation in ICT development, acknowledging that though it is great for companies like Cisco to be building networks and broadband as the city's ICT backbone, the trouble comes when this shifts to the so-called "app store model" (personal communication, July 6, 2012) The "app store," pioneered by Apple as a business model, creates a revenue stream from the initial developer kit and continuous percentage of sales that Apple collects in exchange for the easy distribution and large audience provided by a centralized "store." In this scenario, the network company takes a cut of all profits and added value produced from the bottom, accumulating capital for large technology companies.

THREE CASE STUDIES

Amsterdam, Barcelona, and New York are all recognized as world smart city leaders and are held up as models for other cities to emulate. All three are members of the City Protocol, a group of cities, partner companies, smart city organizations, and universities working to create "sustainable, efficient, cohesive, innovative and smart cities" through new leadership models and leveraging ICT (City Protocol 2012). Furthermore, the cities appear consistently in rankings of the world's smartest cities (Cohen 2011; Cushman and Wakefield 2011; Kotkin 2009). Amsterdam and Barcelona openly identify themselves as smart cities, while New York, interestingly, is branded as a smart city externally by the media more than by local government officials.

Amsterdam

A forerunner in the environmental movement and innovation economy, Amsterdam is a logical location for the development of a smart city. Significantly, its development gives a label to the city's current means of achieving regional economic dominance, which combines innovation, business-friendly policies, and a metrics-oriented sustainability plan. The Netherlands' small population and concentrated geography has made its adoption of ICT comparatively quick, and nowhere is this attainment more visible than in Amsterdam. The city's demographic characteristics are marked by

a highly mobile and educated population, making it an ideal starting point for a technologically motivated development plan. Amsterdam's smart city project is exemplary of the economic motivations underlying the implementation of a project marketed primarily as an environmental program.

Amsterdam's smart city motivations, from the point of view of municipal government, emerged from the potential of technology-related economic growth. Katalin Gallyas, Policy Advisor on Open Innovation for the Economic Affairs Department of Amsterdam, acknowledges that ICT has primarily been marketed as a way to attract investors (personal communication, March 23, 2012). Established in 2008, the city's ICT cluster was a way for the city to position itself as the regional international hub of innovation and growth (Amsterdam Innovation Motor 2012). While Amsterdam's motivations have since diversified, its foundation in attracting investment underscores the smart city's promise of growth. The current Dutch corporate tax rate is below the European Union, average and expatriate workers can receive a tax-free reimbursement of 30 percent of their salary, making it a favorable destination for international companies (Iamsterdam 2012). Perhaps this explains why the Netherlands was the top destination for United States foreign direct investment (FDI) from 2009 to 2011, with 14.3 percent of its outbound investment directed there; within the Amsterdam Metropolitan Area, more than 750 of the 2,300 international companies are American firms (I amsterdam 2012).

This is not to say that city leaders necessarily have a preference for international parties when developing the smart city. Amsterdam Smart City, the partnership dedicated to transforming the municipality into a smart city, has established partnerships not only with Cisco and Vodafone, but also with Philips, Liander, and dozens of other Dutch companies (Amsterdam Smart City 2011). But smart city service provision is largely a global market open to any international competitor, as encouraged by neoliberal ideology. The 2011 report *Information Marketplaces: The New Economics of Cities*, prepared by the Climate Group et al., compares the role of government in regards to smart city services to its role in the development of a shopping center: after providing the basic physical infrastructure, the city cedes operational decision-making to the private sector. The report goes on to state that the municipality must "develop the market for digital assets to be reused and recombined in the most efficient manner possible and ensure the broadest possible participation from the private sector in as open a marketplace as possible" (Climate Group et al. 2011).

