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A Common Management Framework for European Smart Cities? The Case of the European Innovation Partnership for Smart Cities and Communities Six Nations Forum

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A Common Management Framework for European Smart Cities? The Case of the European Innovation Partnership for Smart Cities and Communities Six Nations Forum

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ABSTRACT
To minimize market fragmentation, optimize efficiencies through compatible digital architectures, and encourage collaboration, high-level smart city harmonization efforts have been advocated across Europe. This paper critically analyzes attempts by the European Innovation Partnership for Smart Cities and Communities Six Nations Forum (EIP-SCC 6N) to constitute a common smart city management framework through application of a generic Blueprint. Analysis highlights how these efforts are brought to bear through four techniques: simplification, interoperability, integration, and authorization. Examining the adoption (and rejection) of these techniques underscores the importance of attending to distinctive urban contexts and alternative ways of knowing and acting in the city.

KEYWORDS
Smart city; digital platforms; standards; ICT infrastructure; urban development

Introduction

Smart cities (SC) are orchestrated assemblages of computerized systems that enable the collection, transfer, and analysis of multiple forms of data to more efficiently and effectively manage everyday urban processes at a distance (Klauser et al., 2014: 869). The architectures, operations, and effects of "smart urbanism"—in which digital technologies, real-time data collection, and predictive analytics are seen as having the potential to address contemporary urban challenges—have been extensively discussed (e.g., Kitchin, 2014a; Leszczynski, 2020; Luque-Ayala and Marvin, 2015; Marvin et al., 2016). Political implications of computational governance inherent to smart urbanism have been examined in terms of "soft-ware sorted geographies" (Graham, 2005), implications for everyday urbanism (Kitchin and Dodge, 2011), selective rebundling of splintered networks and fragmented urban space (Luque-Ayala and Marvin, 2016), and the uneven securitization of urban life (Leszczynski, 2016). To date however, the creation of transnational frameworks for smart city implementation and management has been subject to minimal critical scrutiny.

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In Europe, smart cities (SC) are positioned as a means of providing a configurable way to address contemporary "grand challenges," build an inclusive society, and generate a thriving urban future (EIP-SCC, 2019; Immendoerfer et al., 2014, Van Nistelrooij, 2015). To minimize market fragmentation, optimize efficiencies through interoperable digital architectures, and encourage collaboration across cities by identifying common approaches, international industry standards organizations advocate the standardization of smart city solutions and their integration into good governance, security, financial efficiency, and the effective management of climate change adaptation and mitigation (ISO, 2022). These kinds of high-level smart city harmonization efforts are advocated by the European Commission (EC). The question of how multi-state negotiations are undertaken at the European level with the aim of agreeing on a common SC management framework, and the contestations that unfold, lie at the heart of this article. Central to these concerns is the EC's European Innovation Partnership on Smart Cities and Communities Six Nations Forum (EIP-SCC 6N, or 6N), that was established "to identify common needs and exchange experiences of developing national policies and strategies for SC development" (EIP-SCC, 2014: 1). The Forum represents the primary institutional vehicle for promoting a "common approach" to SC management within, and across, Europe (EIP-SCC, 2013).

This paper aims to examine the issues at stake in this attempt to develop a common transnational approach to smart cities and the challenges associated with reconciling variable and vested interests within a standardized management framework. Why is it seen as desirable to develop a common universal framework for smart urban governance to be implemented across highly variable nation states, socio-politically and materially diverse cities, and for diverse levels of public and private engagement? What approaches and tools are used in appraisal and negotiation processes between different Member State (MS) representatives; where and why do tensions arise? And, what do the answers to these questions mean for how urban studies should approach city standards, particularly those related to digital infrastructures?

The article has three objectives, each addressed in a section of the paper. The first is to develop a four-pronged analytical approach to understanding a common framework for smart cities management, identifying what varied socio-material configurations are encouraged to be rendered as standardized, commensurable, and universal. The second is to examine empirically the attempt by the 6N Forum to construct a common approach to smart cities development in Europe, critically analyzing the techniques used and the degree to which participating MS embraced tools outlined in a generic Blueprint. The third examines why the 6N Forum common framework largely failed to meet its own objectives and was unable to build broad consensus. We identify four reasons why this occurred. Finally, the conclusion summarizes the article's contributions and identifies future research challenges.

The article investigates 6N Forum activities and the actions of associated intermediaries during the period extending from the group's initial meeting in April 2014 to the EIP-SCC General Assembly in June 2018. We analyzed grey-literature documents comprising EC policy documents, EIP-SCC 6N Forum minutes, relevant national policy documents, and content from the EIP-SCC website—38 sources in total. Documentary analysis was supplemented by interviews with the EIP-SCC 6N Forum Chairperson and eight interviews with public officers representing the six participating

EU MS—anonymized and numbered INT1 to INT9. Empirical analysis highlights how this harmonization drive is being brought to bear through four techniques: (i) *simplification*, (ii) *interoperability*, (iii) *integration*, and (iv) *authorization*. The use of particular tools advocated by the Blueprint to examine the adoption (and rejection) of these techniques makes visible the agreements and tensions that highlight the importance of attending to distinctive urban contexts and alternative ways of knowing and acting in the city.

Challenges of Standardizing Management of the Smart City

Proponents of international industry standards for smart cities advocate that as sources of best practice, standards can be used to "monitor technical and functional performance," and to "ensure that technologies used in cities are safe, efficient, and integrated." Using standards can also ensure that resources are "optimally manage[d] … to reduce environmental impact and improve service delivery to citizens." Finally, "by enabling systems to work together, standards stimulate innovation, making it easier for cities to procure reliable and cost-effective systems to meet their needs" (ISO, 2022). This ambition stems from the framing of the city as - a system of systems (Light, 2003) according to which conception, the complex nature of the city can be broken into a series of steps, "foregrounding the manageability" of urban interactions (Marvin and Luque-Ayala, 2017: 94). However, such an intention presents major challenges, which include the need to: establish a shared knowledge base, revise financial models, determine procurement regimes, and ensure relevant political and regulatory frameworks. What this might entail for national governments, municipalities, and urban innovation agencies, and what such universalizing aspirations might overlook, has only recently begun to be explored within urban geography.

