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Chapter 2

Smart cities as a platform for technological and social innovation in productivity, sustainability, and livability: A conceptual framework

Hyung Min Kim\textsuperscript{a}, Soheil Sabri\textsuperscript{b}, and Anthony Kent\textsuperscript{c}
\textsuperscript{a}Faculty of Architecture, Building and Planning, The University of Melbourne, Melbourne, VIC, Australia, \textsuperscript{b}Centre for Spatial Data Infrastructures and Land Administration, Department of Infrastructure Engineering, Melbourne School of Engineering, The University of Melbourne, Melbourne, VIC, Australia, \textsuperscript{c}Centre for Urban Research, School of Global, Urban and Social Studies, RMIT University, Melbourne, VIC, Australia

2.1 Introduction

By reviewing the evolution of cities, this chapter establishes a conceptual framework to better understand smart cities from an innovation perspective. Smart cities are broad in concept and definition. Among the broad approaches to defining smart cities, here this chapter stresses that technology, in particular,
information and communication technology (ICT), is a core element in current smart city practices. The term “smart cities” did not originate from the literature on smart urban growth in the early 1980s. Rather, it emerged in the wake of new technological advancements such as digitalization, the world wide web, Internet of Things (IoT), and artificial intelligence (AI), and the proliferation of smartphones in the late 2000s. There are many shreds of evidences worldwide that indicate the role of technological innovations in implementing social (inclusive) urban policies. As an example, many city councils use web-based geographical information systems (GIS) to communicate future urban development projects and engage with communities in providing better urban services.

This chapter formulates a framework with the idea of smart cities as not only the outcome of technological and social innovation but also the platform to facilitate technological and social innovation. The objectives of these innovations in smart cities are to enhance productivity, sustainability, and livability. It is important to understand how smart built environments further facilitate innovation systems in the city. Current literature and practices convey the impression that smart cities are static end status. However, there is little research available on how smart cities can be a dynamic platform that can lead to technological and social innovation. While it is unclear whether technological innovation is a precondition for social innovation, it is undeniable that these two innovations are interlocked with each other.

There are important drivers and actors involved in smart city making. Globalization of smart city ideas and its seemingly promising prosperity may push central governments to establish national-level policy and entrepreneurial local governments to support, implement, and invent smart city projects. New interdisciplinary business models developed by ICT firms, as leaders in new technologies, can cover almost all fields of urban activities including housing, networks, mobility, energy, and infrastructure to name a few. Real estate developers and urban planners/designers are keen to integrate these technologies into built environments. Residents in the city are end users of the realized technology and they become, in turn, new inventors for further innovation.

The chapter will explore both the technological and social dimensions of smart cities and investigates the major drivers and actors for initiating and running smart city programs in different jurisdictions. It concludes with formulating a framework for further study on smart cities as a dynamic platform for deriving technological and social innovations.

2.2 The evolution of cities from being ordinary to being smart

2.2.1 Defining smart cities

Many cities have embraced ICT as an important input for their urban development and adopted digital infrastructures as a fundamental requirement for
urban management, productivity, and future urban form (Kitchin, 2014). ICT is becoming a more important urban infrastructure, fostering innovation-driven urban economies, efficient governance, and more. Angelidou (2015) believes that smart cities are the outcome of urban future movements, knowledge and innovation economies, technology push, and application pull. While there is no one-size-fits-all definition due to the wide scope of smartness and the complexity of cities (Albino et al., 2015), some practitioners, international institutions, and government sectors have attempted to define what smart cities are.

*A Smart City is a place where traditional networks and services are made more efficient with the use of digital and telecommunication technologies for the benefit of its inhabitants and business.*

European Commission (n.d.)

*A Smarter City is connecting the physical infrastructure, the IT infrastructure, the social infrastructure, and the business infrastructure to leverage the collective intelligence of the city.*

Harrison et al. (2010, p. 2)

Smart City initiatives can help overcome the limitations of traditional urban development that tends to manage urban infrastructure systems in silos. The siloed system leads to poor information sharing between systems, functions and stakeholders, such as citizens, businesses, government and civil society organizations. Smart City initiatives leverage data and services offered by digital technologies, such as cloud computing, open data sets, or the Internet of Things to help connect city stakeholders, improve citizen involvement, offer new or enhanced existing services, and provide context-aware views on city operations. A city-wide digital infrastructure can help integrate different urban infrastructure systems including energy, water, sewage, or transport, and enable efficient management, control and optimization of such systems. These initiatives also address environmental and human-capacity issues.

