A new data deal: the case of Barcelona

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Abstract

Cities today are key sites for the operation of global digital marketplaces. It is at the curbsides and the intersections of cities where global digital platforms gain access to valuable urban data to be used in the delivery of data-driven urban services. Signalling an emerging role for city governments in contributing to regulatory responses to global digital platforms, a number of cities have in recent years tested their capacity to reclaim the urban data that is 'harvested' and monetised by digital platforms for improved local governance and participation. Focusing on the City of Barcelona, this paper investigates the conditions that enabled Barcelona to pivot from its strong focus on attracting commercial platforms under the rubric of smart city programs, to becoming one of the leading advocates of a citizen-first data rights and data sovereignty agenda.   Through a series of interviews with key participants involved in the design and implementation of Barcelona's data sovereignty program under Mayor Ada Colau, the paper examines the policy and governance instruments deployed by the city to regain access and control over data and discusses the challenges and tensions it faced during the implementation phases of the program. Finally, the paper presents the main lessons of the Barcelona experience for other cities, including a reflection on the role that cities can play in shaping a global agenda around improved data governance.

1.   Introduction

1.1 Cities and the rise of data sovereignty

What happens in cities today is increasingly what shapes global responses to major challenges, from climate change to COVID-19. Not only are cities places where the majority of the world now live, they are also important institutions for global governance and institutional innovation, underpinned by networks of collaboration that support shared practices, policies and data about complex contemporary challenges (Acuto 2018; Karvonen et al 2020). In a world tightly integrated through global digital infrastructures, cities are now also key sites for the operation of global digital marketplaces and play an increasingly proactive role in their responses to global digital platforms like Uber, Airbnb and Amazon (Hodson et al 2020). It is at the city scale where local and global agendas collide; where expansive financialised digital infrastructures negotiate with local governance institutions in order to operate.

In recent years, a number of city governments have prosecuted proactive regulatory agendas in the face of global ride-sharing companies such as Uber, withdrawing licenses to operate on the basis of safety issues and identity verification practices, and Airbnb, regulating licensing conditions and establishing stay limitations and quotas. These regulatory interventions have highlighted that city governments, despite being geographically bound, have the capacity to shape the operations of globally distributed digital platform companies and can effectively 'punch above their weight'. Where many well-known digital platforms have benefited from their global scale and ready access to global investment capital to acquire granular urban data, these regulatory interventions have demonstrated a continued role for cities in championing the localised needs of citizens against the power of global digital platforms.

Growing attention towards issues of privacy, digital rights and data sovereignty has likewise highlighted important opportunities for city governments to act in protection of citizen interests, including the protection of public and citizen or 'commons-based' data infrastructures (Bria 2018). Against a backdrop of important European Union legislation such as the General Data Protection Regulation,[1] the Regulation on the Free Flow of Non-personal Data,[2] the Cybersecurity Act,[3] the Open Data Directive[4] and the Data Governance Act,[5] 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 on behalf of their citizens (Bria and Morozov 2018; Beraldo and Milan 2019; Hummel et al 2021). Such actions are part of a broader agenda to address global asymmetries of data exchange, and better articulate appropriate models for data infrastructure and governance.

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[1] Regulation (EU) 2016/679.
[2] Regulation (EU) 2018/1807.
[3] Regulation (EU) 2019/881.
[4] Directive (EU) 2019/1024.
[5] Regulation (EU) 2020/0340 to be complemented by the Data Act, in drafting process at the time of writing.

These actions, led most prominently by the city of Barcelona, alongside other cities such as Amsterdam and Helsinki, have seen city governments initiate a new agenda to 'take back citizen data' from corporations, while also supporting experiments in citizen-led decision-making through open-source, privacy-enhancing participatory tools and platforms. In this context, the city scale has emerged as a critical forum for the work of policy makers, activists, researchers and citizens seeking to articulate alternate models for data governance that can better engineer improved civic outcomes through innovative platforms and services, sometimes described as an 'urban data commons' (Barns 2020; De Lange 2019; Mann et al 2020; Sadowski 2021).

These city-scale data governance models represent an extension of the open government agenda advanced by a number of cities worldwide, which has seen cities support open data platforms for civic engagement and improved digital services (Barns 2016; Hawken et al 2020) to address a range of broader challenges. Rather than simply opening up available machine-readable data for a range of private and public uses, these new strategies focus on data-sharing practices between private and public actors, and introduce novel privacy-by-design and open-source technologies, accompanied by institutional models for data-driven decision-making within municipal governments. The corollary to citizen-focused data rights movements is the increasing attention paid to antitrust and tax policies by national governments in the EU, USA and China in curbing the power of digital giants. This paper focuses on the city-level data agenda.

To date, there has been relatively little attention given towards the potential of these emerging 'next-generation' approaches to data governance and custodianship by city governments, which build on the open data agenda by more proactively seeking to 'take back data' from global corporations and digital platforms in the name of citizen empowerment and local decision-making. This paper aims to address this gap.

1.2 Aims of the paper

In this paper we present a case study of Barcelona as one of the key cities leading a digital rights and data sovereignty agenda in recent years. With a focus on the period from 2015 to 2019, the paper investigates how the City of Barcelona sought to operationalise the emerging global agenda around citizen digital rights and data sovereignty, setting out a proactive role for city governments as institutional champions and custodians of citizen data.

Barcelona was one of the leading 'laboratories' for smart city innovation during the years 2011 to 2015, advancing a number of technology partnerships with global technology companies towards the creation of a 'city operating system' through which to manage urban infrastructures and decision-making (March and Ribera-Fumaz 2019). In the local elections of 2015, Barcelona en Comú, a new political platform emerging from social movements with no ties to existing political parties, disrupted the political landscape. The election of its leader, Ada Colau, as mayor, saw the previous vision of the smart city transformed in Barcelona, in favour of a more bottom-up, participatory planning approach that located citizens, not technology companies, more centrally within decision-making. The programmes introduced under this government to promote an alternate vision of the role of technology and data in cities are the key focus of this paper. Since then, Barcelona's strategic shift beyond smart city has made it a leading case study for the

institutional integration of digital rights and data sovereignty, combining new technologies with a citizen-first ethos that has championed the importance of municipal governance, and thus the lessons and experience of Barcelona are valuable for city governments worldwide. As momentum continues to grow around the potential for cities to work collectively and proactively to regain sovereignty in the digital space, embodied by new initiatives such as the Cities for Digital Rights coalition,[6] insights from Barcelona's experience remain instructive.

This paper builds on an emerging set of literature around Barcelona's digital agenda co-developed by policy practitioners, community activists and academic researchers. Existing research includes publications by Charnock et al (2021), March and Ribera-Fumaz (2019), Kitchin et al (2019), Mann et al (2020) and Sadowski (2021), each positioning Barcelona as part of a new wave of urban data politics focused around issues of data privacy, digital rights, technological sovereignty and data sovereignty. As Kitchin et al have argued, through its reform programme, Barcelona became a leading reference for global attempts to 'formulate and implement a different vision of a smart city and smart citizenship' (2019, 11).

