Reclaiming data for improved city governance: Barcelona's *New Data Deal*

Abstract

Cities today are key sites for the operation of global digital marketplaces. It is at the curbsides and the intersections of cities where technology companies and digital platforms gain access to valuable urban data to be used in the delivery of data-driven services. In this context, urban data ownership and control has become a central policy arena for smart city governance. This paper argues that, given the increased policy activism by city governments, there is an urgent need to better understand the key goals and instruments deployed by cities to resist corporate control of urban data. This paper first reviews the treatment of the topic by different strands in the literature on smart city governance and then uses the "New Data Deal" program launched by the city of Barcelona to draw empirical data from interviews with actors involved in the program as well as from key policy and evaluation documents. By studying the design and implementation of Barcelona's "New Data Deal", an early mover and leading reference in the academic and policy debates, the paper presents the key successes, limitations, and tensions faced by a city government trying to regain access and control over urban data, including a reflection on the role that city governments can play in shaping a global agenda around improved data governance.

Keywords

urban data, smart city, city governance, data ownership, open data, platform urbanism, Barcelona

Introduction

Data sits at the crossroads of key urban governance debates. With the deployment of new technologies in cities, vast troves of data are being generated from old and novel sources with unprecedented levels of volume, variety, velocity and granularity (Kitchin, 2014; UK Office of Science, 2015). In response, city governments are exploring new ways to leverage urban data to better inform decisions around planning, mobility, air quality and many other areas of urban policy (Goldsmith and Crawford, 2014; Ruhlandt et al., 2020). The use of data to enhance decision-making for improved public action is at the core of smart city governance (Barns et al., 2017; Kitchin, 2016; Ranchod, 2020). Novel data sources and analytic techniques can be applied to understand how everyday movements drive urbanization processes (Howe, 2021); to analyze the effectiveness, efficiency, and fairness of urban policing (Ellison et al., 2021); to explore segregated urban neighborhood networks (Candipan et al., 2021); or to study the informal housing market (Harten et al., 2021). These are just a few of the applications of urban data that have led Bannister and O'Sullivan (2021: 3067) to conclude that "[b]ig Data is, by its intrinsic nature, an urban phenomenon".

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Despite this potential of urban data, governments face challenges when seeking to access and embed novel data sources into policy making (OECD, 2021; Puttick et al., 2022; Ranchod, 2020). In the context of increasingly powerful and globally distributed digital platforms operating across cities, conditions of access to and use of urban data are increasingly determined by the data-sharing policies of these privatised services (Barns, 2019; Sadowski, 2021). The ways in which urban digital platforms govern and

co-ordinate their ecosystems of users through opaque uses of data and algorithms presents an increasingly significant challenge to governments seeking to regulate their operations and govern on behalf of citizens (Barns, 2020; Boeing et al., 2021; der Graaf and Ballon, 2018). Lack of access to crucial data needed to regulate the operations of disruptive platform providers demonstrates that even in a world of big data, data can also be scarce – especially if private companies can withhold it to prevent their effective regulation (Bliss, 2018; Boeing et al., 2021; Ferreri and Sanyal, 2018).

In this context, access to urban data controlled by private companies has become a focus for new data policies. The European Commission's proposed *Data Act* seeks to "ensure fairness in the allocation of value from data among actors in the data economy and to foster access to and use of data" (European Commission, 2022). Major European cities have also been forging new strategic competencies in data governance and management, championing the need for improved data protection, privacy and sovereignty (Morozov and Bria, 2018; Beraldo and Milan, 2019; Hummel et al., 2021). The city scale has emerged as a critical forum for the work of policy makers, activists, researchers and citizens in creating alternate models for data governance that ensure the value of data is more widely shared by citizens (Barns, 2020; De Lange, 2019; Mann et al., 2020; Micheli, 2022; Sadowski, 2021).