While the governance of smart cities is a burgeoning field of research (e.g., Meijer and Rodriguez Bolivar, 2016), the negotiation of multi-scalar political strategies for the management of smart cities has received less attention to date (although see Haarstad, 2016; Lombardi and Vanolo, 2015; Russo et al., 2016; Smiegiel, 2018). Homing in on the use of standards for the design, implementation, and management of smart city infrastructures and operations, and building upon critical analyses of smart urban operating systems (e.g., Luque-Ayala and Marvin, 2016; Marvin and Luque-Ayala, 2017), Schindler and Marvin (2018) examine the output of the International Organization of Standardization (ISO) technical committee for smart and sustainable cities and communities, and analyzing three standards, warn against attempts to simplify the complexities of the city through "constructing a universal logic of urban control" (2018, 298), leading to one-size-fits-all metrics and management systems. In a response to this paper, White (2019: 245) questions the extent of coherence and unity through which city standards are developed, arguing that, while attempted standardization of city processes is deserving of greater attention from urban scholars, a more situated analysis of their politics of development and authorization could leave "open the possibility of them having positive effects on urban equity and social change." Related to this concern, Joss et al. (2017), analyzing attempts by the British Standards Institution (BSI) prior to 2014 (such as, BSI PAS 181 good practice framework for city leaders), critique the entrepreneurial drivers of change inherent in smart city standards and raise concern around the lack of public participation in their development.

In this paper, we advance this emerging literature, by appraising a transnational attempt to implement a common framework for smart urban development. We identify the following four challenges that international industry standards organizations and their proponents, are motivated to address in attempts to formulate, translate, and accelerate a common approach to smart city management.

First, there is the challenge of encompassing the "*complexity* of urban living" (European Parliament, 2014: 17). While the diversity of cities is downplayed by smart city proponents, cities vary in their size, material infrastructures, political geography, laws and regulations, and bureaucratic practices, presenting significant obstacles to their standardization. The rationale of smart urbanism is that complex city processes can be understood as simplified systems, and everyday dynamics can be computationally managed to deliver smooth urban flows (Marvin and Luque-Ayala, 2017). This techno-rational logic of urban control, transmuted from the "lean" production and management system processes of corporate enterprise (Söderstrom et al., 2014) advocates that particular circulations can be selected, monitored, and reconfigured for optimal efficiency. To become "smarter," it is claimed that the city should be recognized as an expansive network of multiple systems, infrastructures, and flows, organized through diverse sets of actors, which can be enhanced and reorganized for efficiency through software-mediated techniques (Marvin and Luque-Ayala, 2017).

Second, according to the ICT sector and industry standards organizations, a common framework for the computational governance of everyday urban services and circulations is complicated by *incompatibility* in the range of existing software and hardware products used in cities. Urban processes are increasingly being governed by algorithms embedded in digital platforms (Leszczynski, 2020). Functionality of these technologies is based on scientific methods of systems design, data processing, and automated response that assumes that infrastructures, city services, and socio-material flows can be unproblematically isolated, modified, and beneficially re-arranged in accordance with algorithmic predictions (Marvin and Luque-Ayala, 2017; Schindler and Marvin, 2018). To avoid siloed systems and applications with their own specific objectives and functions, which enable strong vertical integration but prevent horizontal integration (Frascella et al., 2018), municipalities (and nations) are encouraged to develop and/or purchase hardware and software packages that "speak the same language." Common and compatible SC systems benefit from scaling, procurement advantages, and can be easily maintained and upgraded. However, cities have considerable investments of resources in their existing bespoke systems and the task of harmonizing those systems, represents a significant technological and fiscal management challenge.

Third, challenges of interoperability are also reflected in the concerns of overcoming the *customization* of data. A significant threat to attempts to internationalize SC information and computing technologies (ITC) is the availability and quality of digital data, which contrasts widely as nations, cities, and institutions use "varying measures (units and classifications), temporalities (how often the data are generated), spatialities (the statistical geography), and technologies (formats)" (Kitchin, 2014b: 157; Schindler and Marvin, 2018). To maximize efficiencies, SC data needs to be easily shareable and re-applied through use of common voluntary technical standards (EP, 2014: 23). Avoiding the need for expensive customization of digital architectures to match the informational landscape of a city, ICT providers frequently attempt to construct a SC platform infrastructure

that is scalable, pervasive, flexible, and replicable, and that enables the integration of SC data and services management. To encourage further efficiencies, voluntary standards are being developed to attempt to cohere the urban context to match the assumptions embedded in software product(s) (e.g. ISO/IEC, 2014; ISO, 2019; British Standards Institution, 2018) (Schindler and Marvin, 2018). However, ICT has long been used in cities and government (Dunleavy et al., 2006), and this is not the first time that a systems theoretical approach has been promoted by the private sector (Light, 2003). It is not evident that attempts to standardize the urban context to match assumptions of ICT software were previously possible, and it is questionable that such ambitions will be achievable in contemporary cities, which continue to be more heterogeneous and complicated than industry standards organizations (and their critics) allow (White, 2019).

Lastly, there is the challenge of *fragmentation* in decision-making. There is variability in how urban centers deliver city services, infrastructural management, and municipal control. Urban service supply is often highly fragmented across a wide range of public, private, or hybrid providers (Graham and Marvin, 2001) and frequently there is not a single purchaser of SC software products. SC products also demand diverse commercial linkages with different service providers to achieve the integration it is claimed they deliver (Bell, 2018). While a municipality may appear the obvious entry point to integrate smart service delivery, departments are often siloed and lack technological capacity (Cabinet Office and Government Digital Service, 2017). To counter these issues, ICT firms and industry standards organizations advocate the need for clear organizational structures for SC governance—"the potential for expanding the scale of existing projects or creating duplicate projects in other areas can be reinforced by strong governance, sustained sponsorship, and the right stakeholder mix" (European Parliament, 2014: 12).

In summary, to develop a common approach to smart city management, as encouraged at the EU level and desired by international industry standards organizations and ICT firms, the challenges of complexity, incompatibility, customization, and fragmentation located in the messy reality of urban contexts and diverse politics need to be addressed. This includes the major underlying challenge that different stakeholders (national governments, city governments, consulting firms, software providers) have vested, and potentially competing, interests in promoting their own proprietary systems or methods, either to minimize the need for change, or to gain competitive advantage. There is no neutral common approach for organizing and managing the universal smart city, but a plethora of different options. The following sections explore how this problematic was addressed by the EIP-SCC 6N Forum.

Designing a Common Approach to Smart City Transformation in Europe

Overcoming Disintegration Across the EIP-SCC 6N Forum

In July 2012, an influential mapping exercise identified that Europe's transformation towards smarter cities, governance, and the "smart tech" market, were highly fragmented (European Parliament, 2014). The exercise, which examined 28 European cities with populations >100,000 residents, noted missed opportunities for collaborative learning and economies of scale in the research and development, procurement, and application of smart urban systems and technologies.

