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# Smart Cities as Hybrid Spaces of Governance: Beyond the Hard/Soft Dichotomy in Cyber-Urbanization

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**Abstract:** This paper problematizes the dichotomy of hard (technocratic) and soft (societal) approaches to the smart city. Smart cities are reviewed as hybrid spaces that transcend the sum of the social and the technical. By providing platforms for enabling, monitoring, digitalizing, formalizing, and amassing information about collective and personal experiences and behaviors, smart cities accelerate the customization of existing urban services and establish new spaces of socialization, accumulation and regulation, including in hitherto hard-to-reach realms of everyday and personal life. These experiences signify the emergence of cyber-physical-social spaces, featuring the hybridization of the digital, governance, and sociocultural domains. The production of such hybrid spaces of governance is reviewed through 50 urban-level strategies for smart cities in different countries across the world. The analysis confirms the tendencies towards a hard/soft fusion and the ever-deepening interpenetration of the digital, physical, and social elements in smart cities. This suggests epistemological problems of separating the hard and soft domains. However, this integration still creates political and analytical tensions that are arguably evident in the early stages of the digital transition.

**Keywords:** city strategies; digital governance; digital spaces; smart city

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## 1. Introduction

The idea of the "smart city" is bringing a number of key and disruptive innovations into the operation of urban life, affecting social dynamics, governance, and markets. Developments in Information and Communication Technologies (ICT) and the Internet of Things (IoT) make it possible to digitally connect myriads of devices, sensors, actuators, and smartphones and to simultaneously collect Big Data for analyzing, managing, and controlling the ever-increasing number of aspects of urban life. The uninterrupted high-resolution flow of users' data, real-time responses to it, and the customization of services to tailor people's individual needs, desires, and trajectories bring the promise of combined efficiency, integration, transparency, inclusiveness, and participation.

Consequently, many cities around the world have launched smart city initiatives, often supported by strategic city-level programs. Discursively, these strategies "place people at the center." Meanwhile, at the core of the emergence of the smart city remain digitalization and ICT. This has produced the dichotomist expression of "hard" and "soft" approaches to the smart city (e.g., [1,2]), where "hard" refers to ICT-centered applications and physical infrastructures such as buildings, energy grids, natural resources, water and waste management, mobility, and logistics, while "soft" points to innovations, education, culture, social inclusion, and governance. This discursive dichotomy of "hard" and "soft" may also appear in other forms such as "technical" or "social" or as part of an integrated approach [3].

The binary of the hard and soft is also often presented as a choice of pathways in the development of smart cities. It has become rare that a smart city vision does not include a form of a pie diagram plotting a circle in the middle that reads "smart city" and

is surrounded by sectors for "smart people", "smart living", "smart economy", "smart government", "smart environment", and "smart mobility" and their variations. This is supposed to demonstrate an integrated approach, where inevitably, the "soft" approach dominates. However, as will be shown in this paper, it is often the case that soft domains are emphasized in a discursive way to justify the rationale for the deployment of smart cities, but that specific areas of real-life smart city application shift the emphasis back to the hard domains such as dataization, its enabling infrastructure, and the deployment of various ICT-based technological solutions. Acknowledging this as a strategy to promulgate technological and instrumentalist agendas in the name of social agendas and citizen empowerment [4], we, nevertheless, argue that this is more than a discursive diversion. What is happening is rather symptomatic of the ever-deepening interpenetration and hybridization of technical, governance, and sociocultural elements in an increasingly digitalized society, where the dichotomy of technology versus society is increasingly difficult to sustain in practice and, indeed, becomes an epistemological obstruction to addressing the smart city as an analytical category.