What is missing in existing discussions of the case of Barcelona is the internal city government perspective: what does it mean to embark on such an ambitious agenda for city officials and bureaucracies? To understand how these programmes were introduced and managed within the city, we undertook a set of one-on-one interviews with key representatives charged with either advising or managing the implementation of Barcelona's Digital Plan[7] (see Appendix 1). These interviews provide a lens through which to understand how the philosophy of data sovereignty and the data commons was introduced. One of the paper's authors, Francesca Bria, was also instrumental in defining and delivering the agenda as chief technology and digital innovation officer of Barcelona during the period under discussion in this paper. This mix of qualitative interviews and direct programme insights, from practitioners actively involved in the translation of critical ideas and manifestos around data rights into practical tools and platforms for contemporary digital governance, provides a basis for reflection around key opportunities and challenges associated with this agenda. This approach also allows us to reflect on the key conditions and capacities needed to empower city governments to act on behalf of their citizens in the domain of data management and use, in ways that accelerate the creation of digital public value and associated public data infrastructure.

We begin by introducing the context of Barcelona as a site for existing political and technological agendas around data sovereignty and digital rights. We explore the highly contingent and localised conditions that informed the capacity for Barcelona to lead these agendas. We then investigate key policies and investments delivered as part of the Barcelona Digital Plan, with a view to both situating this digital transformation programme within its institutional context and understanding how its outcomes apply more broadly to cities who are pursuing an activist data governance agenda. Finally, we reflect on some of the key legacies of the programme and on the implications of the 'Barcelona experiment' more widely, set against a backdrop of increasing policy activism that seeks to curtail the influence of corporate data infrastructures. Since the introduction

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[6] See https://citiesfordigitalrights.org/about.
[7] See https://ajuntament.barcelona.cat/digital/sites/default/files/pla_ciutat_digital_mdgovern.pdf.

of Barcelona's Digital Plan, the digital rights agenda has continued to build momentum, particularly at the European scale, and city governments have continued to build alliances at local, national and supra-national levels to advance a data rights agenda. As this momentum builds, we reflect on the importance of the role played by cities as key sites for the implementation of new data rights frameworks for participatory decision-making and urban resilience.

2. Barcelona as a leading laboratory for technological sovereignty and digital rights

In the first sub-section we introduce the context of Barcelona as a leading smart city, its reputation established during the early waves of smart city innovation, when the City of Barcelona was heavily focused on attracting large technology players to the city to support urban regeneration and to cultivate the city's image as an 'urban laboratory'. This context provided an important motivation for democratic activists, who targeted technology platforms, and data specifically, as a key dimension of their urban political campaign, at a time when many other cities were actively courting partnerships and alliances with global technology companies to outsource municipal operations. As we describe in the second sub-section, the unexpected arrival of Barcelona en Comú to city mayoralty in 2015 opened the door for this citizen-led vision of technological sovereignty to enter city government and reshape the city's policy on data and technology.

2.1 The first wave of smart city innovation in Barcelona: 2011-2015

From 2011, governed by the center-right Catalan Nationalist Party under the leadership of Mayor Xavier Trias, Barcelona became a key site for the promotion of smart city business opportunities to global city leaders. Keen to promote its smart city credentials, Barcelona established partnerships with leading technology providers, such as Cisco, Schneider Electric, Accenture and others, through the creation of a City Operating System (City OS). Barcelona was positioned during this phase as a laboratory for the urban future (March and Ribera-Fumaz 2019: 232), and a vision for the smart city recognised Barcelona's leading role in the global smart cities movement:

> A city of neighbourhoods at the human scale, interconnected and eco-efficient, in the context of a high speed, hyper connected, energetically self-sufficient, renaturalised and regenerated metropolitan centre (March and Ribera-Fumaz 2016: 818).

This wave of smart city activity, now historicised as a first wave or 'smart cities 1.0' movement, 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. These programmes were designed by global technology companies with a view to expanding key insights from individual cities into globally scalable digital products. However, following a number of relatively unsuccessful urban technology experiments, the notion that cities could be sites for highly scalable urban operating systems through which 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 (Barns 2016; Mann et al 2020; March and Ribera-Fumaz 2019; Mattern 2016). Just as a wave of smart city criticism was emerging, questioning the benefits of handing local decision-making capabilities over to global technology companies, Barcelona emerged as a key site for the articulation of a more grassroots or bottom-up technology movement.

2.2 A democratic digital agenda for Barcelona: 2015-2019

The 2015 election of Ada Colau as mayor of Barcelona saw the city's first female mayor elected under the citizen platform Barcelona en Comú, a participatory democracy platform that emerged from social movements with no direct political party affiliation. The result, which saw Colau's platform govern with support from the PSC (the Catalan chapter of the Spanish Socialist Party), was the culmination of a number of years of organising and activism to democratise government at the municipal level. As outlined by Barcelona en Comú in its retrospective *How to Win Back the City: Guide to Building a Municipal Digital Platform* (Barcelona en Comú 2016: 4):

> The proximity of municipal governments to the people makes them the best opportunity we have to take the change from the streets to the institutions. Cities have always been a place of encounter, of exchange of ideas, of innovation and, when necessary, of revolution. Cities are where democracy was born, and they'll be where we can start to recover it.

The new city administration was committed to advancing a bold agenda across a range of policy areas, including housing reform, provision of basic services and regaining control of municipal assets. The policies implemented by Barcelona en Comú aimed to directly assist the most vulnerable populations who had been greatly affected by the 2008 economic crisis. Ada Colau, who had emerged as a community leader through her activism against evictions, was particularly aware of the challenges of the housing sector in Barcelona, under increasing pressure from a massive tourism influx and the takeover of housing stock by Airbnb and similar digital platforms. In the first months of Colau's tenure, the city focused on stopping evictions and increasing social housing, guaranteeing food security and starting moves to ensure affordable provision of energy and water supply (Charnock et al 2021).

Barcelona en Comú's vision for the use of technology in city government rested on two main pillars. First, that technology should be used to revamp participatory democracy and, second, that the smart city paradigm for using technology in cities was limited by its adoption of a top-down, 'tech-first' solutionist approach. The new government's agenda on technology was strongly influenced by and connected with the ideas developed under an EU Horizon 2020 project, D-CENT,[8] launched in 2013 and coordinated by NESTA under the leadership of Francesca Bria. The project brought together a number of citizen-led organisations across Europe and focused on connecting these organisations with the next generation of open source, distributed and privacy-aware tools for direct democracy and economic empowerment. Local elections were held in Spain during this project, with two new political platforms beating established political parties in several

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[8] D-CENT stood for Decentralised Citizens ENgagement Technologies and was a European-wide initiative operating between 2013 and 2016. The project details can be found here: https://dcentproject.eu/; Open University of Catalonia and Eurecat were project partners from Spain.

cities, including Barcelona (with Barcelona en Comú) and Madrid (with Ahora Madrid). These two platforms had emerged, to a large extent, from the Indignados or 15M movement, a series of protests against the economic and political system that gained massive support among the citizenry in most Spanish cities during the spring of 2011.[9] As a result, many of the leaders, technologists and hackers involved in the D-CENT programme in Barcelona and Madrid were suddenly elected or appointed to key positions in the government of the two largest Spanish cities.