Large corporations play a significant role in Amsterdam Smart City (ASC). Within the private sector, ASC has close ties with Cisco Systems, which supports the city's Smart Work Centers by providing its Tele-

Presence videoconferencing service. IBM, too, has partnered with ASC to provide the data management system for Schiphol Airport. Both corporations have been technology partners in specific ASC projects, particularly those related to residential energy management systems and ICT workplace facilities like the Smart Work Centers. The two founding members of ASC that are private companies are KPN, the leading telecommunications and ICT service provider in the Netherlands, and Liander, the largest utility company in the country.

While ASC has formed partnerships with more moderately sized companies on individual projects, it is clear that established companies, not start-ups, are the beneficiaries of local government procurement contracts. Intentionally or not, this practice concentrates the generation of profit and privileges the corporate elite. For instance, Double U SmartWork Foundation, an organization managing Smart Work Centers in Amsterdam, was founded by Cisco, the Dutch banks ABN/AMRO and RABO Bank, and the firm Touchdown Center. The partnership also included the City of Amsterdam, whose employees were intended to be some of the principal users of the system. Nevertheless, that one of the highlights of the Smart Work Center is the deployment of Cisco's TelePresence virtual conferencing technology is suggestive of Ed Steinmueller's worry that "the dominant discourse on the smart city has to do with making cities safe for infrastructure to be built that corporations know how to build" (personal communication, June 29, 2012).

The bifurcated labor market resulting from economies like Amsterdam's, which is dominated by advanced service provision and the ICT industry, seems to be magnified by the smart city model. The sharp divide between high- and low-skilled workers has led to the diminishing importance of organized labor. While labor unions have traditionally been a strong force in Dutch politics, their influence is decreasing; high-skilled workers tend to negotiate individual contracts rather than rely on collective bargaining, and their absence within existing unions has further decreased the authority of organized labor. However, the decline of unionization has still damaged the manufacturing sector disproportionately. The Netherlands' largest union, the Dutch Labor Federation (FNV), shows that among its members, who represent a cross-section of the workforce, the service sector is growing, while the blue-collar manufacturing sector is declining (Woldendorp, 2005). While unionization is particularly low in

[1] Touchdown Center is directed by Peter Kapteijn, one of my interview respondents (personal communication, March 21, 2012). Smart Work Centers lease work space to individuals or groups and are located near a residential center with the aim of reducing transportation demands and congestion. They provide flexibility to employees, who are able to use ICTs to enhance their work experience. In 2008, a network of Smart Work Centers was launched in Amsterdam in mainly as private enterprises in partnership with Cisco's Internet Business Solutions Group.

the ICT sector, in 2001, 23 percent of the Dutch ICT workforce was covered by collective agreements despite the fact that only 11 percent belonged to a union (Van Hoek, n.d.). The rule of the market is becoming paramount in setting the labor conditions of smart city workers; as laborers lose wage protections and worker's rights, there is increased flow of capital, goods, and services. While this trend does not only occur in smart cities, its effect is amplified because of Amsterdam's large high-skilled sector, which appears to have developed without a structure for unionization.

Barcelona

Barcelona seems, in a sense, the least likely of the three to become a smart city. While it is rapidly emerging as a site of international economic activity and is rising as the business capital of Southern Europe, it is only in the past two decades that it has reoriented its economy towards innovation and technology. This rapid growth has led to Barcelona's key position in the "sunbelt"—the increasingly high-tech region along the Mediterranean from Milan to Valencia—that is emerging alongside Europe's "blue banana," the banana-shaped metropolitan axis running from London to Milan that has traditionally been Europe's hotbed of growth and innovation (Hospers, 2003). Unlike Amsterdam, Barcelona is not characteristic of its nation as a whole. The city has historically had a tense relationship with the Spanish government, and sees its project as separate from other efforts occurring in Spain. Consequently, Barcelona is significantly ahead of other Spanish autonomous communities and cities in terms of broadband penetration and ICT investment rates.

