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Leadership in, of, and for smart cities – case studies from Europe, America, and Australia

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ABSTRACT
This paper analyses leadership in, of, and for smart cities. Using a multi-case study research design and Mode 2 research (based upon collaboration between a scholar and a practitioner), we explore smart city initiatives in Europe (Amsterdam, Bristol, and Milton Keynes), North and South America (Chicago and Curitiba), and Australia (Melbourne). We undertake a comparative analysis which looks at leadership through six lenses: place, purpose, person, position, process, and performance. From our analysis four modes of smart city leadership emerge: smart cities as digital government, smart cities as digital driver for economic growth, smart cities as an open platform for digital socio-political innovation, and smart cities as an open platform for digital economy.

1. Introduction

According to the United Nations (2016) by 2030 there will be six out of ten people in the world living in urban areas. Cities are centres of innovation and creativity, but they also face great challenges from rapid urbanization including demand for natural resources, impacts of climate change, increasing demand for city services such as transport, health, housing, and social care, and issues around social cohesion (van de Berg, Braun, and van der Meer 2007; Cohen 2006).

Smart cities is a widely used concept that seeks to address such urban challenges through an intelligent (smart) use of information communication technologies, but there is no agreed definition of what a smart city is. As the smart city concept matures it has evolved from being strongly biased towards technology to a more citizen-centric concept that aims to address the resilience and sustainable development of cities (Marsal-Llacuna and Segal 2017). Yet there is still widespread criticism of the way smart cities are being implemented with claims that smart cities are largely a strategic vision rather than a reality on the ground (Angelidou 2014; Kummitha and Crutzen 2017). Drawing from several authors (Allwinkle and Cruickshank 2011; Börjesson Rivera, Eriksson, and Wangel 2015; Chourabi et al. 2012; Hollands 2008; Nam and Pardo 2011), we refer to smart cities as an umbrella concept to describe the use of technology in cities to improve public services, to increase efficiency (by reducing costs and resource consumption), to address societal challenges, and to foster collaboration between citizens and government.

The goal of this paper is to explore the role of leadership in several well-established smart city initiatives across cities from Europe (Amsterdam, Bristol, and Milton Keynes), North and South America (Chicago and Curitiba), and Australia (Melbourne). Leadership is particularly important in investigating smart cities as understanding which type of direction, meaning, and followership is emerging from smart cities can better inform policy, practice and critical debates around the role of technology and data as a ubiquitous part of life in the twenty-first century (e.g. Grossi and Pianezzi 2017). Whilst the smart cities literature identifies smart governance as a key element of smart cities (e.g. Meijer and Bolívar 2016), there is little research exploring how leadership is being exercised within smart cities (Chourabi et al. 2012; Lombardi et al. 2012; Nicholds et al. 2017).

Specifically, our study draws upon a leadership framework of analysis and combines insights from leadership studies, urban and regional studies, and public management and governance. This will contribute to fill a gap within the public management and governance literature that is scarce of studies on smart cities as recently argued by Gil-Garcia, Dawes, and Pardo (2018), as well as to build a dialogue with the scholars working on leadership from a public lens (see Ospina 2017 on this) and on place leadership within urban and regional studies (e.g. Beer and Clower 2014; Beer et al. 2018; Sotarauta and Beer 2017; Sotarauta and Beer 2020; Sotarauta, Beer, and Gibney 2017). In this paper we shed light on the social side of smart cities and we draw from our analysis four modes of smart city leadership: smart cities as digital government, smart cities as digital driver for economic growth, smart cities as an open platform for digital socio-political innovation, and smart cities as an open platform for digital economy.

The paper is structured as follows: Section 2 presents the conceptual backdrop and the framework of analysis, Section 3 explains our methodological approach, Section 4 provides the case studies, while Section 5 analyses the cases against our framework of analysis and Section 6 discusses the findings and provide some conclusions.

2. Leadership and smart cities

2.1. Conceptual backdrop

Smart city leadership is a neglected angle for empirical analysis and theoretical discussion. According to the website https://googlescholar.com, at the time of writing this paper, just two scientific papers (intended here as peer-reviewed journal publications, so excluding conference papers) have been published with the word 'smart city' (or 'smart cities') and 'leadership' in the title.[1] This is quite surprising given the volume and the rate of growth of the literature around smart cities. Having said that, from our knowledge there are at least three relevant streams of literature that can help us to guide the research on leadership and smart cities. Within public management and governance there is a rising literature on the role of leadership in public and collaborative governance (e.g. Budd and Sancino 2016; Crosby and Bryson 2018; Hartley 2018; Liddle 2010; Vangen, Hayes, and Cornforth 2015) which studies leadership across organizations and in the public sphere, so with a more outward and community-based focus from the longer existing research on administrative and/or organizational leadership in public sector settings (e.g. Van Wart 2013; Tummers and Knies 2013).

Within urban and regional studies there is a rising literature on place-based leadership (e.g. Beer et al. 2018; Sotarauta, Beer, and Gibney 2017), also referred as city and regional leadership (Acuto 2013; Budd and Sancino 2016; Hambleton 2015; Sotarauta 2016; Sotarauta and Beer 2020) which aims 'to understand better how and to what extent the places where we live, work and play are shaped by human relationships and interactions and, specifically, in what ways the meanings ascribed to concepts such as leader, leading and/or leadership can be used to explain how these places evolve' (Sotarauta, Beer, and Gibney 2017, 188).

Within leadership and organizational studies there is an emerging literature which discusses the impacts of leadership in society, so with a broader focus than just leadership from a business point of view (e.g. Kempster, Jackson, and Conroy 2011). This literature is characterized by the fundamental importance of understanding leadership in a complex and changing context and as a practice of leading and following for a purpose (e.g. Uhl-Bien, Marion, and McKelvey 2007; Jackson and Perry 2018).