The centrality of citizen participation in city policy making in Barcelona was inaugurated early on, with the launch of a platform for citizen participation that received support from the D-CENT initiative. In February 2016, the platform Decidim[10] was launched to support the co-production of the Municipal Action Plan. The platform featured 2,000 proposals from the City Council for citizens to comment on. Citizens and organisations could also publish proposals, with more than 400 meetings held to discuss these proposals and define new ones. Pablo Aragon, a researcher at Eurecat[11] at that time and a core member of the Decidim project, interviewed for this paper, portrayed this early initiative as, 'Probably the largest participatory process mediated by technology ever launched in Barcelona prior to that date.'

The participatory processes relied heavily on the participation by civil society organisations, which have historically been strongly embedded within Barcelona's political and social culture. As Aragon recounts, 'In the case of Barcelona there was a very strong techno-political community. Many institutions, researchers and different kinds of activists were involved in challenges and critical views around data and technology. So, the techno-political community of the 15M movement was very active in Barcelona and this helped Decidim to start and to grow.'[12]

Following the 2015 election, the city also launched a bold new agenda for digital transformation around the concepts of digital rights, technological sovereignty and data sovereignty. The programme started with a restructure of city operations to empower the role of a newly created *comisionado para tecnología e innovación digital* (chief technology and digital innovation officer (CTIO)). Francesca Bria, senior programme lead at the UK innovation agency NESTA and leader of the D-CENT project, was appointed as CTIO in June of 2016. The position was a created as an executive level role, representing the elevation of digital strategy from beyond that of IT. This role was active in the design and implementation of the new strategy, policies and programmes for the digital agenda in the city, and received strong political support from the mayor, the deputy mayor and the general manager of the city, to whom she reported directly. This role was designed to create managerial capacity in the implementation of a major digital reform agenda and was empowered to lead transformational digital programmes across the administration. In addition to the CTIO, the city also created a new board for digital transformation, as well as an MDO led by a newly appointed chief data officer, Marius Boada, the first such position to be introduced in Spain.

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[9] See https://en.wikipedia.org/wiki/Anti-austerity_movement_in_Spain.
[10] See https://www.decidim.barcelona/?locale=es.
[11] See https://eurecat.org/es/.
[12] Pablo Aragón, April 2021.

In October 2016 the Barcelona Digital Plan was launched with an allocation of €75 million to be spent annually on digital transformation. The digital plan was structured around three pillars:

- Digital transformation of the city council and the city;
- Digital innovation and development of the entrepreneurial and social innovation ecosystem; and
- Digital empowerment of citizens.

The vision outlined in the digital plan was then translated into a series of legal instruments, organisational initiatives and projects, such as a new City OS, Sentilo, DECODE and Steam Barcelona (see Appendix 2 for a list of strategic projects mapped to the three pillars of the Barcelona Digital Plan). The new vision was described in the *Manifesto in Favour of Technological Sovereignty and Digital Rights for Cities,*[13] which established the values, goals and actions to achieve the new digital vision for Barcelona, and in *Ethical Digital Standards,*[14] an open source policy toolkit for cities to develop 'digital policies that put citizens at the center and make governments more open, transparent and collaborative.' The city made this policy toolkit available on GitHub for others to use and distributed the toolkit via the Cities Coalition for Digital Rights (Bria et al 2017).

Key policy documents of the policy toolkit were released over time and included:

- *Digital Service Standards* (September 2017);[15]
- *Government Measure on Free Software and Agile Development of Public Administration Services* (October 2017) (hereafter referenced as City of Barcelona 2017);[16] and
- *Government Measure on Ethical and Responsible Data Management* (May 2018), known as the 'data policy' (hereafter referenced as City of Barcelona 2018).

Digital Service Standards contained 15 principles that guided the way the city would operate with regards to digital services. These included a focus on digital users; a focus on those needing digital support; the introduction of agile and multidisciplinary teams; the use of open code and standards; and the protection of privacy, security, ethics and accessibility.

Government Measure on Free Software and Agile Development of Public Administration Services introduced a focus on technological sovereignty, which aimed to resolve the challenges of the city and its citizens through a more democratic use of technology. The goal of technological sovereignty was structured around the use of free software, interoperability and free standards. This document also elaborated some of the key aspects of the digital transformation programme launched by the city, such as its governance and roadmap, as well as the key measures, changes and deliverables of the programme. The overall goals of the measure were to lead the city of Barcelona towards 'the delivery of agile digital services, the process for accomplishing

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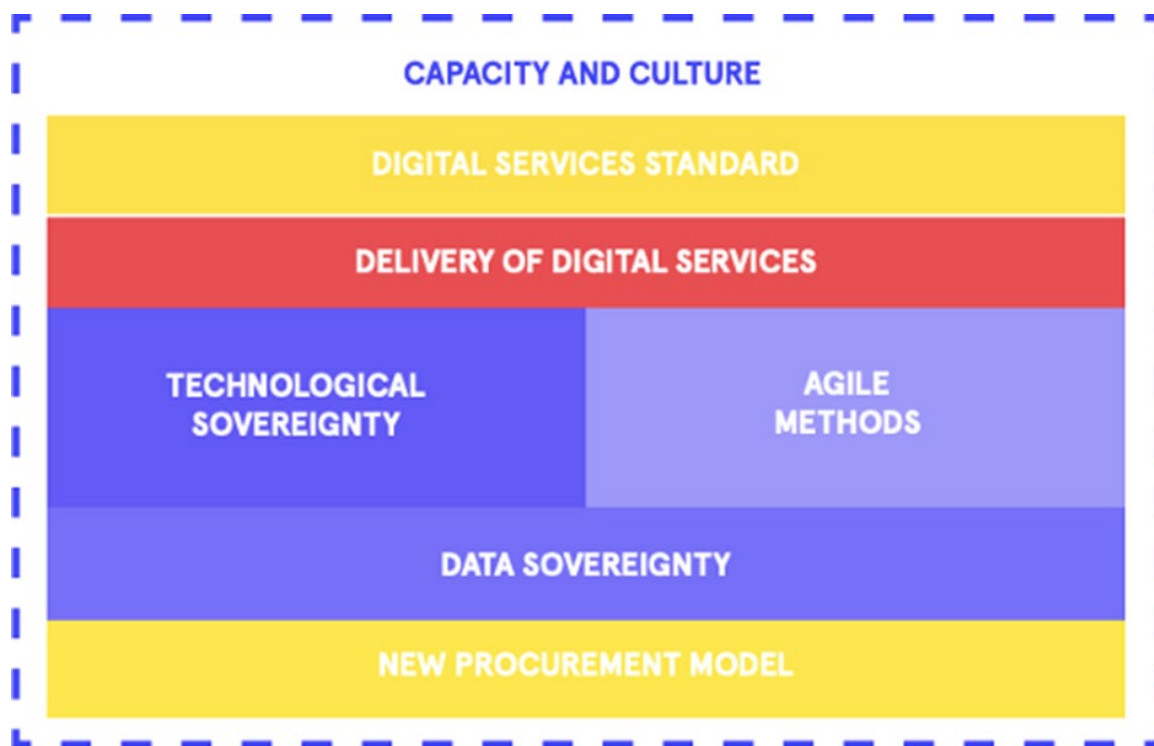[13] See https://www.barcelona.cat/digitalstandards/manifesto/0.2/.
[14] See https://www.barcelona.cat/digitalstandards/en/init/0.1/index.html.
[15] See https://www.barcelona.cat/digitalstandards/en/digital-services/0.1/.
[16] *This Government Measure* was further developed by a set of guides, such as the *Technology Code of Practice* and its companion on agile methodologies, *Guide to Technological Sovereignty*, *Guide to Public ICT Procurement*, *Guide on Free Software Management* and *Guide on Innovative Public Procurement*.

technological sovereignty and the migration to free and open software and open standards' (City of Barcelona 2017:4). Figure 1 details the relationship between each of the key documents.

