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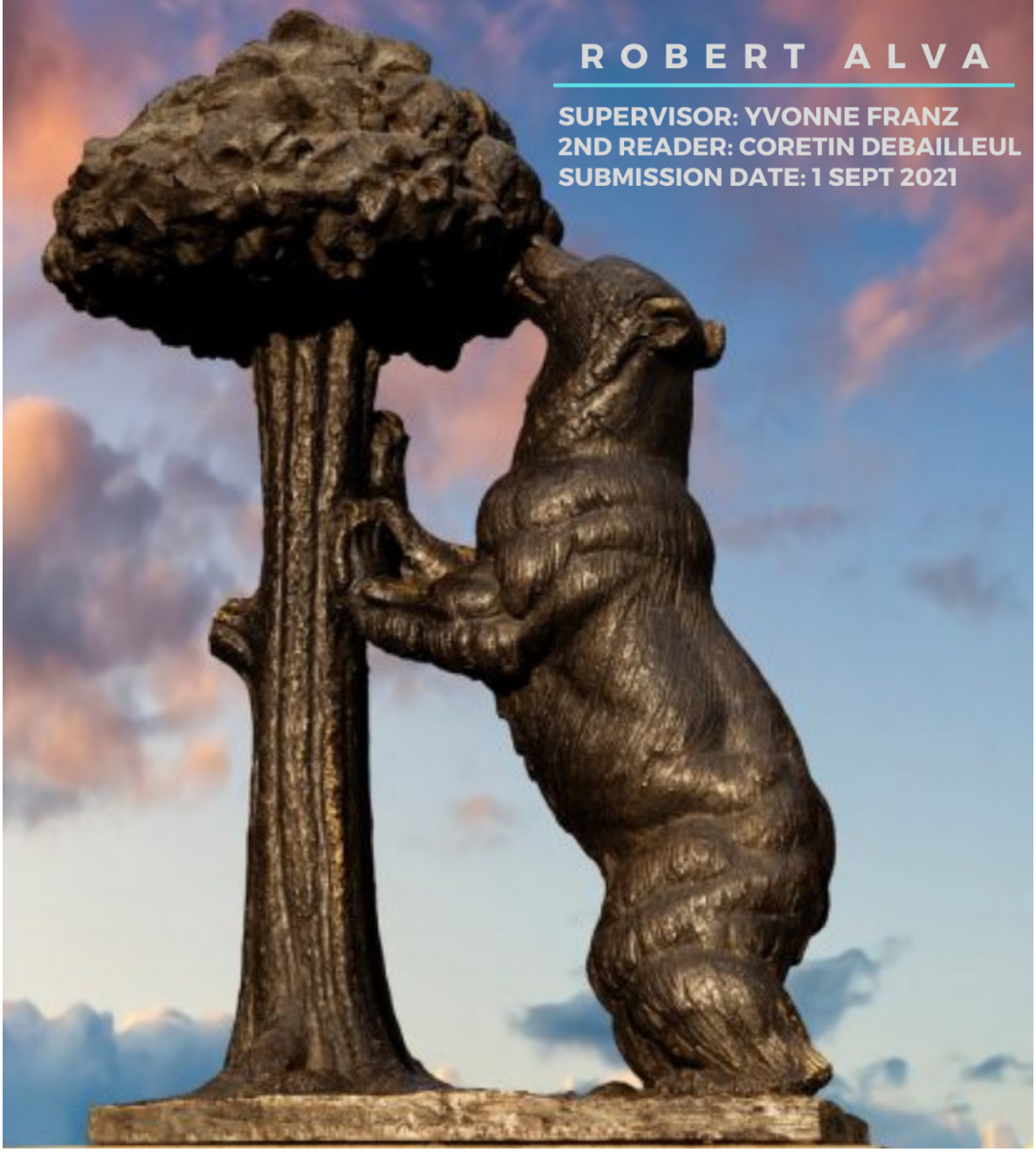
RE-VISITING THE SMART CITY: A SYNTHESIS OF RESIDENT PERSPECTIVES, PRIORITIES, AND BARRIERS FOR AN IDEAL SMART CITY IN MADRID CENTRO



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Thank you to…

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From Tovaangar to Brussels ♡

Abstract

The term smart cities is generally utilized to refer to a wide variety of technology based solutions that are increasingly utilized by municipalities around the world to enhance overall quality of life for residents, confront challenges related to sustainability development or improve citizen exchanges with government. Some scholars argue that a city can only be considered smart when ICT infrastructures are able to sustain sustainable economic growth and a high quality of life. Others are more critical, arguing that dominant narratives of smart city development are leading to the construction of a post-political urban space characterized by technological solutionism, where the digitization of the city has been hailed as the ultimate solution for maximizing efficiency, safety, and citizen engagement. And yet, little research has tapped into the localised perceptions, preferences, needs, and future expectations of urban residents who will be most affected by a shift towards an increasingly digitised urban environment. This thesis attempts to address this shortcoming by utilising a qualitative research design through semi-structured interviews with residents as local experts in the Centro District of Madrid and subsequent cross-examination of data for recurring themes through inductive thematic analysis. By implicating residents in addressing their perceptions of the smart city and use of data, expectations for future smart city development, and the limitations of how the smart city can address identified local urban problems, this synthesis of conversations is connected to wider debates on the smart and how local perspectives can be used to inform decision makers to shift towards a more resident-centered approach predicated on more socially inclusive, responsible development.

Abstrakt

Der Begriff "Smart Cities" wird im Allgemeinen für eine Vielzahl von technologiebasierten Lösungen verwendet, die von Kommunen auf der ganzen Welt zunehmend eingesetzt werden, um die Lebensqualität der Einwohner zu verbessern, Herausforderungen im Zusammenhang mit der Entwicklung der Nachhaltigkeit zu bewältigen oder den Austausch zwischen Bürgern und Behörden zu verbessern. Einige Wissenschaftler argumentieren, dass eine Stadt nur dann als intelligent gelten kann, wenn die IKT-Infrastrukturen in der Lage sind, ein nachhaltiges Wirtschaftswachstum und eine hohe Lebensqualität zu gewährleisten. Andere sind kritischer und argumentieren, dass die vorherrschenden Narrative der Smart-City-Entwicklung zur Konstruktion eines post-politischen urbanen Raums führen, der von technologischem Solutionism geprägt ist, in dem die Digitalisierung der Stadt als ultimative Lösung zur Maximierung von Effizienz, Sicherheit und Bürgerengagement gepriesen wird. Dennoch gibt es nur wenige Forschungsarbeiten, die sich mit den lokalen Wahrnehmungen, Präferenzen, Bedürfnissen und zukünftigen Erwartungen der Stadtbewohner befassen, die am meisten von einem Wandel hin zu einem zunehmend digitalisierten städtischen Umfeld betroffen sein werden. Die vorliegende Arbeit versucht, diesen Mangel zu beheben, indem sie ein qualitatives Forschungsdesign durch halbstrukturierte Interviews mit Anwohnern als lokale Experten im Centro District von Madrid und eine anschließende Querprüfung der Daten auf wiederkehrende Themen durch eine induktive thematische Analyse verwendet. Durch die Einbeziehung der Bewohner in die Diskussion über ihre Wahrnehmung der intelligenten Stadt und die Nutzung von Daten, die Erwartungen an die zukünftige Entwicklung der intelligenten Stadt und die Grenzen der Möglichkeiten der intelligenten Stadt zur Lösung lokaler städtischer Probleme wird diese Gesprächssynthese mit umfassenderen Debatten über die intelligente Stadt und darüber verbunden, wie lokale Perspektiven genutzt werden können, um Entscheidungsträger zu informieren, damit sie zu einem stärker bewohnerzentrierten Ansatz übergehen, der auf einer sozial inklusiveren, verantwortungsvollen Entwicklung beruht.

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ICT = Information Communication Technologies

UNDP = United Nations Development Programme

RECI = Red Española de Ciudades Inteligentes [Spanish Network of Smart Cities]

1. Introduction & Relevancy of Topic

The ‘upgrading’ of municipalities on an international scale through smart city initiatives promises smart urban citizens a heightened quality of life through the utilisation of various information communication technologies (ICT) that streamline public services, optimise traffic and air quality, enhance productivity, reduce social inequalities and seamlessly solve a multitude of urban problems through the integration of the city and technological solutions. However, there remains a large gap between what the overly optimistic, corporatist smart city and its technologies’ promise to remedy socio-economic problems, and the actual impacts that “smartcitytisation" has on the experiences, perceptions, and concerns of people living in smart cities. The widespread and sometimes unquestioned adoption of smart city initiatives by an increasing number of cities brings up important questions of who will be left out of this transition and how urban citizens living in an increasingly digitised and data laden environment relate to these rapid changes.

Furthermore, it brings up questions of how citizens’ perspectives and expectations for how their cities’ politicians, planners, academics, technology companies should influence what a smart city should and could be. By better understanding these nuanced elements, this could better enable researchers and residents to hold their decision makers accountable on the implications of future urban developments, socially inclusive technologies and their alternatives, and ultimately more resilient urban communities. My research will address this problem by comparing and examining resident perspectives of the concept of the smart city and how their expectations can inform decision makers to adopt a more human-centered approach predicated on more socially inclusive, responsible development.

2. Literature Review

Due to the vast spectrum of literature, complexity, and endless dimensions that can be applied to the smart city topic, I aim to provide a kaleidoscope of perspectives on the concept without giving preference to any particular structure. This chapter is intended to provide the reader with a comprehensive understanding of the theoretical dimensions of the subject at hand in order to situate the research within the overarching field of smart city research. The first part unpacks the development trajectory and fundamental notions of the smart city concept, followed

by the more critical and controversial elements that arise from these approaches. Finally, two topics that are inevitably linked to the smart city and are a secondary focus of this thesis are the enmeshed notions of privacy and digitalisation. Overall, the aim of the first chapter is to provide a background for the theoretical underpinnings by examining the origin and developing notions of the smart city concept, both from a theoretical and a practical perspective combined with the implicated dimensions of digitalisation.

i. Tracing the Smart City

The concept of Smart Cities, or more generally the reference to the collection of extensive ICT and software enabled devices weaved into the urban environment is and has been a rather common characteristic of numerous cities around the world. Indeed, these characteristics of the smart city will increasingly become a baseline feature of any given city or municipality across the developing world. The concept itself has played out in reality has been around for some years, arguably even for decades in its more premature forms. Although a rather ambiguous term, the so called "smart city" concept that is used today has been utilised as a "floating signifier" (Sadowski & Pasquale, 2015, p. 2) for a wide array of urban development processes, many of which encompass similar, but preexisting conceptualisations of the evolving city such as the creative city, the innovative city, the resilient city, and the intelligent city among other characterisations that often emphasise aspects of innovation and resource efficiency (Hollands, 2008; Kitchin, 2014; Morozov & Bria, 2018; Vanolo, 2014).

To better understand the potential definitions of the smart city it is useful to review some of these foundational trajectories that have informed the motivations behind its intended achievements. These foundations for the smart city eventually became the starting point for advocating for the fusion of ICT and the city through further foundational characteristics such as the wired city (Dutton, Blumler, & Kramer, 1987), the cyber city (Graham & Marvin, 2001), the digital city (Ishida, Isbister & Van Leeuwen, 2000), and much later, the sentient city (Shepard, 2011) that ultimately solidified the idea that digital technologies should serve as important prerequisites for a functional, up-to-date, and modern city capable of facing the daunting challenges of the 21st century.

While Dutton, Blumler, & Kramer's (1987) wired city painted a rosy vision of future cities making use of informational highways made possible by emerging telecommunications

technologies that could fully connect households, corporations, and individuals with the knowledge they needed; the digital city similarly exhibited a vision of technologically centric city that could make use of a newly constructed broadband infrastructure capable of reducing, even eliminating the more tedious aspects of modern day life by creating an efficient virtual space that could ultimately improve the provision of public services and efficiently serve the needs of its citizens (Anthopoulos and Tsoukalas, 2006). For example, one of the most exemplary cases of the emerging digital city in this sense in the European context was the city of Amsterdam, which was one of the first municipalities to grant wider residents access to the internet back in 1994 and still finds itself commonly cited as an epitomised expression of the smart city (Rommes et. al, 2001).

The vague nature of these seemingly innovative and idealistic terms naturally stimulates the motivation to question what they exactly mean. Particularly when they are constantly being adopted by media outlets and in general academic discussions, this vagueness has confounded researchers on what a Smart City actually is and only produces more variegated understandings as time goes on (Albino, Berardi & Dangelico, 2015; Hollands, 2008; Vanolo, 2014). In his seminal book, Anthony Townsend (2014) describes smart cities as “places where information technology is combined with infrastructure, architecture, everyday objects, and even our bodies to address social, economic, and environmental problems" (p. 15). Thus, separating the realm of ICT and the physical environment over time has become increasingly difficult to distinguish where one begins and the other ends. Alongside the expanding ubiquity of complex algorithms, socially integrated and digital devices, and ensuing data collection that is coming to constitute the “fabric of urban environments” and pervading the everyday lives of the average urban citizen, the Smart City concept has become a popular term to denote a wide range of governance, urban development strategies, and related technologies in an increasing number of cities (Kitchin, 2014, p. 2). Some trademark examples of such digitally integrated technologies include digital cameras, Wi-Fi tracking, smart meters, and other types of sensor networks that are fueling the data-driven city. Through these expanding lists of devices, data collection and analysis thus are one of the main priorities of smart city initiatives, and are often seen as an unbiased source of empirical information about the many activities taking place in any given city to validate stronger policy recommendations, practices, and even further adoption of digitalisation strategies (Kitchin, 2014).