We proceed in the following steps. First, we discuss the application of the hard/soft dichotomy in relation to smart cities in both policy and the academic literature and begin questioning the epistemological grounds for that dichotomy—although, in practice, this dichotomy has been resolved and is heading now more towards an operative tension in the early stages of its adoption within the smart city. Second, we consider smart cities as cyber-physical sociotechnical spaces that cannot be divided into social and technical sub-systems, but the very nature of which suggests the previously unknown hybridization of the digital, the physical, and the social, also leading to new forms of regulation and accumulation. Third, and following on from that, we decipher the framings and contradictions surrounding the dichotomy of "hard" and "soft" as embodied in actual city strategies, plans, or projects for a variety of cities in different countries. We address this empirically by examining "actually existing smart cities"—based on the existence of their smart strategies—that suggest where the tensions lie in smart city development based on the resolution of such dichotomies. Specifically, we analyzed 50 city-level strategies that are publicly available online and used 10 of them for detailed case study support. The articulation of the hard/soft tension (in different guises) in such strategies speaks well to the technical and the social as two origins of the smart city; however, it is clear that rather than being dichotomous or in opposition to each other, these domains represent a more complex hybrid of the digital, governance, and sociocultural domains that are struggling against each other for domination in their operation during the early stages of smart development.

## 2. The Politics of Hard/Soft Dichotomies

Hard and soft approaches to smart cities have been a common language in academic and policy literature, lending to the origin of the smart city concept itself, with the original technocratic focus now increasingly reframed as "citizen-centric" (i.e., [4]). With ICT being central to the smart city, the concept has also drawn from other "hard" sectors such as low-energy buildings, transportation systems, or automation (cf. [5–7]). However, the smart city has quickly developed a dialogue with longer-standing principles of sustainable cities [8]. This leads to a broader and varied engagement with smart cities, now involving the notions of multiple stakeholders, participation, citizens, and other soft/social aspects [9]. Letaifa [10], for example, discusses the importance of approaching smart cities as complex innovation ecosystems with integrated socioeconomic, ecological, and political sub-systems while adopting a sustainability approach.

Nevertheless, political tensions between the hard and soft pathways to the smart city remain. Many authors are cautious about imbalances when the smart city agenda is dominated by digital technology. They question whether so-called smart solutions are all about a technological push driven by high-tech corporations (e.g., [11–14]). This brings forth the entrepreneurial stimulation of smart development by the ICT industries and markets

associated with their products and services [15,16]. Discursively at least, citizen engagement and the idea that technology is leveraged to achieve greater social, environmental, and economic—or overall sustainability—needs become the currency of the smart city. Cities such as Barcelona have adopted an integrated architecture based on sensors, code, and the Internet—all in the name of developing networked habitats and distributive management as part of a "multi-scalar city" empowering its citizens [17]. Admiring Barcelona's recent attempt to re-envisage the smart city around "technological sovereignty" and the notion that technology should be oriented to serve local residents as technology "commons", Refs. [4,18] argue that elsewhere "citizen-centric" roles are narrowly based on predefined choices over market-led solutions (citizens as users or consumers), and not so much in proactive social innovation or political citizenship. They [18] also argue that this approach is common for EU institutions, and, despite all the "citizen-focused" discourse, smart urbanism remains rooted in instrumental and paternalistic practices.

Many authors have similarly questioned the extent of inclusiveness of smart interventions regardless of their capacity to boost sustainability and spur economic growth in cities. Some call the smart city a "hollow signifier" built upon elitist control that only renders further exclusions and injustices, triggering commodification amid a weak economy [19,20]. This perspective considers smart city solutions as neoliberal "techno-environmental fixes" that involve the depoliticization of city governance and the outsourcing of public services to money-grabbing initiatives by technology funders, utility, and ICT companies [14,17,21].

What emerges here is key to the issue of governance. If the "soft" strategy is chosen, sustaining it in practice may be problematic given the strong impulses for marketization via digitalization more aligned with the "hard" strategy offered by technology proponents. Yet, an important extension from that is the deliberation of whether it is still meaningful to make the dichotomist distinction between the "hard" and "soft" domains or whether it is necessary to accept their co-production (if not blurred meanings). That would require acknowledging both the changing nature (digitalization) of society and the political nature of technology and, consequently, the social responsibility, politics, and ethics of governing technological hardware, software, and other infrastructure.