Figure 1. Key Components of Barcelona Digital Programme

Source: City of Barcelona 2017.

These programmes and policies established an ambitious trajectory for transforming the working processes, procurement practices, institutional and organisational arrangements in Barcelona, with a particular focus on redesigning models for data governance in the city in ways that empowered the city and its citizens. The paper now turns to the core elements of this data governance model.

2.3 A new data deal: key principles

Fundamental to the new strategy was a rethinking of the key models and frameworks used to govern the use of data by public and private organisations. As discussed earlier in the paper, existing approaches to data use had tended to privilege benefits to private technology companies, with limited impact on the city's own capacity to make use of the increasing volumes of urban data being generated through new technology platforms and services.

In addition to technological sovereignty, which emphasised how technology was procured, the city also introduced a data sovereignty policy specifically to address the management and use of data by the city on behalf of its citizens. As outlined in the data policy:

> 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 wellbeing, and which is exchanged on a quid pro quo basis (City of Barcelona 2018:7).

A key concept presented by the data policy was that of a 'data commons', which set out the value of data for collective, shared benefits. The creation of a data commons derived from the idea of data sovereignty and required a set of new protocols governing the sharing and use of data, underpinned by new contractual arrangements with citizens and service providers. Through encrypted, privacy-by-design software developed through DECODE, city residents were to be given 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). This intentional, citizen-first approach to data governance placed Barcelona at the vanguard of cities seeking to enhance the capacity of their citizens to 'invest' their data in key areas of interest. Accompanying the introduction of these policies was a joint publication by Evgeny Morozov and Francesca Bria called *Rethinking the Smart City,* outlining the ambition for Barcelona:

> Barcelona seeks to lead a transition towards technological sovereignty that allows the government and its citizens to determine their own priorities in terms of the direction and use of technological innovations, with clear social benefits and public returns.

> This implies reclaiming critical knowledge regarding data and technology infrastructures, which far too often remains in the hands of major multinational service providers, while involving local SMEs and innovators to develop the digital services and solutions citizens need (2018: 27).

Practically achieving greater citizen autonomy over the use of their data was not just a matter of principle, but also necessitated a number of new standards, technologies and procurement practices to re-engineer how data could be managed by diverse stakeholders.

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3. Analysis of the key components of Barcelona's new data deal

In this section we discuss the key components of the new data deal developed in Barcelona, incorporating reflections from leading managers, administrators and advisers active in the programme's implementation. We address three key themes of implementation that emerged from these interviews:

1) From siloed open data to integrated data commons*;*
2) Fostering improved exchange of data through procurement; and
3) DECODE as a new technological infrastructure for data sovereignty.

3.1 From siloed open data to an integrated *data commons*

The new approach developed by Barcelona moved beyond simply releasing existing government data in machine-readable formats, through open data policies, and focused on a more strategic approach to data management. To achieve this, the city launched three key initiatives with a

combined budget allocation of €1.288 million: (1) the deployment of the CityOS data lake, redefining its data architecture; (2) the creation of an MDO; and (3) the revamping of the existing open data portal (City of Barcelona 2018: 39).

Oleguer Sagarra is a data scientist and founder of Dribia, a data analytics start-up, and was hired by the city to translate the vision of the data commons into a set of concrete measures. As Sagarra reflects:

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

The goal of the new CityOS was to establish a 'data lake' with a standardised data ontology for the city of Barcelona. The data lake was described as the 'architecture, processes and operational standards based on application programming interfaces (API), which make it possible to group data sources' (City of Barcelona 2018:7) and was conceived as a key technological tool to improve the data governance in the city. 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 the MDO, and the Municipal Institute of Information Technology (IMI), the municipal entity in charge of IT.

The MDO was the first of its kind in Spain. Its mission, functions and responsibilities were established in a municipal circular published on 18 April 2018. The MDO was put in charge of the governance of all the data owned or under the custodianship of the city of Barcelona. Organisationally, it was established under the city's manager and functionally dependent on the CTIO. The MDO focused on establishing the CityOS data lake, and in parallel on the implementation of the data commons strategy and ethical digital standards, particularly implementing data sovereignty clauses in public procurement. The city also established and runs a board for governing data, which includes departments as well as other agencies that were under the umbrella but directly within the City Council structure.

Operating as an internal service provider to other departments, the MDO's approach is to provide data science services for these areas to use data to better understand their problems or evaluate their actions. The focus here is on 'agile' methodologies, which incorporate relatively lean strategies that involve 'failing fast' and abandoning initiatives quickly if they do not work.

A third strategic action in the move towards a more integrated data commons was to revamp the open data portal. According to Sagarra, 'The existing data portal was already good according to Tim Berners-Lee's standards and compared to other cities in Spain, but there was a window of opportunity because there was a contract being renewed.' The first thing was to make sure it was developed using CKan, a widely used open source protocol for the management of city dashboards. The second important principle was to make sure the portal went beyond publishing data and became more integrated into the workings of the city. The API was changed to make it easier to use, and the city facilitated forums with users to understand how they were using it, what data was being used and the value it was generating.

The third aspect was using the portal as an opportunity for internal transformation. For example, the city had an existing system, called IRIS, where citizens could ask questions and the city had to provide an answer within 21 days. The team integrated IRIS with the open data in a way that if a user asks for a dataset, the person responding can get the data much more swiftly, because the department in control of the data has a legal mandate to provide the dataset. This reflects work by the MDO in seeking to connect the open data portal with the CityOS data lake, making sure that data is shared with the outside world via the centralised 'data brain' within the City Council.

3.2 Fostering improved exchange of data through procurement

Reflecting the first wave of smart city innovation, decisions within the city about who produced, owned and exploited the data generated in the city were made by default through non-disclosure agreements between companies and the city. As a result, changing procurement rules and clauses was essential to meeting the goal of opening and building data as a public infrastructure.

To achieve this, the city established a new set of data sovereignty clauses designed to be integrated into public contracts. Malcom Bain, a lawyer specialising in open source technologies, advised the city in the drafting of its contracts. As he recounts:

> 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 anonymised and cleaned to publish it as open data.

Most of these data sovereignty clauses refer to data that the city manages, where the clauses establish the city's right and mandate to acquire the data generated through the contract. These include data collected through or about public services, such performance metrics, service incidences, etc. Additionally, the city has explored widening the scope of some of these clauses to include private sector data — such as phone calls by citizens or data on rides from mobility operators — that would be shared with the city. The condition to share this data 'about the city' with the city can be established in contracts or as conditions for licenses or concessions.

The idea of integrating these broader data sovereignty clauses was tested in a big contract that the city needed to renew with the telecom services provider, Vodafone. As Bain notes, 'The contract with Vodafone, by which the company agreed to anonymise and share with the city some private data that the company was collecting as part of its services, was a precursor of some of the work around these clauses in public contracts.'[17] Negotiation of this contract was protracted, taking close to a year to finalise. However, it was a major achievement in the city's reclaiming of its access to data. From this basis the city included a data sharing condition on the Barcelona motosharing service norms and is pushing to incorporate similar data sovereignty clauses in other procurement contracts where interesting data about the city may be held in private sector hands.