The report highlighted that European MS, cities and communities are taking different approaches to how they respond to the challenges of urban transformation. It acknowledged that given the diverse challenges cities face this was by itself not unexpected. However, the assessment concluded that extensive commonalities at a systemic level between cities, and the constant need for progress, gives scope for a more coordinated and complementary approach. Thus the EC identified a strategic opportunity to develop a more ubiquitous form of smart urbanism.

The EIP-SCC Six Nations (6N) Forum was established to develop a common approach to smart urban transformation, intended to enable smart technologies to enter the international market and place European cities at the center of innovation. The consultancy UrbanDNA (UrbanDNA, 2019) was appointed by the EIP-SCC, under the advice of the former UK Department of Business, Innovation and Skills, to Chair 6N Forum processes. The Chair described the 6N Forum's position as

> living in a gap between: suppliers—who need to learn to collaborate to build city ecosystems; demand, so cities that need to realize they're not all beautifully unique and they have some common elements, investors, who see cities as too small, too slow, and too risky … and society, which is why we're doing all of this. (INT 4)[1]

Understanding National Priorities for Smart Urban Development

The 6N Forum aimed to develop a collaborative framework to operate at a state level by inviting national-level representatives from six European MS leading in SC development —Austria, France, Germany, The Netherlands, Spain, and UK—to "compare and share strategies, policies and programs; and package up resulting good practices" to accelerate smart transitions across Europe (EIP-SCC, 2016a: 3). Taking "an integrated approach, developing common open solutions and collaborating between stakeholders" (EIP-SCC, 2012) was intended to address the disintegration in smart urban development across these MS and deliver widescale structural change. Yet participating MS varied in their motivations, commitment, and progress towards establishing a national SC plan, policies and programs, operational partnerships, and financing structures. The 6N Forum's starting point was to identify "commonality of needs, context, and priorities" (EIP-SCC, 2016b: 6).[2] Therefore, the first step for each MS was to formulate its national SC priorities by selectively engaging with municipal, corporate, and innovation bodies in their country context. We briefly examine these contrasting processes below.

The French government established the French Mirror Group on Smart and Sustainable Cities that sought input from 60 French cities to enhance the local economic dimension through ITCs (INT 7). Municipalities articulated their SC plans by responding to themed funding calls determined in a *prescribed* way by the Government, although aligning with consultation outcomes. Nineteen SC projects were subsequently supported through the €145 m "Cities of Tomorrow" funds. These projects were at "different levels of maturity," there was a pronounced "gap between large and small cities," and a "lack of coordination within public bodies and public programs" (INT 7). However, keen to "accelerate the deployment of innovations" and "promote French know-how on smart cities abroad" (INT 7), France joined the EIP-SCC 6N Forum.

The Dutch Government adopted a more distributed logic to formulating national SC priorities, with government roles and resources spread across a range of departments,

policies, and governance strategies (INT 1, 2). Keen for "ownership of SC developments to remain with cities rather than with the national government," a *devolved* "explorative and bricolage approach to SC" characterized Dutch SC development (INT 1, 2). The NL national representative described the Dutch innovation landscape as "an ecology of intermediaries" (INT 1, 2), which meant that "it was difficult to manage all stakeholders and keep on track with everything that is going on" (INT 1, 2). Participation in the 6N Forum was, therefore, intended to help the Dutch government to provide a "supportive role" in helping their cities and industry to become smart (INT 1, 2).

Spain already had a well formulated national policy, established institutions, funding programs, and a set of guidance and standards designed to promote SC when the 6N Forum first met. The Government established the business agency RED.ES to promote the national Digital Agenda and integrate into the digital convergence underway in Europe. According to this remit, SC were seen as an opportunity to improve public services and develop a high value ICT sector for the Spanish economy. Together, RED-ES and The Spanish Network of Smart Cities (Red Española de Ciudades Inteligentes—RECI) *convened* local authorities' experiences of smart urban development to develop the National Plan for Smart Cities. The plan was launched in 2014 (Ministerio de Energía, Turismo y Agenda Digital, 2015) and positioned Spain as a leader in SC urban governance within Europe.

The United Kingdom's approach to SC development emphasized delivery through *public private partnerships* (INT 3, 4). In 2012, the United Kingdom's national innovation agency, Innovate UK, launched the Future Cities Catapult and Demonstrator Competition (£33 m) to stimulate technological innovation in four winning cities (Taylor Buck and While, 2015). In 2013, a BIS commissioned report highlighted the "need for government to collaborate with cities, business, and academia" to develop an integrated SC vision focused on smart—energy, water, transport, waste management and assisted living (BIS, 2013: iii). It was intended that the strategy would ensure "spillover effects" nationally (INT3). The report also recommended a SC roadmap to address fragmentation of the market and inform an industry strategy for SC-related ICT business at the national and international level. On this basis, the United Kingdom initially took the lead in establishing the EIP-SCC 6N Forum.

Recognizing that German cities were reluctant to embrace smart urbanism, a publicly funded research organization undertook an internationally comparative project entitled "Morgenstadt: City Insights." This concluded that German smart initiatives "fail to represent a real quantum leap" in terms of innovation (Fraunhofer-Gesellschaft, 2012: 5). Urban municipalities were not focused on technologically mediated smart urban transitions, instead they prioritized a broader concept of place building (INT 8, 9). The *autonomy* to make this choice is enshrined in Germany's political constitution where "cities play a very strong role and operate independently" (EIP-SCC, 2014: 6). Indeed, it was only after a dedicated team for "National Urbanization Policy and Smart Cities" was established within the German Environment Ministry at the start of 2015, that a country-wide consultation process—the Smart Cities Dialogue—commenced (BBSR and BMUB, 2017: 33). Germany's representatives therefore joined the 6N Forum keen to be exposed to different viewpoints but with a firm view that SC should be centered around enhancing urban "livability" (INT 8, 9).

Finally, in Austria, Government-led funding programs such as the "City of Tomorrow" and "smart grid platform" programs facilitated major demonstration projects to advance smart urbanism in line with EU energy and climate objectives (KLEIN, 2020). Specifically, Austria sought to adopt a *problem-oriented approach* to SC development that cut across government departments, integrated social science research with engineering R&D, and privileged the aims of resource preservation, innovation, and ensuring quality of life (INT5; Vienna City Administration, 2014: 12). To help accomplish these goals, transnational collaboration and knowledge exchange were seen as valuable. By participating in the EIP-SCC 6N Forum, Austria aimed to build on previous involvement in the Smart Cities MS Initiative (Klima und Energiefonds, 2018), and on their leading role in the JPI (Joint Programming Initiative) Urban Europe (2019).