Estevez et al. (2016, p. v)

In these attempts to define smart cities, the following three aspects have been stressed which are interrelated. First, technological input is a core driver of smart cities. Digital infrastructure, ICTs, and data-driven urban solutions are key elements. Second, smart cities emphasize “ubiquitousness” or services “everywhere” due to the inherent advantages of ICT (Greenfield, 2006). The significance of geographical expansion has been expressed in networks, interconnectedness, and information sharing beyond geographically bounded nodal points. Third, smart cities cover a wide array of urban functions including urban infrastructure systems and human, environmental and corporate benefits. The wide scope of smart city initiatives has appeared in the New Urban Agenda, with UN-Habitat committing to adopt smart city initiatives to reduce environmental footprints, increase the capabilities of public service providers to be
more engaged with communities, and to support sustainable economic growth (UN Habitat, 2015).

Some confusion has arisen due to the use of the term “smart.” In many cases, the definition of smart cities is mixed up with smart growth management (or New Urbanism) although these two urban approaches originate from different contexts (Luque-Ayala and Marvin, 2015). They might share similarities due to their objective to respond to emerging urban challenges. However, the smart growth movement emerged in the early 1980s when urban sprawl was recognized as a major urban issue associated with environmental degradation (Weitz and Waldner, 2002; Wey and Hsu, 2014). Key policies in smart growth management focused on the density, diversity, and design of cities (Cervero and Kockelman, 1997). On the contrary, smart city initiatives, which are mainly ICT-based as discussed, have been accelerated by ICT devices manifested by smartphones that have become pervasive since the late 2000s (Batty et al., 2012). This book adopts both a narrow scope and broad-scope of smart city initiatives. The former refers to technology-, digital infrastructure-, and data-oriented, but the latter includes all possible efforts to tackle urban challenges in “smart” ways, calling for the inclusion of nontechnical approaches.

Nevertheless, as Kitchin (2015) argues, the current narrow-scope approaches to understand smart cities have drawbacks. He believes that other scholarship, while being more critical and providing essential conceptual and political grounds, still carry four limitations: “the lack of detailed genealogies of the concept and initiatives, the use of canonical examples and one-size-fits-all narratives, an absence of in-depth empirical case studies of specific smart city initiatives and comparative research that contrasts smart city developments in different locales and weak collaborative engagement with various stakeholders” (Kitchin, 2015, p. 131). These perspectives will be further discussed by reviewing the evolution of cities.

2.2.2 A historic overview of smart cities

How are “smart” cities different from unsmart cities? In fact, cities are spatial manifestations of human settlements with a wide range of social and economic activities. “Since their inception, cities have been brilliant ‘machines’ for social interactions and exchange” (Han and Hawken, 2018, p. 2). Although the origin of cities is rather obscure, they have become primary loci for human activities as confirmed by increasingly high urbanization rates worldwide (The World Bank, 2018). Glaeser (2012) has declared “The triumph of the city” in human history.

Urbanism has accelerated since the industrial revolution in the late 18th century and by the early 20th century, it had become a new way of life (Wirth, 1938). Technological advancement, exemplified by the invention of steam engines, was a key driver to the creation of modern cities. Rural peasants left rural areas for cities where productivity was enhanced by these new inventions. Railways were constructed by using newly invented steam engine technologies.
linking key cities, nodal points for access to natural resources and transport nodes such as ports. These railways also facilitated human mobility. In the wake of this first industrial revolution, the urban population increased unprecedentedly, first in Europe and later in the United States. Industrialization remains a primary driver of urbanization and economic growth in most developing countries, notably in Asia and Africa.

Cities are important because people in cities are important. People are primary sources of innovation and growing numbers live geographically together in cities. The concentration of people in small geographical areas infers frequent, active interactions between them, positive/negative externalities within the city, and opportunities/threats for the residents. People have established social, technological, political, economic, and natural infrastructures in cities that can support, strengthen, and stimulate human activities in response to present problems they face and in search of new values. These societal advancements have been achieved through technological and social innovations by people. Although inspirational thoughts for innovation are not necessarily spatially bounded, cities have been the font of innovation (Shearmur, 2012). These innovations are made by people and made largely for people and these people stay in cities (Florida, 2002). Technological innovation is a pivotal input to the transfiguration of cities. Technology-oriented thinkers stress the present distinctive technological evolution due to the unprecedentedness of (1) velocity, (2) breadth and depth, and (3) systems impact (Schwab, 2016). However, these technological aspects are tightly interlocked with social systems which are outcomes of historically and culturally accumulated social innovations. The stance of this book is that smart cities are the outcomes of these interlocked technological and social innovations produced by people with “creative audacity” (Mumford, 1961, p. 4) and, in turn, smart cities spur new technological and social innovations. The smart city is not an end status, but a dynamic platform to guide, support and/or expedite new urban changes via innovations. When the smart city is conceptualized in this manner, any human settlements or cities can be smart. Historically, “smart” inventions have been embedded in cities. While the smartness of cities is valid in any historic time because people in the cities are intrinsically creative and innovative, the current debates center on the strength, capability, or degree of smartness. These discussions are tied up with (technological) innovation explicitly and implicitly (Han and Hawken, 2018; Albino et al., 2015).