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[17] Malcolm Bain, April 2021.

It now requires all departments to change their contracts to be able to collect and manage data much more productively.

In addition to the use of procurement contracts, additional mechanisms for companies and other organisations were implemented to share data with the city. This was the purpose of the Data Exchange, one of the strategic projects outlined in the data policy. The goal is for this Data Exchange to be connected with the CityOs data lake, so that there is a constant feeding of data from the city to the world and vice versa. At the time of writing, the city had just published a tender to develop a new web with more tools for citizens, institutions and companies to share data, as well as to generate and appropriate value from the data.[18]

3.3 DECODE as a new technological infrastructure for data sovereignty

In addition to making these internal changes within the City Council, moving towards a data commons paradigm still demanded greater involvement and control of the data by citizens. Antonio Calleja-López, a researcher at the Techno-political Unit of the Open University of Catalonia,[19] was a member of the ecosystem of academic, social and city organisations that were pushing for a rethinking of the data paradigm in the city. As he outlines, 'The difference between open data and the recursive data commons paradigm is the centrality of the community control over data. [In public institutions' open data initiatives] usually, technicians set up the rules for accessing the data, etc… In the recursive data commons paradigm, it is the community members who control the data.'[20]

This was the goal of the DECODE project, which 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' (NESTA 2020:6). DECODE aimed to enable more active management and sharing of personal data through the use of distributed ledger technology (DLT), to reconcile that increased sharing with the goal of providing greater control to the way citizens shared their data.

DECODE was funded by the EU Horizon 2020 programme to a total of €5 million to run between January 2017 and December 2019,[21] and was conceived and coordinated by Francesca Bria, still working at NESTA when DECODE was approved. In a 2018 op ed for *The Guardian*, Bria set out her vision for the city's digital infrastructure to be reformed through the logic of 'solidarity, social cooperation and collective rights' rather than the 'feudal lords' of global technology companies.

DECODE played a critical role in this vision, providing a cryptographic solution that would enable citizens to gain better control of the data generated both in their homes and in the city at large, in

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[18]See https://licitacions.bcn.cat/licitacion/licitaciones/detalle?id=1107152.

[19] The Techno-political Unit (tecnopolitica.net) is a half-research, half-activist group connected to the Communications Networks and Social Change group at the Internet Interdisciplinary Institute of the Open University of Catalonia. This unit was one of the partner organisations in the DECODE project, leading one and participating in the other pilots in Barcelona.

[20] Antonio Calleja-López, April 2021. For a more elaborate articulation of the differences between open data and recursive data commons, along with a definition of the latter, see Calleja-López 2018, and Calleja-López and Vila-Viñas 2021.

[21] Project no. 732546.

part by setting rules on who can access it, for what purposes and on which terms. As part of 13 partner organisations across Europe, Barcelona and Amsterdam were identified as two participant cities, and with Bria taking on the role of CTIO within the city of Barcelona the coordination of the project was moved to Barcelona as well. The project attracted global attention as a leading digital sovereignty in cities programme (Barns 2020; Calzada 2018; Charnock et al 2021; Kitchin et al 2019).

In Barcelona, the technology was tested in three pilots that sought to translate the ideas of the data commons into practical applications in the city. These practical applications required the development of a new infrastructure that allowed the realisation of the data commons while also ensuring greater data sovereignty. The pilots under DECODE enabled the development and testing of 'privacy by design' and privacy-enhancing technologies that were core to the vision for the ethical management of data outlined in the data policy, which stated:

> The necessary measures must be taken to incorporate privacy by design strategies and/or privacy enhancing technologies (PETs), through which the privacy of those concerned is taken into account during all design, development and management processes for the City Council's data systems. Wherever applicable, encryption, anonymisation and pseudo-anonymisation algorithms must be used (City of Barcelona 2018:23).

The first pilot integrated with the Metadecidim community and the Decidim platform. Decidim, which in Catalan means 'let's decide' or 'we decide', is a digital infrastructure for participatory democracy; a digital platform built entirely and collaboratively as free software. Metadecidim is the community that collaborates in the design of the platform and the construction of the project.[22] After the success of Decidim in supporting the participatory process in the co-production of the Barcelona Municipal Plan, there was further demand to create modules that could be replicated in other places.

Interviewees reflecting on the establishment of Decidim explained that one of the challenges experienced during this process was that the platform did not monitor participants' demographic characteristics to protect their privacy.[23] As a result, it was difficult to understand who was participating and the potential biases that may be happening if only certain groups or people contribute through the platform. Through DECODE, a new encryption and storage technology was developed, to allow people who are browsing or debating to share their demographic characteristics, but remain fully anonymous when they vote. Also, if users wanted, the platform could gather, in an aggregated way, demographic information (district, age and gender) about those voting through the platform, which can be used for enhancing the platform's processes.

In addition to enabling a more privacy-protecting participation in the Decidim platform, the DECODE pilot sought to (i) generate aggregated data that could be used to better understand the

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[22] See https://docs.decidim.org/en/whitepaper/decidim-a-brief-overview/ There was a recognition that a governance mechanism was needed to regulate the design of the platform and the development of the code. As Pablo Aragón, committee member of the Metadecidim community described it, 'Since this is a platform that is going to shape participation, how this platform is designed should not be only guided by a specific group of people, and normally this group of people have very strong bias… They are male, middle aged and with high level studies, so we tried to build a community to decide how the project should evolve. And that is how Metadecidim started in December 2016.'
[23] Pablo Aragón, April 2021.

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 MDO on all matters related to data policy in the city. In this way, the project sought to increase the community's participation in the city's data governance ecosystem. In the first pilot, 223 participants posted 77 proposals, submitted 118 votes, 86 comments and two petitions, and held eight meetings (DECODE 2019).

The second DECODE pilot was focused on the use of Internet of Things (IoT) 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, the 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 cryptographic technology, to allow users to share the same data at different granularities with different target groups. This, again, 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 visualise the data donated by the communities in the other two pilots. The purpose was to make the data generated in the other two pilots available, so that the value of the data could be unlocked. This tool merged data from the city, directly fetched from its infrastructure, like the IoT platform Sentilo and CityOS, with citizen-donated data from the other two pilots, as well as other external datasets curated by external developers. According to Pablo Aragón, '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.'[24]

The DECODE Barcelona pilots were fully implemented, and their process and results were documented in a report published in December 2019 (see DECODE 2019).

4.   Taking stock

This section presents the key findings on the progress and key impacts of Barcelona's digital agenda and new data deal derived from the interviews and public information.

4.1   Progress of Barcelona's digital agenda and new data deal

As we have discussed, the transformation of Barcelona's digital infrastructure saw a number of significant reform initiatives introduced and the impacts of these transformations will continue to evolve over the coming years. Given the high-profile nature of the digital reform programme, a number of assessments have been undertaken to date, identifying areas of increased participation, social innovation and digital capacity building as key areas.

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[24] Pablo Aragón, April 2021.