This rapid pace of urban growth ushers in its own set of conflicts, with every city's own transition playing out its own role in confronting localised problems and improving overall quality of life for its residents (Yin et. al, 2015). Acclaiming discourses surrounding the smart city is typically sorted between techno-centric promotional gray literature emanating from prominent international IT companies such as Siemens (2019) and IBM (2010), or highly fragmented academic literature that places special emphasis on the wide spectrum of technological implementations in the urban environment while neglecting factors of social intelligence and localised cultural and environmental conditions (Komninos & Mora, 2018; Mora, Bolici & Deacon, 2017; Calzada & Cobo, 2015).

Indeed, the genesis of the term “smart city” itself is derived not from an academic background, but rather a result of promotional marketing efforts by the international technological behemoth IBM, which sought to reinvigorate its long time declining business model that focused on its signature hardware and software programmes to a shift towards providing consulting services (Morozov & Bria, 2018, p. 6). Along the same lines on an international scale, particularly in the development context of low income countries, smart cities and digitalisation are also being advocated by large international organisations, namely the United Nations Development Program (UNDP), as a potential anecdote to the various challenges connected to housing, food, economies, and livelihoods. Increasingly, by advocating for smart cities and digitalisation services through providing specific technical expertise across pre-defined foundations of digitalisation that continue to encompass continually emerging evolving forms of digitalisation such as cybersecurity, software, data management, and skills and change management, such organisations continue to have a large influence on the understanding and expectations of what smart cities are capable of achieving (UNDP, 2021). It is here where the association of the smart city becomes synonymous with an exclusive club of forward thinking and innovation friendly cities made possible through a combination of clever urban leadership and technological interventions (Vanolo, 2014). In a way, this branded the smart city as a marker of differentiation, the logical next step that would usher cities around the world into the almost utopian ideal of the 21st century.

The intense interest in smart city literature and its varied themes is partly a result of a cascade of wider urban trends that have signaled a dire need for drastic intervention in order to come to terms with shifting urban realities, such as the much cited figure that the majority of the

world's population will be inhabitants of urban areas for the first time in human history (World Bank, 2018; Shelton, Zook, and Wiig, 2014). This has inspired and amplified the field of smart cities research with the aim of creating more pleasant and future-proof urban environments for residents. Adopting this perspective is often accompanied by a sense of optimism and self-righteousness that aims to include discussions from a variety of academic perspectives. The ever expanding area of academic studies combined with related marketing and promotional literature typically investigates the wide selection of technologies, their applications and related effects in the urban environment. The literature surrounding smart cities is both far reaching and is constantly being published, but in comparison, there is typically very little produced in the area of critical discourse (Galdon-Clavell, 2013). According to Stübinger and Schneider (2020), "the vast majority of literature defines the term 'smart city' as applications and technologies which satisfy the following three characteristics: (i) Target group are cities and communities, (ii) the way of living and working in the region is improved, (iii) information and communication technologies (ICT) are deployed" (p. 1).

ii. Dimensions of the Smart City

Although there are ample definitions, there are recurring themes that characterise the smart city throughout these definitions. Caragliu, Del Bo & Nijkamp (2011) offer a prescription of a Smart City when a combination of strategic management of natural resources and investments, human and social capital, and ICT infrastructures align in an optimised manner that enables sustainable economic growth and a high quality of life for its citizens. In order for smart cities to meet this definition, Caragliu et. al (2011) argues that six factors delineate smart cities from non-smart ones: smart economy, smart mobility, smart environment, smart people, smart life and smart governance. Furthermore, a host of other researchers reinforce that there is no widely recognised set of indicators, characteristics, or performance measures that determine if a city is considered smart city or not, although the most common characteristics are ICT infrastructure, social capital and entrepreneurial urban development, and the strategic role of the natural environment (Albino, Berardi & Dangelico, 2015). Although elements of hard infrastructure such as transportation or sensor networks are often given precedence and sought after, it is acknowledged that the management of soft infrastructure such as "human and social

capital" can be equally, if not more valuable elements that should be considered for smart city priorities (ibid, p. 65).

Several additional frameworks have attempted to create a typology that encompasses a variety of characteristics into a set of distinct categories. Following Colado et. al's (2014) definition, smart cities should essentially operate as a resource efficiency optimiser, and are thus defined primarily by their ability to effectively and efficiently manage energy resources and municipal services to support an improved quality of life for its residents and ability to actively respond to increased pressures to act against the degradation of the environment. The six elements that are adopted in their description of the smart city are identical to the ones posited by Caragliu et. al (2011) and also include: smart economy, smart governance, smart environment, smart living, smart mobility and smart people. Taking a more comprehensive approach to the smart city that acknowledges the concept will continue to evolve, even though it often places ICT at the core of initiatives, Chourabi et. al (2012) classified initiatives across eight foundational categories that represented indicators involving 1) management and organisation; 2) governance; 3) technology; 4) people and communities; 4) policy; 5) the built infrastructure; 6) economy; 7) governance; and 8) the natural environment.

According to Giffinger et. al (2013), six principal categories are outlined based on a review of various indicators pertaining to 70 mid-sized European metropolises: 1) smart economy, 2) smart people, 3) smart governance, 4) smart environment, 5) smart living, and 6) smart mobility. Similar to other proposed models, these categories encompass characteristics of innovative competitiveness, social and human capital, resident participation, transportation and ICT, natural resources, and quality of life indicators and have been a fundamental operational definition for smart city policies, particularly in the European context. Indeed, this same framework has been institutionalised in the European context as it was adopted by the European Parliament to operationalise as an official definition for a city to be considered smart, if at least one of the indicators housed within one of the six smart city dimensions were followed (Millard et. al, 2014). A comparison of these models is visualised in Table 1 with the six common dimensions that outline Giffinger et. al's (2013) framework is described in more detail below. These main silos will serve as a conceptual understanding for this thesis of how to categorise and understand some of the potential initiatives and encompassing expectations that residents might associate with the smart city concept.

a. Smart Economy

The dimension of smart economy is an essential building block that conceives of the smart city idea as a mutually dependent engine for the knowledge economy powered by innovation and technology while also exhibiting a high rate of productivity and flexibility of the labor market to adopt those practices (Bakici, Almirall, and Wareham, 2013). Ensuring a flexible environment of economic competitiveness that allows for inclusion in global markets that attracts entrepreneurial activity, tourism, students and increasingly integrates notions of social responsibility and green growth responsibility can also play a prominent role (Giffinger et. al, 2007). Importantly, "the efficient utilisation of ICTs in every aspect of its economic activities" are paramount to fulfilling the "clear long-term economic vision, which is agreeable to civil society, public and private sectors, and other relevant stakeholders" (Kumar and Dahiya, 2017, p. 42).

b. Smart Mobility

According to Albino, Berardi & Dangelico (2015), smart mobility again implicates ICT at the center in relation to modern transportation technologies that could utilise sensors or cloud networks to manage and continually improve urban traffic and can be further classified into "indicators of local accessibility, international accessibility, availability of ICT-infrastructure, and sustainable and safe transport systems" (p. 13). Residents and visitors are highly implicated in this axis, as they come most into contact with its services to move through the smart city and thus, it encompasses an implicit reference to public transportation systems, bicycle systems, walking, car-sharing, car-pooling and other current and emerging forms of urban mobility. Transportation and communication networks made possible by a strong and ever developing ICT sector, creating a smart ecosystem of high-speed connections that connect all the city's available resources including people, goods, and information have the power to shape competitiveness and development of particular areas of the city (Orłowski & Romanowska, 2019).

Key objectives pursued by smart mobility initiatives could include: reducing mobility costs, reducing air pollution, reducing noise pollution, reducing traffic congestion, increasing safety and improving the speed of mobility (Benevolo, Dameri, & D'Auria, 2016). This particular axis also has crossover with other silos, particularly Smart Mobility as environmental sustainability is increasingly implicated as a goal of smart city initiatives with focuses on

reducing private vehicle use and integrating alternative modes of transport with the ultimate goal of reducing net emissions (Aletà, Alonso, & Ruiz, 2017).

c. Smart Environment

A smart city exhibits this characteristic as a form of sustainable natural resource management, capable of optimizing energy consumption with the inclusion of renewable resources, adoption of new practices that reduce the emission of pollutants back into the environment and overall support environmental protection (Giffinger & Gudrun, 2010). On one hand, the measuring of a smart environment can follow indicators relating to energy consumption through practices of renewable energy, pollution control, green buildings and green urban management, and efficiency; while another set of practices is connected with the management of urban resources through waste management, sewer systems, water resources, street lighting, and overall sanitation and cleanliness of the urban environment (Millard et al. 2014).

d. Smart Governance

In comparison to other elements of smart city frameworks, smart governance potentially encompasses more wide understandings of what is expected of the smart city. This could implicate the adoption of smart procedures for cooperating with other designated smart cities or smart city networks, inclusive practices, engaging with local authorities and residents, and advocating for the use of innovative technologies that ultimately benefit the overall functioning of the city. Smart governance could involve a variety of stakeholders and decision makers in the provision of public services and often involves initiatives related to e-governance initiatives that are often portrayed as needing to be "citizen-centric and citizen-driven" (Albino, Berardi & Dangelico, 2015, p. 12).

According to Colado et. al (2014), these initiatives are often pursued with the goal of reducing inefficiencies and improving the overall user experience of residents as they interact with public services by helping to reduce costs, increase open transparency, establish consistent channels of communication, and improve the quality and overall availability of relevant information to smart city residents. As such smart city governance practices could include showcasing practices of accountability and transparency; utilisation of big data and geo-spatial

technologies to support better decision making; improving public service delivery through e-services or e-governance initiatives; integrating elements of participatory planning, budgeting, implementation, and monitoring; and the increasing collaboration of government, academia, and business, sometimes commonly referred to as the triple helix model in academic and professional discourses (Kumar and Dahiya, 2017).

e. Smart Living

Smart Living is a way of thinking to heighten the overall quality of life for residents and visitors of smart cities through the improvement in multiple areas that could include public services, healthcare, safety, social cohesion, quality of housing, education, and fostering of cultural and touristic activity (Kirimtat et. al, 2020; Giffinger et. al, 2007) with innovative technologies signaled yet again in their enabling role as making life more productive, sustainable, and efficient for residents and tourists alike (Meijer & Bolívar, 2016; Arroub et. al, 2016). This silo is particularly relevant for specific communities such as the eldery, people living with disabilities, women, children, etc. as smart living can entail new forms of tailored living that takes the needs of multiple communities.

This intelligent way of managing communities and their connected services highly implicates the use of data and ICT to achieve those goals and is not a universal perception for all urban residents and does not equate to improved quality of life for all residents of smart cities (Martínez-Ballesté, Pérez-Martínez, & Solanas 2013; Chourabi et al., 2012). According to Han, Jee, & Jeong (2021), despite cities' smart achievements of heighted quality of life and sustainable practices due to implemented ICT based services, the actual benefits on the receiving end of residents are not as intricately explored in terms of their overall experiences, whether or not they can be relied on, or even if they are aware of smart initiatives and receiving the services that they are actually needing (p. 3).

f. Smart People

This dimension involves the inhabitants themselves and are at the core of the smart city. They are the carriers of smart city initiatives as users of its technologies and services, and are thus pushing forward any changes by acting out practices of the other smart city dimensions such as preventing excessive energy consumption, limiting environmental pollution, and working

towards improving their overall quality of life and living environment (Yeh, 2017). The importance of designing and planning around smart citizens' immediate needs cannot be overstated, and their perspectives and concerns should be firstly considered in order for any smart city initiative to be properly effective or useful in the first place, particularly in relation to their growing privacy and security concerns (van Zoonen, 2016; Belanche-Gracia et. al, 2015).

As reviewed in the above section, it can be said that these frameworks attempt to capture the complex expressions of the smart city and are a starting point for understanding and classifying concrete initiatives. Such multi-layered frameworks were designed to guide and influence city managers and residents towards certain expectations of the smart city concept, but still do little to explain what residents utilise themselves or find relevant within these outlined dimensions.

Table 1: Smart City Dimensions (Author's Own Elaboration)		
Colado et. al (2014)	Chourabi et. al (2012)	Giffinger et. al (2013)
Smart Economy	Economy	Smart Economy
Smart Governance	Governance	Smart Governance
Smart Environment	Natural Environment	Smart Environment
Smart Living	x	Smart Living
Smart Mobility	x	Smart Mobility

iii. Critical Approaches to the Smart City

The vision that the smart city paints is obviously an attractive option for municipalities looking to devise rather quick and intuitive solutions to endemic urban problems. The idea that with some help from technology, long standing social, political, and economic issues can be solved is tempting for municipal administrators and involved stakeholders to immediately adopt and implement. However, the reality is not that simple with many critical perspectives arising around the Smart City concept, namely against the overly idealist vision of a technologically centric city (Townsend, 2014) with some arguments claiming that the concept is more of a

promotional tool that has been utilised by private actors across several industries to entice municipalities to contract their services, rather than being a practical and beneficial tool that focuses on the improvement of the overall wellbeing of urban residents (Hollands, 2008; Greenfield, 2013).