How modern cities, borne of the industrial revolution, have adapted to the changes in surrounding macro- and micro-environments reflects evolutionary trajectories of cities via innovation from being “smart” to “smarter” and the interlocked nature of technological innovation with social innovation. Before European cities had established urban infrastructure, the industrial revolution triggered rural-to-urban migration, causing a series of urban issues. There was limited housing stock and the new urban residents were unable to afford decent housing. Consequently, their livability was sacrificed by slum conditions, ghettos, and squatter settlements with poor sanitation. New technology was mainly
used for manufacturing such as textiles that produced pollution. Chimneys of factories were symbols for economic vitality. The dominant *laissez faire* economic and political thinking left these urban issues as they were, hoping the “invisible hand” of the free market would bring prosperity for all. However, the economic benefits of technological innovation were not fairly shared with new urban dwellers and the built environments in these cities remained desolate. Technological innovation seemed to bring human-made disasters as exemplified by the Great Smog of London in the early 1950s.

However, disastrous urban outcomes inspired thinkers and policymakers to respond by social innovation. In the urban realm, Ebenezer Howard’s Garden City (Howard, 1902) and Le Corbusier’s Radiant City (Le Corbusier, 1935) were outstanding examples that attempted to tackle these issues by proposing ideal cities. Ebenezer Howard asserted that the marriage of urban life with the countryside would mitigate chaotic urban issues arising from sudden population increases in cities. The garden city movement left an important legacy in a way that emphasized public infrastructure including green space, public transport networks, and community centers. The ideas were partly implemented in new town developments and offered the lesson that urban planning can solve the problem. Le Corbusier’s contribution included important planning principles such as intensive land use through high-rise buildings, a job-housing match, and a social mix. Later his ideal city model offered justification for urban consolidation, mixed-use development, and the preservation of green spaces.

Technological advancement facilitated mass production represented by car manufacturing in the early and mid-20th century, labeled Fordism. In the view of Schwab (2016), this was the second industrial revolution. Widespread car ownership, sped up by the rise of middle-income households and lowered car manufacturing costs, not only provided the freedom of mobility but also generated new urban problems. Along with ever-growing car ownership, the government constructed new roads that connected far and wide. The combination of car ownership and highway construction expanded the geographical scope of motor vehicles for both regular commutes and irregular leisure activities (Hall, 2002). The enhanced freedom of mobility through Fordist production meant the spatial expansion of residential location choice into suburban areas. Urban sprawl has destroyed walking and transit-oriented cities and created automobile-oriented cities predominantly in the United States and Australia and to a lesser extent in Europe (Newman and Kenworthy, 1999; Mees, 2009).

The consequence of suburbanization was long-commuting patterns, mundane and homogeneous suburbs, and high dependency on motorized vehicles. Urban planning has responded to this unsustainable form of urban growth by introducing a wide range of policy measures and movements such as urban growth management, new urbanism, compact cities, complete streets movement, and *smart* growth since the 1980s (Downs, 2005). Here the term “smart” was first employed in the field of urban management. The smart growth approaches centered on the idea that urban problems can be or should be managed
by juxtaposed planning measures such as urban growth boundaries, transit-oriented development (TOD), socially mixed housing development, and mixed-use complexes. Urban planners have pointed out that sedentary life patterns due to high car dependency are detrimental to human health and proposed healthy communities encouraging active transport like walking and cycling (Srinivasan et al., 2003).

As briefly reviewed here, modern planning has responded to new urban challenges, but many of these challenges have been the unintended outcomes of technological innovation. Without these social approaches (or social innovation), technological innovation alone is unable to achieve problem-free smart cities. Hence, cities are sociotechnical systems (Lim et al., 2018, p. 97). Albino et al. (2015) also identified two domains for smart cities: “hard” elements, ICT, and “soft” elements, social structure (Albino et al., 2015). Batty et al. (2012) have asserted that core functions of smart cities are holistic beyond technological aspects; they include competitiveness, quality of life, social and natural resources as well as new ways of community-government or participatory connections and new methods of access to public services.