For example, an evaluation of the Digital Plan[25] conducted by the City Council found 54,000 jobs and 2,600 companies were operating in Barcelona's digital sector. The plan also provided figures on the technological infrastructure and the open data portal and their use, with, for example, 50 datasets uploaded to the Open Data Portal, 130,000 users and 3 million daily registries from sensors. The activities launched by the City Council on democratic participation (over 40,000 participants), transparency (160 whistle-blower communications on corruption cases), digital inclusion (for example, 39,000 participants in digital capacity-building sessions and 15,000 participants in training on technological entrepreneurship) and social innovation (30,000 participants in the Maker Faire) also point to the high levels of dynamism and engagement generated during the period around the key strategic areas of the digital transformation plan for the city.

Changes to working practices are also ongoing, with an increased mainstreaming of agile methodologies, and the adoption of free and open source software and innovative procurement practices. Progress on some of these fronts is not easy, however. As Carol Romero, who is part of the community that runs the Decidim platform, Metadecidim, recounted, 'Even though Barcelona has been an advanced city in all these processes of digital transformation, it still is an institution with a culture that needs to go through a change process… We have seen some changes in the adoption of free software and open source, and the initial work of publishing policies and guides has had an impact, but change is too slow.'[26] In part, this may be due to organisational inertia and resistance to change, but there are also legitimate reasons for the adoption of new tools and practices. The public administration has a duty to protect rights and fulfil its fiduciary obligations, and meeting those may sometimes require additional steps or longer processes. There are also concerns about the sustainability of some open source or free software providers, and whether they will have enough capacity and for long enough periods to meet the city's needs on technology.

With regards to the new data deal, we heard several reflections from participants. First, the city has made progress in raising the institutional importance of data through the creation of the MDO, which has strong political backing, and its close connection to top decision-making. At the same time, its strategic insulation from day-to-day politics has been revealed to be an effective way to ensure that it can support decision-making without being meddled in political battles. The MDO has also become a key interlocutor on data issues for the wider entrepreneurial ecosystem in Barcelona and, with the launch of the new CityOS, the MDO has increased its control over the data infrastructure, which fundamentally enhances its ability to use data more strategically and leverage it for better decision-making and the creation of value.

While substantial progress has been made in the rollout of the new CityOS, the project is complex. Sagarra identified some key challenges: 'Controlling the data infrastructure is the most difficult part. There are 10,000 workers across departments in the city, so it is hard. Progress here is slow, but you need to think about the impact that this will have in some years' time.' The need to map the whole data universe in the city and integrate all the existing datasets into a single data lake

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[25] See https://ajuntament.barcelona.cat/digital/sites/default/files/pla_barcelona_digital_city_in.pdf.
[26] Carol Romero, May 2021.

was the biggest challenge. Pau Balcells, programme manager at the MDO, also emphasised this as a challenge: 'It is hard to say, because we do not know what is the whole universe of data, but I would estimate that 20 per cent of the city's data is on the CityOS.'

Through the new sovereignty clauses in procurement contracts and the new Data Exchange, the city will also increase its control and access to additional sources of data and create a healthier data ecosystem with a level playing field for all actors. Private actors have sometimes resisted this greater exchange, on the grounds of concerns about privacy and the loss of competitive advantage. Yet, the city of Barcelona is convinced of the need to go beyond a one-way 'government releasing data' model, to a true exchange of data that increases business-to-government data flows and ensures the buildup of data as a social infrastructure, so it plans to stay the course and also advocate for this position in the new Data Act that the European Commission is currently drafting. The example set by Barcelona with procurement clauses is also going beyond the city and already being explored by other cities.

This international dimension is also one of the key legacies of Barcelona's progress with a new technological infrastructure for data sovereignty through the DECODE project. The tools and technologies developed in the DECODE pilots have provided tangible examples of alternative technological infrastructures that can be deployed to increase data sharing, while protecting privacy and providing greater control over data to citizens. All the work carried out under the DECODE project also helped to further articulate a community of developers, activists, academics and policy makers around a more progressive data agenda. More importantly, what happened in Barcelona did not stay in Barcelona. DECODE has been widely referenced as a viable alternative by commentators, policy makers and academics alike, and has already influenced the EU Data Strategy, which expressly mentions it as an example of the new tools that can give citizens greater and more granular control over their data.

4.2 Losing momentum in Barcelona?

In the local elections of 2019, Barcelona en Comú lost 20,000 votes and came second to a new alliance of left-wing, mostly independentist, parties. It managed to reach a coalition agreement with the PSC, 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. This had implications for the digital agenda launched in 2015. According to researcher Antonio Calleja-López, 'As a result of the elections of 2019, the Socialist Party entered the government and became in charge of the digital area. Since then, the narrative has shifted from digital sovereignty to digital humanism: from a narrative potentially open to radical politics to one tied to a rather soft ethics, from the centrality of public-common (or public-community) partnerships to that of public-private partnerships (even when in quadruple helix arrangements), from systemic socioeconomic critique and imagination to limited calls to social change, from a road of technopolitical democratisation to one of tech humanisation, and from the distant horizon of an alternative digital society to that of a renewed

technological capitalism with a human face.'[27] Later that year, before the new elections, Francesca Bria left the city after having completed her mandate.

A loss of momentum towards digital sovereignty at the political level may also have impacted the focus on building the capabilities of the city administration with regards to data. For Pau Balcells, one of the main challenges faced by the MDO was the lack of skills:

> 'The biggest challenge that we have is to train personnel in data science. If you want to enroll people, you need to go through a public process which is really slow and really painful. You have to negotiate with civil service unions, and you also need to negotiate budget with the different areas of the city and so on, so this is a really hard process, and, unfortunately, it's not a fast process, so we really have a lack of well-trained personnel in data science, or in the related aspects of data, so we have very limited capacity.'[28]

Given these limitations, the MDO has also focused on providing training and capacity-building to other areas, and it also supports other departments when they are contracting data science services. Overall, 'We are less than halfway where we want to be,' is Pau Balcells' assessment.[29]

Finally, mainstreaming and scaling the technology piloted through DECODE has also faced some challenges. For Calleja-López, the lack of emphasis on digital sovereignty and a shortage of time impacted the scalability. 'We had almost all the pieces together: communities of people that are still in contact and are doing many projects; we had the vision; we had actually also a prototype of the technology. We had the key element that was the connection within the city and someone who was absolutely committed to this… but we were not able to finally close the loop and make it fully stable… I believe things like extra funding and Francesca (or someone akin to her) staying another term were necessary conditions to stabilise the DECODE model.'[30] Pablo Aragon gave two additional possible reasons for why the pilot developed through DECODE was not fully integrated into Decidim: 'Either a lack of political commitment or a need for greater resources, or both.'[31] Others, like Andres Pereira de Lucena, one of the developers of Decidim, found that the technology developed under DECODE posed some usability challenges: 'The problem with the technology developed under DECODE was that, due to how blockchain operates, participants had to use an external mobile application and we found that this was too cumbersome, and what we wanted to have is fewer steps for the voting process to enable scalability and better user experience…' The DECODE solution had not been designed and built to enable secure electronic voting, but when Decidim searched for a tool for it, it turned to a Microsoft application called ElectionGuard.[32]

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[27] Antonio Calleja-López, April 2021. A preliminary take at these differences by Calleja-López can be found at https://www.elsaltodiario.com/atenea_cyborg/el-futuro-de-la-humanidad-y-la-tecnologia-hacia-un-capitalismo-tecnologico-con-rostro-humano and in a forthcoming academic article that reviews the last ten years of technology and city visions in Barcelona.
[28] Pau Balcells, April 2021.
[29] Pau Balcells, April 2021.
[30] Antonio Calleja-López, April 2021.
[31] Pablo Aragón, April 2021.
[32] Andrés Pereira de Lucena, May 2021.