A leading example of such city-scale data reform is that of the City of Barcelona, whose agenda to create a "new data deal" (Bria, 2018) following the 2015 election of Mayor Ada Colau received wide attention in academic and policy debates (e.g., Charnock, March and Ribera-Fumaz, 2021; Janoschka and Mota, 2021; Kitchin et al., 2019; Mann

et al., 2020; March and Ribera-Fumaz, 2019; Sadowski, 2021). Barcelona has become what Charnock, March and Ribera-Fumaz (2021) describe as a "referent for a radically different vision of urban governance – as the quintessential 'rebel city'", by formulating a "different vision of a smart city and smart citizenship" (Kitchin et al., 2019: 11). As a leading referent, Barcelona "stands out internationally as a smart city that aims to harness technology to empower citizens" (Mann et al, 2020), championing the rights of citizens to benefit from the value of their data rather than a widespread commercially-exploitative data capture (Charnock et al, 2021: 591).

As the leading referent city, we argue that Barcelona remains a key site for not only articulating different principles and policies of alternate data governance, but also for understanding the challenges of implementing reforms around urban data ownership. To this end, in this article, we aim to address in more detail the specific policies and programs, such the data sovereignty clauses introduced in procurement contracts, that aimed to reclaim access to corporate-controlled urban data. In doing so, we aim to extend existing research into the 'Barcelona Model', much of which has been undertaken in response to earlier funding and policy announcements, to address their implementation in practice. As Calzada (2018: 16) has recognised in his valuable analysis of Barcelona's smart-city strategy and digital policy, more research is needed on the implementation of policies changing the nature of urban data ownership.

We therefore aim to focus specifically on the tools and programs used to address the ownership and control of urban data in smart city governance. Our focus is on the policy initiatives deployed by the city and the internal dynamics required to implement

those policies, to highlight key lessons for practitioners, researchers and activists seeking to advance a more proactive agenda for data governance. The paper is structured as follows. We first provide an overview of the academic and policy debates around corporate ownership of urban data and city governments' efforts to regain control over it. We then briefly describe how this review of the current debates informed our methodological approach to analyzing the case of Barcelona. The third section presents the results of the analysis, followed by a discussion of the key findings, in particular as they relate to the broader topic of city governments' efforts to reconfigure data ownership in the context of smart city governance.

Resisting the Corporate Control of Urban Data

Corporate-controlled data, its ownership and use, have steadily moved to the center of the smart governance debate (Barns, 2016; Sadowski, 2019). The control of data already figured prominently in the early debates around smart cities (Kitchin, 2014). These programs were designed by companies with a view to expanding key insights from individual cities into globally-scalable digital products (Sadowski, 2021). However, following a number of relatively unsuccessful urban technology experiments, the notion that cities could be sites for highly scalable 'urban operating systems', where complex urban challenges could be centrally-managed through data-driven insights, came to be challenged on a number of fronts by technology practitioners and urbanists (Greenfield and Kim, 2013; Mann et al., 2020; March and Ribera-Fumaz, 2019; Sadowski and Bendor, 2019). As best exemplified, perhaps, by the case of the Sidewalk project in Toronto (Artyushina, 2020), the debate around smart cities has focused on the

destruction of city governments' capacities due to the privatization of urban governance (Kitchin, 2015; Morozov and Bria, 2018) as well as the risks to citizens' privacy derived from the abuse of technology devices to track peoples' movements and actions (Calzada, 2018).

With the emergence of 'platform urbanism', the debates around corporate-controlled urban data have been framed in a different light. Platform companies' exclusive control over data, often well beyond the capabilities of local governments, enabled these platforms to disrupt urban living while bypassing the regulatory framework and powers of local authorities (Söderström and Mermet, 2020; Barns 2020; Sadowski 2021). Here the debate was not only about the loss of capacities of city governments and the risks to privacy derived from surveillance tactics, but on the need to access critical data to respond to the irruption of business models that were transforming core aspects of cities such as mobility and housing. Since 2018, however, city governments started to react to this situation by issuing formal policies requiring access to the data controlled by urban platform companies. An interesting analysis of these mandatory policies by Larrick (2022) shows a clear increase in the adoption of such regulations by US cities.