These three different but partly overlapping and much complementary fields of research seem to take different perspectives of analysis but commonly focus on the community/place/society, concepts that can be self-contained in the concept of city. Specifically, leadership in the city is the perspective mainly taken by public management and governance; leadership in and of a city (or city region), or place leadership, are the perspectives taken by urban and regional studies depending on the authors; leadership for a purpose in a given context is a perspective taken by the above-mentioned leadership studies. All these three backgrounds gave us the inspiration to consider issues around leadership in, of, and for smart cities as reported in our title.

2.2. Framework of analysis

In this study we refer to leadership as providing direction and meaning that produce followership (action). The absence of studies on smart city leadership suggested us to find a framework of analysis within the literatures above mentioned. The fundamental question was – as written by Sotarauta, Beer, and Gibney (2017, 190) – to understand 'Who influences whom, how, for what purpose and in what kind of context – and with what outcomes?'. To this regard, Jackson and Parry (2018) proposed that leadership should be looked at through its six lenses: place, purpose, person, position, process, and performance. They adapted a leadership framework originally developed by Grint (2005) and added the place and purpose dimensions in the attempt to offer a more complex and multidimensional view of leadership. We believe these six dimensions are relevant for the aims of our study.

Table 1 further details on the six lens of leadership within the framework and clarifies the focus of our analysis by showing how we applied the framework to our smart city cases through guiding question for each lens.

The first analytical lens is place. Here we focused our analysis on the main domains/ arenas identified by Hambleton and Howard (2013), Sancino and Budd (2018, 176), and namely: professional leadership, which deals with the public services (e.g. housing, healthcare, education, regeneration, leisure, etc.) delivered within a city; political leadership, which deals with the democratic processes and decisions affecting a city and its citizens; community leadership, which deals with all the community processes provided by the community and its actors operating outside the traditional realm of

Table 1. The leadership lens framework and focus on smart cities.

Lens of leadership	Explanation	Focus for our analysis
Place	'Combinations of infrastructure, technology, specialty activities, entrepreneurial culture, human capital, and quality of life' (Feiock, Jae Moon, and Park 2008, 24) The interplay between power, resources, institutions and policy' (Sotarauta, Beer, and Gibney 2017, 191)	Where is leadership emerging? For example domains of place-based leadership (political/democratic, professional/public services, business, and community) (Hambleton and Howard 2013; Sancino and Budd 2018)
Purpose	'The reason something is done or created or for which something exists' (Oxford Dictionaries 2018)	Why is leadership created? For example dominant narratives
Person	'Individuals, groups of individuals, but also an organisation and/or a group of organisations which play a key leadership role' (Budd et al. 2017, 319)	Who are the leaders? For example key leaders
Position	Where leaders operate (Grint 2005) – 'facilities, arrangements, organisations that support and enable leaders to achieve their goals and to implement decisions stemming from their roles' (Budd et al. 2017, 321)	What supports and enables leadership? For example governance arrangements
Process	The way in which leaders build, activate, mobilize, and set directions for the followers	How are direction and mobilization provided? For example strategic formal planning versus emergent collaborative strategy
Performance	'First-order outcomes are changes to the government organisation such as efficient government and readiness for disaster management. Second-order outcomes entail changes in the position of government vis-a`-vis other urban actors such as citizen-centric services and interactions with citizens. Third-order outcomes are improvements to the city such as economic growth, social inclusion, ecological performance, and highly educated citizens' (Bolívar and Meijer 2016, 679)	What is achieved by leadership? For example changes in urban governance, engagement of civil society, and achievement of outcomes

the public and private sector; and business leadership, which deals with the processes of (co-)creation of value provided by the private sector. Place can thus be understood as a collective and relational space of knowledge, power, resources, and institutions that can differently combine into governance domains (professional/public services, business, political/democratic, community) where leadership is enacted.

Our second lens is purpose. Its relevance for leadership has been clearly reaffirmed by Kempster, Jackson and Conroy (2011). They pointed out that leadership is tied up with purpose even if societal purposes are often overlooked by leadership scholars. The purpose lens refers specifically to why something is created. We focused here on the narratives behind the smart city initiatives we analysed. Narratives (and stories) are a powerful relational element of leadership; they provide meaning and can mobilize action (Orr and Bennett 2017). A narrative is 'a basic human strategy for coming to terms with time, process and change' (Herman 2007, 3).

Leadership as a person is our third lens – we focused here on the key persons (leaders) that make the smart city initiatives happen. Leadership as position occurs when the emphasis is on the leadership formal positions in an organization/context – in this respect we focused on the governance arrangements in our smart cities' initiatives and particularly on the role of local government.

Leadership as a process is our fifth lens. Here we focused our analysis on which type of strategic processes provided direction into our smart cities' initiatives. Specifically, we were interested to see if these processes were embedded into formal strategic plans or rather collaboratively deliberated in an emergent and ad hoc basis – this distinction is drawn by Bryson, Edwards, and Van Slyke (2018, 327) who distinguished between strategic planning conceived in a procedural or functional terms.

Finally, leadership has been looked also in terms of performance, the results/outcomes, and in relations to followership – the way leaders interact with followers and the effects of leadership on followership (and vice versa). Drawing from Bolívar and Meijer (2016, 679), we focused here our analysis on changes in urban governance, engagement of civil society, and achievement of city outcomes.

3. Methodology

We adopted a multiple-case study research design, which is well established within governance-related research (Stewart 2012). 'A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between the phenomenon and the context are not clearly evident' (Yin 2009). Our research design is based on Mode 2 research which produces knowledge within the context of an application and is based upon collaboration between a scholar and practitioner (e.g. Buick et al. 2016; Gibbons et al. 1994; Hartley 2017). Mode 2 research differs from traditional Mode 1 research for the following main reasons: it is transdisciplinary, it is aimed at defining action repertoires for practice, and it is characterized by the quality control that takes place through collaboration of practitioners and researchers rather than just from a theoretical and conceptual perspective (Gibbons et al. 1994, vii). On the importance of Mode 2 research in investigating urban issues, Acuto, Parnell, and Seto (2018, 3) say that 'Urban scientists need not be urban managers, but the two communities of research and practice need far better connections. Few scientists today are able to make sense of the party politics or the dynamics of governance that are an integral part of urban transformation.'