The multifaceted nature of smart cities, therefore, necessitates a different approach that is more in line with systems thinking, where hard and soft domains are co-occurrent and combined in their operation rather than other-replacing. Therefore, we need to consider more complex systems that unify these domains and their respective components.

## 3. Cyber-Physical-Social Spaces

Smart cities are quintessentially a sociotechnical system. From a sociotechnical approach, society and technology are bound together and co-evolve (i.e., [22–24]; for a techno-public approach, see [25]).

According to [26] and others (i.e., [1,27]), the physical and social domains of smart cities can be conceptualized as hard and soft resources, with the hard providing tangible facilities (such as infrastructure) and the soft entailing intangible resources (such as people and organizations, but also knowledge, wealth, and so on). The hard and soft domains work as sub-systems of a system, much like hardware and software are part of ICT architecture, which includes information, business systems, technical, and software or application architecture—demonstrating smart city synthesis. The multitiered meta-architecture of a smart city operates across the different components and breaches the hard/soft domains when operationalized (e.g., [26]). As conveyed by [28], a smart city ecosystem establishes a cyber-physical integration (union) of its domains.

Smart cities, thus, represent a version of sociotechnical hybridity as a cyber-physical system [29,30]. The conception and application of cyber-physical systems are rapidly developing across many disciplines, with one of the recent advancements also being the notion of "cyber-physical-social systems" [31]. These are argued to represent a tri-space fusion: cyber, physical, and social [32]. It is important to acknowledge that contemporary society increasingly lives in such a cyber-physical-social fusion and, if anything, the smart

city and all the digital technologies surrounding this idea is a further push in this direction. As Floridi [33] (p. 1–2, original emphasis) notes:

> [W]e increasingly live in that special space, or *infosphere*, that is seamlessly analogue and digital, offline and online . . . The deeper truth is that the revolution has already occurred: the transition from an entirely analogue and offline world to one that is increasingly also digital and online will never happen again in the history of humanity... And this is the really extraordinary turning point, because that landing in the infosphere happens only once . . . [T]he real challenge [is] no longer digital innovation, but the *governance* of the digital.

The ever-deepening interpenetration and hybridization of technical, governance, and sociocultural elements creates new spaces of regulation and accumulation. The surge of the smartphone, IoT, mobile social network, Cloud computing, and other connected smart terminals provide new platforms for enabling, monitoring, formalizing, digitalizing, amassing, and also monetizing information about collective, personal, and even tacit experiences and behaviors, much of which was previously shielded from markets.

The amassment of information can serve as a vehicle itself to drive various intentions, including the production of "new urban science" and the mobilization of new services [34]. Human sensors are deployed through "participatory sensing" [35], where mobile devices such as smartphones are used as sensors for real-time monitoring of the urban environment, transportation, and public health [36]. Similarly, data derived from social media (i.e., "geosocial media" data and metrics) can be used to understand and control problems in cities. Digital space here is more dynamic than physical space and can be more easily redefined and so it has the potential for greater customization. Cosgrave et al. [37] refer to this as "information marketplaces" that point to the potential for commodified information, including about people as objects in the physical realm, becoming digital, as, for instance, in their movements and citizenship. The new cyber-physical spaces, therefore, accelerate the customization of existing services and the establishment of new markets in hitherto "hard-to-reach" realms of everyday and personal life.

The fusion of physical and digital space can be exemplified with smart street lighting. Public lighting is a ubiquitous part of the modern urban landscape. Placing this service in a network based on wireless communication and a control protocol (i.e., [38]) enables not only distantly turning lights on/off but also sending information regarding lamp status as well as voltage, current, level dimming, and more. Lamp posts can be equipped with sensors providing environmental and social monitoring systems, and via CCTVs can become surveillance tools, for example, in terms of traffic intensity, monitoring car plates, the availability of parking places, or even face recognition as part of policing the city. They can also be equipped with interactive services such as info panels and pay stations. This wireless communication and control effectively establish a cyber-physical space that is based on continual digital sensing, monitoring, and self-regulation contingent on feedback systems. Combined, this offers a regulation potential and a critical infrastructure of smart control and sustainability delivery.