In summary, according to diverse logics and priorities, MS joined the 6N Forum and prioritized SC development seeking to accommodate their country's and cities' distinctive needs. While the majority of MS pursued a demand-led approach to smart city management, the drivers behind this ambition were varied—ranging from innovation to environmental resources protection, to enhanced quality of urban life. Acknowledging important structural differences between MS, the ways in which diverse sets of SC stakeholders, with contrasting power, knowledge, and concerns, are incorporated into urban decision-making, is critical to shaping national SC governance strategies. Having selectively engaged with municipal, corporate and innovation bodies in their respective country contexts, the MS national representatives could take their SC governance priorities forward into the EIP-SCC 6N Forum. But the question remains, to what extent could this diversity be captured within a common framework intended to work across nations?

Negotiating a Common European SC Approach: The 6N Blueprint

The EIP-SCC 6N Forum worked with participating MS and their respective smart urbanism priorities to construct a common framework for SC implementation and management. Forum processes were organized around an overarching Blueprint developed by Urban DNA (EIP-SCC, 2016b) to encourage adoption of "consistent, measurable approaches to SC."[3] The Blueprint had three objectives intended to "position the European smart market on the global stage" (EIP-SCC, 2016b: 7). The framework sought to provide a "baseline assessment" of existing national policy practice; offer a "structured model" to help align activities in Government within any EU MS, and provide a "consistent frame of reference for the capture of practices, tools and learning" (EIP-SCC, 2016b: 7).

The focus of this article, while encompassing all three objectives, particularly relates to this last objective, the creation of a common framework, and its relationship with the four key challenges associated with enabling scalable smart urban transformations—complexity, incompatibility, customization, and fragmentation. UrbanDNA devised four tools to promote a common framework: (a) a national SC vision, (b) a mass procurement intervention, (c) international and national standards, and (d) a roles and responsibilities matrix within Government (EIP-SCC, 2016c). Each of these tools maps on to one of the four urban challenges (identified earlier). Analyzing the dialogues involved in attempts to adopt and use these tools provides important insight into the degree to which a common approach would be brought to bear at the European level, and the limitations encountered.

Addressing Urban Complexity by Agreeing a Smart City Vision. The EIP-SCC 6N Forum worked on the presumption that complex city dynamics can be understood as simplified systems and that key urban processes benefit from computational management. The Blueprint recognized how "systemically, cities do have similar forms" and, therefore, "can and should learn from each other" (EIP-SCC, 2016b: 2). It also proposed that the city could be "performance managed as a system" (EIP-SCC, 2014: 10). Each MS was, therefore, encouraged to develop a *Policy, Strategy, and Plans* that would define a *National Vision* for smart urban governance. Just as for corporate management systems seeking to streamline business processes, MS representatives were tasked with developing "a strategy to provide clear direction on market evolution" (EIP-SCC, 2016b: 8). This would be "clearly aligned to national urban policies," include agreed "goals and targets," and "detail multi-year and annual plans" for effective smart urban transformation (EIP-SCC, 2016b: 8).

While acknowledging MS had "different motivations for national-level plans and were at differing points of development and degrees of commitment" (INT6), and while the importance of a coherent national framework was agreed, nevertheless national representatives cautioned against attempts to adopt a common approach to deliver any city in Europe to a singular preferred state of technological implementation and market development (INT1, 2, 5–9). For example, the 6N Forum discussed how the United Kingdom initially acted as a leading MS in national SC transformations, a Ministerial Smart Cities Forum of diverse stakeholders having been set up to identify barriers to success and develop and evidence solutions (EIP-SCC, 2014; UK DCMS and BIS, 2016). Despite these early steps towards developing a national plan, the UK Government decided "not to set out a single model for UK cities to follow" due to the adoption of conflicting devolution policy which sought to "support UK places in addressing local priorities" (UK DCMS and BIS, 2016: 1). Additionally, most 6N national representatives—including Germany and the Netherlands who by 2017 had negotiated a national SC strategy (BBSR and BMUB, 2017; The Netherland's Smart City Strategy Group, 2017)—recognized the need to prioritize the socio-political, economic, and environmental requirements of cities, and the dynamic nature of urban transformation processes. As one interviewee stated, "there can be no singular approach to smart cities" (INT1).

Addressing Incompatibility Through Interoperability and Mass Procurement. Enshrined in the 6N Blueprint tool was the priority of working with cities and suppliers towards a programmatic procurement approach for SC systems (EIP-SCC, 2016b: 11–12). These goals were underpinned by the view that through interoperable ICT systems, compatible algorithms, shared data sets, and coordinated data analytics, urban processes could be effectively tracked and reconfigured, to render city processes manageable (EIP-SCC, 2016b: 3). For example, a Forum representative discussing digital infrastructures for electric vehicle charging argued that

> the physical realization may be different because you've bought it from different providers, but the logical architecture [can be] the same. If we can drive towards a logical framework, then we will move cities faster and get better deals. (INT4)

The critical issue was then to design procurement strategies that could ensure interoperability between SC ICT systems.

The *EIP-SCC Humble Lamppost* initiative—"to upgrade 10 million smart lampposts across EU cities to save energy," and concurrently "implement a common component-based solution tailored to local needs with smart add-ons"—Wi-Fi, concealed speakers, e-vehicle charging, and environmental sensing (EIP-SCC, 2017: 3)—presented the opportunity to build "a scale marketplace in the space between European cities" (INT3). Describing this initiative's rationale, one Forum member stated, "cities think they're unique … but rather like human beings they have an awful lot of common DNA so what can you do to define a common-solution and purchase at scale?" (INT3). Shared physical and informational architecture was promoted to "move into joint venture territory … and shared procurement for the city" (INT4). By nations and cities working together to install coordinated and layered SC systems and by endorsing an "open data approach" (INT6), the 6N Forum sought seamless integration of technologies and applications, increasing their capability, while also optimizing service delivery and encouraging efficiencies.

While some MS recognized the value of interoperable calculative smart systems and open data exchange in enabling more accurate and real-time urban decision-making (INT3, 4, 6, 8, 9), other MS questioned 6N's approach of widescale technological development towards a SC ideal for "being too industry focused" (INT8, 9). Instead, they advocated prioritizing the distinctive needs and livability of cities, which would require a range of socio-technical and political interventions that did not need to be interoperable (INT1, 2, 7, 8, 9). It was also highlighted how, rather than cities being used to "showcase ICT applications … the potentials of ICT should be used, wherever they contribute to the wider goals of sustainability" (INT5).