In regards to public- versus private-sector smart city planning, Barcelona represents a middle ground. In 2011, the Mayor's Office was internally restructured to dedicate one of its five deputy mayors to ICT and sustainability-related urban planning policy. Antoni Vives, the Deputy Mayor for the Urban Habitat, is responsible for fostering holistic and cross-sector city planning and managing Barcelona's smart city project; he was also co-president of the Smart City World Congress, an international summit of smart city leaders. The City participates extensively in initiatives to spur involvement from small and medium enterprises [SMEs], but also requires corporate sponsorship to raise its international status and legitimize its smart city claims. The Smart City Expo and World Congress, held in Barcelona in November 2011 and 2012, has become a global conference showcasing the transition to sustainable and innovative cities. As a result, Barcelona's smart city project is driven jointly by the municipality and the private sector, which have partnered as a way to garner international attention and further foreign investment.

Barcelona represents the most salient example of the smart city's alignment with

economic growth, and has, like Amsterdam, shifted its approach since the smart city project's inception. Joan Batlle, Head of the International Cooperation Department for the City Council of Barcelona, explains that "instead of being focused solely on economic goals, sustainability and quality of life are [now] primary concerns as well" (personal communication, June 15, 2012). The city's initial incentives, however, were grounded in the potential to transform the city and its economy. Central to Barcelona's goals was changing the city's economic identity from one of industry to one of technology "and to associate the city with high value and knowledge-led businesses" (Iberian Lawyer 2011). This rebranding process—changing Barcelona from an industrial manufacturing center to a new technology hub—has resulted in the city's distinctive technology park and innovation district, 22@Barcelona, often referred to as a "smart city campus" or simply as 22@. This urban redevelopment project is managed by the 22@Barcelona municipal society, created by the Barcelona City Council in 2000, and has converted two hundred hectares of the historically industrial neighborhood Poble Nou into usable space for knowledge-intensive activities and business incubation (22 ARROBA S.A.U. 2006).

Likewise, the Barcelona City Council is a strategic partner with Barcelona Business Landing, an international consulting network that has the specific goal of integrating international companies and institutions in the city (J. Batlle, personal communication, June 15, 2012); its motto, aptly, is "Barcelona is growth" (Barcelona Business Landing 2010). To facilitate foreign direct investment, Barcelona also offers tax deductions for research and development and technological innovation, as well as loans at low interest rates, microcredits, and support services for start-ups (Barcelona Activa 2010). In recent years, projects connected to ICT have represented more than 20 percent of FDI in Catalonia, which has over 3,100 foreign companies, mostly from the European Union, over 75 percent of them in the Barcelona metropolitan area (Adjuntament de Barcelona, 2009). Barcelona, like Amsterdam and New York, attributes its economic success and continued growth to its streamlined eGovernment services, widespread ICT infrastructure, and favorable regulatory and tax framework.

These economic developments demonstrate the potential for smart cities to concentrate profit accumulation by unintentionally favoring large companies over small ones. Regarding barriers to testing in Barcelona's Urban Lab—an inclusive program that accepts applications without limitations on company size, especially encouraging start-ups—Urbiotica director Irene Compte notes that companies must have an established economic base because the Urban Lab does not provide funding for project implementation (personal communication, June 18, 2012). In short, companies must

be able to pay upfront for the costs of installation and must keep themselves running with the hope that the city will contract them for their services. Though larger companies tend to be less innovative than smaller ones, the latter types of companies are shut out of ventures like the Urban Lab for financial reasons. Without financial backing from the City, the practical effect of this initiative is that the Urban Labs model benefits established companies, which undermines the very bottom-up model that it aims to promote.

Furthermore, even more so than in Amsterdam, the role of the small and medium-sized company in the smart city is ambiguous, especially in Barcelona. Start-ups and entrepreneurship are encouraged as a part of the smart economy, but not particularly in terms of smart city service provision. For instance, while Irene Compte's company Urbiotica produces sensor technology that complements Cisco and IBM's products, there is no clear role or established role for newcomers in the market, which means players with less power are still finding their place (personal communication, June 28, 2012).