Our research method involved three stages: case selection, data collection from a variety of sources including policy documents, websites, academic literature, and direct observations, and data analysis using a comparative research approach. Each of these stages is described in detail below.

3.1. Case selection

After several meetings held by the authors, we agreed on a theoretically informed framework of analysis and we sampled the case studies on a purposeful basis. Our main criteria were to sample international cities that can be all considered as champions for smart cities. We selected cities whose smart city programmes involved a broad range of actors from both the public and private sectors, as well as local citizens, and where the focus was on the use of technology to craft new forms of human collaboration to address city challenges. Our six cases (shown in Table 2) are a broad spread of cities in terms of size (both area and population) and for all of them the local governing body is the local authority and some also have elected mayors.

3.1.1. Amsterdam
Amsterdam is a city with a long tradition of smart city innovation, receiving international recognition through awards such as the World Smart Cities Award 2012 for its Open Data Program and European Capital of Innovation in 2016 and 2017. The Amsterdam Smart City (ASC) Platform was established in 2009 and involves the local municipality, businesses, and knowledge institutions (Amsterdam Smart City 2017). It encourages organizations and citizens to submit and apply innovative ideas and sustainable solutions to urban challenges.

3.1.2. Bristol
Bristol is well known for its smart city and sustainability initiatives; the city was ranked first in the UK Smart City Index in 2017 (Huawei and Navigant Consulting 2017) and was European Green Capital in 2015. Bristol City Council launched the Smart City Bristol programme in 2011, which is delivered through an informal public–private–people partnership. It developed from the recommendations of a Smart City Report commissioned by the Council and funded by the UK Government (Advancing Sustainability 2011).

3.1.3. Milton Keynes
Milton Keynes was identified as a contender in the UK Smart City Index in 2017; these are cities that have established their smart city strategies and implemented significant projects (Huawei and Navigant Consulting 2017). The Milton Keynes Future City Programme is led by Milton Keynes Council and includes a range of collaborative projects. MK:Smart is the flagship project, a large collaborative smart city initiative developing innovative solutions to support the economic growth of Milton Keynes, which ran from 2014 to 2017, and was led by The Open University (OU).

3.1.4. Chicago
Chicago is well known for its community approach to utilizing technology to improve people's lives. The Smart Chicago Collective was founded as a civic organization in 2011 and they have initiatives across areas such as health, education, justice, and open data (Smart Chicago 2018). They recently merged with City Digital to form City Tech,

Table 2. Socio-economic data on the smart city case studies.

	Amsterdam	Bristol	Milton Keynes	Chicago	Curitiba	Melbourne
Country	Netherlands	United Kingdom	United Kingdom	USA	Brazil	Australia
Population of municipality	851,573[a]	456,000[b]	264,480[c]	2,695,598[d]	1,879,355[e]	4,820,000[f]
Area of municipality (km²)	219	110	89	606	431	9,993
Local governing body	The City of Amsterdam and Mayor	Bristol City Council and Elected Mayor	Milton Keynes Council	Chicago City Council and Mayor	City of Curitiba and Mayor	City of Melbourne

[a]2017 (CBS Netherlands), [b]2016 (Bristol City Council), [c]2016 (Milton Keynes Council), [d]2010 (United States Census Bureau), [e]2015 (City of Curitiba), [f]2017 (Population Australia).

which is 'dedicated to reimagining cities as places where technology fuels opportunity, inclusion, engagement and innovation' (The Chicago Community Trust 2018). City Digital was established in 2015 and is focussed on bringing Chicago's commitment essential services and infrastructure into the modern era (Labs 2018).

3.1.5 Curitiba

Curitiba is a city widely recognized for its innovation work within sustainable urban development and was awarded the Global Sustainable City Award 2010. More recently, it was ranked top in the Brazilian Index of Digital Cities (Duarte et al. 2014) and has started to develop a collaborative smart city programme. The local municipality of Curitiba has established Curitiba Collaborates which aims to promote collaboration, innovation, and development of the creative economy through the use of technology to address local challenges (SmartGov 2017).

3.1.6. Melbourne

Melbourne is known for its liveability work and was ranked top in the Global Liveability Ranking from 2011 to 2017 (The Economist 2018). The city also won Intelligent Community of the Year for 2017, in recognition of its work around liveability and its community plan called Future Melbourne (Intelligent Community Forum 2018). The City of Melbourne's smart city work started around 2010 and they have a strategy with a vision 'to enhance the aspects of our city that make us uniquely Melbourne, and intelligently prepare for the changing needs of the community, the environment and the economy' (City of Melbourne 2018).

3.2. Data collection

We collected the case study evidence from multiple sources: academic literature, policy documents, reports, websites, the re-analysis, and interpretation of data sets from previous smart city studies and from knowledge gained by one author participating as a consultant and researcher in two of the cities (see Table 3 for more

Table 3. Case study data sources.