Addressing Customization through Integration of Data and Processes. The EIP-SCC 6N Forum viewed the role of standards, guidance, and performance indicators as fundamental to implementing "common solutions for shared challenges" (INT4). *Voluntary industry standards* were intended to ensure that data captured in urban systems could be used across a range of service delivery channels and enable the integration of SC services. However, more broadly, the 6N Forum positioned common standards as a strategic means to steer public, private, and community-focused leaders through integrated processes to reduce risks, lower costs, and enable "economies of scale" (EIP-SCC, 2014, 2016b; INT3, 4). Thus, standards were promoted as a key means to integrate data exchange at the city, coordinate SC management processes, and strengthen smart urban decision-making at the national and international level.

Given that "in several countries, Government funds influenced standards strategy, there [was] clearly a role and legitimacy for standardization to be part of the 6N debate" (EIP-SCC, 2016a: 11). The criticality of ensuring technical communications between urban ICT platforms was also largely agreed across MS (INT1, 2, 3, 4, 6, 8, 9). Attention turned to Spain as an exemplar, although the leading work of the British Standards Institute, and standards developed by Germany, France, and the Netherlands were also recognized. In 2012, through collaboration with the Spanish Network of Smart Cities and industrial bodies, Spain's national standards body (AENOR) developed a series of 22 SC standards (INT6). Notably, two Spanish standards specify approaches

for smart urban governance[4], intended to aid municipalities in the transition and develop Spain's smart technology industry (AENOR 2015a, 2015b). The majority of MS expressed resistance to wholesale standardization of SC, which, it was agreed, should be limited to ensuring smooth technical operations in cities and should avoid attempts to make decision-making processes more ubiquitous (INT8, 9). Ultimately, MS agreed that smart urban transformations should be "shaped in a socially and politically acceptable way" (INT 8).

Addressing Fragmentation through the Authorization of Roles and Responsibilities. The key tool designed to integrate the "cross-cutting, transversal involvement" of government departments with diverse public, and private of actors involved in smart urban transformations was the *6N Roles and Responsibilities Matrix* (EIP-SCC, 2016c: 3). Recognizing the "lack of clarity of roles" within Government (EIP-SCC, 2016c: 1) and seeking to reduce "confusion for the market," the process of populating the matrix sought to make clear "who does what" for the priority needs of cities and their digital enablement (EIP-SCC, 2016c: 3). Translated from corporate management systems, the tool aimed to clarify the "top twenty priority needs of the city" and define the duties, capabilities, and resources of key administrators and stakeholders (EIP-SCC, 2016c: 3). Besides ascribing core SC platform operations to dedicated urban actors and capacities, the matrix sought to ensure digital leadership, data capability, and agreed channels for urban data sharing. It was hoped this would create "an environment [and market] where vision, strategy, policy, plans, investment, and metrics"—would be easier to establish (EIP-SCC, 2016c: 3).

Although the 6N Forum was intended as an open forum where MS representatives could "all talk about what [they] wanted to do, [and] what [they] were failing to do" (INT3), completing the Roles and Responsibilities matrix "became shockingly political and so never got filled in" (INT4). "Pretty much all" delegates struggled "to try and get that aspect of clarity of role[s]" (INT4), despite recognition that national and local governments need to

> … operate as twenty-first century organizations with modern tools … and a Chief Technology Officer or mayor who has the seniority to ensure that sectors share data. (INT3)

Most representatives rejected the notion that cities could be remade as digitally enabled as corporate entities. Furthermore, the matrix "failed to acknowledge how MS governments possess differing capacities to act" (INT5).

In summary, these four EIP-SCC 6N Forum techniques attempted to know, configure, and remake the European urban context in accordance with a common logic of computational governance and control. However, while MS acknowledged the benefits of the "explorative nature of the Forum" (INT1, 2) which enabled transnational knowledge exchange and learning (INT1–9), to date, this institutional body has struggled to produce a consolidated agenda for a common European smart urbanism approach. Indeed, by the conclusion of the 6N Forum, only four of the six participating MS had completed the final Blueprint appraisal,[5] with a wide diversity of "progress" illustrated by participating nations (EIP-SCC, 2016b). MS participants shared their discomfort about this benchmarking activity as they objected to being openly ranked against other countries (e.g., INT1, 2, 5, 8, 9).

Contesting a Common European Approach to Smart Urbanism

This paper has shown that while there was a broad receptivity to promises associated with the digital enablement of the city and a welcome reception to debating shared experiences, tensions were associated with the goal of implementing a common pan-European framework for smart cities. The six MS engaged in the 6N Forum with diverse rationales for smart urban transformation, representing different sets of actors and intermediaries' interests, with varying approaches to, and at contrasting stages of smart city development. To date, agreement and implementation of a common SC framework shared by the six European MS, has proven unobtainable.

Table 1 compares four analytical techniques used by EIP-SCC 6N Forum, each represented by a tool of the Blueprint, and all intended to encourage a common international approach towards smart city management. Each of these four techniques raises serious limits about the possibility of a single, shared approach to smart urban development, which we briefly discuss in turn.

Simplification. Urban areas are characterized by extraordinarily complex and contingent practices and processes that are difficult to simplify and systematize through a singular SC vision. A smart city needs to be understood as "a diverse, contested set of places, rather than constituting a system of systems" (Kitchin and Dodge, 2019: 62) The EIP-SCC 6N Forum advocated an approach which understood city services and infrastructures as able to be dissected, analyzed, and continually re-engineered for optimal

Table 1: Analytical techniques comparing the EIP-SCC 6N Forum common framework for smart cities

Shared Urban Challenges	EIP-SCC 6N Forum Blueprint Toolkit	Technique	Limitations
Complexity: Urban processes are characterized by complexity and contingency that are difficult to systematize.	National SC vision	*Simplification:* Urban processes can be understood as simplified systems open to reconfiguration.	Risks oversimplifying urban processes and narrowly framing city priorities according to a techno-rational logic of urban control.
Incompatibility: Due to proprietary features, some smart technological systems are not currently compatible in cities.	Procurement at scale e.g., The Humble Lamppost Initiative	*Interoperability:* Interoperable computational systems allow city processes to be reconfigured to be more efficient.	Denies local specificities, fails to acknowledge the risks of integration, and raises concerns about public data ownership.
Customization: The availability of digital data, their quality and format, and associated governance decisions, vary widely across cities and sectors limiting scaled smart city solutions.	International and National Standards	*Integration:* Standards provide a strategic means to integrate data flows, coordinate city services, and harmonize governance processes.	Standardizing the urban context to match assumptions embedded in software products excludes alternative ways of knowing the city, such as: uncertainty, informality, qualitative knowledge, and everyday expertise.
Fragmentation: Extreme variability associated with urban decision-making, across infrastructural management and municipal control.	Roles and Responsibilities Matrix	*Authorization:* of core smart city governance to dedicated capacities and actors.	Underplays the multiplicity of stakeholders (and their varying power and capacities) that shape the continually emerging politics of smart urban transformations.

performance. This functional simplification of urban flows and dynamics according to the presumptions of calculative systems and managerialism, risks narrowly framing urban priorities and modes of decision-making (Marvin and Luque-Ayala, 2017: 86). Attempts to govern urban transformations according to simplified computational presuppositions risk overlooking the specific needs of individual cities and their citizens and the dynamic nature of urban processes, which are central to urban decision-making processes. Furthermore, such simplified visions often minimally focus on transformations towards more socially just and environmentally sustainable cities, rather they can serve to "optimize, stabilize, and ensure the continuity of [existing] city systems" (Schindler and Marvin, 2018: 306).