From the broad-scope of smart city perspectives, any city can be smart and any effort for better city functions can be smart city making initiatives. However, in this highly generalized understanding, ambiguity and vagueness are inevitable. Accordingly, attempts have been made to clarify current smart city debates by focusing on technological input (here labeled the narrow scope of smart city initiatives) in dealing with challenges and creating new values (Kitchin, 2015; Albino et al., 2015). Unprecedented technological advancement has offered new hope that ICT can support almost all types of human activities, including urban management (Lim et al., 2018). ICT connects the world through virtual platforms and digital technology, creating local opportunities while still being global, encouraging face-to-face communications and location-based services as “what happens online does not stay online” (The Economist, 2012, p. 2). There is no doubt that the state-of-the-art of technology is an important source for smart cities.

### 2.2.3 Objectives of smart city making initiatives

The purpose of citywide efforts can be described with the following three fundamental objectives: (1) productivity, (2) livability, and (3) sustainability.

1. **Productivity:** Driven by neoliberalism, corporate strategies to seek out more productive sites are now a common practice relatively free from geographical boundedness in comparison with the past. In knowledge-based economies, ICT infrastructure has become increasingly pivotal, as most advanced producer service firms collect, process, and produce data and information rather than manufactured tangible products. Technological innovation has long assisted to improve productivity. The enhanced productivity is derived from lowering costs and/or enlarging benefits. This can
happen both at individual and institutional levels. For instance, commuters can save travel time by real-time information from an urban traffic information system (UTIS) and a smart grid can minimize energy loss in transit. Improved productivity means end users can produce higher values that can be reflected in citywide economic growth. When cities attract skilled knowledge workers, they can bring new ideas, innovation, and prosperity (Florida, 2002).

(2) Livability: Livability is in the interest of all key actors. Residents benefit from enhanced livability (Kim and Cocks, 2017); ICT firms sell all kinds of products to end users who look for better living conditions; urban planners aim to design livable cities; and real estate industries can make a profit by developing more livable properties (Kim, 2020). Although livability is broad in concept, safety, quality of built environments, walkability, the convenience of public facilities, access to transport and natural environments are keys to livability (Southworth, 2003). ICT has a high potential to enhance almost all subsectors of cities as technology is intrinsically evolved to bring convenience for people. E-government administrative facilities are examples of ubiquitous public services that can possibly improve livability for residents. Another example is a control center that monitors a number of closed-circuit televisions (CCTVs) (despite concerns about privacy issues), widely adopted by local governments to improve public security, as seen in the smart city making projects such as Songdo, South Korea (Kim and Han, 2012) and Fujisawa Sustainable Smart Town, Japan (see Chapter 5).

(3) Sustainability: ICT solutions can support environmental sustainability in multiple ways. Managing ecosystems assisted by new technological inventions can benefit both human beings and nature. Outstanding fields are energy sectors such as renewable energy sources and smart grids. Environmentally keen local governments, such as the City of Melbourne, Australia, have managed street trees combined with geospatial data. Singapore has employed a quantitative urban environment simulation tool (QUEST) implemented on a web-based multidimensional GIS platform to examine the thermal comfort index and urban heat islands effects of urban redevelopment projects (Lim et al., 2017; Sabri et al., 2019).

2.2.4 Smart city making initiatives vs smart city status

It is rational to distinguish smart cities as an end status from smart city making initiatives. Smart cities refer to the well-functioning status of cities, assisted and spurred primarily by technological innovation and inevitably by social innovation as will be explored later in this chapter. This means smart cities are both (1) achieving high levels of productivity, livability and sustainability, and (2) facilitating new innovations as a platform. Smart cities have not only innovative technologies but also the ability to innovate. Fig. 2.1 depicts the self-reinforcing
structure of smart cities. When cities become smart, they are in a position that sustains, strengthens, and magnifies urban functions via innovation. The innovation makes cities smarter. Smart city making initiatives refer to all kinds of efforts to enhance the function of the cities, including governmental, corporate, individual, and institutional approaches. While smart city making initiatives aim to enhance the function of the city in a smart way, the smart city cannot be an end status because there is always room for further innovation. In this sense, the smart city is and should be a city as a platform for innovation.