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Another concern around corporate control over data is the emergence of the monopolistic business models created through the exclusive control of massive amounts of data (Srnicek, 2016). This debate, often centered around Big Tech companies, has reached cities with global platforms' efforts to own and develop urban space, in what

has been identified as the third phase of smart urbanism (Sadowski, 2021). According to existing research, tackling the corporate enclosure and assetization of urban data is key to deter the unrolling of data rentiership models where companies seek to replicate in urban contexts the monopolistic positions achieved by platforms in the digital space (Artyushina, 2020). Accessing the data controlled by platforms is not justified solely on the grounds to regulate the operations of these companies, but as a challenge to the whole rentier business model advanced by these companies.

Breaking the corporate control of urban data therefore becomes a key tool to move from a corporatized view of urban data to a public value creation approach championed by city governments. This approach goes beyond the focus on privacy protection that has been one of the main concerns of the debate, including those studying the case of Barcelona (Calzada, 2018). Access to non-personal urban data may be essential to achieve some of the goals such as regulatory compliance or curbing monopolistic corporate power that destroys local businesses.

Following Kitchin (2016), the debate around accessing corporate-controlled urban data lies at the heart of a key normative question for the academic and policy debate on smart cities: what are the goals of smart city governance? Based on the literature, we can identify four goals that justify city governments' control over certain corporate-owned urban data: regaining (lost) capacity to deliver public services (Barns, 2019; Ranchod, 2020), regulating disruptive businesses (Boeing et al., 2021; Ferreri and Sanyal, 2018; Larrick, 2022), informing policy-making (Bannister and O'Sullivan, 2021; Goldsmith

and Crawford, 2014), and breaking data enclosure of monopolies to facilitate innovation and a more inclusive urban economy (Artyushina, 2020; Sadowski, 2021).

Depending on the goal(s) that city governments pursue, there will be different instruments regarding two key dimensions of the process of resisting corporate control over urban data: (i) the *access* of the data from the private entity and (ii) the *use* (in particular as it relates to whether it is made openly available) of the data that the city government accesses (Susha et al., 2017). On the first dimension, access to the data can be voluntary (data will only be accessed when corporate entities agree to share their data) or mandatory (data will be shared when required by a legal mandate). On the second dimension, data use can be placed in a spectrum from closed (remains under the sole control of the city government requesting the data) to open (published as open data) (Open Data Institute, n.d.).

If the goal of the city government is to access the data, for example of a micromobility operator, to regulate its use of the public space, this data may be mandatorily requested and does not need to be opened. If, by contrast, the goal is to pool data from different sources to transform corporate-controlled siloed data into a public infrastructure, then the data needs to be open. Table 1 provides an illustration of different examples of efforts to access corporate-controlled data mapped to these two dimensions.

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A key gap in the literature, however, is understanding how these approaches can be implemented by city governments. This paper addresses that gap, arguing that to study city government efforts to regain control over corporate-owned data, it is essential to understand: (i) what goals are pursued by the city government? And (ii) what are the instruments deployed to achieve those goals?

With those questions in mind, we now turn to the methodology we used to study the Barcelona's efforts to regain control over urban data, its successes and limitations, and the broader lessons that can be extracted for the debate around urban data ownership in the context of smart city governance.

Methodology

As set out in the previous section, through the study of the data governance policies implemented by Barcelona during the period of 2015-2019 we seek to better understand city governments' approaches regarding access to corporate-controlled urban data. The selection of the case of Barcelona was justified by its nature as a critical case (Yin, 2018). Although in the last years many city governments had become more proactive in issuing policies to access data from micro-mobility platforms, in 2015, when the policies in Barcelona started to be designed, very few city governments were active in this space. This pioneering nature, the breadth of Barcelona's policies and the fact that they have been implemented, made it a critical case to study this topic.

Prior to 2015, the City of Barcelona became a key site for the promotion of smart city business opportunities. Keen to promote its smart city credentials, the City established

partnerships with leading technology providers, and Barcelona was positioned during this phase as a laboratory for the urban future (March and Ribera-Fumaz, 2019: 232). This wave of smart city activity included novel experiments by technology companies such as IBM, Cisco and Siemens who promoted the idea that a city could be run like an 'operating system', in much the same way as a computer itself (Barns, 2017; March and Ribera-Fumaz, 2019; Wiig, 2015). In 2015, with the election of Ada Colau and the appointment of one of the co-authors of this article, Francesca Bria, as Chief Technology and Innovation Officer, the city sought to overhaul its policy towards technology and data. While much of the attention towards the technology agenda introduced by Barcelona in 2015 has focused on its significance in advancing more 'bottom up' models of citizen-centric digital services, the implementation process of its policies around data has received much less attention.