In short, the emergence of cyber-physical spaces, which were previously unknown to society, makes many previous assumptions about the possibility of the analytical separation of the cyber, physical, and social sub-systems increasingly problematic. Bearing this in mind, we now turn to the manifestation of smart cities as embodied in city-level strategies.

## 4. Operationalizing Smart Cities

Contrary to previous studies, which have taken the perspective of "actually existing smart cities" as if they were an accomplished reality, we understand smart cities as an emerging concept-in-practice, where policy self-proclamation is one of the most significant moments in the whole experience of cities becoming "smart". From this perspective, a smart city strategy is a significant blueprint for each city undertaking the route to "smart city". In divergence with comparative studies on smart cities, our focus has been on cities less covered in the literature on smart cities but which can, nevertheless, demonstrate

the deep penetration of these tendencies across different cultural traditions beyond the "usual suspects". We have consequently explored the smart city strategies of 50 cities from all parts of the world (see Appendix A). We have only included those strategies that had a version published in an open domain and were available in English, which potentially excludes many cities in the non-English-speaking world that do not have a translated version; however, for us, the methodology has been to find an inclusive representation of cities in both the Global North and South, rather than to comprehensively map such strategies.

Using all 50 city strategies to provide a broader context for this discussion of smart cities embracing a combined hard–soft domain, categorical trends may be identified (Table 1). Hard/soft domains are integrated into the use of communications, the Internet, and sensors to render soft aspects, such as information, engagement, inclusion, innovation, and public services. These integrated domains are evident in the strategies available for cities in both the Global North and South. While most cities embrace communications to derive information, others rely on the Internet and sensors to deliver the "soft" domain. However, it is not possible to get to the soft without going through the hard domain, as technology is the mechanism responsible for data collection, digital engagement, public services, and so on transferred from the physical to digital (soft) realms.

**Table 1.** City strategies combining hard and soft domains.

| Hard/Soft | Communications | Sensors | Internet |
|---|---|---|---|
| Information | Brussels, Canberra, Cape Town, Dubai, Dublin, Las Vegas, London, Lyon, Milton Keynes, Oslo, Seattle, Singapore, Sydney, Taipei, Vancouver, Washington, DC | Brussels, Canberra, Las Vegas, Lisbon, Lyon, Rio de Janeiro, Singapore, Songdo, Washington, DC | Brussels, Canberra, Las Vegas, Leipzig, Melbourne, Montreal, Seattle, Shanghai, Taipei |
| Engagement | Columbus, Dublin, Las Vegas, London, Lyon, Ottawa, Seattle, Sydney, Vancouver | Las Vegas, Lyon, Rio de Janeiro | Bologna, Las Vegas, Ottawa, Seattle |
| Inclusion | Brussels, Cape Town, London, Lyon, Milton Keynes, Oslo, Sydney | Brussels, Lyon | Bologna, Brussels, Oslo |
| Innovation | Dubai, Las Vegas, London, Milton Keynes, Seattle, Taipei, Tshwane, Washington, DC | Las Vegas, Washington, DC | Bologna, Las Vegas, Leipzig, Montreal, New York, Seattle, Shanghai, Taipei, Tshwane |
| Public Services | Brussels, Dublin, Sydney | Brussels, Rio de Janeiro | Bologna, Brussels, Heraklion, Montreal |

It is perhaps unsurprising that the most overlap appears among communications-information components, characterizing ICT in smart city deployment. On the other hand, there is room for expansion in the area of public services based on e-governance. Innovation, for instance, has already experienced developed integration due to an early entrepreneurial approach fostering smart city development. Interestingly, the social components of engagement and inclusion are relatively well-represented in the roster.