Types of sources	Sources consulted
Policy documents	Milton Keynes Council (2018); Chicago Tech Plan (2018); City of Melbourne (2018)
Websites	Amsterdam Smart City (2017); Connecting Bristol (2017); Bristol is Open (2018) Knowle West Media Centre (2017); The Open University (2017); IoT World Today (2018); Array of Things (2018); KTH Royal Institute of Technology (2018); SmartGov (2017); New Internationalist (2018); University of Twente (2018); City of Melbourne (2018); IBM (2018); The Economist (2018); Intelligent Community Forum (2018)
Reports	van Winden et al. (2016); van Beurden (2011); Advancing Sustainability (2011); Huawei and Navigant Consulting (2017); van Beurden (2011); Huawei and Navigant Consulting (2017); Burgoyne and Mallsen (2017)
Academic literature	Angelidou (2014, 2017); Anthopoulous (2017); Caird, Hudson, and Kortuem (2016); Duarte et al. (2014); Ersoy (2017); Gooch et al. (2018); Hambleton and Howard (2013); Prezybilovicz and Cunha (2017)
Data sets from previous research studies	Caird, Hudson, and Kortuem (2016); Gooch et al. (2018); Hudson et al. (2019)
Observations	Direct observation and professional participation in smart city initiatives in Bristol and Milton Keynes

details). The use of multiple data sources not only helps to validate specific details but also widens and deepens the coverage of events (Stewart 2012). It also helps in the development of converging lines of inquiry, through a process of triangulation and corroboration (Yin 2009).

We created a case study database to organize and document the data collected, which provides details on the actual evidence used and helps to maintain a chain of evidence which increases the study's reliability and ensures consistency in applying the framework of analysis (Yin 2009). One of the paper authors collected the data and compiled the case study notes which were reviewed by the other author.

3.3. Data analysis

Analysis of the cases was undertaken using a comparative research method. We developed a framework of analysis described in Section 2, which was built upon the author's expert knowledge on the topic and current thinking and discourse (Yin 2009). This theoretical proposition shaped the data collection plan for the study; we focused on collecting evidence on the six dimensions of smart city leadership for each of our six cases. One of the authors then drafted the case studies, using all the available evidence and focussing in on the most significant aspects of the case studies to ensure a high-quality analysis (Yin 2009). The draft case studies were reviewed by the other author and changes made to enhance of the accuracy of them. One of the authors then undertook a cross-case analysis, which examined similarities, differences, and key themes between the city cases, and the results were reviewed by the other author and changes and additions made. The findings of this analysis are presented in Section 5. This rigorous process of case study review helps to enhance the accuracy of the case studies and increase the construct validity of the study (Yin 2009).

4. Case studies

4.1. Amsterdam

The City of Amsterdam, Amsterdam Economic Board, Pakhuis de Zwijger, and Waag Society are the key actors of smart city projects in Amsterdam[2] (van Winden et al. 2016). The ASC Platform has 11 programme partners, who contribute financial and human resources and have representatives on the Board, and over 150 project partners participating in more than 100 smart city projects (van Winden et al. 2016). Amsterdam defines a smart city as a city where social and technological infrastructures and solutions facilitate and accelerate sustainable economic growth (Amsterdam Smart City 2017). They also encourage active involvement of citizens to test drive new technologies. In 2014 Amsterdam was the first city in the Netherlands to appoint a Chief Technology Officer (CTO) who collaborates with units within the municipality to make innovation happen, addressing the silos and forming a first port of call for companies developing innovative products or services (van Winden et al. 2016). The CTO also chairs the ASC Steering Committee. Since its formation ASC has shifted its focus from managing projects to becoming a facilitator of the smart city community, as it found project management took significant financial and human capital and there was a lack of ownership of problems by project partners (van Winden et al. 2016). ASC has also increasingly focused on the

economic viability and sustainability of projects. An evaluation of ASC projects found that while many say citizens as central to their purpose, there is rarely evidence of this and citizens are seldom included as an official part of the project partnership, so there is still a long way to go to move from a technology-led approach towards a citizen centred approach (van Winden et al. 2016).

4.2. Bristol

Smart City Bristol is coordinated by Connecting Bristol, the city's digital partnership which delivers innovation projects in partnership with universities, business, and community organizations and is led by Bristol City Council (Connecting Bristol 2017). The University of Bristol and the City Council have established Bristol is Open, a digital infrastructure research network, funded by local, national and European governments, academic research funding, and private sector companies (Bristol is Open 2018). Knowle West Media Centre (KWMC), an arts-based charity, run the Bristol Living Lab 'a place where citizens, artists, technologists, businesses and public sector organisations come together to co-create ideas, tools and technologies that address local challenges, to innovate and explore new possibilities' (KWMC 2017). Bristol's smart city work has a strong focus on sustainability, in particular the reduction of carbon emissions through smart energy, smart data, and smart transport initiatives (Advancing Sustainability 2011). The city places a strong focus on citizen-centric smart city solutions and KWMC, working with the Council and Ideas for Change, have developed the Bristol Approach, a framework for running inclusive and community-driven digital projects (KWMC 2017). Bristol is well respected for its innovation and political and professional leadership in bringing together the green and digital sectors (Hambleton and Howard 2013). Bristol has had an elected mayor since 2012, but the current Mayor is not a leading figure in steering the smart city work. Smart City Bristol is a collection of innovation projects with the governance largely determined on a project basis. Rather than adopting a Smart City Strategy, the aims of the programme have been embedded within the Council's service delivery plans (Caird, Hudson, and Kortuem 2016).

4.3. Milton Keynes

Smart city initiatives in Milton Keynes are led by Milton Keynes Council, through their Future City Programme, and by the OU who lead MK:Smart. Many of the initiatives are partnership projects involving the council, business, government bodies, universities, and community groups. The main focus of Milton Keynes's smart city work has been to support sustainable economic growth within the city. MK:Smart developed the 'MK Data Hub' which brings together data relevant to city functions, such as energy, transport, water, sensor networks, satellite data, and social media, and it also included innovation projects in the areas of energy, water, transport, citizen engagement, education, and enterprise (Caird, Hudson, and Kortuem 2016). Funding for MK: Smart (£16 million) ended in June 2017, but the Council committed an additional investment of £500,000 to continue some elements of the programme for another 2 years (Huawei and Navigant Consulting 2017). The Council has a Director of Strategy and Futures, whose role 'involves creating a long-term vision for the city's growth and leading a suite of major transformational projects to deliver the vision'

(IoT World Today 2018). They published a MK Digital Strategy in 2018, with a focus on digital connectivity, services, and economy (Milton Keynes Council 2018). Milton Keynes also has a Futures 2050 programme which is progressing six big projects including a new spatial framework for the city, creation of a new technology university, and a smart city programme that has a particular focus on intelligent and autonomous mobility (IoT World Today 2018). Governance of smart city initiatives in Milton Keynes is determined on a project basis. The OU and Community Action MK (a local charity) have worked with communities in Milton Keynes to help them develop local smart city ideas and projects using an online platform (OurMK 2018). However, people implementing the projects experienced significant barriers when trying to engage the Council in taking forward their ideas (Gooch et al. 2018).