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To study this topic we reviewed public documentation such as regulations, project deliverables and evaluations, policy documents, and academic and grey literature. To triangulate and complement the insights from one of the co-authors' key involvement in the smart city governance policies of Barcelona, we also conducted a set of semi-structured interviews with key decision makers, legal experts, technology advisers and city officials. A total of seven interviews were conducted between February 2021 and May 2021 with representatives closely involved in the implementation of the agenda (see Appendix 1). These included: one of the key authors of the data strategy, a project manager from the municipal data office, one of the lawyers involved in the drafting of regulations and data sovereignty clauses, members and coders of the Metadecidim

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community as well as members from academia who actively participated in shaping the data agenda.

Through the investigation of these sources we sought to address the following key questions: (i) What were the key goals for regaining control over corporate urban data?; and (ii) What were the key policy instruments deployed to achieve those goals? We also drew empirical data on the achievements, challenges, and lessons learned in the process of implementing these policies that are presented in the discussion section.

A new data deal: reclaiming urban data for public purpose in Barcelona

What were the key goals of Barcelona's new data policies?

As discussed, it is increasingly clear that city governments utilise distinct policy instruments to achieve improved access and use of urban data in the context of widespread corporate control via urban platforms. Barcelona introduced the *Government Measure on Ethical and Responsible Data Management*, as a municipal measure issued by the City of Barcelona in May of 2018. With this new regulation, the new administration sought to address a problem generated by the smart city policies advanced by the previous administration, which had allowed technology companies to control the data generated through the operation of urban platforms. This in turn had limited the administration's ability to access key data and govern effectively, pushing the City to re-think the model and introduce a new framework for data governance built around the concept of 'data commons'. As stated in the new measure:

> The public and private perception of data has to change from that of an asset that offers a competitive advantage to one of a social "infrastructure" that must be public in order to ensure common well-being, and which is exchanged on a quid pro quo basis. (City of Barcelona, 2018:7)

According to this measure, a new data commons should be leveraged to inform policies, to improve public service delivery and to promote responsible innovation (City of Barcelona, 2018: 5). Throughout the measure, there are several references to leveraging the data internal to the city administration with external data to promote innovation and create value in the city. This goal explicitly sought to "establish a playing field where SMEs and other economic players that are not large corporations can enter the 'game' with a chance of winning tenders related to technology and data" (City of Barcelona, 2018: 19). The goal of accessing data controlled by the city was not only justified, therefore, on the need to regulate these companies, but on the explicit objective to reconfigure the modes of data ownership to generate improved value for citizens.

The measure used the concept of data sovereignty as key to this outcome, defined as "the need for an individual to have control, at all times and in all relevant systems, over the collection, storage, use, transfer and publication of their data, whether it be of a technical, scientific, economic, social or personal nature" (City of Barcelona, 2018: 15). This not only entailed giving city residents the opportunity to "decide what they keep private and what they want to share, and with whom and under what conditions" (City of Barcelona, 2018: 8), but also ensuring that contracting processes and standards

facilitated the sharing of corporate data through government contracts (City of Barcelona, 2018: 15).

Finally, the measure also recognized the city government's role "as a protector of city residents'data" (City of Barcelona, 2018: 12) and in turn established the ethical principles and values that should guide the City's use of data (City of Barcelona, 2018: 16).

In short, the goals of the policies were to ensure citizens could have more choice over how their data was used by private platforms, and promote greater use of corporate-controlled data for the improvement of services delivered by the City. To deliver on this vision, however, the City needed to change how data access was regulated in its interactions with corporations, and had to test new technological tools for data sharing. We now turn to some of the key instruments deployed by the City of Barcelona to deliver on its goals.

What were the instruments deployed to achieve these goals?