Connected to such critiques, especially those concerning the lack of participation and the sharing of benefits by citizens, a more recent vision of the smart city putting an emphasis on the shifting of power to citizens has come to life (Cardullo & Kitchin, 2019, p. 8; Townsend, 2014). From this perspective, input from local residents serves as a counterweight to the techno-centric, top-down approach. Smart city initiatives are thus increasingly presenting themselves as citizen-centric, claiming to generate more informed citizens, foster creativity, inclusivity, empowerment and participation. The critical discourses that confront the predominantly positivist claims and dominant depictions of smart city developments allude to a post-political space of technological solutionism for urban problems (Graham, 2002; McFarlane & Söderström, 2017) in which the related processes of datafication and digitisation of the urban environment have been tied to solving problems of efficiency, safety, and convenience while simultaneously empowering citizens to improve their lives (Vanolo, 2014; Verrest & Pfeffer, 2018). Opposing perspectives argue that marketing strategies and ideological assumptions put smart cities at risk by creating governance structures that are overly dependent on technological interventions as the end-all solution for diverse urban problems, highlighting questions of how privacy issues may be more detrimental for marginalised residents who are sidelined out of dominant discourses (Verrest & Pfeffer, 2018).

More generally, how actual residents living in smart cities perceive and experience this intensifying data hungry environment, or more broadly how and with what particular nuances of the smart city concept, are not being adequately addressed neither by academic nor corporate perspectives (Han, Jee, & Jeong, 2021; Kitchen, 2014; Hollands, 2015; Hollands, 2008). According to a systematic literature review of technical, peer-reviewed smart city publications by Mullagh, Thomas, Wang & Dunn (2016), citizen perspectives were found to be largely excluded from both academic and internal smart city discourses, and were typically only integrated or included in the design phase, after the intended technologies to be used had already been decided on and well into the process of being developed. Typically the contributions of residents were only implicated within a set of narrow methodologies and while “true co-design, which invites

participants to design with scholars and practitioners from the outset of a project, was entirely absent from the literature (ibid, p. 2). Similarly, Richter et. al (2019) demonstrates with residents of Amsterdam the huge divide between experiences of the smart city and growing digital infrastructure, highlighting the fact that smart city residents are largely absent from the conversation and are only included after technological solutions have been implemented, corroborating the position that smart citizens are not truly at the heart of the smart city, but their ability to (unwillingly or willingly) provide data fuel for the smart city is essentially being treated as a more valuable resource.

This transition from data-informed to data-driven urbanism has normalised the secondary position for residents of smart cities to serve as instruments, and establishing data collection and surveillance practices (Kitchin, 2016) while cementing the dominant positioning of private investment interests to shape and technologically enable the city to their benefit as they see fit (Söderström, Paasche & Klauser, 2014). From this perspective, the problem is less grounded in the generated data itself, but more with the "uncritical, ahistorical, and aspatial understandings of data often promoted within smart city imaginaries," which have been repeatedly recycled over time to frame urban developments and in the field of urban studies to appear more coherently "scientific" (Shelton, Zook & Wiig, 2015, p.22). As Greenfield (2013) delineates, the measure of intelligence that a city retains is derived from its citizens, not from a collection of technological apparatuses and smart city concepts that might do more to stifle that intelligence than anything. Moving towards an updated conceptualisation of the smart city, Sassen (2017) underscores the importance of the "third space" which imagines a smart city as an incomplete entity made up of a collection of small changes produced from the ground up and reveals the importance of urbanising new technologies in horizontal ways. But where are the resident perspectives in this process and how have residents been integrated in the existing smart city research paradigm?

iv. Fueling the Smart City

This thesis implicates the residents of Madrid as 'resident experts' as it is already a widely accepted idea and implemented practice that residents are capable of greatly supporting the efforts of stakeholders and decision makers to produce more impactful solutions and effective services as they have first-hand experience and local knowledge of the addressed issues (Innes & Booher, 2007). In contrast to the 'smart city 1.0' characterised by a more centralised, top-down

approach emphasising technology and economic growth, 'the smart city 2.0' is a "decentralised, people-centric approach where smart technologies are employed as tools to tackle social problems, address resident needs and foster collaborative participation" (Trencher, 2019, p. 117) Although the actual "smart citizens" living in smart cities are implicated in the central core of many of the smart city definitions and are often assumed to be proactively involved and technology-savvy (Zandbergen & Uitermark, 2020), there is a concern that they are only considered in a post-political framework as instruments that contribute data, provide feedback, and participate in the smart city mainly to maximise the goals of growth and efficiency (Cardullo and Kitchin, 2017; Roitman et. al, 2012).

For example, it is not uncommon for initiatives to recruit residents to become sensors to gather information about the state of their environment or day-to-day movements. This is exemplified by such an initiative that deployed wearable air quality sensors to engage Copenhagen residents in "sensing activities" that implicate them in the scaling up of technologies as participants in collecting data (Trier and Jenkins, 2020). Another similar example was the Utrechtsestraat initiative in Amsterdam which purported to publicly display energy consumption following changing weather conditions over time by equipping the busy thoroughfare with smart motion sensors and assigning local residents as users (Mancebo, 2020). And yet, we have to consider the set of interests behind such projects and whether or not these technical interventions are actually in line with what residents in smart cities are actually hoping for, or if they are simply being imposed upon residents after the fact.

This positioning of urban residents as needing to utilise technology more and more every day to communicate and move through the smart city, entails a behavioural and spatial pathway of digital footprints that brings up questions of how residents respond to the idea that their information is being collected and used. The unequivocal integration of varied data-collecting and sensing technologies into the urban environment resulting from the evolved form of urban entrepreneurialism positions corporations, technology providers, and other relevant actors with profit motives as problem solvers while assuming urban residents will both want and benefit from this techno-solutionist model (Hollands, 2015).

This sliding scale of potential roles that residents play in the smart city could be shallow or invoke deeper connections from providing feedback on already decided project proposals to directly participating in decision making processes as co-creators (Cardullo and Kitchin, 2019).

Cities have also made great strides to include residents in decision and policy processes, with civic engagement and civic hacktivism initiatives being pushed forward by smart city proponents who are already focused on presenting them as "citizen-centric," with the aim of stimulating a socially inclusive, innovative, and participatory environment often through the strategic use of ICT (Townsend, 2014, p. 8).

For example in the city of Barcelona, co-creation of urban solutions and policies is expressed as enhancing a mutual democratic dialogue between residents and the city through initiatives like Decidim Barcelona, a portal aimed at enhancing public participation processes, or by organising promotional events such as Smart City Week, which aimed to familiarise residents with the goals of sustainability, fairness and inclusivity of the wider Barcelona Smart City project (Noori, Hoppe, & De Jong, 2020).

Meanwhile, in Dublin, Ireland, attempts to integrate co-creation alongside residents or community organisations through short-term interventions such as hackathons or living lab projects are often lead by corporate sponsors who have the financial ability, technical expertise and guidance at their disposal while focusing more on producing scalable or cheap business solutions rather than actually trying to identify the root causes of issues that are most pressing to Dublin residents and negotiating community-led solutions (Cardullo & Kitchen, 2019). As Mancebo (2020) points out, private actors that are more often than not sponsoring and providing the technologies in collaboration with the municipality and its technical partners raises the question of how such a project could be labeled as "grass-roots," simply because residents who might have been completely unaware of such interventions were involved.

As awareness plays a large role in the wider acceptance and eventual adoption of smart technologies in the daily lives of residents, a rather low understanding of their use value can equate to higher mistrust and eventually can pose a threat to their successful implementation, even if made with the best intentions (Habib, Alsmadi, & Prybutok, 2020). Further threats brought on by the perspectives of residents towards the technology such as distrust in its purveyors, lack of knowledge about its functions and final utility, and related privacy concerns can threaten its intended and effective long term application as these factors constitute trust in a data enabled version of the smart city (Habib et. al, 2020; van Zoonen, 2016). Although multiple case studies demonstrate new advances in ICT technologies are playing a greater role in urban

systems, most smart city strategies fall short of successfully integrating perspectives from local needs, particularly in the areas of privacy and security (Angelidou, 2017).

These concerns are particularly salient in relation to the extensive spread of smart surveillance and digitally enabled technologies, or what Greenfield (2013) identifies as "everyware," in which increasingly amount of sophisticated and rich data is derived from people's decisions, behaviors, purchases, and movements throughout the urban environment and are consistently harvested and analysed in the name of optimisation. Critical scholars have called attention to the potential implications for social, ethical, and human rights risks and the limitations of decision-makers' and public officials' abilities to critically assess the implications of such technologies being pushed under the banner of the smart city arguing that smart citizen empowerment, bottom-up participation, and privacy concerns are being neglected (Galdon-Clavell, 2013).

v. Smart Cities, Smart Virus

Furthermore, the COVID-19 pandemic has added and accelerated a new layer of concerns, undoubtedly influencing future expectations of the smart city as patient tracing, quarantine enforcement, travel restrictions, social distancing monitoring, symptom tracking (Kitchin, 2020), and a host of novel tracking mechanisms such as digital vaccination certificates, still remain to be fully developed and have in recent months exponentially grown in importance, particularly for urban areas. These practices with familiar notes of smartness are set forth as public health measures, forcing cities to decide between the extensive use of technology to manage their populations or enforcing crippling lockdowns that both damages the overall economy and disproportionately affects marginalised groups (Sonn and Lee, 2020).

Even more widely, the COVID-19 pandemic has exposed the weakest points of long standing urban issues across the mainstream smart city dimensions, particularly for city governments needing to suddenly revamp or even introduce robust urban digital infrastructures such as e-government services, mobility management, and monitoring of tightly occupied public spaces, making for a great justification for local governments to shift urban development strategies and priorities, solidify digitalisation and push for rapid smart city development (Kunzmann, 2020). Particularly in Europe, the pandemic has exposed the major weaknesses and shortcomings of longstanding governance structures and processes across many levels to respond

both effectively and unanimously in a consistent manner. Particularly in terms of digitalisation, with the EU Commission and national governments are expected to intensely fund increased smart cities research, maintaining the position that further technological interventions could be the perfect facilitator for post-pandemic economic growth (ibid).

Already in Spain, new technological developments that utilise mobile crowdsourcing technologies which derive collectively shared data from either social media postings or other personal shared information such as GPS location from residents are being increasingly explored as existing lockdown and social distancing measures fall short of producing the necessary results (Cecilia et. al, 2020). And yet, the reassuring connection between adopting potential smart solutions to respond to the spread of COVID-19 and overall future growth is seemingly unfounded as these technologies are mostly rapidly implemented with limited testing that is mostly "simulated rather than 'in the wild' and concerned with whether the technology functions, rather than whether it is an effective solution or its other effects" (Kitchen, 2020, p. 365). Already in the pandemic era, it is impossible for many to escape their computer, mobile phones, and almost exclusively must utilise technology to adapt to changing work, study, shopping, communication, and mobility patterns to name a few areas.

vi. Smart City Reality: Perspectives from Resident Experts

Despite the many definitions of the smart city, for the purposes of this thesis I will adopt the framework employed by Richter et. al (2019) that conceptualises the smart city as an urban information structure, as both "information systems and infrastructures have come to transcend the boundaries of formally circumscribed organisations, such as one company, one government department, or one country" (p. 123). This "system of systems", where the conglomeration of data collecting and surveillance enabled ICT infrastructures and mechanic, quantifiable systems are superimposed upon the city, approach the smart city as an efficient machine needs to be constantly reconfigured and managed to the needs of its administrators, rather than adapting to the stated needs of its residents (Söderström et. al, 2014, p. 308). As Wilson (2011) argues, the urban is increasingly software, or more precisely that an increasing number of movements and interactions taking place within cities are being guided by a set of software instructions and codes. Along this same line of thinking, the term "smart cities" could be more accurately positioned as "instrumented urban environments," calling attention to the fact that it is not

necessarily “the city” that defines itself as a smart city, but rather an evolving pantheon of participants that could include not only private corporations, but also potentially public institutions and academic researchers (Dalla Corte, van Loenen & Cuijpers, 2017, as cited in Taylor, 2018, p. 3). In contrast to the entrepreneurial and overwhelmingly optimistic vision of smart cities, or “smartmentality” that emphasises sustainable prerogatives and seemingly admirable objectives of enhancing efficiency, safety, and democratic citizen engagement (Vanolo, 2014); it is precisely these same objectives that demand a constant intake of scrupulous, dense, and potentially intrusive information surrounding all elements of the city, including its residents (Wood, 2013).