4.4. Chicago

The Smart Chicago Collective was founded by the City of Chicago, the MacArthur Foundation, and the Chicago Community Trust. It was born in the conversations of the early to mid-2000s in a mission to 'to ensure that all of Chicago achieves digital excellence and takes advantage of the social and economic opportunities that arise from universal use of digital technology' (Smart Chicago 2018). Its approach is to increase access to the internet, improve digital skills, and developing meaningful products from data that contribute to the quality of life of residents. Smart Chicago recently merged with City Digital to form City Tech, which has a similar mission. The Mayor of Chicago, Rahm Israel Emmanuel, has played a leading role in Smart Chicago. Elected in 2001, he has a clear understanding of the role of technology and data in transforming a city and established two new positions; a CTO and a Chief Data Officer. The City of Chicago Technology Plan sets out a vision of Chicago becoming a city where technology fuels opportunity, inclusion, engagement, and innovation for all (Chicago Tech Plan 2018). Smart Chicago operates as a start-up bringing together municipal, philanthropic, and corporate investments in civic innovation (Smart Chicago 2018). Its primary source of funding is the MacArthur Foundation, whilst the City of Chicago plays a key role as a policy lever and a critical partner for getting things done (Smart Chicago 2018). It works in partnership with universities, business, government organizations, and not for profits, guided by an advisory committee. Chicago has an open data portal with more than 900 data sets and an urban sensing project (The Array of Things) focused on changing people's understanding of urban life by bringing together city stakeholders to collect real-time data on the city's environment and infrastructure (Array of Things 2018).

4.5. Curitiba

Curitiba Collaborates was set up by the local authority and involves universities, technology developers, entrepreneurs, Code for Curitiba, and local citizens. It is a set of articulated actions under the leadership of the Curitiba Secretariat of Information Technology with the objective of creating an ecosystem which supports the use of technology and innovation to engage citizens in solving public problems and to support the creative economy (SmartGov 2017). Smart City initiatives in Curitiba are build upon the city's previous work on digital infrastructure and use of data (Duarte et al. 2014). The city pioneered low-cost solutions to improving urban life through an ambitious city

development plan and innovative public–private partnerships, first led by the city mayor Jaime Lerner elected in 1971 (New Internationalist 2018). Curitiba is developing a smart city roadmap (Hudson et al. 2019) and has established international collaborative agreements with universities, business, and governments, for example a 5-year collaboration with The University of Twente around projects in mobility, urban design, and sustainability to realize a Smart Curitiba (University of Twente 2018). They also have a smart city collaboration with KTH Royal Institute of Technology in Stockholm, to develop projects in mobility, planning, and environment, also working companies such as Volvo and Vinnova, a Swedish Government agency (KTH Royal Institute of Technology 2018). Curitiba Collaborates started with the creation an open data policy in 2014 which led the local municipality to open up data sets and provide space for civic hackers' meetings to use the data to address local issues. They have run three hackathons involving 400 people and established a number of academic research projects using the open data, but this has not yet made a clear contribution to sustainable urban development, but it is improving the collaborative ecosystem within the city (Prezybilovicz and Cunha 2017).

4.6. Melbourne

The City of Melbourne works in partnership with other organizations and citizens to deliver their Smart City Strategy. They position 'the smart city as a methodology, a way of giving citizens agency, futureproofing Melbourne and preparing for digital disruption, to be embedded across all of council practices' (Burgoyne and Mallsen 2017). The local authority work with the local community to utilize technology to design, develop, and test the best ways to live, work, and play in Melbourne (Anthopoulous 2017). They also collaborate with industry partners and were accepted on IBM's Smarter Cities Challenge in 2015 (IBM 2018). However, the city's smart city programme is vendor agnostic, preferring a multi-vendor approach to provide the best possible systems for the city (Burgoyne and Mallsen 2017). Both politicians and city managers have demonstrated strong leadership in adopting smart city approaches in Melbourne. The Chief Executive Officer created the Smart City Office in 2015 (40–50 staff) and established a Chief Digital Officer role who sits with the Chief Information Officer on the executive leadership team to ensure the smart implications for other decisions being made across the council are taken into account (Burgoyne and Mallsen 2017). The City of Melbourne also created CityLab, a living lab, where they use human-centred design to prototype and test new ideas and city services with the community (City of Melbourne 2018). They run hackathons and open innovation competitions and have an open data platform with more than 150 data sets. A major insight from the city's initial consultation work was the need to help people build knowledge and literacy around change and to include citizens in the process of change (Burgoyne and Mallsen 2017).

5. Findings of the comparative analysis

5.1. Smart city leadership through place

We begin our analysis by applying the leadership through place lens. The central guiding question posed by this lens is: Where is leadership emerging? Drawing from Hambleton and Howard (2013), as well as Sancino and Budd (2018), we particularly

focused on four main domains: political/democratic, professional/public services, business, and community. In the six cities studied, the leadership was mainly emerging in the professional/public services domain, specifically within the local authority. However, many of the cities were experimenting with new forms of smart urban governance involving collaboration across different domains of place-based leadership. In four of the cities (Amsterdam, Bristol, Curitiba, and Milton Keynes), we observed leadership from within the professional/public services domain working closely with the community and business domains. Whilst these smart city initiatives appeared to have political endorsement, we didn't observe evidence of strong leadership within the political/democratic domain. Differently, in Chicago leadership was emerging from the political/democratic domain, with the Mayor central to the development of the Smart Chicago Collective (now City Tech), and working with leaders across all the four domains mentioned above. In Melbourne leadership from within the political/democratic domain was also driving the development of the smart city initiative and the CEO of the local authority had established a smart city office. The office works with business and community organizations on projects, but organizations in these domains appear to play more of a followership role.