Smart city-making is multifaceted and interconnected. Multiple factors influence their courses, such as global city functions, the size of cities and sustainability features. De Falco (2019) examined the interrelation of global cities with a strong presence of inward foreign direct investment (FDI) and smart cities in Europe. He concluded that “the technological dimension is totally superimposable upon the global dimension; in fact, all current global cities are also smart cities, but the technological character of these cities has not yet acquired a full global dimension” (p. 774) Borsekova et al. (2018) have discovered the size of cities matters in smart city rankings in Europe. Parks and Rohracher (2019, p. 51) have pointed out the focus on sustainability in smart city discourses by noting “… even when smart city discourses are appropriated by actors in existing sustainable city assemblages, the discursive shift might eventually allow smart city assemblages to colonize existing institutions and socio-material practices. But the shift does not take place through explicit controversy between two discourse coalitions and it therefore remains important to further investigate the conditions that allow for a change in dynamics from appropriation to colonization.”
2.3 Technological innovation

Technological innovations have been at the forefront of the incremental changes in human life and expressed in cities. Skyscrapers in modern cities were impossible without the development of steel construction technology and the invention of elevators that enabled vertical movement in high-rise buildings. Since what is labeled the fourth industrial revolution (Schwab, 2016), technological aspects have been leaders in most smart city initiatives. The following are notable examples that might have significant implications in urban management.

- IoT through the deployment of sensors on a wide array of devices (Roche, 2017)
- Analytics platforms (Chen et al., 2020; Rajabifard et al., 2016)
- Fast-growing application of AI and machine learning (ML) in the process of decision-making and providing services (Jafar et al., 2010)
- Digital Twins for simulation on virtual cities (see Chapters 4 and 10)
- Big data
- Personalization of ICT

IoT has played a crucial role in urban management including parking, lighting, and traffic controls (Plautz, 2018). In addition, the IoT sensors enable real-time monitoring to inform environmental attributes including pollution, heat, and rainfall for emergency management (ANZLIC, 2019). The advancements in streaming data types enabled developed analytics platforms, which allow harmonization and integration of spatial and nonspatial data for livability (Chen et al., 2020). These technological advancements are enriched with optimization methods assisted by AI, and ML, to further enable the analysis of big data in multidimensional platforms such as Digital Twins. As an example, the Australian government has developed the spatially enabled Digital Twins strategy to modernize the planning, development, and monitoring of the built and natural environments using IoT, AI, ML, and multidimension spatial data (ANZLIC, 2019).

Technology-oriented smart city initiatives acknowledge the presence of unmet demand, identify unused resources, and attempt to seek answers from technology for desired outcomes in every aspect (Yigitcanlar et al., 2018). However, there is a fundamental question: How strong is our trust in technology in dealing with the complexity of urban challenges? This question is not new. The early 20th century saw technological advancements in science and mass production, with Taylorism as a major influence. There was a conviction that scientific approaches could predict the future and therefore, optimize urban functions. However, scientific urban modeling approaches have failed to forecast future changes despite their valid logics, due to unrealistic assumptions and unexpected political, economic, and technological circumstances that were unforeseen. Technologies evolve over time. The key to smart cities is to create an urban system where new technological inventions “plug and play” into the city effortlessly. The system is likely to be strengthened by social systems.
2.4 Social innovation

Social innovation concerns the adaptation of norms, values, and behavior to achieve some desired state or to improve upon a less desired condition. It requires cooperation, inclusiveness, and trust and is a collective endeavor. From a Schumpeterian perspective, innovation in business is a process of adoption and diffusion (Schumpeter, 1939). Social innovation aims to generate social benefits rather than individual benefits bringing new values for society. While social innovation is an extremely broad concept in scope, this chapter addresses urban-focused social innovation. The social dimension is significant in the literature on smart cities too. New technologies, including the proliferation of smart devices and associated digital infrastructures, have brought a new paradigm of space and distance as seen in social media and crowdsourcing. Innovation, however, has retained its spatiality (Shearmur, 2012); as Alfred Marshall stated in 1890 in reference to the efficacy of industrial clusters, “if one man [sic] starts a new idea, it is taken up by others and combined with suggestions of their own; and thus it becomes the source of further new ideas” (Marshall, 1890, p. 225).

There are three interrelated dimensions of social innovation in relation to smart cities. First, technology provides an increasing array of and subscribed to social platforms for interaction. From this angle, social innovation is about socializing. Second, there is also the positive externality of bringing people together, virtually or face-to-face. This leads to other agglomeration benefits such as labor market matching and the exchange of information. Third, there is an acknowledgment of the implications of inherently unequal cities for the application of smart technology. Rather than a conventional “public good,” the introduction of smart technology can reflect unequal relations, which conflicts with key values of social innovation, particularly the importance of community well-being and control over one’s environment and life.