Despite all their contextual and political variety, the vast majority of recent city strategies demonstrate important parallel tendencies in their understanding and deployment of the smart city. Given limited room to cover them all here in detail, we have selected 10 case studies from our roaster of 50 cities for a more detailed illustration, including: Berlin, Brussels, Cape Town, Columbus, Edmonton, Milano, Milton Keynes, Moscow, Taipei, and Tel Aviv (Table 2).

**Table 2.** Case studies of smart city initiatives.

| City | Strategy | Flagship Endeavor |
| --- | --- | --- |
| Berlin (Germany) | The Smart City Strategy Berlin (2015–2030) | Data protection |
| Brussels (Belgium) | Brussels Smart City (2014–2019) | Five dimensions of digital society and economy |
| Cape Town (South Africa) | Smart City Project (2001–2005) | "One-stop-shops" for access and efficient services |
| Columbus, Ohio (USA) | Smart Columbus (2012–2050) | Columbus Partnership, entailing 50 CEO from its leading businesses and institutions |
| Edmonton, Alberta (Canada) | The Way Ahead (2008–2040) | Citizen-centered; technology intensive "innovation ecosystem" |
| Milano (Italy) | Milano Smart City (2013–2020) | Digital Milano as a springboard; inclusive and "glocal" |
| Milton Keynes (UK) | MK Digital Strategy (2018–2025) | Seamless digital connectivity |
| Moscow (Russia) | Smart City Strategy (2018–2030) | Open digital government; Big Data analytics and AI in business and decision-making |
| Taipei (Taiwan) | Livable City (2015–2050) | Free Wi-Fi in public spaces; Air Box Project; "matchmaking" to industry |
| Tel Aviv (Israel) | Tel Aviv Smart City (2014–2019) | Citizen-centered, i.e., Smart City Card and Digi-Tel Club; Free-of-charge Wi-Fi |

Most of these city strategies advocate an integrated framework, often stressing the "soft" approach (i.e., "technology as a means, not an end") as their preferred pathway. The smart city strategy for Edmonton, AB (Canada) [39] (pp. 6, 9) has put this rather boldly:

> To some, a Smart City refers to a technology intensive city where Internet of Things (IoT), robots, autonomous vehicles and drones play a significant role in delivering efficient and effective services to the citizens . . . To others, a Smart City refers to an innovation ecosystem where technology is leveraged to improve the relationship between citizens and their government, to enable social innovation and to improve the quality of life . . .

Edmonton stresses an "innovation ecosystem" to develop resiliency, livability, and workability as part of the plan to make the city a thriving community with engaged citizens that share in a unified experience as well as having access to efficient and effective services.

Similarly, Brussels' "integrated city" comprises citizens, businesses, the academic world, and public services. Brussels calls for "the integration of the new technologies into all fields of collective life: governance, school, health, digital services for businesses, intelligent mobility, security, etc." Such strategies promise the benefits of e-government and other services, including the compilation of Open and Big Data, which will, in turn, serve citizens and society. In the case of Tel Aviv, participation is a necessary part of its citizen-centered approach; the smart city model here is based on registered citizens who obtain a Smart City Card and become members of the Digi-Tel Club when they reach 13 years of age. Cape Town has, likewise, embraced a model allowing its citizens to deal with local government services in an integrated manner via "one-stop-shops" that make local government more customer-friendly and citizen-oriented, leading to "digital democracy":

> [T]he city should make a concerted effort to ensure more equitable access to, and spread the benefits offered by, ICTs to all. For local government, communities and business to take full advantage of the benefits offered by ICTs there is an overall need for infrastructure, skills development, and planning.

In Moscow, transparency in city governance is based on Big Data and artificial intelligence (AI). Moscow discusses robotics and AI more than the other cases, conveying the importance of AI as a driver of the digital transformation in both economy and social life.

It is counting on AI to reduce managerial errors and optimize decision-making, affecting the city economy and governance.