5.2. Smart city leadership through purpose

In applying the 'leadership through purpose' lens, the key question is: Why is leadership created? The use of technology and data to support economic growth is a dominant narrative for many of the smart city cases and they often refer to addressing wider sustainable development outcomes such as improving quality of life and reducing environmental impacts. Amsterdam and Milton Keynes focus on the use of digital technology and innovation to support sustainable economic growth, whilst in Chicago the focus is on digital inclusion and innovation to support jobs and business growth and in Curitiba digital innovation to support growth within the creative industries. Melbourne stood out as it has a strong focus on quality of life, with the aim to use of technology to futureproof the city and to prepare the city for digital disruption. Bristol has a strong narrative around digital innovation for sustainability and reducing carbon dioxide emissions. All the smart city initiatives also include a narrative around actively involving citizens to address local issues; we explore this issue in more detail later in this section.

5.3. Smart city leadership through person

The primary question posed by this lens is: Who are the leaders? In all the case studies, local government managers are the primary leaders of the smart city initiatives. Amsterdam and Chicago have both appointed CTOs to lead on smart city innovation working alongside other city partners and Melbourne has a Chief Digital Officer and a Chief Information Officer. In Milton Keynes the Future City Programme is led by the Council's Director of Strategy and Futures, a post like that was established by Bristol City Council when it had a Director of Bristol Futures. In Melbourne politicians played an important role in establishing the Smart City Office which has both a CTO and a Chief Information Officer. The Mayor of Chicago has played a leading role in establishing the Chicago Smart Collective appointing a CTO and a Chief Data Officer. Bristol and Curitiba also have directly elected mayors, but we found no

evidence to suggest they currently play a leading role in their smart city initiatives, although in the past political leaders have played a significant role in the drive to integrate green and digital activities within Bristol and a previous Mayor of Curitiba implemented radical plans for sustainable urban development.

5.4. Smart city leadership through position

The positional lens of leadership examines the question: What supports and enables leadership? In terms of governance arrangements that support and enable the smart city leaders to operate and achieve their goals, many of the cities have established public–private partnerships but there are differences in how they operate and are funded. ASC is a formal public–private partnership bringing together partners from business, the local municipality, and knowledge institutions, who each contribute human and financial resources. It plays a coordinating role engaging other organizations and citizens in smart city projects through its online innovation platform. The Smart Chicago Collective was led by the local municipality, a private foundation trust, and a community foundation trust, operating like a start-up and pulling together different strands of municipal, philanthropic, and corporate investments to fund civic innovation projects. Smart City Bristol is an informal partnership model, led by the Council, and bringing together the universities, community organizations, business, and citizens. Its activities are coordinated by the local authority with funding from UK and EU smart city projects. In Bristol it is interesting to note that in the last 2 years there has been a significant reduction in the Council's budget (a national trend in the United Kingdom) reducing the resources dedicated to the smart city programme. Milton Keynes takes a similar partnership approach to Bristol, with a focus on partnerships built around funded projects, and here the major funding for its showcase smart city programme has recently ended. In Curitiba the authority has a number of smart city collaborative agreements with international universities, companies, and government departments. In Melbourne the smart city initiatives appear to be led and funded by the local authority, who then work with other organizations and citizens on a project basis.

5.5. Smart city leadership through process

In applying the leadership through process lens, the key question is: 'How are direction and mobilization provided?' In particular, we focus on processes of strategic planning to better understand in what way the leaders build, activate, mobilize, and set directions for the followers. In the cases studied, the cities are taking two different approaches to smart city development. Some have adopted a formal smart city or digital strategy with projects aligned to this, whilst others take a more open approach to innovation. In all the cities the local authorities take on the role of community facilitator bringing together the actors. The City of Chicago has adopted a Technology Plan and the Smart Chicago Collective (now Tech City) facilitates digital innovations through funded activities which involve other partners in the city. Milton Keynes Council has recently adopted a Digital Strategy and their focus is on collaboration with other actors in the city through UK and EU-funded smart city projects. The City of Melbourne focuses on collaboration through projects aligned with their Smart City Strategy, bringing in other types of partners as required.

Curitiba hasn't adopted a smart city strategy yet, but the local authority is working on a roadmap and has agreements in place with international universities and companies to deliver smart city initiatives. The ASC Platform facilitates stakeholders to work together to create innovative projects, but they don't have a formal strategy document. Their CTO made the observation that 'the concept of smart cities is like art: the context is more important than the product' (van Beurden 2011). Bristol City Council focuses on convening other actors to co-create innovation projects, which are captured within their Service Delivery Plans rather than a formal smart city strategy. Engaging citizens is a key focus in all the cities and the use of urban living labs or innovation platforms are the mechanisms they use to bring together the actors (local authority, government, university, business, community groups) with local citizens to co-create solutions, for example the Bristol Living Lab, CityLab in Melbourne, Curitiba Collaborates, ASC Platform, and OurMK in Milton Keynes.