New York City

New York City's ICT projects are the result of Mayor Bloomberg's aggressive pursuit of growth in the technology industry to keep the city relevant and, more importantly, dominant in the world economy. He has committed the city to bold investments such as Cornell NYC Tech, which, in addition to creating tangible facilities and bringing technology students to the city, is symbolic of New York City's commitment to fostering the tech industry. Like Amsterdam, New York City emerged from the manufacturing era decades before Barcelona, and thus has long had well-established services and financial sectors. Its growth towards ICT in the current age of telecommunications and information technology, consequently, is one of its many adaptations to the realities of the current postindustrial economy.

New York City in particular exhibits the application of the concept that open data represents the profit-oriented deregulation of information. Government-sponsored apps challenges, or competitions to develop applications for mobile devices by using open data to solve citizen problems, have been highly publicized and successful. The main participants in these types of competitions fall into the first camp of Slee's (2012) open data users: citizen "hacktivists" who are well-educated—and well-paid—professionals with a desire to give back. Despite genuine intentions for open data policies to increase civic participation, only those with the knowledge of how to interpret and build on digital data have truly been empowered by it, putting the city at risk of "empowering the empowered," as mentioned above. Correspondingly, this puts technology companies with a marketing capacity at an even greater advantage than individual pro-

grammers.

New York City has also made significant strides towards expanding ICT use among residents and especially businesses. The New York City Economic Development Corporation (NYCEDC) and Department of Information Technology and Telecommunications (DoITT) have partnered with the City to lead five main initiatives to expose and address gaps in broadband availability (City of New York, 2012). The first, ConnectNYC, is a competition among businesses to apply for free build-out of fiber connectivity, and targets industrial business zones across the five boroughs. The second is WiredNYC, a building certification program that evaluates broadband infrastructure in buildings, and the third, NYC Broadband Connect Map, is a crowdsourced, dynamic website that businesses can use to learn about connectivity availability in a specific building or neighborhood. The fourth, called Broadband Express, is an initiative to simplify operational issues and regulatory hurdles for Internet Service Providers to expedite broadband build-out. Finally, Citizen Connect is a competition to develop mobile applications that will help residents access workforce development opportunities, job listings, and worker support programs such as childcare, healthcare, and transportation. This last initiative is meant to provide access to job-related resources for low-income residents who, given the widespread use of smartphones, may have mobile Internet access but no home broadband connection.

With the exception of Citizen Connect—which operates on the questionable assumption that a mobile phone app would be a particularly useful tool in the job search—these initiatives are clearly directed at businesses and blatant in their encouragement of commercial activity. However, they have the overall effect of geographically spreading broadband connectivity and specifically targeting users that are at a disadvantage as information technology continues to proliferate. New York City, regardless of its motivations, is making a substantial financial commitment to close the gap between access and adoption, and ConnectNYC may boost the city's 97 percent access rate even higher by building out fiber connectivity to industrial zones that have been historically underserved by resident-focused services.

However, beneath the veneer of social equity, these initiatives targeting the digital divide are justified by their potential to drive economic growth. This is not to say that the social equity benefits of expanding access to underserved populations and geographic areas are negated, but that the dominant interests advocating for digital divide policies may not be primarily targeting the digitally underserved. New York City's digital divide programs, for instance, appear to have been marketed to the private sector under a context of economic growth, not egalitarian ideals. Bill Ruden, Chairman of the Association for a Better

New York applauded the City's efforts to increase broadband connectivity, explaining that "the new WiredNYC program will enhance and market New York's tech accessibility, creating jobs, spurring capital investment, and making our city even more competitive in the global marketplace" (as cited in City of New York, 2012). Ruden's notion of competitiveness does not refer to the viability of bridging the digital divide, but explicitly to boosting the city's tech industry. This perspective falls in line with how Jean-Marie Bemtgen, Project Officer of the European Commission Directorate-General for Energy, identifies the United States: "The U.S. is business-driven, so solutions are seen as things that make money" (personal communication, March 26, 2012).