As implied, related to these criticisms are the concerns that citizens are not afforded sufficient opportunities to participate in the construction of the smart city or in the reaping of the benefits, which has largely led to an increased focus in academic literature on the shifting power relations towards the inclusion of local resident inputs as a counteracting force to the techno-centric, top-down dynamic (Cardullo & Kitchin, 2019; Kresin, 2016). And yet, despite the last couple of decades of research on the evolving smart city paradigm, we still know relatively little about residents’ perspectives of smart cities, their “lived experiences of this techno-historical transformation,” (Barassi, 2019, p. 426) and in the day to day life between the overlapping physical and digital spaces of the smart city (Richter et. al, 2019). Related to this lack of participation of residents is questioning to what extent are residents themselves are actually benefiting from the variety of smart city initiatives taking place around them, accentuating the calls for residents and citizens to play a greater role in the future vision of the smart city (Townsend, 2014; Cardullo & Kitchin, 2017).

This shift is what some scholars name as a need to re emphasise the ‘urbanism’ side of ‘smart urbanism,’ and to move away from a technical, policy, or economic focus (Joss, Cook & Dayot, 2017; Luque-Ayala & Marvin, 2015) towards a more nuanced understanding of how existing forms of technology and urbanisation come together in locally grounded Smart City contexts and their impacts on the everyday life of the urban resident (Verrest & Pfeffer, 2018). McFarlane & Söderström (2017) articulate this gap as a much-needed push towards a “knowledge-intensive smart urbanism” that balances the role between technologies and local knowledges that instead positions smart cities and their digitally integrated and data collecting infrastructures “in the service of social improvement” (p. 29).

In cultivating a more knowledge centric urbanism that includes the perspectives of residents, I would utilise the concept of a "sound data infrastructure" which is a more suitable future vision for what a smart city infrastructure that acknowledges urban residents do not make all the same choices or share the same practices when engaging with technology in the city (Taylor et. al, 2016). As Taylor et. al (2016) further elaborates, the issue of privacy in relation to space will have greater importance and "will influence the behavior of people within it. Urban spaces will exist on a continuum of more- to less-surveilled, with their position on that continuum influencing the way people use them," particularly as we gradually adjust to a yet to be materialised post-COVID world (p. 32). The related issues of privacy and trust in relation to the smart city infrastructure also have particular saliency for marginalised urban residents as infrastructure almost always excludes certain groups of people (Aanestad, Monteiro & Nielsen, 2007). Rather, the delivery of technological services to residents are mostly unsuccessful, largely because of the lack of knowledge of their needs and instruction about smart services that ultimately lead to a smart environment being only accessible for users with the most economic or knowledge resources (Han, Jee, & Jeong, 2021).

As local residents, or "insiders" are most likely to be in the position to accurately assess what priorities are desirable or undesirable for their communities and wider city, it can be contended that the most successful, most "smart" cities will be the ones that are constructed with the direct participation and input of local actors and stakeholders alongside the residents themselves (Lara et. al, 2016, p. 10). In order to negotiate a future where residents are required to live, make choices, and engage with an urban environment laden with multiple and ever changing digital and data collecting technologies, it is important to inquire how they perceive the concept of the smart city itself and its connection to its related and emerging infrastructures with important implications for the uses of their data (Kitchin & Dodge, 2011).

v. Research Gap

While the idealistic goal of smart cities is evidently to make overall urban life more streamlined for urban communities while simultaneously reducing financial and environmental impact through a broad combination of both technological and non-technological mechanisms, the concrete perspectives of how residents continue to conceive of the subjective concept of the smart city itself and their ongoing experiences interacting with and use of its manifestations are

not as expressly articulated. In addition, despite the several existing frameworks that serve to assemble a series of sharply outlined, compartmentalized directions of smart city initiatives, they still fall short of situating the nuanced perspectives and concerns of smart city residents such as whether or not residents are even aware about using smart city initiatives or if their expressed needs or concerns are being adequately addressed.

Too little focus has been given to the concrete or technical impacts on residents of the everyday utility of existing smart services, and whether or not they are actually benefiting or even relevant for residents in the first place. In addressing this gap that implicates not municipalities, politicians, or private sector actors that typically only consult residents after the fact, but what local residents themselves expect from and know about the smart city concept, and how existing initiatives address their needs, we can move towards a future smart city model that takes into which priorities are most applicable for its own residents and what precisely makes the city "smart" (Han, Jee, & Jeong, 2021; Lara et. al, 2016; Kitchen, 2014; Kitchin & Dodge, 2011; Hollands, 2015; Hollands, 2008; Mullagh, Thomas, Wang & Dunn, 2016; van Zoonen, 2016; Belanche-Gracia et. al, 2015)

3. Methodology:

i. Research Design: Qualitative Research

In comparison to quantitative methodologies, which typically focus on testing developed models that demonstrate clearly isolated cause and effect structures, or are primarily based upon statistical or numerical analysis of clearly measurable and quantifiable phenomena, qualitative research methods conversely consider the viewpoints and practices observed in the field that can vastly differ based on subjective perspectives and a wide range of social backgrounds related to those obtained perspectives (Flick, 2014). Furthermore, as Saldaña (2011) points out, qualitative research combined with an inductive thematic analytic approach is typically informed by a constructivist and interpretive research outlook which negates against the idea of essential truths and instead concedes to the fact that the generation of knowledge is an entirely subjective process that is gradually assembled according to the many elements that contribute to the formation of a particular context and perspective.

And yet, knowledge can be furthered by attempting to examine and make sense of the individual and collective experiences, perspectives, and perceptions of highlighted phenomena through the processes of direct interaction and interpretation. Thus, as Seidman (2012) elaborates, qualitative research is most appropriate when we are interested in other people's stories, and by extension, a section of their personal experience and reflection engaging in a particular phenomena or set of practices and beliefs. Unlike the lifeless subjects that typically characterise natural science research, the residents of a smart city are the focal point as subjects of this research, each with their own innate ability to formulate and express their own ideas concerning a particular phenomena in different ways and thus warrant a qualitative approach (Seidman, 2012).

Initially, this thesis was envisioned to be an ethnographic inquiry into how residents of two or more smart cities perceived the smart city aims and what their experiences have been with such initiatives. In addition to semi-structured interviews the intention was to combine this form of data collection either with observational journals and/or participant observation to incorporate the element of how residents precisely interacted with some of the mentioned smart interventions or physical smart features of the city. However, there were several obstacles that were not foreseen and made that this was not a practical venture and are further detailed in the scope of research section. The entry point focus shifted towards identifying initial potential resident experts who were willing to be interviewed through the many "asociaciones vecinales" [neighborhood associations], where each barrio within the Centro district hosts their own platforms, events, and networks of participating residents.

ii. Research Questions

The primary objective of this paper attempts to bring citizen voices into the wider smart city research paradigm by addressing the localised perspectives of residents living in smart cities, in this case, the capital smart city of Madrid. Therefore, this thesis attempts to address the following questions:

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i. How do Madrid residents as local experts perceive the smart city concept?
    a. What do residents expect of future versions of smart cities?

b. Which specified issues are most important to address according to residents living in Madrid?

ii. How do residents living in Madrid perceive the increasing use of digital data?

The first question attempts to prospect residents' degree of familiarity as local experts with the concept of the smart city while taking into account their initial perceptions of the concept and learning about residents' level of awareness and engagement with the smart city in terms of how they utilise existing smart services.

The following two sub-research questions seek to probe residents' expectations surrounding the applications of 'smartness' in their community. These questions are intended to force residents to consider the current state of existing urban problems that are perceived as the most pertinent and identifiable in their immediate environment. The discussion is intended to address the limitations and expectations for what the smart city is capable of addressing in the Madrid context and therefore, examines residents' projections of which kinds of characteristics they would like to see in future versions of their city.

Lastly, the final research question aims to implicate the connected role that existing and emerging technologies, particularly those that implicate the collection and integration of geographical, mobility related, health related, and a whole host of data sources that could be perceived as being particularly 'private' or 'personal,' can often play in the procurement of smart city services. In particular, this paper seeks to investigate how residents would perceive and feel about the use of their own personal data in exchange for smart services or if they conceive of other avenues for addressing local problems.

iii. Data Collection & Analysis

To investigate residents of smart cities perspectives of the smart city concept and its related themes, qualitative research in the form of semi-structured interviews are the principal chosen methodology to carry out the collection of data. In regards to chosen methodology, this paper aims to address some of the gaps in previous research in the area of smart cities, which has typically been approached from a one-size fits all perspective, emphasizing the readings of "corporate or government documents, rather than interview, ethnographies, or genealogies that that would add substantive insight" (Kitchin, 2014, p.134). Additionally, previous research has

engaged too little with the humanistic side and critical narratives and practices of "smartness," instead predominantly focusing on the technical, political, and market conditions of the smart city (Luque-Ayala & Marvin, 2015).

Considering that the research questions of this paper are formulated primarily to seek to understand residents' feelings, beliefs, experiences, and often includes their understanding and reflections of their perspectives on a whole range of related themes that could be, but are not limited to family, work, movement, personal identity, and social life, qualitative semi-structured interviews will be employed for this research (Alsaawi, 2014). Even more, as Flick (2014) contends, the use of qualitative semi-structured interviews are one of the only methods for collecting data when one is primarily seeking to examine the multi-faceted perspectives of individuals contextualised within their own personal histories or experiences that are often connected to a specific location or set of circumstances. Through semi-structured interviews, it will be possible to manage the content to be discussed by interview participants, while still allowing them to convey their perspectives, ideas, and personal experiences in new, but still related pathways with the overall goal of identifying and analysing recurrent themes, high-order patterns, and relationships among these themes (Flick, 2014). In addition, as qualitative semi-structured interviews could be utilised as much to consider experience, meaning and the reality of participant experiences, they can be used to investigate how these experiences, 'realities' and meanings might be informed by discourses, assumptions or ideas which exist in wider society (Braun & Clarke, 2006).

Data analysis was conducted based on an inductive thematic approach outlined by Braun & Clarke (2013). In the context of exploring the perspectives of residents living in the smart city, thematic analysis was identified as the most pragmatic approach as it enables researchers with a constructivist position to analyse both the explicit and latent meanings that residents relate to their experiences and perceptions, the role and significance the topics that the research questions sets out to investigate plays in their individual lives and more broadly, the social constructions of these themes. Following the interview sessions, the transcripts were compiled in a single document to facilitate the coding process and grouped by thematic questions. Depending on the linguistic abilities of the resident, the interviews were conducted in both English and Spanish, with all translations to English being conducted with sensitivity on the content and meaning of responses, utilising the Royal Spanish Academy's dictionary as needed. Next, the transcripts

were read repeatedly several times before first identifying overarching themes. After several rereads of the interview transcripts, the initial identified themes were then later refined to ensure they took into account patterns of meaning, repeated themes, relationships, grouped categories, as well as statements that diverged from other respondents or posed a disruptive question. This recurring process was repeated until all possible profits from the collected data sample were extracted, thereby once data saturation was achieved (Flick, 2014).

iv. Sampling Process

I aimed to find a certain composition of participants in terms of socio-demographic diversity that corresponded to the Centro district. Two basic criteria were set, namely the exclusion of tourists who were visiting the city and instead identifying residents who were currently residing in one of the barrios that constitute the Centro district. In order to receive a certain representative sample of the population, a socio-demographic analysis of the case study unit was conducted in order to identify a certain composition that mirrors the reality of the several geographical neighborhoods that constitute the Center. This follows the logic of 'maximum variation' where Seidman (2012, p. 56) suggests that "...the range of people and sites from which the sample is selected should be fair to the larger population." Thus, the sample is not representative of the population but followed this logic as much as possible to fulfill the criteria of population composition in terms of age, gender, and education within the Centro District of Madrid.

Selection of interview participants was highly opportunistic and employed a mixed approach which consisted of physically approaching people on the streets and plazas to request an interview. Following consultation with the thesis supervisor, I aimed to identify between fifteen and twenty participants. After soliciting interviewees on the street proved to be unfruitful, I approached several local neighborhood associations corresponding with each of the barrios within the Centro district which included: La Asociación Vecinos Cavas La Latina, Asociación Vecinos Sol y Barrio de las Letras, Asociación Vecinos Chueca, and Asamblea Ciudadana Del Barrio de Universidad. I identified myself as a Master student researcher and prepared a general overview of the aims of the thesis with a request for potential participants who would be willing to participate in an approximately 30 minute interview.

v. Scope of Research

There were several empirical limitations that included elements of access. The first obstacle was that there was simply not enough available resources and time to be able to select more than one case study site. Initially it was intended to follow a comparative approach to people in several or at least two Spanish smart cities. However, the ability to make the appropriate travel arrangements outside of the Madrid region were dubious and unstable at the time, so the scope of the thesis was practically reduced to adopt a single case study approach.

Secondly, approaching potential participants in the street and screening their applicability as interview respondents by confirming their status as residents in the Centro District while also providing up initial informed consent proved to be too time-consuming and initially did not result in neither rich data nor agreeable participants. The vast majority of the approached people on the street lost interest rather quickly and were either completely unaware of the topic, too occupied to stop and participate in the conversation, or expressed considerable hesitancy to agree to such interviews on the public street after being given the informed consent. In addition, the social distancing requirements and rising case numbers brought on by the ongoing pandemic made it uncomfortable and potentially unsafe for both parties, the participants on the street and for myself, to be repeatedly exposing ourselves to multiple interactions with strangers in a short period of time. While this paper lamentably focuses on a single stakeholder, the residents, further studies could follow a more integrative approach that includes additional stakeholders such as academics, business leaders, or members of the municipal government (Calzada & Cobo, 2015).