1. Guidance on procurement & data sharing standards

Improving how the City could access data to deliver improved value for its citizens required changes to the terms allowing different providers to operate in the city. For example, the City of Barcelona was able to mandate the introduction of data sharing clauses as part of its contracts and licenses with companies who acquire citizen data as part of their operations. This process commenced with benchmarking how Barcelona

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was actually managing data sharing with service providers operating in the city. An interviewee described the process:

> The City benchmarked 15 contracts and while some were good, in many others the City did not get any access to the data generated by contractors in their work with the City. The idea behind these clauses is to establish a minimum set of requirements so that the data generated as a result of these contracts is available, accessible, is privacy compliant, enables sharing among City departments and, if possible, can be anonymized and cleaned to publish it as open data. (Interview 2)

In line with the goals of the *Government Measure on Ethical and Responsible use of Data,* a new set of 'data sovereignty' clauses were then introduced into the City's contracts. These clauses established the City's right and mandate to acquire data generated through the operation of the contract. This included data collected through or about the public service, such as performance metrics, service incidences, etc. The City also sought to widen the scope of some of these clauses to include private sector data – such as phone calls, geolocation or data on rides from mobility operators. The most notable instance of this approach to data sharing was achieved through a new contract the City established with the telecom services provider. Negotiation of this contract was protracted, and was reported by one interviewee as taking close to a year to finalise. It was, however, a major achievement in the City's reclaiming of its access to data.

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From this basis the City included a data sharing condition on the norm regulating shared motorbikes and pushed to incorporate similar data sovereignty clauses in other procurement contracts where valuable data about the city is held in private sector hands. It also required all departments to change their contracts to be able to collect and manage data much more productively.

2. Developing the technical infrastructure to build a data-economy for the common good: DECODE

Accessing data mandatorily through procurement clauses was an important step, but the City still needed to find ways to enable citizens to voluntarily share their data in secure and privacy-protecting ways. In line with its goal to make better use of citizen data to improve service delivery, the data needed to be compiled, processed and made available for innovators, NGOs, small companies, cooperatives and local communities to leverage this information "to create applications and services that respond to their needs and those of the community in general" (City of Barcelona, 2018: 37). All this demanded a new technological infrastructure that Barcelona piloted through the EU-funded DECODE project.

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The DECODE project received much publicity as one of the first city-led initiatives to utilize blockchain technology for 'privacy by design' outcomes on behalf of citizens (Barns, 2020; Calzada, 2018; Mann et al., 2020). It explored practical ways in which "the value of our personal information can be returned back to citizens that create that value in the first place, with a focus less on how money can be made from data, and more on how data can benefit society as a whole" (Old and Bass, 2020: 6). DECODE

aimed to enable more active management and sharing of personal data through the use of 'distributed ledger technology', to reconcile that increased sharing with the goal of providing greater control to citizens. Through a cryptographic solution, DECODE aimed to set rules on who can access data, for what purposes, and on which terms. The project attracted global attention as a leading program of digital sovereignty in cities (Barns, 2020; Calzada, 2018; Charnock et al., 2021; Kitchin et al., 2019; Old and Bass, 2020), but its impacts have, to our knowledge, not been discussed widely in the academic literature. Through the revision of the project documents and the interviews, we were able to gather key insights on the implementation of the project and its contributions to reconfiguring data ownership in the city.

In Barcelona, the technology developed under DECODE was tested in three different pilot programs that aimed to translate the ideas of the data commons into practical applications in the city. The first pilot was tested in the Decidim platform.[1] Having proved successful as an instrument to facilitate participatory processes in the co-production of the Barcelona Municipal Plan, Decidim was seen as an ideal platform to create modules that could be replicated in other processes and places.

Reflecting on their role in the establishment of Decidim, one interviewee explained that one of the challenges experienced during this process was that, in order to to protect their privacy, the platform did not monitor participants' demographic characteristics (Interview 3). As a result, it was difficult to identify potential biases or unbalances in

[1] Metadecidim represents the community that collaborates in the design of the Decidim platform and the construction of the project: https://docs.decidim.org/en/whitepaper/decidim-a-brief-overview/ (accessed 28 July 2023)

participation through the platform. In response, DECODE established a new encryption and storage technology, to allow people who participated in the platform to share their demographic characteristics, while also remaining fully anonymous when they voted. Further, if users wanted, the platform could gather, in an aggregated way, demographic information (district, age and gender) about those voting through the platform, an information that could be used to enhance the platform.