2.4.1 Social innovation: Genesis and concept

Ideas and practices under the heading of social innovation have emerged in response to the failure of the market and in some cases government to deliver services. More specific events, often economic in nature, have signposted surges of interest in social innovation. Postindustrial decline and more recently, the Global Financial Crisis are examples (Baker and Mehmood, 2015; Ardill and Lemes de Oliveira, 2018). Now, the coronavirus disease-2019 (COVID-19) presents the worst health crisis since the Spanish Flu and the worst economic and welfare crisis since the Great Depression. These crises promote interest in “the social and solidarity economy for welfare provision” (Ardill and Lemes de Oliveira, 2018, p. 208).

Clear definitions are elusive (Choi and Majumdar, 2015). Ardill and Lemes de Oliveira (2018, pp. 208, 217) describe “a quasi-concept with hybrid characteristics adaptable to different situations...it is necessary that a conceptual meaning of social innovation be better defined and agreed if social innovation
is to provide a framework for the positive transformation of cities.” The common, broad themes are change and betterment: “in social relations, political arrangements and/or governance processes that lead to an improvement in a social system” (Castro-Arce et al., 2019, p. 2256), as well as “attitudes, behavior or perceptions of a group of people joined in a network of aligned interests...[leading to] collaborative action” (Neumeier, 2017, p. 2) that “tackle social challenges...that simultaneously meet social needs” (Morrar et al., 2017, p. 14).

2.4.2 Citizens, social innovation and governance

It has been argued that the social innovation approach engenders a fundamental realignment of the relationship between citizen, state, civil society, and market. Partnerships, rather than top-down government, are promoted. Citizens work more interactively with government and can supplement and take on activities traditionally the role of the state. Citizens become active partners and “embedded urban resources,” working with government to develop and deliver solutions (Ardill and Lemes de Oliveira, 2018, pp. 218–219). This process makes democracy and governance “more horizontal, participatory, and inclusive – i.e. an adaptive governance system” (Castro-Arce et al., 2019, p. 2259). Public-private partnerships also play a key role, particularly in the delivery of services (Baker and Mehmood, 2015). For social innovation, notions of collective action and redistributive mechanisms are core. There are three key elements: “satisfaction of the interests of actors; changes in socio-political arrangements; and empowerment of the participating actors” (Castro-Arce et al., 2019, p. 2259). Social innovation represents the power to change, but above all, the power to change collectively. ICT has great potential to re-shape the way of conventional communication and decision-making.

2.4.3 Social innovation and smart cities

Authors have differing views on the relationship between social innovation, industry, and technology. Some are ambivalent: “The innovation paradigm of the industrial society perceives technical innovations such as products and processes as the only avenue for societal development...[authors] foresee the rise of a social innovation paradigm with the transition from an industrial society to a service and knowledge-based society” (Choi and Majumdar, 2015, p. 11). Others argue there is no inconsistency between technological and social innovation: “Industry 4.0 pave[s] the way to a new age of digitalization, ‘smarter’ networking of production systems, and interlinked business processes...there is a mutual relationship between the technical and social innovation...” (Morrar et al., 2017, p. 16).

The focus of social innovation is on the civic and neighborhood level. There are many examples. Here, some pertinent cases are provided to clarify the nature of these initiatives. Oliveira and Campolargo (2015) are well aware of the
gap between smart cities (represented by technological management) and human smart cities (represented by neighborhood solidarity), but the gap, it is argued, is being filled. Their example of the My Neighborhood program, implemented in four European cities, shows that through the use of neighborhood-specific websites, local communities can exchange information and ideas with each other and with local government authorities to improve their neighborhood. The generation of new and better ways of doing things can be considered and shared among citizens. One such outcome has been the parklets initiative, small green spaces in unlikely locations. The Smart Citizen App was applied in Pisa, Italy so that citizens could identify the availability of services and resources and collect and share daily experiences about life in the town, including quality of life issues such as environmental conditions (air quality, weather, other pollution) (Delmastro et al., 2016). Holderness and Turpin (2015) show how Jakarta residents uploaded the location of flooding to Twitter, critical information that has never been coherently provided by government. In Philadelphia, The Digital On-Ramps app attempts to link the unemployed with training and job opportunities (Wiig, 2016). Arribas-Bel et al. (2015) show how the geography of cultural diversity can be established through the language used in Twitter messages. As Letaifa (2015, p. 1416) suggests, “Smart people are the result of ethnic and social diversity, tolerance, creativity, and engagement.” There are also “networked publics” of do-it-yourself urban design proposals and virtual visions of local park planning (Hollands, 2015), maintenance requests and community consultation, and use of social media to participate in graffiti, flash mobs and yarn bombing (Foth et al., 2016).