Efficiency as key to being competitive in a changing world is expressed in many strategies, for example: making local government more efficient and effective in Cape Town; Edmonton's stress on efficient and effective services; city governance efficiency planned for Moscow; improved operational efficiency in Tel Aviv; and Milano's ambition for a resilient city that is competitive in a globalized world as a "glocal" smart city. The latter requires aware and active citizenships operating in "an inclusive and smart city through the use of new technologies that are able to foster a social realignment between public and private resources".

Another common ambition amongst these cases is that of becoming a prosperous city, where citizens are not only connected but are also healthy and happy—including having access to a high quality of life and jobs. This has been promoted by Columbus—Ohio (USA), which plans to face its development issues as a Midwest city, including: "issues of socioeconomic and geographic isolation, a built environment and mobility systems dominated by the private automobile, and limited financial resources" and contemporary challenges of "an aging population; a growing younger population that is moving to the dense urban areas; mobility challenges in select neighborhoods; and a growing economy and population with related housing and commercial, and passenger and freight, and environmental issues".

Taipei encourages engaging its citizens to become part of an "ecosystem of co-prosperity" through its "matchmaking to industry" in order to meet the needs of its citizens. This is made possible by public-private partnerships—also adhered to by other cities such as Milano, the Columbus Partnership scheme, and Tel Aviv's nine partners, making it possible to realize aspects of its smart strategy—for example: Motorola and Check Point creating a safer city; TSG and the digital city program; Microsoft in CityNext; Saferplace enforcing traffic regulation; and FSM for public bike sharing initiatives.

There is a necessary baseline of infrastructure in place to realize the smart city vision. Milano's smart city strategy used Digital Milano as a springboard based on infrastructure and services already in place (i.e., Big Data analysis, city time structure plans). Milton Keynes—prior to its current campaign (MK Digital Strategy, 2018–2025)—began with MK: Smart (2014–2017), which included the MK Data Hub. The city continues to emphasize "seamless digital connectivity to its citizens and businesses". Freely available Wi-Fi, for instance, is one of the techniques for maneuvering into the smart city; and many cases show evidence of this, as with Milton Keynes, that prioritizes digital connectivity, digital services, and digital economy while upholding key principles: collaborative, innovative, inclusive, but also Brussels, which acknowledges the importance of bridging the digital divide. Taipei is building an open government through its Open Data policy (since 2011) towards transparency and governance by the public. Here, free Wi-Fi is offered in public spaces to encourage participation and establish necessary services to fulfill the needs of its citizens and improve their day-to-day living.

It is clear from this that the promulgation of soft domains such as governance, education, economy, creativity, and social inclusion, very much relies on the deployment of "hard domains". However, even "soft" domains are often "hardened" in the concrete areas of practical implementation and flagship initiatives. This is, for example, evident when sensors are put in place to monitor and gather information regarding people and their environment. This has already been delineated for Brussels, where sensors were deployed along with fiber optic networks. In Taipei's Air Box Project, 300 air sensor units are to gather information on temperature, humidity, and fine particulates in order to monitor the quality of the environment and to improve health.

In addition to collecting environmental data and human-derived information about the environment, cities are also collating social data in the amassment of Big Data. However, the ethics of data management is not necessarily ignored in smart strategies. Berlin, for instance, gives much attention to this. The strategy maintains that the city will protect its

citizens' data and continues to constitute their democratic decision-making and voting rights, ensuring that "usage complies with data protection laws so that those affected retain control over their own personal data". This city promotes, for its democratic state, data autonomy in capturing external movements as well as within the smart home: "meeting the demands for data [minimization], secure data storage, data transparency, data sovereignty or data security will play a decisive role in determining the acceptance of Smart City Berlin".

## 5. Beyond Dichotomies

The majority of cities with "smart city" ambitions do try to link technology with more purposeful goals to improve the quality of life for its citizens, reduce the environmental impact, and generally orient themselves towards sustainability. Here, the idea of the smart city (like the sustainable city before it) serves as certain leverage for cities to reflect on the social benefits of technology. Of course, the aim of utilizing technology to improve the quality of life for citizens does not guarantee that this is what will actually ensue. However, then, urban strategies proclaiming these aims can become a political instrument for local civil society to actually hold urban elites accountable for their declarations and promises.