CONCLUSION

The smart city embodies the high degree of faith that many place in technology's ability to address social challenges. Appropriately, Morozov (2013) calls this "technological solutionism." There are two components to this phenomenon: cyber-utopianism, or the belief that online communication is in itself emancipatory and that the Internet favors the oppressed rather than the oppressor, and Internet-centrism, the belief that every important question about society can be framed in terms of the Internet (Morozov, 2011). The principles defining the smart city are heavily influenced by this perspective, and by seeking to attach sensors, screens, and Wi-Fi to all aspects of urban life, policymakers declare their adherence to the notion that technology is intrinsically a positive, solution-bearing tool.

While ICTs certainly are capable of these benefits, this paper seeks to convey that this reliance on a technological fix is problematic because of its tendency to favor the powerful over the powerless unless explicitly checked. In light of the rapid adoption of the smart city model by municipalities worldwide, it is crucial to understand the consequences, intended and not, of such dependence on technology. As the frenzy to seize opportunities to spur urban economic growth through technology projects increases, more power is given to nontransparent corporations through tax incentives, deregulation, and the offloading of risk onto cities and their citizens. Amsterdam, Barcelona, and New York's smart city projects reveal an element of corporate dependence and business-centrism that is not surprising given the smart city's foundation in a globalized, neoliberal model. However, while the propensity of smart city initiatives to reinforce the neoliberal agenda is troubling, rejecting the model altogether is unproductive.

In fact, the very networks and devices built by technology corporations have enabled a dispersed, yet potent bottom-up movement to emerge, bringing the interests of citizens to the forefront of the smart city discussion.

The empowerment and legitimation of non-traditional stakeholders like citizen activists who use data and technology to make an impact continues this governance trend at the individual and community levels. On the other hand, the economic liberalization underpinning most smart city initiatives goes unnoticed in publicity campaigns launched by technology corporations and city governments implementing the model. A cursory look at smart city projects shows their most vocal proponents not to be ordinary citizens, but stakeholders that have much to gain from the transition to a technology-driven economy. This identifies a crucial distinction between a smart city and a smart citizenry; the smart city should be designed in deference to the citizenry, not the other way around.

Both the benefits and risks of the smart city must be explored in order to identify the winners and losers of ICT-based policy and decision-making. While this paper aims to shed light on these issues by examining Amsterdam, Barcelona, and New York, further studies remain to be done on other cities. Research done in smart cities, both on greenfield and brownfield sites, and especially in the developing world, will contribute greatly to the identification of successful policies and unanticipated results. When well implemented and mindful of citizen needs and local context, smart city policies enable positive change, but the converse is also true: when policies are dominated by private interests or insensitive to the city's particular circumstances, they run the risk of prioritizing business amenities at the expense of citizen needs. The smart city is proving to be anything but trivial, and if properly implemented, its dynamic nature and emphasis on results will allow the best elements of this urban intelligence to proliferate.

22 ARROBA BCN, S.A.U. 2006. Who we are. http://www.22barcelona.com/content/blogcategory/33/403/lang,en/.

Accenture, Cisco, and GSMA. 2011. Smart mobile cities: Opportunities for mobile operators to deliver intelligent cities. http://www.cisco.com/web/about/ac79/docs/ps/Smart-Mobile-Cities-Report.pdf.

Adjuntament de Barcelona. 2009. Foreign investment in the Barcelona area and Catalonia. http://www.acc10.cat/en/acc10/publications/competitiveness-studies/foreign_investment_barcelona_catalonia.jsp.

Amsterdam Innovation Motor. ICT-cluster. http://www.aimsterdam.nl/ict/projecten/ict-cluster.