However, there are contradictions between the ideals of social innovation and the characteristics of smart cities. These can be seen in the dissemination of “fake news” often shared across the “echo-chambers” of affiliated groups, which does not enhance civil society and democracy nor serve the public good (Allcott and Gentzkow, 2017). To this can be added cyberbullying, information and location leakage, fake profiles, and fake photos. Given the nature of the mediums, they are difficult to control and when they are controlled, it is usually for reasons of political censorship, not in the name of public decency or fairness (King et al., 2013). There are further concerns that use and control of data is not subject to public scrutiny and debate, let alone control, and is used for repressive police surveillance (Bass et al., 2018; Wood and Mackinnon, 2019; Lebrument and de La Robertie, 2019; Caprotti, 2019; Sadowski and Pasquale, 2015; Krivý, 2018). David Harvey (2005) wrote of “accumulation by dispossession,” by which he meant shifting ownership of assets such as housing from individuals to financial investors. He was also concerned, in a tone not unlike that of social innovation, with the “right to the city,” “an active right to make the city different, to shape it more in accord with our heart’s desire” (Harvey, 2003, p. 941). To paraphrase Harvey, there is a danger with the smart city of a new form of dispossession—of individual privacy, but similarly, of alienation of spaces once considered separate from the public realm or from government surveillance.
It has to be said that the social innovation literature has not considered privacy as a central concern or objective.

Social innovation ideas are concerned with improving and empowering underprivileged groups. With smart cities, there are also concerns over the uneven application and control of benefits and applications (Glasmeier and Christopherson, 2015). Social innovation has an organic view of society, with the government as benevolent, capital as helpful and citizens as willing and able, all trusting and working together in “constructive cross-sectorial partnerships” (Baker and Mehmood, 2015, p. 214). This “dissolving of traditional boundaries” takes an ironic turn when we consider the concerns over enhanced and unaccountable surveillance. Moreover, this is said to be achievable in an era where neoliberal priorities have enhanced the role of the market while curtailing the distributive mechanisms of government.

At the time of writing, the world is confronted with an unprecedented economic and health emergency—COVID-19. While shut down in “hibernation,” citizens are connecting digitally as never before. This is a conjoining of, on the one hand, greatly expanded use of digital technology and on the other, the need for “the social and solidarity economy for welfare provision” (Ardill and Lemes de Oliveira, 2018, p. 208). In the post-COVID-19 recovery process, social innovation will be necessary. This makes the need to integrate and reconcile the ideas and practices of social innovation with smart cities all the more profound.

2.5 Smart city drivers and actors

2.5.1 Key drivers of the smart city making

The political, institutional, and historical context should be considered to holistically understand the emphasis on smart cities. This framework suggests that the smart city is an outcome of historical paradigm changes in cities. Current smart city practices have been accelerated within broad economic and political settings. Key drivers include:

(1) National and local policies: These embrace new technology in infrastructure development. Ironically, although ICT is aiming to be ubiquitous, infrastructure is spatially selective (Kim and Kim, 2013). Both nonspatial and spatial public policy measures have been in place for smart city making.

(2) Business opportunities and market demand: There is the ever-growing size of ICT industries and ICT is seen as a sector producing imperatives in almost all other sectors, including education, manufacturing, retail, logistics, and even the arts and performance. The penetration of ICT into a wide array of industries and daily life for professionals and ordinary citizens has pushed smart city actors to expand ICT at the city scale.

(3) Globalization: Transport networks have shrunken travel time and far-reaching ICT has triggered the process of “time-space compression”
Globalization has yielded new business opportunities theoretically everywhere, but phenomenally so in global cities, with economic and political command-and-control functions (Taylor and Csomós, 2012). Most global cities aspire to smart city status (De Falco, 2019). Now cities learn from, compete against, and collaborate with other cities. Stories about the success of smart cities are easily shared with other cities motivating them to become smart.

**Political push**: The prevailing of neoliberal thinking has been a driver to capitalize on all available sources for economic growth and market efficiency since the 1980s. Central governments have privatized infrastructure fully or partially and local governments have become entrepreneurial, to enhance the competitiveness and the image of their city (Storper and Scott, 2009). ICT may seem to be free from political conflicts as a neutral, objective, and scientific tool, although it involves complicated political decisions in practice. Efficiency-seeking infrastructure operators have actively adopted ICT solutions such as a smart grid for energy and the UTIS.