Work by [1] conveys some issues concerning the smart city. It provided a framework for more recent work by [40] (p. 1024), articulating two major areas, including (1) office and residential buildings; nature resources and energy; waste management; environment; transport, mobility and logistics; and public security as well as (2) education and culture; welfare and social inclusion; public administration and (e-)government; and economy. These areas tend to reflect the hard/soft domain break or dichotomy that is considered here in this paper. As [40] delineates, the hard domain is often associated with tangible assets (1), whereas intangible assets are part of the soft domain (2). The author considers health and public safety to represent a "special" category because of the interaction of the hard/soft domains inherent in health and public safety (after [1]). Therefore, such work has already paved the way for current thinking. According to [41], the role of ICT is integral to the functioning of the different domains, In particular, the deployment of ICT is critical in the hard domain, but its role is limited in the soft domain where there is user choice (as evident in education, e-government, etc.). Where integration is concerned, referring to [42]'s 5-level pyramid framework entailing an Intelligent Community Open Architecture (i-COA)—where the first two levels correspond to the hard domain (places and infrastructure), and the soft strategies are associated with the top three levels of collaboration ecosystems, applications, and life. Appio and colleagues [43] stipulate that it is necessary to go beyond hardware and infrastructure through the creation of "collaborative environments" that stimulate innovation as well as the quality of life. This approach reiterates that of [27], with an emphasis on the transboundary of hard plus soft domains.

Since it is becoming increasingly difficult to imagine and operationalize dichotomies in an integrated approach to smart city development—especially where a sustainability framework is deployed for strategizing the smart city—it is necessary to acknowledge tensions in their combined emergence. Their original dichotomous pulls have created a struggle between hard and soft domains expressed as a "tension" in their mutual operation. However, rather than being mutually exclusive, these domains should operate in conjunction with each other—and not compete for dominance—to further progress in smart city evolution. This is already evident in such sectors as governance, where public services are provided in the digital space to facilitate access and lubricate service provision via e-governance. Continued cooperation between what was originally conceptualized as a hard/soft dichotomy is essential for the efficient and effective operation of smart cities as they evolve. Co-producing hard and soft parts as critical components of the system—devoid of any developmental tensions—is required in order to augment a socio-technocratic vision of our urban future. Afterall, technology in the service of society can promote a powerful new package in technic-savoy contemporary cities.

## 6. Conclusions

In this paper, we have problematized the dichotomist approach to viewing soft and hard domains in smart cities as somehow offering alternative pathways between "integrated" and "technological" approaches. We rather argue that the emergence of cyber-physical-social space, to which one should include smart cities, too, has made the boundaries between such alternative pathways or dichotomist vision blurred.

Our analysis of case smart city strategies demonstrates the use of "hard" domains in the operationalization of smart city ideas and associated investment projects, while the emphasis on "soft" domains is more visible in the smart city rationale and justification. However, this does not necessarily imply a sinister discursive diversion and pushing of technocratic ambitions in the name of society. To be sure, there may be such motives in some cases, and, certainly, the emergence of the smart corporate city and the production of the beneficiary community of high-tech ICT companies can be well anticipated as an outcome of the implementations of many smart city strategies. It is also unrealistic to expect that cities wanting to become a "smart city" (and explicitly marketing themselves as such) will divert themselves from the "cyber-physical" foundation of the concept, however hard they try to disguise it behind citizen-centric rhetoric.

Simply put, cities that want to avoid being associated with those technocratic orientations do not need to proclaim themselves as "smart." However, given the ever-growing tendencies towards the digitalization of society, it is nowadays challenging to find places that would not be engaged in one form or another as a cyber-physical system. Here, what makes the distinction between self-declared smart cities and all the others is whether the process is (at least discursively) coordinated at the city level or is happening "naturally" along with general technological trends.