Finally, the last main barrier faced was with approaching how to make concrete observations of residents participating and/or interacting with the smart city through some of its initiatives or programmes. Despite some of the official sanctioned smart projects underway or having been already implemented in the urban space of Madrid such as smart municipal services or citizen participation platforms such as Decide Madrid, it was challenging to observe residents actively engaging with these platforms and features of the city.

4. Single Case Study Analysis: Smart City Madrid

Recognizing the need to ground critical Smart Cities research within specific geographical contexts with particular localised challenges, concerns, and perspectives of the

often-side-lined citizens, this paper was envisioned to be an exploration of people's familiarity with the impressions, expectations of, and narratives in the data-enabled smart city (McFarlane & Söderström, 2017), and thus a single intrinsic case study approach using resident experts living in the Centro District of Madrid Smart City and their perspectives surrounding a specific phenomenon in-depth of the smart city in depth was adopted (Crowe, Cresswell & Robinson, 2011). The case is selected not due to its representation of other typical smart cities examples, but because of its uniqueness in potential to further develop a distinct pathway of smart city as outlined by the following sections. The research aims to address the mostly unincorporated voices of the urban citizens living and experiencing the continually developing smart city while also adding to the emerging critical body of literature.

i. Madrid City Profile

Cities around the world are undergoing an intense period of digital transformation without precedent. In the case of Spain, its capital city of Madrid has similarly undertaken a decades long transformation process through strengthening several core areas including technology, demography, physical infrastructure, and social and economic structures with the goal of positioning itself as a competitive city through offering an advanced service-based economy and serving as a national and international communication hub. In addition to being one of the largest cities in terms of population within the European Union, only after Berlin, and the largest city in Spain with an official population of 3.334.730 residents, Madrid is also considered to be the most wealthy in terms of nominal GDP per inhabitant for the year 2019 at 35.913 euro, greater than both the Spanish national average of 26.426 euro and the European Union average of 31.160 euro (INE, 2020a). The municipality of Madrid is a part of the more encompassing Autonomous Community Madrid that further constitutes one of 17 autonomous communities that comprise the Kingdom of Spain. It is important to consider that along with the officially registered 3.3 million municipal inhabitants, an additional estimated 1.4 million or more 'floating population' that may reside in other municipalities but regularly comes to the capitol for a variety of reasons some of which include work, study, and tourism, and share great relevance for the demand public services and infrastructures (Ayuntamiento de Madrid, 2009). Moreover, out of all the 17 autonomous communities, Madrid registered the highest growth rate in terms of GDP per inhabitant in terms of volume (2,6%) while also being the highest

contributor to overall urban population growth in the country due to both natural growth and net migration to Spain for the entire period of 1981-2019 (Banco de España, 2020).

In Spain, accelerated urbanisation has been in part stimulated by an exodus in its rural population that has long been rapidly declining for decades, sharply beginning in the 1950s until the early 1980s, with the country's largest cities such as Madrid, Barcelona, and Sevilla disproportionately facing the mounting challenges of urbanisation and signaling a dire need to develop corresponding solutions (Collantes & Pinilla, 2019). The largest municipal population growth occurred during 2000 and 2010 when it reached a high of 3.273.000 residents, largely in part fueled by the world economic crisis of 2008 that plagued this time period and attracted more residents from rural and smaller municipalities to the capital.

According to the World Bank (2019), already 81% of the total population of Spain is considered to be living in urban areas while the Instituto Nacional de Estadística [INE] (2020a), Spain's official body charged with monitoring statistical information regarding demographic and economic aspects of Spanish society, accounts for as much as 90% of the Spanish population (47.351.567 inhabitants) as living in urban areas that conversely make up only 12% of the country's area. Further consider that out of the almost entirely urban population, just two of the largest metropolitan areas in the country, Madrid and Barcelona, constitute 23% of the national population, or in other words, at an officially accounted for level almost a third of Spanish society is living in just these two cities.

This state of urban Spain foregrounds the pressure brought on by territorial imbalances in line with worldwide trends towards increased urbanisation and raises important questions surrounding the viability of its environmental, social, and economic systems and more generally, the future of these particular urban regions within Spain.

ii. Selection of Central City District

One of the most fundamental ideas within the field of urban studies is approaching the city as a complex and adaptive system made of numerous and complex human interactions, behaviours, and use values that are often mediated and made possible through specific physical spaces (Jacobs, 1961). The ideal technologically enabled smart city moves beyond this conceptualisation, superimposing a layer of enabled ICT infrastructures and systems that can gather information about these interactions, behaviours and uses, enabling a structure that allows

the city to constantly be revised by both its administrators and its residents (Richter et. al 2019). The urban city center is potentially the space where many European capital cities compress a collection of social interactions and processes.

Urban centers are also showcasing sites that are particularly demonstrative to the typical problems plaguing cities such as traffic congestion, ongoing privatisation of public space, and strife within social and political relations that make them both attractive and essential parts of European cities and as a result, are often a product of disorderly urban growth and are consequently, concentrated sites of urban change (Tanrıkul & Hoşkara, 2019; Borja, 2013).

Particularly for the organisation of mobility for people and products, companies, particular services, enactment of social relations, and symbolic value, urban centers are particularly important (Borja, 2013). The multifunctionality of the city center attests to the particular development trajectory of a given locality, so that its position as a central space is not just from a physical perspective, but also as a space that structures how residents form relationships within their own communities and relate to their own identity.

The proliferation of initiatives that could be considered as being "smart" could also have a profound impact on not only the development trajectory of the city but also the living and environmental conditions, physical and social structures of neighborhoods, and perhaps most importantly, the everyday public and private lives of residents experiencing the gradual transformation of their spaces. And yet, since what constitutes “smart” is not universally agreed upon or recognised as such in the physical realm of urban space, it can be difficult to observe the smart city itself and situated practices of smartness. Thus, for the purposes of this thesis the case study site chosen for analysis within the context of Madrid is its corresponding urban city center, Distrito Centro.

iii. Socio-Demographic Population Composition

Neighborhoods, or in Spanish, *barrio* is the term that municipalities utilise in their statistical and administrative applications to outline the smallest spatial units that are housed within the larger District or *Distrito,* units. The Distrito Centro (01) is administratively characterised as the first of 21 districts that constitute the entire Madrid municipality and further consists within itself of six neighborhood units as follows: 011 - Palacio, 012 - Embajadores, 013 - Cortes, 014 - Justicia, 015 - Universidad, and 016 - Sol. There are also further informal and

distinctive spatial units within the barrio scale, such as the informal *Lavapiés* area within the administrative Embajadores barrio or *Barrio de las Letras* area within the Cortes barrio. The Centro District has an officially registered population of just 141.323 inhabitants (as of 1 January 2021), from which 69.238 (49%) are women and 72.085 (51%) are men, having added approximately 10.000 residents in just the last 3 years, and is home to one of the highest residential densities within the entire municipality at 269 residents per square hectares (Ayuntamiento de Madrid, 2020a).

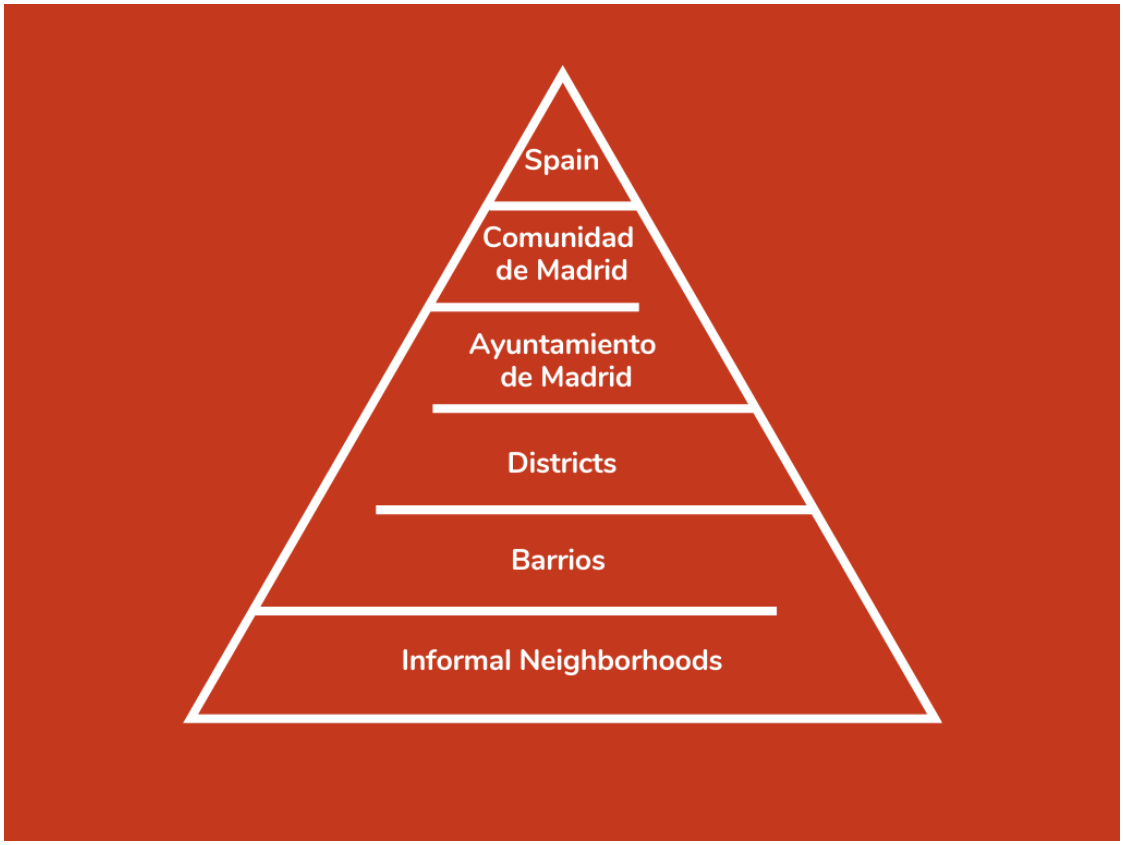


Figure 1: Spatial Units within Smart City Madrid | *Source: Author's Own Elaboration*

Figure 2: Neighbourhoods Spatial Units within Centro District of Madrid | *Source: Ayuntamiento de Madrid, 2020b*

The Centro district shares a combination of the lowest birth rate in the entire municipality (6.13 compared to city average of 7.78) and negative natural growth rate (-2.76) together with being the highest indicators for overall net migration and immigration rates at values of 29.96 and 109.36 per one thousand inhabitants respectively, compared to the city wide values at 2.82 and 60.34 per one thousand inhabitants, respectively (Ayuntamiento de Madrid, 2020a). This translates into a district with a considerable low number of children permanently residing and that is primarily growing in size not due to natural growth of households but rather, due to inbound migration flows.

There is a high number of foreigners in the District as of 1 January 2021, compared to any district in the municipality that represents approximately 26,03% of the population (15,8% on average in Madrid) with the Sol barrio hosting the highest share of foreigners (32.23%). Of this foreign born population in the district, those that are considered statistically as immigrants, that is, that do not come from other countries belonging to the European Union or the OECD region, are only 12.9% (8.4% in the Municipality) and are sizeable communities mainly of Bangladeshi, Venezuelan, Colombian, Chinese, as well as considerable Filipino, Moroccan, and Romanian communities in smaller percentages (Ayuntamiento de Madrid, 2021).

In terms of age, the distribution of the number of inhabitants that fall within the range between the ages of 25 and 39 (44,854 inhabitants) constitute one of the highest age groups within the district (approximately 32%), surmising that larger families units are moving further away from the city center and are being replaced by younger people (Ayuntamiento de Madrid, 2020c). Considering other wide ranges of ages groups, the district is composed of 7.51% of 0-15 year olds, 76.94% of 16-64 year olds, and 20.57% of residents over the age of 65 or higher with an overall average age of 42 years old (Ayuntamiento de Madrid, 2020d).