Interoperability. The EIP-SCC 6N Forum claimed that coordinated business models and interoperable technological solutions offer the potential to "act at scale and pace, collaborate on needs and aggregate demand to create value for cities and nations" (EIP-SCC, 2018: 10). Yet the attempt to construct a common procurement framework for smart infrastructure based on "common solutions, for shared challenges" (INT4) largely failed. Such efforts need to be more sensitive to the reasons why urban circulations are currently connected and/or disconnected and would benefit from informed appraisals as to what the advantages of making new networked connections would be, to whom, and for what reason(s).

Integration. Our analysis questions the vision of the contemporary city as a space where it is possible to "know, measure, compare, manage, and 'correct' cities" in a neutral and standardized way (Schindler and Marvin, 2018: 229). Attempts to integrate SC data and managerial processes through compliance with standards, seek to reconfigure the urban context to match the inbuilt assumptions of software products, but fail to allow for local specificities, contingencies, different modes of social organization, and other forms of knowledge. Adopting common digital data sets, SC protocols, and smart modes of decision-making, gives primacy to computational techniques and knowledge, while marginalizing other ways of knowing the urban context. Such attempts to deliver the fully integrated SC exclude valuable alternative modes of framing urban transformations that operate outside of the logic of calculative and managerial control, such as "uncertainty, informality, qualitative knowledge and [everyday] expertise" (Schindler and Marvin, 2018: 306).

Authorization of Roles and Responsibilities. Populating the 6N Forum Roles and Responsibilities Matrix proved too controversial for most national representatives. It was simply not possible to translate the messy governance of smart urban experiments, programs, and initiatives into a simplified matrix. Smart urban transformations require the knowledge, "work, views, and politics of a multiplicity of stakeholders, who interact with, complement, build upon, reinterpret, and transform SC systems in ways that have broader systemic qualities" than a technological system (Marvin and Luque Ayala, 2017: 101). More than this, urban decision-making is a highly political and recursive process which cannot easily be captured in corporate models of simplified roles and responsibilities.

Conclusion

This article has explored the issues at stake in attempting to develop a common approach to smart city management, highlighting the underlying abstract computational rationale, and myriad difficulties associated with negotiation in practice. This represents a significant but under-explored dimension of smart city research, and leads to three key contributions. First, the paper develops a novel analytical framework for assessing the critical challenges of developing a common approach to smart cities in the messy reality of urban contexts and diverse institutional, organizational, and commercial interests. We identify four analytical techniques: *simplification* to address the challenge of urban complexity, *interoperability* to address the concerns around incompatibility in technological systems, *integration* to address the issues associated with customized data, and the *authorization* of roles and responsibilities to address the trials of fragmented urban decision-making. Second, we have examined the work of the EIP-SCC 6N Forum, a significant multi-national institutional attempt to develop a common approach capable of scaling-up smart urban transformations across Europe. We have appraised the attempted adoption of the EIP-SCC 6N Forum Blueprint, the use of four tools embedded within the Blueprint schema intended to address the urban challenges identified, and the ensuing negotiations within and between MS. Third, we have shown the difficulties in optimizing the city as a rational, stabilized, and digitally enabled system in relation to the analytical framework developed in the paper.

Yet, as the article suggests, there is merit in seeking to harmonize aspects of smart city management if it can reduce urban resource requirements and support innovative urban transformations. The question is whether it is possible to do that in an open and collaborative way given the range of actors and institutions involved and the complexity of the decision-making landscape? Further research should examine three issues.

First, there is a continued need to look critically at attempts to establish smart city standards given the vested interests involved and how their implementation stands to (re)shape the city in potentially uneven ways. As opposed to accepting such city standards as "authoritative, objective, uncontroversial and natural" (Russell, 2014: 16), and recognizing the contested and uneven processes of standards development, in line with White's (2019) critique, we argue that further research is needed to understand not just the negotiations of standards development, but how standards land in, and are taken up by, cities in practice. Understanding how cities select, attempt to adhere to, or resist the requirements of common management frameworks, and how such agreements circulate, offers opportunities to challenge status quo assumptions, and opens up opportunities for critical urban concerns to be addressed in an inclusive and equitable manner. Second, consideration should be given to supporting smart city innovation through cities' contextualized needs that do not exclude alternative ways of knowing and acting on the urban context, society, and the environment. This might include mapping and trialing alternative standard-setting logics and knowledge platforms that work with decentralized, experimental, user-led, and open-sourced innovations (e.g., Smith and Martín, 2020).

Notes

1. INT plus number refers to specific interviews conducted with EIP-SCC 6N Forum national representatives and the Chairperson.

2. Participating national representatives met three times per year on a *pro bono* basis between April 2014 and January 2017.
3. The EIP-SCC 6N Forum Blueprint was devised around (1) policies, strategies, and plans, (2) governance and organization, (3) programs and funds, (4) market engagement, (5) guidance, protocols, standards, and benchmarking activities, and (6) urban transformation targets. For each, MS progress was appraised against five "levels" of development "nascent, emerging, coordinated, programmatic, and world leading" (EIP-SCC, 2016b: 12).
4. Comparable to the BSI guidance on establishing SC operating models for sustainable cities and communities (British Standards Institution, BS ISO 37106).
5. Identities not disclosed.

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References

AENOR, *UNE-ISO 37120:2015. Sustainable Development of Communities: Indicators for City Services and Quality of Life* (Madrid: Asociación Española de Normalización, 2015a) <https://tienda.aenor.com/norma-une-iso-37120-2015-n0054983> Accessed April 28, 2022.

AENOR, *UNE 178303:2015. Smart Cities: City Asset Management. Specifications*. (Madrid: Asociación Española de Normalización, 2015b) <https://tienda.aenor.com/norma-une-178303-2015-n0054948> Accessed April 28, 2022.