5.6. Smart city leadership through performance

The leadership through performance lens poses the question: What is achieved by leadership? This can be observed through the results achieved, for example changes in urban governance, such as improved efficiency or resilience; new ways of engaging with civil society; or the achievement of outcomes such as increased economic growth. In the cities studied, the smart city initiatives were innovation projects and the information available largely focussed on the project aims and processes rather than the actual outcomes achieved. Funding appears to be an issue influencing the longevity of smart city initiatives and how to effectively engage citizens is also a concern. In Chicago the civic use of technology has developed over a period of more than 15 years and the initiatives are delivered through a collaboration (Smart Chicago Collective) that has been successful at securing funding from both public, private, and philanthropic sources, although it has recently gone through a restructure. In Amsterdam the Smart City Platform is a collaboration that has been in operation for nearly a decade and is funded by both public and private organizations. It has helped to address silos across the local authority and has also brought together city actors through innovative projects, making Amsterdam a recognized leader in smart cities. However, an evaluation of Amsterdam's projects revealed there was still a long way to go in terms of active citizen engagement as they were seldom central to the projects although that is the platforms wider aim (van Winden et al. 2016). Curitiba and Melbourne's smart city initiatives are still at a relatively earlier stage, but they have focused on new collaborative approaches to engaging city stakeholders using technology. In Bristol the integration of digital and sustainability activities has developed over more than a decade and impacted on urban governance through the established of Bristol Futures Directorate, who worked with other actors to pioneer new approaches to collaborating with citizens such as the Bristol Approach. However, recent financial pressures have led to the loss of key staff and the directorate was subsumed into another one. In Milton Keynes the major funding source for MK:Smart ended in 2017, but the Council and the OU (based in Milton Keynes) have continued to make an investment in smart city initiatives along external funding sources. However, engagement with the Milton Keynes Council was identified as a significant barrier to delivering citizen led innovation in MK:Smart (Gooch et al. 2018) and from the Council's digital strategy it appears they are largely

focussed on economic growth rather than citizen's ideas. Citizens and businesses in other cities around the world have also found it hard to engage with local government politicians and officers around their smart city ideas, which could be due to a lack of understanding and skills around smart city approaches beyond those directly involved in managing such initiatives (Hudson et al. 2019). A study in Bristol and Milton Keynes also uncovered some concerns about who is involved in smart city projects, whether the infrastructure was accessible to all citizens, and who makes the decisions in the projects (Ersoy 2017). We found no evidence of how successful any of the smart cities have been in achieving their intended outcomes such as sustainable economic growth and improving quality of life. A study of UK smart cities (which included Milton Keynes and Bristol) found that the cities often have difficulty measuring the citywide outcomes of their programmes, as the evaluation methodologies are still at an early stage of development (Caird, Hudson, and Kortuem 2016).

Table 4 summarizes the key findings of the comparative analysis which explored how the six lens of leadership (i.e. place, purpose, person, position, process, and performance) are being practised in each of the smart cities.

6. Discussion and conclusion

The aim of our paper was to shed light on the leadership in, of, and for smart cities by conducting a multiple-case study comparison of cases from Europe, America, and Australia. We undertook a comparative analysis that looked at leadership through six lenses: place, purpose, person, position, process, and performance. Drawing upon our analysis we propose some theoretical generalizations about 'modes' of smart city leadership which are illustrated in Figure 1. Direction was the first element in our definition of leadership and this is shown by the horizontal arrow in the matrix. Meaning was the second element in our definition of leadership and this is shown by the vertical arrow in the matrix. The matrix also shows four 'modes' of leadership: smart cities as digital government, smart cities as digital driver for economic growth, smart cities as an open platform for digital socio-political innovation, and smart cities as an open platform for digital economy. These modes can coexist, as we found in our comparative analysis. The four modes of smart city leadership can be understood as an implicit discourse that influences the type of followership (action) that it is activated in smart city initiatives. Followership was the final construct in our working definition of leadership (direction and meaning that produce followership).

In terms of direction, our comparative analysis of leadership through the person, process, and position lenses highlighted that smart city initiatives can be positioned along a continuum ranging from a technical direction through to a civic direction which resonates with the concept of smart cities as socio-technical structures. Our analysis highlighted the key role of the local government leadership in making smart cities happen. In that respect, local governments may play different roles, but all act as the pivot of the network of actors that can take a role in implementing smart cities projects. Our findings show that smart cities often involve new types of technical leadership roles, such as the Chief Technological Officer, who drive smart cities as digital government (top left in the matrix), as a digital driver for economic growth (bottom left in the matrix) and as an open platform for digital economy (bottom right in the matrix). But

Table 4. Leadership observed across the different lens for each the case studies.

	Amsterdam	Bristol	Milton Keynes	Chicago	Curitiba	Melbourne
Leadership through place Main domains of place-based leadership	Professional/Public services and business domains prevalent but some involvement of community domain	Across domains of professional/public services, business, and community	Across domains of professional/public services, business, and community	Across domains of political/democratic, professional/public services, business, and community	Mainly professional/public services domain with involvement of business and community domain	Political/Democratic domain and professional/public services domain prevalent
Leadership through Purpose Dominant narrative	Sustainable economic growth	Innovation – digital, environmental, and social	Sustainable economic growth	Digital inclusion and innovation for employment and business growth	Digital innovation and creative economy	Quality of life, futureproof city against digital disruption
Leadership through Person Key leaders	Chief technology officer	Director of futures	Director of strategy and futures	Mayor, Chief Technology Officer, Chief Data Officer, Community Foundations	Local authority manager	Politicians, Chief Digital Officer, Chief Information Officer
Leadership through Position Governance arrangements	Formal public–private partnership	Informal public–private–people partnership Joint venture (company) between local authority and university	Project based public–private partnership	Formal public–private partnership operates as a start-up	Informal public–private partnership International alliances	Local authority-led programme
Leadership through Process Strategy	No formal strategy Innovation platform Citizen lab	No formal strategy, actions embedded in Council Service Plans Living lab	Adopted strategy Citizen innovation platform	Adopted strategy Public–private collective delivering civic innovation	Working on roadmap Civic innovation through public–private collaboration	Adopted strategy Citizen lab

(Continued)

Table 4. (Continued).