Amsterdam Smart City. 2011. Smart stories [PowerPoint slides] (accessed March 31, 2012). http://issuu.com/amsterdamsmartcity/docs/smart_stories.

Barcelona Activa. 2011. Who we are. http://www.barcelonactiva.cat/barcelonactiva/en/all-about-barcelona-activa/who-we-are/index.jsp.

Barcelona Business Landing. 2010. Get to know us. http://www.barcelonalanding.com/index.php/en/spanish-consultancy.html.

Bates, J. 2012. "This is what modern deregulation looks like": Co-optation and contestation in the shaping of the UK's Open Government Data Initiative. The Journal of Community Informatics 8 (2). http://ci-journal.net/index.php/ciej/article/view/845/916.

Caragliu, A., C. F. Del Bo, and P. Nijkamp. 2011. Smart cities in Europe. Journal of Urban Technology 18 (2): 65–82.

Cisco Systems. 2010. Smart+connected communities: Changing a city, a country, the world.http://www.cisco.com/web/strategy/docs/scc/09CS2326_SCC_BrochureForWest_r3_112409.pdf.

City Protocol. 2012. City Protocol Society: Building together better cities. http://www.cityprotocol.org.

Climate Group, Arup, Accenture, and Horizon. 2011. Information marketplaces: The new economics of cities. http://www.theclimategroup.org/_assets/files/information_marketplaces_05_12_11.pdf.

Coe, A., G. Paquet, and J. Roy. 2001. "E-governance and smart communities: A social learning challenge." Social Science Computer Review, 19 (1): 80–93.

Cohen, B. 2011. The top 10 smart cities on the planet. FastCoExist. http://www.fastcoexist.com/1679127/the-top-10-smart-cities-on-the-planet#disqus_thread.

Cushman & Wakefield. 2011. European cities monitor 2011. http://barcelonacatalonia.cat/b/wp-content/uploads/2011/11/EUROPEAN-CITIES-MONITOR-2011.pdf.

Florida, R. 2002. The rise of the creative class: And how it's transforming work, leisure, community and everyday life. New York: Perseus Book Group.

Gurstein, Michael. 2011. Open data: Empowering the empowered or effective data use for everyone? First Monday 16 (2). http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/3316/2764.

Harvey, D. 2003. Accumulation by dispossession. In The new imperialism, 137–182. Oxford: Oxford University Press.

Hin, L. T. W. and R. Subramaniam. 2012. "Creating smart cities with intelligent transportation solutions: Experiences from Singapore." In Green and ecological technologies for urban planning: Creating smart cities, ed. O. Y. Ercoskun, 174–190. Hershey, PA: Information Science Reference.

Hollands, R. G. 2008. Will the real smart city please stand up? City 12 (3): 303–320.

Hospers, G. J. (2003). Beyond the blue banana? Structural change in Europe's geo-economy.

Intereconomics 38 (2): 76–85. http://link.springer.com/content/pdf/10.1007%2FBF03031774.

I amsterdam. Cooperation between businesses, academia and government. http://www.iamsterdam.com/nl-NL/Business/Amsterdam-Economic-Board/About-the-Amsterdam-Economic-Board/Visie-en-Ambitie/Samenwerking-tussen-bedrijven--wetenschap-en-overheid (accessed October 31, 2012).

Iberian Lawyer. 2011. Barcelona Report 2011: Finding a new economic formula. April 27. http://www.iberianlawyer.com/index.php/special-reports-iberia/barcelona/2011/2401-finding-a-new-economic-formula.

IBM Corporation. 2012. IBM smarter cities: Creat-

ing opportunities through leadership and innovation. http://public.dhe.ibm.com/common/ssi/ecm/en/gvb03014usen/GVB03014USEN.PDF.

Institute for the Future. 2011. The future of cities, information, and inclusion [map illustration]. A planet of civic laboratories. http://www.iftf.org/inclusion.