C. Bell, *Smart Cities Special: Six Steps for Smart City Procurement* (London: Supply Management, 2018) <https://www.cips.org/supply-management/analysis/2018/september/smart-cities-special-six-steps-for-smart-city-procurement/> Accessed January 24, 2019.

BBSR and BMUB, *Smart City Charta: Digitale Transformation in den Kommunen Nachhaltig Gestalten*. (Bonn: Bundesinstitut für Bau-, Stadt- und Raumforschung [BBSR] and Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit [BMUB], 2017) <https://www.bbsr.bund.de/BBSR/DE/Veroeffentlichungen/Sonderveroeffentlichungen/2017/smart-city-charta-dl.pdf?__blob=publicationFile&v=2> Accessed January 24, 2019.

BIS, *The Smart City Market: Opportunities for the UK* (London: Department for Business, Innovation and Skills, 2013) <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/249423/bis-13-1217-smart-city-market-opportunties-uk.pdf > Accessed December 20, 2019.

British Standards Institution, BS ISO 37106: 2018 *Sustainable Cities and Communities. Guidance on Establishing Smart City Operating Models for Sustainable Communities*. (Milton Keynes: BSI, 2018) <https://www.iso.org/standard/62065.html > Accessed April 28, 2022.

Cabinet Office and Government Digital Service, *Government Transformation Strategy 2017–2020*. (London: Cabinet Office and Government Digital Service, 2017) <https://www.gov.uk/government/publications/government-transformation-strategy-2017-to-2020> Accessed April 28, 2022.

P. Dunleavy, H. Margetts, S. Bastow, and J. Tinkler, *Digital Era Governance: IT Corporations, the State, and E-Government* (Oxford: Oxford University Press, 2006).

EIP-SCC, *Commitment 6746.: Six Nations Forum* (Brussels: European Innovation Partnership on Smart Cities and Communities, 2012) <https://eu-smartcities.eu > Accessed March 1, 2015.

EIP-SCC, *Strategic Implementation Plan* (Brussels: European Innovation Partnership on Smart Cities and Communities, 2013) <https://www.nachhaltigwirtschaften.at/resources/e2050_pdf/strategic_implementationplan_eip_summary.pdf > Accessed January 24, 2019.

EIP-SCC, Six Nations Smart City Workshop (London, European Innovation Partnership on Smart Cities and Communities, 2014).

EIP-SCC, *Six Nations Forum Paris Meeting Report* (Paris: European Innovation Partnership on Smart Cities and Communities, Six Nations Forum, 2016a).

EIP-SCC, *Consolidated EIP-SCC 6N Forum Blueprint* < https://smart-cities-marketplace.ec.europa.eu/sites/default/files/Blueprint%206-N%20consolidated%20-%20anonymous.pdf> (Brussels, EIP-SCC, 2016b) Accessed August 1, 2017.

EIP-SCC, *Clarifying Central Government Roles* (Brussels: European Innovation Partnership on Smart Cities and Communities Six-Nations Forum, 2016c).

EIP-SCC, *Humble Lamppost Survey Insight Paper* (Brussels: EIP-SCC Integrated Infrastructure Action Cluster, 2017) <https://www.luciassociation.org/humble-lamppost-survey-insights/> Accessed January 24, 2019.

EIP-SCC, "Towards a Joint Investment Programme for European Smart Cities: A Consultation Paper to Stimulate Action" (Brussels: EIP-SCC, 2018) <https://cupdf.com/document/towards-a-joint-investment-programme-for-european-smart-a-4-towards-a-joint.html > Accessed January 24, 2019.

EIP-SCC, *The Marketplace of the European Innovation Partnership on Smart Cities and Communities* <https://eu-smartcities.eu> (Brussels, EIP-SCC, 2019) Accessed December 20, 2019.

European Parliament, *Mapping Smart Cities in the EU* (Brussels: Directorate General for Internal Policies, Policy Department A: Economic and Scientific Policy, 2014).

Fraunhofer-Gesellschaft, "Morgenstadt: City Insights. Joint Research Project on Today's Cities as Future Markets for Systems Innovations Towards Smart and Sustainable Cities" (Stuttgart, DE: Fraunhofer, 2012) <www.fraunhofer.de > Accessed January 24, 2019.

A. Frascella, A. Brutti, N. Gessa, P. De Sabbata, and C. Novelli, "A Minimum Set of Common Principles for Enabling Smart City Interoperability," *Techne: Journal of Architecture and Environment*, Special Issue 1: European Pathways for the Smart Cities to Come (2018) <https://jpi-urbaneurope.eu/wp-content/uploads/2018/09/European-Pathways-for-the-Smart-Cities-to-Come-1.pdf > Accessed April 29, 2022.

S. Graham, "Software-Sorted Geographies," *Progress in Human Geography* 29 (2005) 562–580.

S. Graham and S. Marvin, *Splintering Urbanism: Networked Infrastructures, Technological Mobilities and the Urban Condition* (London: Routledge, 2001).

H. Haarstad, "Who is Driving the 'Smart City' Agenda? Assessing Smartness as a Governance Strategy for Cities in Europe," in A.: Jones, P. Strom, B. Hermelin, and G. Rusten, eds., *Services and the Green Economy* (UK: Palgrave Macmillan, 2016) 199–218.

A. Immendoerfer, M. Winkelmann, and V. Stelzer, *Energy Solutions for Smart Cities and Communities Recommendations for Policy Makers from the 58 Pilots of the CONCERTO Initiative* (Brussels: European Commission, 2014) <https://smartcities-infosystem.eu/sites/default/files/concerto_files/concerto_publications/2014-01_concerto_premium_recommendations_for_policy_makers_final.pdf > Accessed January 24, 2019.

ISO/IEC, *Smart Cities: Preliminary Report 2014* (Geneva: International Organization for Standardization, 2014) <https://www.iso.org/files/live/sites/isoorg/files/developing_standards/docs/en/smart_cities_report-jtc1.pdf > Accessed April 28, 2022.

ISO, *ISO 37107:2019 Sustainable Cities and Communities—Maturity Model for Smart Sustainable Communities* (Geneva: International Organization for Standardization, 2019) <https://www.iso.org/standard/62066.html > Accessed April 28, 2022.

ISO, *#Worldsmartcity* (Geneva: International Organization for Standardization, 2022) <https://www.iso.org/sites/worldsmartcity/> Accessed April 26, 2022.

S. Joss, M. Cook, and Y. Dayot, "Smart Cities: Towards a New Citizenship Regime? A Discourse Analysis of the British Smart City Standard," *Journal of Urban Technology* 24: 4 (2017) 29–49.