In addition to enabling a more privacy-protecting participation in the Decidim platform, the DECODE pilot also aimed to (i) generate aggregated data that could be used to better understand the participation dynamics of the city, and (ii) create a community of activists, developers and hackers that could become an interlocutor to the City's newly launched Municipal Data Office (MDO) on all matters related to data policy in the city (Interview 5). In this way, the project sought to increase the community's overall participation in the city's data governance ecosystem. This generated a kind of 'up voting' system for policy initiatives and proposals. In the first pilot some 223 participants contributed close to 80 proposals (DECODE, 2019).

The second DECODE pilot was focused on the use of IoT (internet of things) technology, specifically with citizens who use sensors to measure environmental impacts such as noise or pollution levels in their homes. Since this data is very granular, community members had concerns about the detailed information they were giving away and how this could be used, for example, by private companies to profile homes subject to certain pollution levels, with associated negative impacts on housing prices or insurance premiums. The pilot focused on developing effective rules, combined with

privacy-enhancing cryptographic technology, to allow users to share the same data at different granularities with different target groups. This pilot also enabled this community to share data to contribute to unlocking its value, while giving citizens the ability to control the terms of that sharing. In this second pilot, 100 people shared data from their devices (DECODE, 2019).

The third DECODE pilot, 'BCN Now', was built to share, publish and visualize the data donated by the communities in the other two pilots. The purpose was to make the data generated in the other two pilots publicly available. This tool merged data from the City captured via its own platforms with citizen-donated data from the other two pilots, as well as other external datasets curated by external developers. One interviewee reported that one of the main outcomes of this pilot was the debate that it surfaced around governing data as a common:

> The main value of this pilot was the educational use around data governance. So how to, not only explore the data and make it sovereignty compliant, but also understand how by exploiting that data conflicts and trade-offs may emerge around governing data as a common, including personal, public and private data. (Interview 3)

3. Ensuring organisational readiness for data governance

The literature has often found that the lack of adequate organizational maturity can imped the effective governance of data (Ranchod, 2020). We therefore sought to inquire about this critical component in Barcelona; specifically how the City re-organised its

operations in order to make improved use of data. As described in the reviewed documentation and reported in the interviews, the City realized that the work around procurement practices and control over technology infrastructures to protect digital rights and data sovereignty had to be accompanied by a set of organizational changes. There were some key institutional changes that were needed to translate the vision of the data commons into a workable reality. As one interviewee described it:

> We basically needed three things: First, to put all the city's data in one place. Second, we had to create a unit that controlled the data infrastructure, and determined how data can be used and leveraged, by whom and when, and that trained people about what it means to deal with data. Third, we needed to give more value to the existing open data portal. (Interview 1)

All these initiatives were needed to ensure that the data could be effectively managed, valued and in turn shared, both internally and externally, by the City. With a combined budget allocation of 1.288m EUR, a new CityOS data lake was introduced, with a view to creating a common ontology and a set of processes around which data could be stored (City of Barcelona, 2018: 39). The MDO was established to manage this data, and the decisions on how to build the data lake, how to feed it and how to connect it with the outside world were assigned to both the MDO, and the Municipal Institute of Information Technology (IMI), the municipal entity in charge of IT. The open data portal was also transported to an open source platform (CKan) and integrated into a citizen support service called 'IRIS', which established a legal mandate for the department in control of the data to provide the dataset to the requesting citizens.

Through these combined initiatives, Barcelona implemented a new agenda for data governance at the city scale. In the following section, we reflect on the challenges experienced during the implementation of Barcelona's reforms.

Discussion

Barcelona's efforts to reclaim access to corporate-controlled urban data highlighted a set of different goals and instruments city governments can use to improve how they govern a city's data ecosystem in ways that support improved citizen services. Since Barcelona's data reforms were introduced, more city governments have experimented with tools such as mandatory data sharing policies (Larrick, 2022) and procurement clauses (Micheli, 2022). Barcelona was not only a pioneer in establishing mandatory data sharing requirements for corporations through its procurement clauses, but also sought to enable the creation of novel data infrastructures, such as that established through DECODE. The experience of Barcelona in implementing these initiatives practically offer some important lessons for other city governments seeking to reconfigure data ownership regimes in their communities. We reflect on these lessons below, incorporating insights from those active in the implementation of Barcelona's new data policies.