### 2.5.2 Key actors of smart city making

Smart cities have been led and often promoted by multiple actors. Smart cities should create new values for stakeholders (Lim et al., 2018). The key actors include:

1. **Central and local governments**: In response to new technological opportunities, governments have attempted to utilize ICT in urban development and management. Governments aim to achieve a smart city status with an ambition to realize futuristic images primarily via formulating urban policies, investing in ICT-embedded infrastructure, and guiding urban development with new technologies. Governmental approaches are efforts for smart city making in a wide range of sectors (Anthopoulos, 2017). In a narrow scope, governmental approaches include administrative services for citizens such as e-government and inner- and intergovernmental facilities such as e-conference facilities (Hur et al., 2019). Infrastructure is an essential component under government control. Efficiency-seeking government departments, local governments, and government agencies endeavor to exploit benefits from ICT in the provision and management of infrastructure. While ICT can be set in all fields, tangible infrastructure, such as transport, energy, and waste management has attracted more attention. In a broad scope, governments direct new urban development projects and urban renewal projects by incorporating ICT facilities for citizens. Their role can be passive as a regulator and/or active as an agent or a developer (Shin et al., 2015). Governments inevitably invite private sectors with ICT skills and serve the public in their smart city making approaches.

2. **ICT firms**: ICT firms are primary suppliers of ICT-related products. As Hollands (2008) points out, current smart city initiatives are largely
entrepreneurially driven. By virtue of their expertise in ICT and raison
detre as a for-profit private sector, ICT firms overemphasize ICT solu-
tions and attempt to enlarge the scope of these ICT solutions to larger geo-
graphical areas to the community, local, city, regional, national and even
cross-national levels. Larger geographical coverage means large project
size, but also, enhancing the global reputation of the firm by generating
larger impacts. In fact, current smart city initiatives in many cities have
not been academically driven, but industry-driven, by ICT firms such as
Apple, Google, IBM, Facebook, and Samsung. In tandem with the increas-
ingly growing significance of ICT in urban management, their role is also
growing and expanding in the process of urban planning and management.
However, their focus is to incorporate their products into urban systems as
a profit-seeking stakeholder.

(3) Urban professionals: Urban planners are broad in scope (Levy, 2013).
They liaise with many other urban professionals such as architects, sur-
veyors, demographers, economists, and developers who contribute to the
changes and plans for urban space. As such, urban planning inevitably re-
quires an understanding of local areas and skills to communicate with spa-
tial information like maps and spatial data. ICT elements can be embedded
into sectorial planning such as transport planning, infrastructure planning,
and community planning and lead long-term strategic planning. Urban
planners coordinate the planning process and negotiate with stakeholders
including ICT professionals, developers, landowners, and residents. Most
planning processes are driven by the public sector, requiring approvals and
endorsement from the public authority. Another important group of urban
professionals is developers. Much of urban development is realized by real
estate investment which is a major role played by developers who directly
invest or attract investors (Kim, 2020). Developers and real estate investors
seek out higher rates of return as a private sector. Input from ICT products
can offer distinguished urban products that can possibly increase the value
of the property. When a smart city initiative comes down to the urban scale
for implementation, it becomes a real estate development project with the
customary issues of that sector, including housing affordability, pocketing
windfall gains, social/spatial inequality, and struggles for land ownership.

(4) Residents and end users: People are or should be the primary benefici-
aries of ICT. Smart cities should support coordination and collaboration for
citizens (Han and Hawken, 2018). Growing significance on participation
in the planning process is a push to employ ICT solutions that can support
interactions between residents, public sectors, and ICT professionals. End
users include all kinds of interest groups such as individuals, firms, and
retailers. They can be passive users of ICT facilities in their local areas
and can be proactive in raising their voices through a formal public con-
sultation and informal comments. When the level of satisfaction in ICT
facilities is high, the abovementioned key players are motivated to respond.
As shown in the discussion above on social innovation, the extent that such programs are people-oriented depends, in part at least, on who controls them.

2.6 Conclusion

In summary, the intention of this chapter is by no means to oversimplify the definition of smart cities. Instead, it acknowledges the broad scope and identifies a number of contentious issues. Smart cities are the spatial outcome of technological and social innovations and in turn, they are platforms to facilitate innovations. Cities are, by definition, a center for human settlements and economic activities. Historically, new technologies have been nurtured in cities even when the origins of these ideas lie outside the city itself.

In general, the key drivers of smart cities can be exogenous and endogenous. The current literature has highlighted a series of parameters such as national and local policies, growing demand for the ICT industry, a new global pattern of fast movement of goods and information, as well as political interests as important factors. The weightage of these drivers varies, depending on the jurisdictions and services that smart city initiatives offer. Accordingly, the key actors, who can be different levels of governments, ICT firms, urban professionals, and even end users have different approaches, interests, contributions, and demands. As such, it is crucial to explore smart cities in multiple geographical, socio-cultural, economic, and political contexts.

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