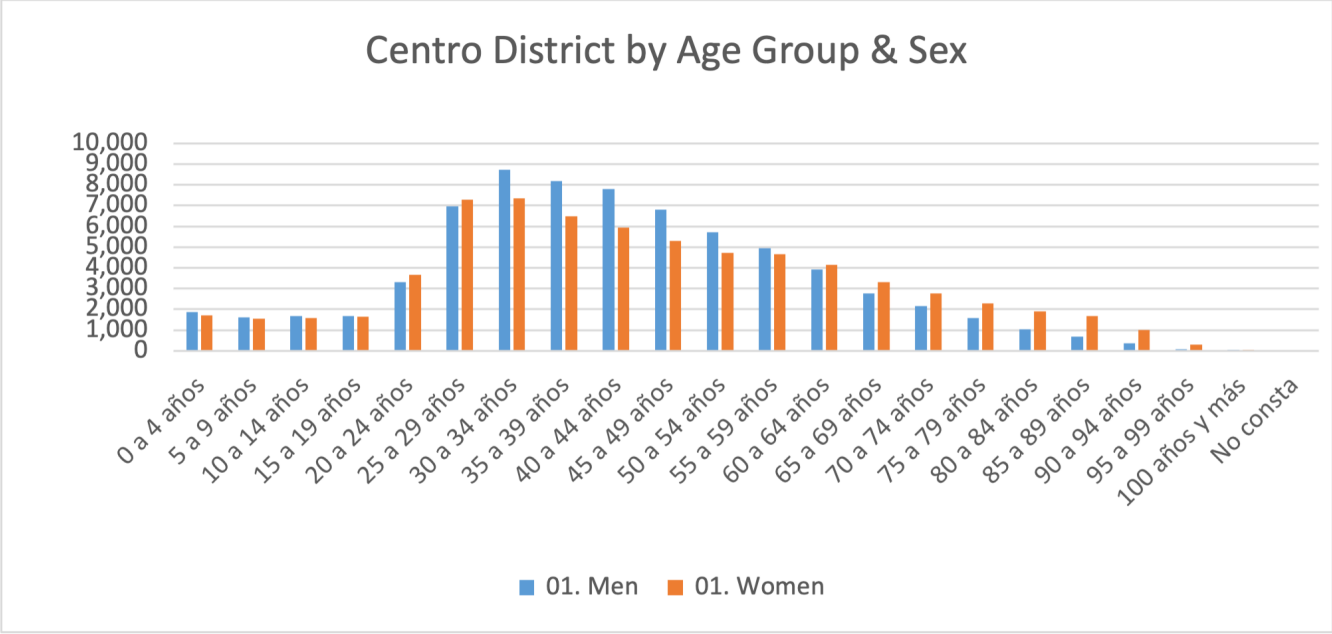


Figure 3: Distribution of Residents by Age Group & Sex in Centro District | Data Source: Ayuntamiento de Madrid. (2020c)

In terms of higher education, the Centro District again exceeds the city-wide average since at least 48.5% of male and 49.5% of female inhabitants have attained this level of education, compared to 36.6% and 35.7% respectively for the wider municipality. Simultaneously, the proportion of inhabitants whose education level is at the primary level or below represent 29.65% of the district's population, significantly lower than the municipal average of 40.5% (Ayuntamiento de Madrid, 2019a). However, despite having higher education levels, this does not necessarily translate into higher average yearly household income with the Central District at 36.072 euro compared to the higher municipal average of 40.083 euro (INE, 2018).

iv. Smart Indicators

One important indicator that can help provide an accurate vision of how smart cities are being applied and adopted in the everyday life of cities in the techno-centric side of the smart city is by looking at to what extent households are connected to the internet. By examining at the only available indicators at the level of the Comunidad provided from INE's National Survey on Equipment and Use of Information and Communication Technologies in Households (2020), compared to other members of the European Union, Spain performed quite poorly in this indicator not that long ago in 2014 with almost 4.1 million homes or approximately 25% of Spanish households without internet access and becoming quickly excluded from the rapidly digitizing world, falling within the lower range within the bloc of 28 European Union countries and even further behind other major world economies including Canada, Australia, the United States of America, Singapore, and Japan (EuroStat, 2020; INE, 2014). Generally, it can be observed that there was a substantial digital divide between the national and comunidad level, with Madrid households enjoying greater rates of internet access.

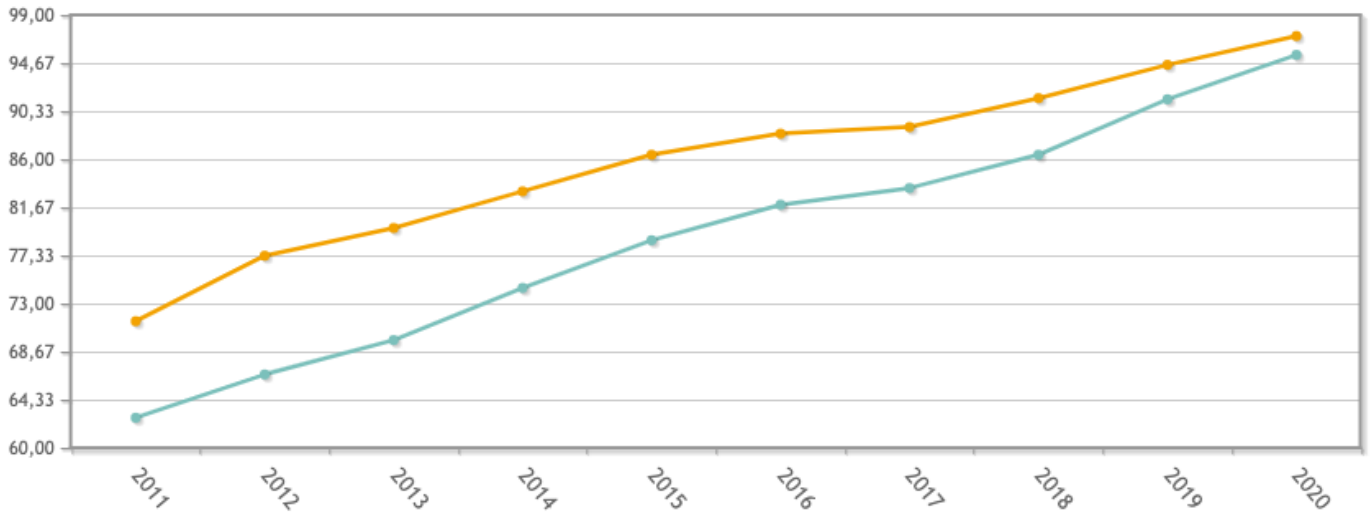


Figure 4: Evolution of Households with Internet (National [Blue] vs. Community of Madrid [Orange]) | Data Source: (INE, 2020b)

And yet, less than decade later, there has been dramatic change towards the opposite direction in 2020 with both national and comunidad levels reaching almost equivalent levels of households with internet access at 95,4% and 97,1% respectively (INE, 2020b). At the same time, 86% of households in the Comunidad Region own some type of computer or laptop device, while it can be said that the use of mobile devices can now be considered essentially universal in 2020 among the entirety of the registered population at 99,6% ownership of a mobile phone (Figure 6). Broadband access is another indicator that substantially increased in the last ten years at almost the same rate of growth as access to mobile phones in the last decade to become almost universal among Madrid households.

According to Eurostat (2016) the term broadband or *banda ancha* in Spanish refers to:

> "telecommunications in which a wide band of frequencies is available to send data. Broadband telecommunication lines or connections are defined as those transporting data at high speeds, with a speed of data transfer for uploading and downloading data (also called capacity) equal to or higher than 144 kbit/s (kilobits per second)."

In recent years, 4G, LTE, and 5G and colloquial examples of broadband with increasing speed and affordability have been rolled out in many regions of the world. Increasing the availability of both fixed and mobile broadband at competitive prices for wide swaths of the resident population has been cited as a key ingredient for enabling a smart city environment as they allow for a range of low-cost technologies including mobile phones, sensors, cloud computing, big data analytics, machine learning, visualisation tools and a whole range of internet of things (IoT) mechanisms that support the ability to track and manage urban challenges (Dryjanski et. al, 2020).

In the Community of Madrid, 97,1% of households with at least one member between the ages of 16 and 74 (compared to 87,5.% in 2015 and 70,5% in 2011) have fixed and/or mobile broadband internet access. Broadband connection is provided either through fixed modes through fiber optic or cable network, which is present in 87,6% of households while only 9.5% access the Internet through a mobile connection such as 3G or 4G networks (INE, 2020d).

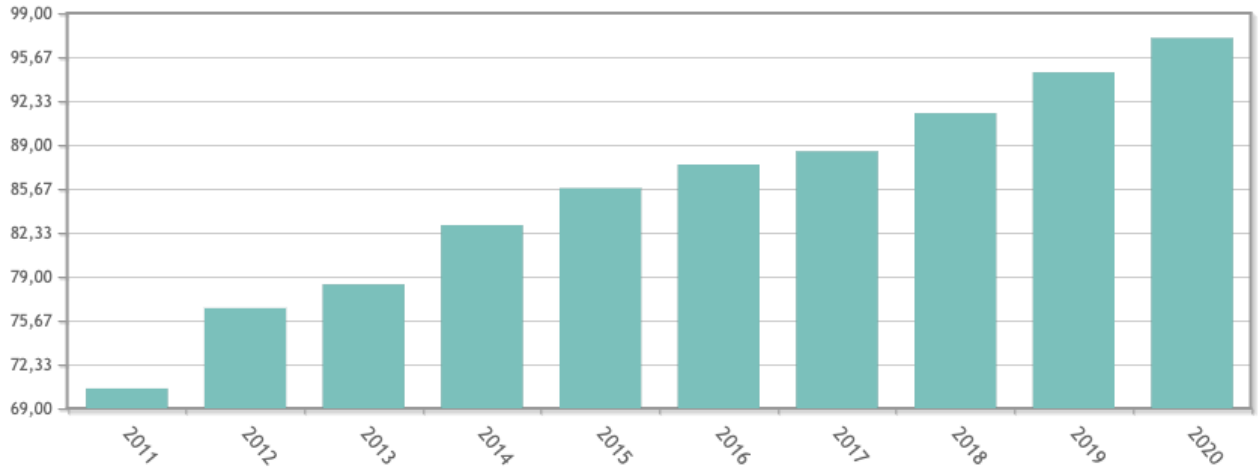


Figure 5: Evolution of Households with Broadband in Comunidad de Madrid (2011-2020) | Data Source: (INE, 2020d)

Furthermore, it can be observed in the everyday habits of residents utilising internet-connected devices living within the comunidad of Madrid that only a decade ago, only about half of households (55%) utilised internet in their daily lives, defined as the use of an internet powered device at a minimum of 5 times per week, while in 2020 the share has skyrocketed to 87,6% (INE, 2020b). This number still remains high with residents between the ages of 16 and 74 years utilising the internet in some form even more frequently, with use at various times per day at 86,2%, while a substantial portion of residents over 75 year olds old still

use internet daily at a minimum of once per day, five times a week (23,33%) or still at a similar rate, several times per day at (22%) (INE, 2020b).

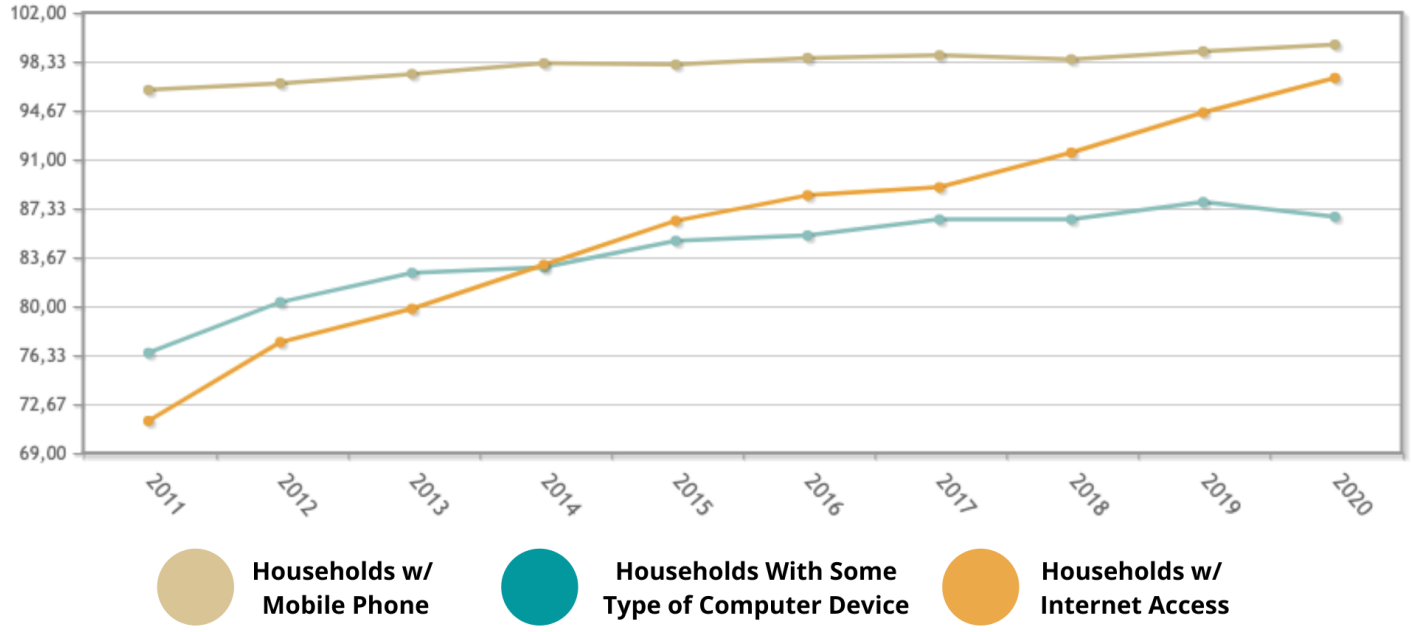


Figure 6: Evolution of Type of Equipment in Households in Community of Madrid | Data Source: (INE, 2020b)

a. Electronic Public Administration

In the year 2020, the Comunidad de Madrid was the highest out of any region in Spain at 71,3% of the population either having contacted or interacted with the public administration through the internet for various reasons at least once in the past 12 months. In general terms, some of the many given reasons by residents that were tracked include having obtained information from the web page of the administration (64,2%), downloaded official forms off the website (50,3%), managed administrative paperwork such as tax payments or submitting a medical form (58,7%). On the other hand, users who expressed the need to present documents but declared that they never submitted forms to the public administration through the internet in the last 12 months was 9,6% (INE, 2020b).

b. Confidence in the Protection of Personal Data & Privacy

By looking at the available indicators relating to the behaviors of residents aged 16 to 24 in the face of personal and privacy issues when interacting with the internet or connected devices, we can deduce their level of awareness of when and where they feel it necessary to protect themselves in relation to data collecting technologies. A significant share of Internet users (84,3%) in the last three months expressed that they took some type of action to manage how their personal information could be accessed on the Internet. Among these residents, the most actions mentioned being undertaken were explicitly denying permissions for their personal information to be used for advertising purposes (70,4%), limiting access to their profile or published content on social networks (63,2%) and restricting access to their geographic location (61,1%) (INE, 2020c).