JPI Urban Europe, *JPI Urban Europe: The Knowledge Hub for Urban Transitions* (Vienna: Joint Programming Initiative, 2019) <https://jpi-urbaneurope.eu > Accessed January 24, 2019.

R. Kitchin, "The Real-time City? Big Data and Smart Urbanism," *GeoJournal* 79: 1 (2014a) 1–14.

R. Kitchin, *The Data Revolution: Big Data, Open Data, Data Infrastructures and their Consequences* (London: Sage, 2014b).

R. Kitchin and M. Dodge, *Code/space: Software and Everyday Life* (Cambridge, MA: MIT Press, 2011).

R. Kitchin and M. Dodge "The (In)Security of Smart Cities: Vulnerabilities,: Risks, Mitigation, and Prevention," *Journal of Urban Technology* 26: 2 (2019) <https://www.tandfonline.com/doi/abs/10.108010630732.2017.1408002> Accessed April 28, 2022.

F. Klauser, T. Paasche, and O. Söderstrom, "Michel Foucault and the Smart City: Power Dynamics Inherent in Contemporary Governing through Code," *Environment and Planning D: Society and Space* 32: 5 (2014) 869–885.

KLEIN, *The Climate and Energy Fund* (Vienna: Federal Ministry for Sustainability and Tourism, 2020) <https://www.bmnt.gv.at/english/environment/Climateprotect/The-Climate-and-Energy-Fund.html > Accessed January 20, 2020.

Klima und Energiefonds, *The Smart Cities Member States Initiative* (Vienna: Klima und Energiefonds, 2018) <https://smartcities.at/wp-content/uploads/sites/3/Smart-Cities-Initiative-2.pdf /> Accessed January 24, 2019.

A. Leszczynski, "Speculative Futures: Cities,: Data, and Governance Beyond Smart Urbanism," *Environment and Planning A* 48: 9 (2016) 1691–1708.

A. Leszczynski, "Glitchy Vignettes of Platform Urbanism," *Environment and Planning D: Society and Space* 38: 2 (2020) 189–208

J. Light, *From Warfare to Welfare: Defense Intellectuals and Urban Problems in Cold War America* (Baltimore: The Johns Hopkins University Press, 2003).

P. Lombardi and A. Vanolo, "Smart City as a Mobile Technology: Critical Perspectives on Urban Development Policies," in Rodrìguez-Bolívar, ed., *Transforming City Governments for Successful Smart Cities* (Cham: Springer, 2015) 147–161.

A. Luque-Ayala and S. Marvin, "Developing a Critical Understanding of Smart Urbanism?" *Urban Studies* 52: 12 (2015) 2105–2116.

A. Luque-Ayala and S. Marvin, "The Maintenance of Urban Circulation: An Operational Logic of Infrastructural Control," Environment and Planning D: Society and Space 34: 2 (2016) 191–208.

S. Marvin, A. Luque-Ayala, and C. McFarlane, *Smart Urbanism: Utopian Vision or False Dawn?* (London: Routledge, 2016).

S. Marvin and A. Luque-Ayala, "Urban Operating Systems: Diagramming the City," *International Journal of Urban and Regional Research* 41: 1 (2017) 84–103.

A. Meijer and M. Rodriguez Bolivar, "Governing the Smart City: A Review of the Literature on Smart Urban Governance," *International Review of Administrative Sciences* 82: 2 (2016) 392–408.

Ministerio de Energía, Turismo y Agenda Digital, *Plan Nacional de Ciudades Inteligentes* (Madrid, Ministerio de Energía, Turismo y Agenda Digital, 2015) <http://www.agendadigital.gob.es/planes-actuaciones/Bibliotecaciudadesinteligentes/Detalle%20del%20Plan/Plan_Nacional_de_Ciudades_Inteligentes_v2.pdf > Accessed January 24, 2019.

The Netherlands Smart City Strategy Group, *NL Smart City Strategy: The Future of Living* (Amsterdam, The Netherlands Smart City Strategy Group, 2017) <http://digitalestedenagenda.nl/wp-content/uploads/2017/01/NL-Smart-City-Strategie-.pdf > Accessed December 20, 2019.

A. Russell, *Open Standards and the Digital Age: History, Ideology, and Networks* (New York: Cambridge University Press, 2014).

F. Russo, C. Rindone, and P. Panuccio, "European Plans for the Smart City: From Theories and Rules to Logistics Test Case," *European Planning Studies* 24: 9 (2016) 1709–1726.

S. Schindler and S. Marvin, "Constructing a Universal Logic of Urban Control? International Standards for City Data, Management, and Interoperability," *City* 22: 2 (2018) 298–307.

C. Smigiel, "Urban Political Strategies in Times of Crisis: A Multi-scalar Perspective on Smart Cities in Italy," *European Urban and Regional Studies* 26: 4 (2018) 336–348.

A. Smith and P. Prieto Martín, "Going Beyond the Smart City? Implementing Technopolitical Platforms for Urban Democracy in Madrid and Barcelona," *Journal of Urban Technology* 28: 1-2 (2020) <https://doi.org/10.1080/10630732.2020.1786337> Accessed April 28, 2022.

O. Söderstrom, T. Pasche, and F. Klauser "Smart Cities as Corporate Storytelling," *City* 18: 3 (2014) 307–320.

N. Taylor Buck and A. While "Competitive Urbanism and the Limits to Smart City Innovation: The UK Future Cities Initiative," *Urban Studies* 54: 2 (2015) 501–519.

UK DCMS and BIS, *Evidence Check: Smart Cities. Government Statement* (London, Department for Culture, Media and Sport and Department for Business, Innovation and Skills, 2016) <https://www.parliament.uk/documents/commons-committees/science-technology/evidence-tests/Smart-Cities.pdf > Accessed January 24, 2019.

UrbanDNA, UrbanDNA: *Innovate, Incubate, Accelerate* (Abingdon: UrbanDNA, 2019) <http://www.urbandna.eu > Accessed January 24, 2019.

L. Van Nistelrooij, "Smart Cities: EU Needs Greater Coherence in City Policies," *The Parliament Magazine*, 12 October (2015) <https://www.theparliamentmagazine.eu/news/article/smart-cities-eu-needs-greater-coherence-in-city-policies> Accessed January 24, 2019.

Vienna City Administration, *Smart City Wien: Framework Strategy* (Vienna: City of Vienna, 2014) <https://www.wien.gv.at/stadtentwicklung/studien/pdf/b008384b.pdf > Accessed April 28, 2022.

J. M. White, "On the Difficulty of Agreeing upon a Universal Logic for City Standards: A Response to Schindler and Marvin," *City* 23: 2 (2019) 245–255.