First, interviewees noted that mainstreaming and scaling the technological infrastructure piloted through DECODE faced some important challenges. A number of interviewees (3, 5 and 7) pointed to several reasons for this: weakening political support for the

Mayor Ada Colau after the elections of 2019[2]; the discontinuation of dedicated funding for programs such as DECODE from the EU; as well as some usability challenges faced by its new technology. Beyond the described pilots, the DECODE initiative did not result in the release of a new app for widespread public use. The pilots remained relatively small scale, and while providing thought leadership and influence in design models for data governance, it did not advance long-term changes to citizen use of urban data via its new blockchain technology. Interviewees described the fact that a number of the project developers were recruited to work on the newly launched Libra currency being developed by Facebook, which saw a significant loss of expertise on the project. This outcome evidences the difficulties faced by governments to attract and retain critical capacity particularly in fast-growing technology sectors. The outcome also shows the need for increased public investment into privacy-enhancing technology to make cryptography usable and friendly and overcome the current trade-offs between privacy protection and the unlocking of data's social value, as well as to strengthen the capacity inside public institutions and reduce the skill mismatch between the public and private sectors.

Second, and connected to this last point, our research also confirmed that policy measures to change data governance need to be accompanied by substantial political and resource investment in developing the necessary capabilities within the city organization. In Barcelona, the city relied on strong charismatic leadership, but this was

[2] In the local elections of 2019, Ada Colau's party, *Barcelona en Comú,* lost 20,000 votes and was voted second to a new alliance of left-wing, mostly independentist, parties. It managed to reach a coalition agreement with the Socialist Party, who more than doubled the number of votes won in 2015. Barcelona en Comú renewed its mandate, although this time sharing the cabinet with the socialists. Ada Colau stayed for a second term as mayor, but in a much weaker political position.

susceptible to waning support over time. This impacted the attention with regards to building data capabilities of the city administration. One of the main challenges faced by the MDO was the lack of skills combined with the complexities and length of hiring practices. This required the MDO to focus on providing training and capacity building to other areas, and on supporting other departments when they are contracting data science services.

Third, given the conflicting interests and values that will operate over decisions about what data to share, with whom and how, city governments are well placed to make stewardship decisions over data flows (Beckwith et al., 2019). On the one hand, Barcelona's data governance model is one rooted in civic participation, citizen control of data and a supporting civic community. On the other hand, the process of institutionalising the data commons model is achieved through the city administration, with public funding of the required technologies and with the development of supporting bureaucratic autonomy and capabilities. As described in Interviews 3, 5 and 6, this combination resulted in tensions, reflecting concerns around the degree of reliance on the city government as the central actor in the new data governance model. The City's role in creating and supporting the institutions, norms and technologies necessary for the data commons was key to advance this vision, but at the same time, the civic ownership of and participation in the process helped new ideas to infiltrate and expand what the City was willing and able to explore and test. Arguably, this productive tension can be seen as inherent to the experimental nature of data commons pilots, particularly when run in a democratic and inclusive way. The tension particularly lies in the institutionalization of certain practices and innovations. Some of this process will

necessarily lose autonomy and dynamism, but also open new opportunities by operating at a much greater scale. This tension was expressed through the outcomes of Decidim, which was ultimately expanded beyond the institutional remit of the City itself, to operate as a stand-alone platform for wider use and uptake by cities seeking to advance citizen-oriented participation and data governance agendas.