	Amsterdam	Bristol	Milton Keynes	Chicago	Curitiba	Melbourne
Leadership through Performance Changes in urban governance, engagement of civil society, wider city outcomes	Long established partnership and innovation platform co-funded by city stakeholders Weaknesses in citizen engagement in projects and citizens often not part of project governance	Innovative models of engaging city stakeholders and citizens in local innovation Some concerns about citizen's accessibility to smart city infrastructure and decision-making in projects	Innovative projects involving city stakeholders Citizen-led innovation project, but participants found it hard to engage with council. Also some citizen concerns on accessibility of smart city infrastructure and decision-making	Long established partnership (Smart Chicago Collective) delivering civic innovation funded by public and community partners	Some success in developing collaborative ecosystem	Citizen focussed programme with clear focus on liveability and resilience

Meaning (Leadership IN & OF Smart Cities)
(Purpose & Performance of Place)
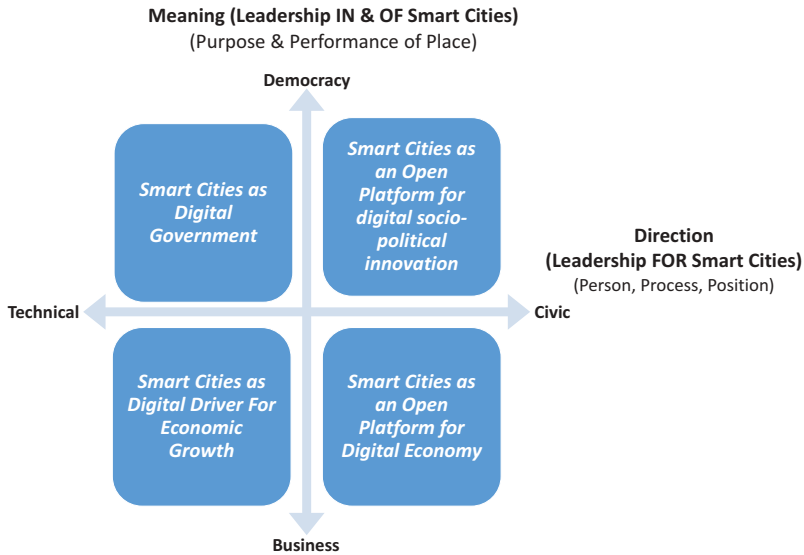
Figure 1. Modes of smart cities leadership.

Source: Own elaboration.

smart cities can also benefit from civic leadership for example from a Mayor who champions them as an open platform for socio-political innovation (top right in matrix).

Smart cities governance is intrinsically collaborative and hybrid. Public–private partnerships appear to offer an effective model for delivering smart city initiatives that can be used to meet the needs of a variety of smart city actors in both formal and informal ways. Cities take different approaches to smart city development, some opting for a formal strategy with projects aligned to this, whilst others take a more open approach to civic innovation through living labs and innovation platforms that seek to bring together stakeholders with citizens to co-create value (Bryson et al. 2017) and solutions that meet local needs.

However, followership can be technocratic and technologically informed. To avoid that smart cities become the exclusive domain of the technologically savvy, there is also a need to address the digital skills of local government and other stakeholders, and to consider the role of citizens in the governance of such initiatives. In terms of meaning, our analysis of leadership as a purpose and performance of a place suggests that smart city initiatives can be driven by both business and/or democratic considerations – smart cities as digital economic and socio-political innovations. When a more technical direction for a democratic purpose characterizes smart cities, we end up in implementing smart cities as a way to use the digital potential to reform local government and local governance (smart cities as digital government, top left in our matrix). When a democratic purpose is implemented through a more civic type of direction, smart city initiatives become an open platform for digital socio-political innovations (top right in our matrix). When business and technical considerations drive smart city initiatives, we end up with smart cities mainly understood as a digital driver for enhancing the economic performance of places. When both business and civic considerations drive smart city initiatives, we end up with smart cities that can be seen as an open platform for fulfilling the disruptive potential of a new digital and data-driven type of economy.

Looking into the main realms of place-based leadership, we found smart cities largely dominated by market logics within the public services realm. They appear to be new socio-technical structures to innovate, with the potential participation of multiple actors in the design and the delivery of public services and with clear business interests from technology companies. There is limited evidence for thinking about a politically innovative use of technology (see on this Bloom and Sancino 2019) and more generally of smart cities as new socio-political structures (Meijer 2018). In terms of leadership through performance, it is apparent that smart cities are still in the demonstration stage and experimenting with new forms of collaborative urban governance to address local needs, but the longevity of such approaches is limited by the availability of funding and there is little evidence they are achieving their wider aspirations yet.

Overall, as smart city initiatives are implemented, it is fair to say that they will be inspired by different modes of smart city leadership. However, when we position our case studies into Figure 1, the majority would probably fall in the bottom two modes, where smart cities are a driver for economic growth and/or an open platform for digital economy, although Chicago and Melbourne show some evidence of digital socio-political innovation. In this respect, as a final consideration, if we really want to fulfil the potential of smart cities to become a new datapolis characterized by a participatory economic and political public governance (Meijer 2018), smart cities must invest more resources in engaging citizens and ensuring the initiatives are accessible to all. This could be achieved by providing more opportunities for learning, community-based innovation and active citizenship helping to ensure smart cities meet the needs of citizens (Gooch et al. 2018; Hudson et al. 2019; Mulder 2014). Addressing obstacles such as finance, public procurement and risk will also be essential to smart city initiatives becoming more sustainable in the longer term (Osbourne Clarke 2015).

Notes

1. Research performed on the website https://scholar.google.co.uk on 17 January 2019.
2. Amsterdam Economic Board includes directors from academic institutions, businesses, alderpersons, and mayors, whilst Waag Society is a leading institute for art, science, and technology who run a Smart Citizen Lab (Waag Society 2017) and Pakhuis de Zwijger is a cultural platform that unites change makers in Amsterdam.

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No potential conflict of interest was reported by the authors.

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