Despite these challenges, Barcelona remains one of the frontrunners in promoting the cause of digital rights and data sovereignty at the city scale, and its programme remains influential worldwide. The active community of hackers, academics, practitioners and citizens that pushed the government to embrace a progressive agenda for data governance is still present and the building blocks for transformation are now in place. This is the assessment by people like Sagarra, who think it is still early to fully evaluate the transformation of Barcelona: 'This was a very ambitious and radical agenda, so it is not realistic to find impact so soon. Time will say which initiatives stay and which ones fall.'[33]

Nevertheless, there is an impact that is already visible. Barcelona has turned into a tangible example of how a new governance model for digital rights and data sovereignty is possible. The city has not only designed and started to implement this new model, but has also showcased it and defended the need to promote an agenda that needs to spread to other cities and move beyond the local level.

4.3 Spreading the digital rights and data sovereignty agenda beyond Barcelona

Barcelona's experience has already influenced the EU strategy and policy on data. First, it has put the concepts of sovereignty and rights at the center of the debate, with the European Commission declaring that it will use its convening and financial powers to 'strengthen Europe's "technological sovereignty for the data-agile economy"' (EU Data Strategy 2020: 16). This document also expressly references DECODE as one of the innovative tools that enables citizens to share their data while protecting their rights, and declares the need to continue investing in environments that enable those innovations to flourish (EU Data Strategy 2020: 10).

The lessons of the Barcelona case have also been incorporated into 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 replicated by the German development bank KfV in its Smart City Pilot Programme,[34] which is explicitly based around the Barcelona data sovereignty model and is now being tested by the city of Hamburg in its new digital city strategy in collaboration with the New Institute.[35]

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 the vision. *Ethical Digital Standards*, developed in Barcelona (Bria et al 2017) and published on Github as an open source policy toolkit for wider reuse, were designed to support a range of governments in implementing citizen-first models of technology procurement and data management, and have been an adopted by other cities. 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,

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[33] Oleguer Sagarra, April 2021.
[34] See https://www.kfw.de/stories/economy/innovation/smart-cities/.
[35] See https://thenew.institute/en/what/the-new-hanse.

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 policy making. The coalition is committed to promoting and defending digital rights in an urban context through city action; to resolving common digital challenges; and working towards legal, ethical and operational frameworks to advance human rights in digital environments. As well as supporting the city of Barcelona in drafting data access, use and management clauses for its procurement contracts. Malcolm Bain, who was interviewed for this paper, remains active in the coalition.

One of the key supporters of the coalition is the United Nations, through UN Habitat and the UN Office of Human Rights. UN Habitat has been distributing the policy toolkit developed by Barcelona in cities around the world and has incorporated the lessons and instruments in its flagship programme, People-Centered Smart Cities, which 'promotes the deployment of technological innovations to realise sustainability, inclusivity, prosperity and human rights to make the urban digital transformation work for the benefit of all.'[36]

5.   Reflections on the Barcelona digital agenda and new data deal

With more and more cities today seeking to proactively promote and enforce citizen digital rights, including through more participatory data governance models, the experience of Barcelona provides a set of useful insights about the challenges and opportunities available. In this section we reflect on the key factors that have supported Barcelona's new data politics, with a focus on four interlinked pillars: leadership; network of civil society actors; institutional and regulatory innovations; and building capabilities. We also reflect on the key opportunities and challenges faced by Barcelona when introducing new data governance models built around notions of a data commons and data sovereignty.

5.1 Key factors supporting Barcelona's new digital vision

Leadership

Strong and complementary leadership at political (mayor) and managerial (CTIO) levels created political and managerial support for a wide range of reforms. The political vision of a digital society and economy based in democratic principles was extremely well-aligned with the managerial vision of strong internal city capabilities in open technologies and agile practices, and data governance principles based on digital rights and data sovereignty. The creation of the CTIO post elevated the importance of data governance across departments and within the city.

Civil society networks

Both political and managerial leadership relied on a wider network of social actors drawn together around broadly similar ideas on digital rights, technological sovereignty and data sovereignty. EU

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[36] See https://unhabitat.org/programme/people-centered-smart-cities.

and other public funding has been crucial in nurturing this network. Thus, the initiatives could rely on the support and co-creation of a wider set of actors, both in terms of creating legitimacy and support, but also in terms of a community of practice between the public sector, local start-ups and civic organisations.

Institutional and regulatory innovations

Institutional and regulatory innovations translated technological and data sovereignty from a political and theoretical concept into city government laws, standards and practices. Importantly, through the data commons model, the concept of sovereignty in this case emphasised the idea of civic participation and engagement in a way that is well-aligned with Barcelona's history of civic participation. Thus, institutions such as Decidim, or projects like DECODE, reflect both data rights and democratic participation ideas. While the legal and regulatory space in which Spanish cities can take innovative action in data governance is quite flexible, we learn from the case of Barcelona that it is important to translate innovative ideas into actual administrative guidance, norms and procurement practices. Barcelona also followed a commitment to openness by publishing all the standards and guides on Github, making them available for other cities to use.

Building capabilities

Building technological and administrative capabilities within city institutions is critical to ensure implementation of ambitious political goals, as well as complex data solutions. In contrast to 'smart city 1.0' initiatives in Barcelona in the early 2010s that outsourced most of the agenda and its implementation to external consultants, the new data politics firmly focused on building data skills and capabilities within city organisations. This would, ideally, allow for continuous learning by civil servants and public institutions. The city also collaborated actively with other cities to expand capabilities and knowledge to other locations through initiatives like the Cities Coalition for Digital Rights and networks like Eurocities, and a constant coordination amongst CTIOs.

5.2 Learnings of the Barcelona new data deal

Perhaps the most important lesson from the case of Barcelona concerns a governance tension around the data commons model. The tension can be expressed through competing notions of autonomy. On the one hand, Barcelona's data commons model is rooted in civic participation, citizen control of data and a supporting civic community of practice. On the other hand, the institutionalisation of the data commons model takes place through public organisations with public funding of the required technologies and development of supporting bureaucratic autonomy and capabilities. These tensions can be at least partially solved through democratising digital governance inside the public administration, while rethinking ownership of such platforms as Decidim. As reflected by Carol Romero, 'Decidim was created thanks to the political commitment of Barcelona City Council, which is a leading city in digital and democratic innovation, and this has helped the project to gain international recognition as a model of participatory democracy. But as the project and its community started to grow, we realised that we needed a

more distributed governance model, so we created an independent association.'[37] And, as the same interviewee pointed out, 'Because if the funding comes solely from a municipality, its own needs will naturally dictate the priorities of the development roadmap. On the other hand, building a free and open source software project in an agile way from a public institution is a complex task, due to the conditions of public procurement law.[38]

At the heart of the tension here is the need to build digital capabilities and awareness among both city leadership and bureaucracy, as well as among citizens. 'It must be taken into account that the City Council acts as a protector of city residents' data. It is therefore very important to make this data available to them, so that it is accessible to city residents and so that a verifiable and trustworthy relationship can be built up. However, for this to become a reality, it is not enough for the data and the protocols to be transparent. City residents must also have the tools and knowledge to be able to verify them. In a world that is becoming more and more digitalised, this means that the City Council must promote activities that help to train city residents in digital knowledge' (City of Barcelona 2018: 12).