Fourth, central to the objectives of the Barcelona experiment was to shift how data was understood and used across the city, not so much as an asset extracted and used for competitive advantage by corporations, but as "a social 'infrastructure' that must be public in order to ensure common well-being" (City of Barcelona, 2018: 8). How data can contribute to better decisions and more effective and transparent policies in areas that are relevant to citizens was in turn demonstrated with key pilots run by the City of Barcelona. Yet, how this infrastructure can be used at scale to transform the city and its economy has not, we would argue, been sufficiently proven within Barcelona, despite efforts by smaller companies, cooperatives, civic organizations or citizens to act as an alternate data ecosystem to those developed by private global platforms. As described by one interviewee, an important reason for this is scale: the city level is often too small to generate viable examples of alternative models of data based on privacy preservation and public value. Here is where the role of the EU and the articulation of approaches that integrate the principles of new models of data governance into instruments such as the European data spaces is crucial.

Finally, despite the reported tensions, the City's policies regarding data governance have achieved impact more widely. The range of programs and interventions made by

the City of Barcelona to ‘take back citizen data’ provided important guidance to cities by demonstrating how their governments can play an instrumental role in technology design and data governance in an era of global digital infrastructures. Critical here is the role played by Barcelona in influencing the wider regulatory reforms to advance the need for more public data infrastructures over private platforms.

In particular, Barcelona has demonstrated how a new governance model for digital rights and data sovereignty is possible, promoting an agenda that has extended to other cities, moving beyond the local level to influence the EU’s strategy and policy on data. In 2020 the European Union declared that it will use its convening and financial powers to “strengthen Europe’s ‘technological sovereignty for the data-agile economy’” (European Commission, 2020: 16). This document also references DECODE expressly as one of the innovative tools that enable citizens to share their data while protecting their rights and declares the need to continue investing in environments that enable those innovations to flourish (European Commission, 2020: 10). The case of Barcelona has also informed the *Vision for the Global Urban Age* developed by the four biggest cities in Finland (Espoo, Helsinki, Tampere and Vantaa) and the think tank, Demos Helsinki (Demos Helsinki, 2020). In Germany, the lessons from Barcelona are being tested by the City of Hamburg in its new smart city strategy (The New Institute, nd).

The influence of Barcelona has therefore gone beyond the rhetoric and provided concrete examples of policy instruments and technologies that can be used to implement this vision. The *Ethical Digital Standards* developed in Barcelona, and adopted by other cities, were designed to support a range of governments in implementing citizen-first

models of technology procurement and data management. A key platform for such diffusion has been the Cities Coalition for Digital Rights. Launched by the Cities of Amsterdam, Barcelona and New York in November 2018 and now with a membership of over 50 cities worldwide, the Coalition operates as a network of cities helping each other in the greenfield of digital rights-based policymaking. The Coalition is committed to promoting and defending digital rights in urban contexts through city action, to resolve common digital challenges and work towards legal, ethical and operational frameworks to advance human rights in digital environments. Some of the people that developed the Barcelona data governance framework, including one of our interviewees, remain active in the Coalition.

Conclusion

Resisting corporate control of urban data has become central in the academic and policy debates on smart cities. Giving government and citizens more democratic control over the data generated in the city is not only essential to de-activate surveillance regimes in urban settings, but also a key regulatory tool to respond to the disruption brought by platform companies and to curbe monopolistic and rentier models that destroy local business ecosystems.

Despite the importance of the topic, research on this specific policy domain is still nascent. There is a need to advance our conceptual understanding of the issue and the empirical investigation of the policy responses that have started to emerge. This paper has contributed to addressing this gap using the City of Barcelona as a critical case study of a city that defined a new approach to data governance in the era of smart cities

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and platform urbanism. The case study underlined the role that cities can play as key actors in the design and implementation of policies and tools to rethink urban data ownership in smart city governance. Our research confirmed that these efforts face substantial barriers in developing the capacities necessary to balance the often greater resources and expertise marshalled by the private sector. It also showed that the commitment to the civic ownership and democratic participation of citizens in data ownership regimes, such as the one consciously advanced by the city of Barcelona, generates productive tensions between experimentation and institutionalization dynamics that are difficult to manage. Finally the research highlighted that Barcelona's efforts need to be evaluated beyond the city's boundaries, as its international impact is, perhaps, one of the most important legacies of the Barcelona experiment. By developing a bold agenda and implementing concrete measures while using the showcasing capabilities of a city of its size and relevance, Barcelona has fundamentally shaped a political agenda that is spreading to other cities and influencing other levels of government.

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