What's more is that 71.3% of Internet users in the last three months expressed awareness that cookies are files that can be used to track the movements of people, to make a profile of each user and present them with customised advertisements and 31.0% have made modifications to their browser settings to prevent or limit cookies (INE, 2020c). Essentially three out of every four users (76.1%) expressed concern that their online activities could be monitored to offer tailored advertising, while within this sub-section 24.8% declared being very concerned and 51.3% somewhat concerned. And yet, despite the expressed concerns, only 14.9% took some kind of action in the form of using anti-tracking software to limit the ability to track their online activities (INE, 2020c).

More broadly speaking, according to a survey conducted for users who had utilised the internet in the last 3 months to measure the confidence level related to their use of the internet (Figure 7), 56% of respondents stated that had a fair amount of trust in the internet, 39% stated that they have little to no trust, and lastly, only a meager 5% felt fully confident that they completely trusted the internet with men and younger people on average expressing more trust compared to women and older age groups, respectively (INE, 2020e).

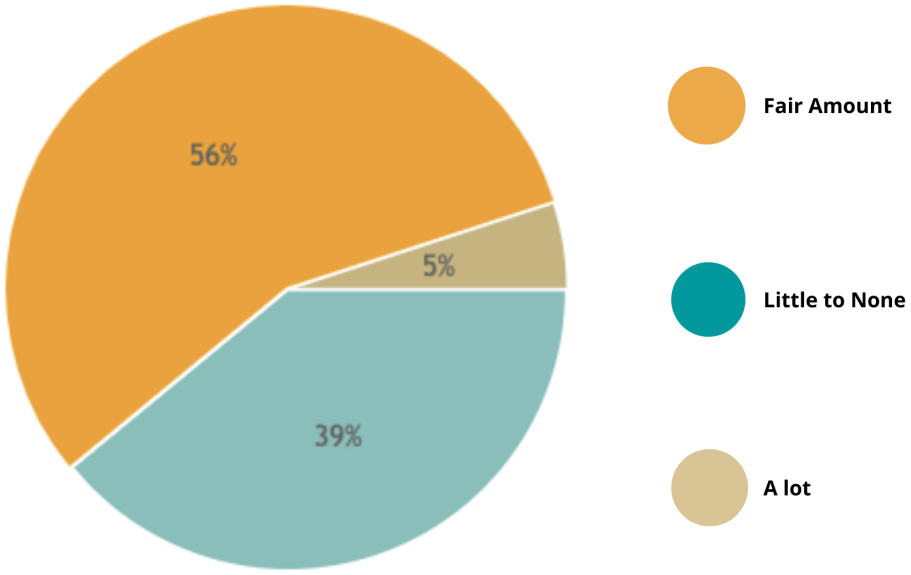


Figure 7: Internet Users in the Last 3 Months, Grade of Confidence in the Internet within Community of Madrid Data Source: (INE, 2020e)

c. Red Española de Ciudades Inteligentes (RECI)

One of the criteria that justifies Madrid as a single case-study for this paper and can in fact be classified as a 'smart city,' is its membership as a part of the *Red Española de Ciudades Inteligentes*. Known in English as the Spanish Network for Smart Cities, or by its abbreviated moniker 'RECI,' as the name suggests, the network is a collection of Spanish cities who are pursuing smart initiatives and/or seeking to become a smart city. The network plays an important role in Spain in influencing how the smart city concept is expressed in the country through public relations, partnerships, and knowledge sharing. Initially established in June 2011 with the signing of the manifesto 'Manifesto for Smart Cities,' the agreement of cities committed to create an open network to promote economic, social and business progress primarily through the application of innovation and knowledge, while strongly emphasizing and relying on innovation and communication technologies (ICT), by applying them on areas such as energy saving, sustainable mobility, eGovernment and safety (Ayuntamiento de Madrid, 2018a). In order for a given Spanish city to become a member of the network, the municipality must have adopted an official strategic plan with outlined actions that specifically combine ideals of innovation and the seeking out of new technologies that enable such an environment. Additionally, member cities must maintain a collaborative atmosphere by contributing resources, sharing best practices, and

the promotion of research, development and technical expertise to other members with the wider goal of developing a sustainable management model and improving the quality of life of citizens. (RECI, 2014).

Madrid is one of the 83 Spanish cities that constitute the RECI and following the 2nd installation of the Smart Cities Congress in 2016, spearheaded by a consortium of public and private actors including the RECI, Grupo Tecma Red and several public bodies including the City Council of Madrid, Ministry of Agriculture, Food and Environment; Ministry of Industry, Energy, and Tourism; Ministry of Health, Social Affairs and Equality, the capitol was affirmed as the benchmark city for smart cities in the Spanish national context (FutuRed, 2015).

v. Smart City Rankings: Pinpointing Madrid

Furthermore, being the country's capital city and one with the highest population in the country, Madrid holds unique potential to leverage its existing resources and integrate smart practices into its everyday operations as a city. Madrid has regularly appeared in several indices as being ranked as one of the top smart cities both in the world and within its national context. According to the IESE Cities in Motion Index 2020 conducted by the University of Navarra, which ranks cities on the condition of cities in relation to sustainability and quality of life for inhabitants based on indicators pertaining to areas such as governance, urban planning, technology, the environment, international projection, social cohesion, human capital, mobility and transportation, and the economy, Madrid is ranked as number 25 out of 174 cities around the world (Berrone & Ricart, 2020). Notably, Madrid surpassed its usual competitor within its own national context, the widely cited smart city of Barcelona, appearing as the highest ranking city in Spain with particular strengths in the dimensions of Mobility and Transportation as fifth place and eleventh place in International Projection. Similar to several cities in Spain, it is particular to note that Madrid stands out recurrently in the 'Smart Mobility' dimension, among which the management of public transport is integrated, according to data from the Red Española de Ciudades Inteligentes (RECI, 2019).

Furthermore, by examining the Institute for Management Development (IMD) Smart City Index which ranks 102 cities around the world in collaboration with the Singapore University for Technology and Design (SUTD) places heavy emphasis on economic, social, and human indicators such as health and safety, mobility, activities, opportunities and governance. Notably,

the index places particular emphasis on citizen perceptions regarding the scope and concrete impacts of implemented technological provisions across the aforementioned key areas placing Madrid at the 21st place for 2019, while falling to the 45th for the year 2020, most likely due to the acute perceptions following the sanitary crisis that overwhelmed the city and its residents for most of the year (IMD, 2019; IMD, 2020). It is important to note that despite the gradual rise in rankings and outlined aims to achieve many of the smart city aims, Madrid still has continued to face great challenges to achieving their Sustainable Development Goals. The city only achieved high rankings in just three of the Sustainable Development Goals, namely: SDG 3 [Good Health and Well-Being], SDG 12 [Responsible Consumption] and SDG 16 [Peace and Justice], corroborating some of the many challenge areas that the overall Madrid Smart City was intended to address (Osorio, Jiménez & Fuentes, 2021). Thus, the Madrid Smart City case study sets out to reflect on how the concept is perceived and tangibly affecting the lives of its residents.

vi. Reviewing Madrid's Recent Smart City Initiatives

As mentioned previously, one of the most notable smart city dimensions that Madrid regularly appears high in rankings is mobility. One of the earlier and most ambitious smart city initiatives in this area includes transforming the city's main square, Puerta del Sol, into an 'intelligent' pavement that sought to connect residents and tourists alike to a series of digital services such as free Wi-Fi access, transportation and city maps, and information relating to entertainment, events and other happenings in the city via a cloud interface (Ayuntamiento de Madrid, 2011). This later coincides as a foundation for the development of the Spanish Plan Nacional de Ciudades Inteligentes [National Smart Cities Plan] that explicitly designates ICT as the key component for the future pathway towards smart development of Spanish cities. Along these lines, the plan mentions the goal of improving "competitiveness of vital productive factors where the contribution of the ICT industrial sub-sector is predicted to be one of the major contributors to the industrial sector GDP" (Gobierno de España, 2015, p. 10).

Namely, an increased focus since the induction of the plan, the municipality prioritises the improvement of the overall effectiveness and efficiency of public service provisions, establishing a pathway to standardisation of the smart city concept, and advancing the governance model of smart cities. Along with many other cities, both in Spain and across the world, the municipality expresses these desires to be met primarily through a two fold focus on

creating an environment friendly to technological innovation and through the financing of intelligent resource management and sensor networks as demonstrated by the Puerta del Sol pavement.

While another notable advancement in recent years that would correspond to the dimension of the Smart Environment involves the installation of the Red de Vigilancia e Información de la Calidad del Aire de Madrid [Madrid Air Quality Surveillance and Information Network] that functions as a monitoring mechanism of the air quality in the city and detect danger levels of pollution and can emit warnings. This is one mechanism part of the 'Madrid 360 Plan," which seeks to replace the city's existing 'Madrid Central' plan, led by former mayor Manuela Carmena of the Ahora Madrid party which famously transformed the city's central district into a low-emissions zone and instead emphasises the mobility of pedestrians, bicycles and public transport and came into force in November 2018 (Ayuntamiento de Madrid, 2018b). Madrid Central encompassed the entirety of the 472 hectares that make up the Central district of Madrid and effectively eliminated the free circulation passage of vehicle traffic through the center of the city with the exception of certain road incorporations. Prior to the introduction of Madrid Central, four residential barrios had already been designated as priority areas within Centro, (Cortes, Letras, Embajadores and Ópera) where free circulation of cars had been prohibited.

Despite the reduction in measured contamination in the city from 22% to 10%, the Spanish Supreme Court formally annulled the Madrid Central project in May 2021 after several claims from a collection of political adversaries and private interest groups that claimed the plan infringed on the individuals' right and personal freedom to operate vehicles and hampered economic activity in the Central district (Martiarena, 2021).

Foreseeing the polemic judicial battle and eventual reversal of the original Madrid Central plan, the municipality under the more conversative mayorship of José Luis Martínez-Almeida of the Partida Popular party announced the replacement *Plan Madrid 360* in 2019 which includes provisions for: the introduction of two zero-emission and fareless bus lines that transverse the central district with future plans to dramatically increase its electric fleet; the creation of a municipal application that allows for car drivers to reserve parking; expansion of the city's bicycle sharing system and creation of new cycling lanes; construction of thousands of parking spaces and rapid charging ports; making funding in excess of over 30 million euros

available to private individuals and taxis for the gradual replacement of their vehicles that meet emission standards; and finally, while currently allowing high emission vehicles in the Central district, the plan provides a gradual phasing out of their use by 2025 (Ayuntamiento de Madrid, 2019c, p. 58-61).

The plan was and is highly contentious among both political adversaries, public officials, business owners, and the wider public, with remaining potential of continued legal battles in the national courts with many still preferring the previously more hardline and strict approach against vehicles operating in the Central district.

Another noteworthy initiative that would correspond to the Smart Governance axis that the city of Madrid pushed forward was the creation of the citizen participation platform called "Decide Madrid," that seeks to ensure resident participation and inclusion within the design of public policies. The platform was also established under the same mayorship as the Madrid Plan with Manuela Carmena and adopts many techno-political aspects which seek to fuse together technological innovation and more democratic forms of digital development that more directly involve residents in the development of solutions to endemic problems that the wider public collectively faces (Smith & Martín, 2021). Similar digital platforms have emerged in other countries including Canada, Australia, Ireland, and even a similar platform emerged within the same national context in Barcelona all with the same goal of bringing resident voices closer to their municipal government.