Kotkin, J. 2009. The world's smartest cities. Forbes, December 9. http://www.forbes.com/2009/12/03/infrastructure-economy-urban-opinions-columnists-smart-cities-09-joel-kotkin_2.html.

Lee, J. 2011. "Building an integrated service management platform for ubiquitous ecological cities." Computer 44 (6): 56–63.

Lindsay, G. 2010a. Cisco's big bet on New Songdo: Creating cities from scratch. Fast Company. http://www.fastcompany.com/1514547/ciscos-big-bet-new-songdo-creating-cities-scratch.

---. 2010b. HP invents a "central nervous system for Earth" and joins the smarter planet sweepstakes. Fast Company. http://www.fastcompany.com/1548674/hp-invents-central-nervous-system-earth-and-joins-smarter-planet-sweepstakes.

---. 2010c. IBM's decade of smart: Making money by making sense of data. Fast Company. http://www.fastcompany.com/1514591/ibms-decade-smart-making-money-making-sense-data.

---. 2010d. "The master plan: A city in the cloud." Fast Company. http://www.greglindsay.org/articles/the_master_plan_a_city_in_the_cloud/.

McFarlane, C. 2011. Learning the city: Knowledge and translocal assemblage. Hoboken, NJ: Wiley-Blackwell.

Miraftab, F. 2004. Public-private partnerships: Trojan horse of neoliberal development?" Journal of Planning Education and Research 24: 89–101. doi:10.1177/0739456X04267173.

Morozov, E. 2011. The net delusion. London: Penguin Group.

---. 2013. The folly of technological solutionism. CDDRL Seminar Series. Lecture conducted from Stanford University, Stanford, CA.

Nam, T., and T. A. Pardo. 2011. Conceptualizing smart city with dimensions of technology, people, and institutions. In Proceedings of the 12th Annual Digital Government Research Conference (DG.O 2011): 282–291.

National Archives, The. 2000. Freedom of Information Act. http://www.legislation.gov.uk/ukpga/2000/36/contents.

New York, City of (2012). Mayor Bloomberg and Speaker Quinn announce new initiatives to expand New York City's broadband connectivity, bolstering the growing tech sector and allowing businesses and residents to access high-speed Internet [Press Release] PR-236-12. June 21.

Pike Research. 2011. Global investment in smart city technology infrastructure to total $108 billion by 2020. http://www.pikeresearch.com/newsroom/global-investment-in-smart-city-technology-infrastructure-to-total-108-billion-by-2020.

Saxenian, A. 1994. Lessons from Silicon Valley. Technology Review 97 (5): 42–51.

Schaffers, H., N. Komninos, M. Pallot, B. Trousse, M. Nilsson, and A. Oliveiras. 2011. Smart cities and the future Internet: Towards cooperation frameworks for open innovation. In Future Internet Assembly, ed. J. Domingue, A. Galis, A. Gavras, T. Zahariadis, and D. Lambert. LNCS 6656: 431–446.

Slee, T. 2012. Open data movement redux: Tribes and contradictions. Whimsley, May 9. http://whimsley.typepad.com/whimsley/2012/05/open-data-movement-redux-tribes-and-contradictions.html.

Van Hoek, A. A. H. n.d. Collective agreements and individual contracts of employment in labour law: The Netherlands. doi: 1874/98793.

Vickery, G. 2011. Review of recent studies on PSI re-use and related market developments. European Commission, under "Information Society," http://ec.europa.eu/information_society/policy/psi/facilitating_reuse/economic_analysis/index_en.htm.

Woldendorp, J. 2005. The Polder model: From Dutch disease to miracle? Dutch neo-corporatism 1965–2000. Amsterdam: Thela Thesis.

Yu, H., and D. G. Robinson. 2012. The new ambiguity of "Open Government." UCLA Law Review Discourse 59: 178–208. http://www.uclalawreview.org/?p=3663