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## Appendix A

**Table A1.** Online Resources for Smart Initiatives.

| City Strategy | Smart Initiative |
|---|---|
| Amsterdam (The Netherlands) | Amsterdam smart city program, 2007 |
| Barcelona (Spain) | DC4CITIES, 2013–2016 |
| Berlin (Germany) | Smart city strategy Berlin, 2015 |
| Bologna (Italy) | SMARTiP, 2010–2014 |
| Brussels (Belgium) | smartcity.brussels: Livre blanc, 2014–2019 |
| Canberra (Australia) | ACT government digital strategy, 2016 |
| Cape Town (South Africa) | Cape Town's "Smart City" strategy in South Africa, 2001–2005 |
| Chicago (USA) | City of Chicago Technology Plan, 2013 |
| Columbus (USA) | Smart city: Columbus, Ohio, 2016 |
| Dallas (USA) | Smart Dallas Roadmap, 2015–2017 |
| Dubai (UAE) | Dubai plan 2021, 2017 |
| Dublin (Ireland) | Smart Dublin: Open, connected and engaged, 2016 |
| Edmonton (Canada) | Smart city strategy, 2017 |

**Table A1.** *Cont.*

| City Strategy | Smart Initiative |
| --- | --- |
| Eindhoven (The Netherlands) | Triangulum: Demonstrate, disseminate, replicate, 2018 |
| Flanders (Belgium) | Smart Flanders, 2017–2019 |
| Gothenburg (Sweden) | EU-GUGLE, 2013–2018 |
| Heraklion (Greece) | Heraklion smart city, 2009 |
| Hong Kong (Hong Kong, China) | Smart city blueprint, 2017 |
| Las Vegas (USA) | Innovate Vegas, 2018–2025 |
| Leipzig (Germany) | Smart infrastructure hub Leipzig, 2017 |
| Lisbon (Portugal) | POR Lisboa 2020, 2014–2020 |
| London (UK) | Smarter London Together, 2018 |
| Lyon (France) | Let's invest a co-smart city together, 2016 |
| Manchester (UK) | Triangulum: Demonstrate, disseminate, replicate, 2018 |
| Melbourne (Australia) | A knowledge city strategy: Strengthening Melbourne's knowledge sector through collaboration, 2014–2018 |
| Milano (Italy) | Milano smart city, 2014 |
| Milton Keynes (UK) | MK digital strategy 2018–2025, 2018 |
| Montreal (Canada) | Montréal: Smart and digital city, 2014–2017 |
| Moscow (Russia) | Moscow "Smart city—2030," 2018–2030 |
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| Oslo (Norway) | Smart Oslo, 2017 |
| Ottawa (Canada) | Smart city 2.0, 2017 |
| Pune (India) | Reimagining Pune: Mission smart city, 2015–2030 |
| Rijeka (Croatia) | mySMARTLife project, 2018 |
| Rio de Janeiro (Brazil) | Big data to smart city: Recommendations to COR, 2017 |
| Seattle (USA) | Seattle IT, 2017–2018 |
| Seoul (South Korea) | Social Seoul City, 2015–2020 |
| Shanghai (China) | The smart city in 2030, 2018 |
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| Songdo (South Korea) | Songdo International Business District, 2001–2015 |
| Stockholm (Sweden) | GrowSmarter, 2015–2019 |
| Sydney (Australia) | Digital strategy, 2009–2030 |
| Taipei (Taiwan) | Taipei smart city project, 2017 |
| Tampere (Finland) | Tampere, working together for a bright future, 2025 |
| Tel Aviv (Israel) | Tel Aviv smart city, 2016 |
| Toronto (Canada) | Sidewalk site plan, 2018 |
| Tshwane (formerly Pretoria, South Africa) | Tshwane vision 2055: Remaking South Africa's capital city, 2013 |
| Vancouver (Canada) | Digital strategy, 2013 |
| Vienna (Austria) | Smart city Wien: Framework strategy, 2013–2015 |
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