To some degree, this governance tension is the result of the still undefined character of data governance models, which are a nascent phenomenon currently being tested and explored in different contexts and with different shapes. Scholars and practitioners investigating these emerging models acknowledge their still unclear boundaries and components (Micheli et al 2020). Some researchers have argued that 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). Without providing a definite answer to this question, the experience in Barcelona shows that the role of city governments in data stewardship is necessary, but still undefined and subject to a governance tension, albeit a very productive one. The City Council's role in creating and supporting the institutions, norms and technologies necessary for the data commons was key to advancing this vision, but at the same time, the civic ownership of and participation in the process helped new ideas to infiltrate and expand the 'realm of possibility' of what the city was willing and able to explore and test.

This productive tension is inherent to the experimental nature of the data commons pilots, particularly when run in a democratic and inclusive way. The tension particularly lies in the institutionalisation of certain practices and innovations. Some of this process will necessarily result in a loss of autonomy and some of the dynamism, but will also open new opportunities by operating at a much greater scale.

There are other limitations to the Barcelona experience that the research highlighted. One relates to the sources of autonomy that are so central to Barcelona's trajectory, as described above.

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[37] 'At the same time, we needed to secure the funding that until now has come from public institutions. Fortunately, both the City Council and the regional government have always supported this model of public-common partnership. Thus, we have been able to sign an agreement in which the city and the region recognise the association as responsible for preserving the values of the project and the quality of the code, and are committed to funding it. There is also an ecosystem of companies offering services on Decidim that will be able to contribute to this common good through the association… In any case, financial support cannot compromise decisions on the governance of the code.' Carol Romero, May 2021.
[38] Carol Romero, May 2021.

Barcelona's data commons model relied on strong charismatic leadership. However, as we have seen, such forms of leadership can be susceptible to changing political support. For charismatic leadership to remain transformative, it needs to be institutionalised in order to stabilise bureaucratic autonomy, and build further digital and governance capabilities within city institutions.

The civic autonomy also faced usability issues in its key 'privacy by design' solutions. In the case of Decidim, there are still questions about whether issues about privacy really affect citizens' participation in online platforms. As noted by Andres Pereira de Lucena, 'Privacy issues and concerns about their data does not seem the main concern of users in Decidim. What we see from anecdotal evidence is that the main barriers are the level of impact of the process (non-binding consultations do not seem to attract participation), as well as the lack of usability and clarity in the presentation of the topic subject to participation in the platform.'[39] This points to important challenges in turning co-creation practices into technological solutions able to deepen and retain the momentum of co-creation. To Aragon, 'Citizens are more likely to participate if they perceive that their participation is going to lead to some action that is meaningful for their life.'[40] Further, the issue about not being able to know who is participating in the Decidim platform remains. One way the community has tried to address this is by including a voluntary questionnaire, so that people willing to share their data can give their consent, yet this is in a quite experimental stage. As Romero notes, 'We still have this trade-off between protecting privacy and understanding better who is participating in the platform.'[41] This highlights another important lesson from the experience in Barcelona, which is 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.

Finally, the hypothesis behind the data commons paradigm remains to be further tested. As explained, the goal in Barcelona was to shift from the concept of data as an asset extracted and used as a source of competitive advantage by corporations, to 'one of a social "infrastructure" that must be public in order to ensure common wellbeing' (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 has been demonstrated with some concrete cases related to economic, environmental policies and urban planning by the city of Barcelona. Yet how this infrastructure can be used beyond monetisation of 'open data' by corporations has not been sufficiently proved, particularly by smaller companies, cooperatives, civic organisations or citizens. There are scattered use cases and anecdotes, but this remains an untapped potential that would require more robust economic analysis and experimentations. An important reason for this is the scale and level of governance. The city level is often too small to generate viable examples of alternative economic 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.

Balcells, from the MDO, points to some potential reasons for this status quo: 'Many companies do not know how to make money out of data. The community at large has an even harder time

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[39] Andrés Pereira de Lucena, May 2021.
[40] Pablo Aragón, April 2021.
[41] Carol Romero, May 2021.

extracting and appropriating that value. One of the reasons for this is lack of data literacy. Also, the public sector has to put more pressure on for a better business-government data exchange and finally government needs to provide a better technical tool for people to use the data.'[42] Advancing on all these fronts will be essential for a city to fully realise the vision of data as a social infrastructure for public value.

6.   Conclusion

The case of Barcelona shows the increasing role that cities — their governments and their citizens — have in shaping the response to some of the most pressing questions around digital rights and data sovereignty posed by the increased datafication of our societies and the power dynamics that go with it. The city of Barcelona was able to articulate a novel vision around the democratic and ethical governance of data in the city through a set of policy, organisational, legal and technological tools available to local governments.

First, the city articulated a clear vision around an ethical management of data that protected citizens' rights and ensured that data is configured as a social infrastructure leveraged for unlocking public value. Second, it reshaped the locus of data in the city organisation by setting up an MDO headed by a chief data officer; redesigning the data architecture and infrastructure through a new CityOS data lake; and revamping the data portal to ensure that public, private and personal data could be transformed into that social infrastructure. Third, the city boldly used procurement clauses to ensure that decisions around who produced, owned and exploited the data generated in the city remained in public hands. Finally, the city experimented with the development of cutting-edge technology that would enable citizens to share data while retaining control over it.

In so doing, Barcelona showed how cities can use tools such as procurement practices and licenses to operate to shape the conditions in which data is collected, shared and used. Since vast amounts of data are actually generated in cities, the impact of the adoption of these practices at scale by city governments around the world can be transformative. The case also demonstrates how cities can become fundamental testing sites, but also promoters of technological innovations and infrastructures that are necessary to provide alternative models to the ones developed by the private sector.

Renegotiating the data contract to ensure democratic and ethical standards will not be an easy path. Political and contextual conditions, such as the ones present and evolving in Barcelona, can seriously affect the viability of some of these initiatives. Many of these measures will quickly perish or not even take off unless they are accompanied by a strategic and intentional investment in capabilities in public organisations. More research on what these capabilities are, what different shapes they can take in different organisations, and how investments can be selected and sequenced by local governments is an important area for further research.

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[42] Pau Balcells, April 2021.

There are also inherent and productive tensions in efforts directed at defining more democratic and ethical models of data governance. This is a nascent field, both in practice and in research, so there is also a need to further investigate the strengths and weaknesses of emerging models and their ability to solve or manage some of these tensions. Other tensions, of course, are inherent to the process and will just morph as different needs, power dynamics and models evolve.

Core to a new agenda on data is the conviction that data can be unlocked to create public value through better decision-making and policies, and Barcelona and other cities have demonstrated this with concrete cases. This is an important contribution, but in order to articulate alternative economic models of data, the city level may not be enough. It is fundamental to continue exploring what these models look like and what is needed to materialise them. Cities can play a major role as sites of experimentation and demonstrators of use cases, but a lot of the changes will need to occur at the national or EU levels of governance.

This is, perhaps, one of the most important legacies of the Barcelona case. 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 being picked up by other levels of government.

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