The Decide Madrid platform was initially launched in September 2015 and creates an online space for a digital forum where citizens are able to contribute to proposals, cast votes in citizen consultations, propose municipal budgets, policies, and development plans, field questions with experts, and participate in exchanges and opinions with other residents (Decide Madrid, 2021). Notably the platform has allowed for enhanced participatory processes which has led to over 200 funded measures ranging from typical smart city features such as intelligent street lighting, electric vehicle charging points, and noise monitoring systems to more community specific initiatives such as constructing drinking water fountains, dog-friendly parks, and establishing homes for refugees (Ayuntamiento de Madrid, 2017). The United Nations Department of Social and Economic Affairs even recognised the Madrid City Council out of hundreds of nominees from over 80 countries with the award for Best Public Service in 2018 for

the advancement of "more open, transparent, participatory and inclusive governance models (Constantini, 2018).

And yet, there are still several critical voices that continue to shroud the initiative and point out some of its strongest shortcomings. Despite the seemingly acclaiming results of these digital participatory mechanisms, the platforms themselves were not created with input from Madrid residents and technical limitations set the rules for how residents are able to deliberate over certain issues and control which types of knowledge and discussions that can be contributed, alluding to what Wilson (2011) describes as the city being configured by a set of codes (Smith and Martín, 2021; Wilson, 2011). This has important implications for which kinds of residents with certain kinds of ideas are being allowed to voice their concerns and exercise change. As Constantini (2018) points out, this 'remote-controlling' of the city by the municipal government and its problems are demonstrated by instances of exclusion of requests from participatory processes in districts further from the city center and even outright ignoring of collective resident initiatives that don't meet the high thresholds requirements for registration as proposals that can be voted on. Thus to acknowledge claims that such technologies constructed for participatory mechanisms are democratic platforms is reductive and that such implemented platforms are high risk for being tokenistic actions that persist in favouring policies that promote free-market capitalism, deregulation, and reduction in government spending, revealing how true urban democracy is a constant work in progress (Kitchin et al., 2019).

5. Analysis & Findings

i. Overview of Resident Participants

Overall, the completed fieldwork resulted in sixteen semi-structured interviews, lasting between twenty and thirty-five minutes in length. An interview guide was developed in consultation with my supervisor and consisted of a short introduction and icebreaker section that introduced the purpose of the study, providing a short introductory overview of the smart city topic, and a series of priming questions intended to orient residents' thought process towards identifying elements they enjoyed about their urban environment and some of the gradual changes they could recognise. This icebreaker section was followed by a list of questions grouped into three thematic areas as follow: 1. Local Perspectives of Smart Cities, 2. The

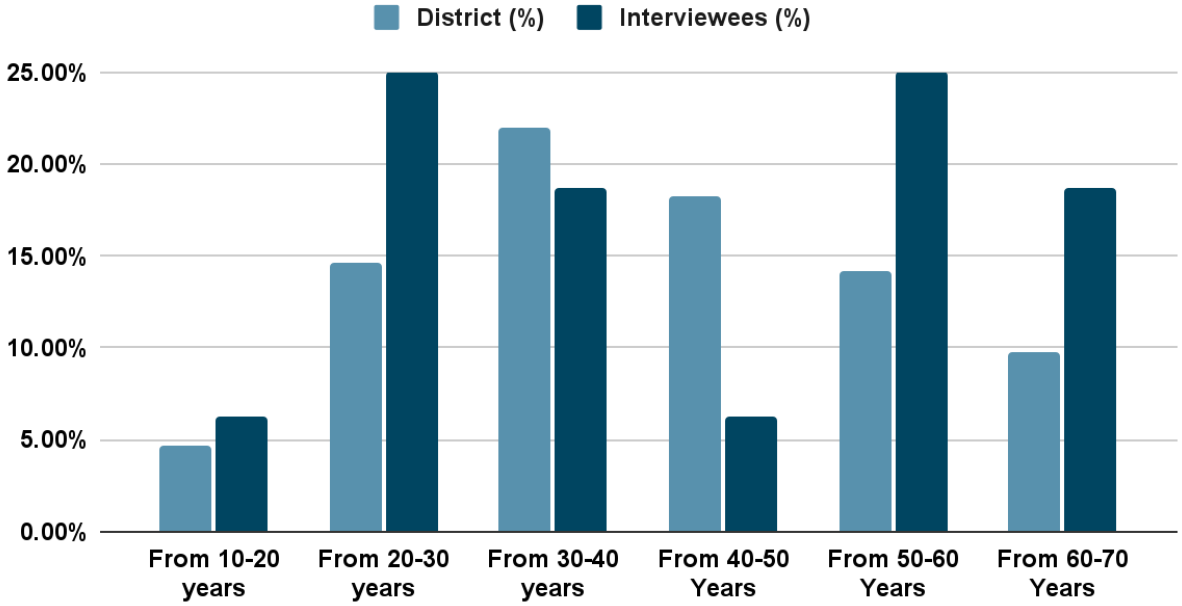
relationship between Data-Collecting Technologies & The City; 3. Related issues of Personal Data. The participants consisted of nine female residents and seven male residents spanning from the ages of twenty until sixty-seven years and also had a high degree of diversity in terms of the time they had spent living in one of the barrios that make up the Centro district of Madrid, ranging from less than a year to fifty-one years (Table 2).

Less than a year	1-5 Years	5-10 Years	10-30 Years	30+ Years
2	3	3	2	5

Table 2: Number of Years Residents Have Lived in Respective Barrio | Source: Author's Own Elaboration

Four participants are residents of each of the two Barrios Sol and Embajadores, two participants residing in each of the Barrios Cortes, Justicia, and Universidad, and finally, with only one participant residing in Barrio Palacio. The occupations of the residents were wide ranging but one could presume from their stated occupation that the majority of the interview subjects held a minimum of a university bachelor degree with the exception of some younger participants who were currently students. The residents' occupations included hospitality, students, IT professionals, social media and digital marketing, teaching, nursing, financial consulting and banking, government civil servant, architecture, medicine, and engineering. In terms of representation of age groups, the percentage of 10 year age groups roughly corresponds to to the existing demographic structure of the Centro District, with the largest share being between 20-30 years old and 50-60 years old while it is recognised that for the age group between 40-50 years of age and 20-30 years of age are underrepresented and overrepresented in the sample of resident interviews, respectively.

Figure 8: Interviewees Age Demographics vs. Actual District Age Demographics (Author's Own Elaboration)



ii. Results of Semi-Structured Interviews

As mentioned previously, questions were grouped according to thematic categories (Local Perspectives of Smart Cities, Data-Collecting Technologies & The City, and Issues of Personal Data in Relation to the City.) Responses from the participants are presented in the following sections according to these guiding questions and the related sub-themes that emerged from the conversations with residents.

a. A Changing Madrid

The first section was reflective in nature and geared towards probing residents to think about the time they had spent living in the city of Madrid and to consider the related changes that they had either experienced and observed in their immediate surroundings. Although residents had already been primed with the purpose of the study and were aware that the interview being undertaken dealt with themes relating to concept of the smart city and technology, the participants interpreted the question differently based on their time spent living in the city and their understanding of the wide number of changes that they perceived in Madrid. All of the

observed changes had nothing to do with technological interventions, but rather signaled a change in the characteristics of the social fabric of the residential neighborhood.

Among the five residents that had spent thirty or more years living in the city of Madrid in some capacity, the evolution of the population composition, combined with a related sense of their respective neighbourhoods shifting slowly from a place where one resides as an active member of an organic community in contrast to being a resident dweller where one is simply allowed to exist was a central binding theme for four out of five participants that shaped their experiences as long time residents over time.

The concept of diversity played an important role and was often neutrally characterised as matter-of-fact in the Central district with one resident noting an "influx of populations both from the national sense from other regions of Spain and several internationals" (Interview with STH_9) and another noting an overall increase in the number of people and overall diversity in terms of international visitors and students. And yet, diversity and increase in population also elicited other related anxieties in the general character of their respective neighbourhoods. One resident recalled that the Sol neighborhood over the time span of thirty three years he had spent living there had "seen a huge transformation, which used to be a totally residential area with a lot of small businesses and so on. It has become an area practically for hotels, tourists, with a lot of housing for tourist use" (Interview with STH_1). While another reminisced about the kinds of people they encountered on the street: "I can tell you that Lavapiés 30 years ago was completely full of students, musicians, writers, etcetera, and now a lot of tourists and people here are just passing through." (Interview with STH_5). These excerpts from the participants point to their perceived shift in orientation of the Centro district over time from a residential district with a more 'local' atmosphere catering to the needs of its inhabitants to an economically driven district catering mostly towards certain key industries, namely the tourism and hotel industries.

Residents also connected these related industries with issues such as access to housing and more generally, the use of the public space that is shifted away from residents towards the benefits of these industries. One resident of six years who originated from Galicia noted that soaring cost of living and rising rents made it difficult for those who actually want to remain residing in the Centro district with "more and more people having to move farther away from these neighborhoods in order to be able to afford it," adding that the neighbourhoods feels increasingly disconnected from the rest of the city due to a combination of an ever present tourist

population with the absence of community oriented establishments that are "more geared for consumption and high prices" (Interview with STH_7).

Another longtime resident lamented that "from a community standpoint, there is less consideration for others and sense of neighborhood while on the side of the municipality, there is less awareness of political authorities of the socio-economic needs of the Madrid population" (Interview with STH_9). Again, this sense of the loss of community is intimately tied with the neighborhood social unit which coincides with another theme, a distant municipal administration that is disconnected from the needs of its residents and the wider neighborhood. Instead the municipality is perceived as catering to the profitable interests of the mentioned certain key industries. Many of the problems within the district and the city identified by residents that are described in great detail in later sections are described as either being a direct or indirect result of the municipality's inability to connect with the endemic problems facing residents. Long time residents who had spent thirty plus years described some of the new gradual physical changes as "construction with very little city planning nor sustainability planning" but acknowledged that there were great improvements in certain areas notably in enhanced mobility infrastructure and public spaces that were increasingly prioritising the needs of pedestrians (Interviews with STH_9 & STH_4).

Likewise, residents who have lived a substantial amount of time in one of the neighborhoods of the District between ten and thirty years outlined similar changes in the accessibility of social fabric characterising Madrid as "a city in constant change" (Interview with STH_6). One resident of the Embajadores barrio focused on the marked increase in the number of chain businesses coinciding with the declining prominence of the traditional Madridleño social spaces of the *mercados*, or markets, famous community and consumption spaces in Madrid which have played an enormous role in the social life of Madrid neighborhoods as a marker for even deeper social fragmentation in other areas of the community. As she elaborates "there are more supermarkets/franchises like Carrefour Express, Clarel, Dia. There has been a renewal of two of the municipal markets. The Mercado San Fernando re-opened and the occupancy of the Mercado Antón Martín has changed. There are more small restaurants/cafes in both markets that have introduced a night life while maintaining the more traditional puestos" (Interview with STH_16). Even a more recent resident of Lavapiés, an area within the Embajadores District, could resonate with this theme acknowledging that "the neighborhood is

very accessible without having to go to one of the commercial shops like Carrefour but instead I can go to one of the more local shops that are in the neighborhood" (Interview with STH_10), again highlighting the importance of familiar local businesses as a key feature of the neighborhood that facilitates a greater sense of social belonging and attachment to the neighborhood.

It is here in the mercados where for centuries, local residents of the barrio regularly rub shoulders and socialise with other members of their community as they visit their favourite *puesto,* or market stall, while shopping for their daily or weekly food supplies. Gradually in the last decades, the traditional Madrid market has become a symbolic marker for the wider changes taking place at the neighborhood level across the city, signalling processes of gentrification and displacement as day-to-day traditional working class spaces are gradually replaced by upmarket stalls and experiential tours that instead serve the preferences of higher income residents and tourists, transforming and in some cases, eradicating an institution that has been central to the social and economic development of Madrid (Salinas Arreortúa, 2016).

Another resident echoed the same sentiment explaining that "many of the changes are related to tourism so a lot more people are visiting and the neighborhood here especially has become a lot less community oriented so it doesn't feel smart in that sense" (Interview with STH_15). It is precisely this reference to a feeling of 'community,' 'human contact,' and 'street life' that more than half of residents regardless of the amount of time spent in the city or which age group they belonged to could identify in some way as being the most enjoyable and valuable aspect of the District. All residents also connected this sense of community with the theme of accessibility, in multiple senses of the word. Whether its social accessibility through neighborhood festivals and social life on the streets, and cultural opportunities, or physical accessibility through access to green spaces and parks, effective transportation systems and general walkability that allow for more personal freedom and a car-free lifestyle, accessibility was identified as a key feature of their communities and what makes life so enjoyable for interviewed residents.

On the other hand, more recent residents who had only lived in the Central District for the last few years or hovering around a year or less could only point to one major observable change in their neighbourhoods - the pandemic and its effects on the accessibility of social life on the streets. All residents who had lived under a year could only mention that fact the acute

changes that took place as restrictions slowly loosed to become more open in the city leading to a resurgence of people back on the streets and openness that residents who had lived longer in the Centro had described as being the most enjoyable aspect.

b. Use of Data in the City

The dimension of Smart People implicates residents as the primary beneficiaries of the smart city as 'users' as active participants in the gradual shaping of the urban environment towards an end goal of improved efficiency and quality of life for the wider community (Yeh, 2017) while also potentially compromising their individual privacy and security in the process (van Zoonen, 2016; Belanche-Gracia et. al, 2015). This is reflected in the ensuing discussions with residents which interrogated their perceptions of personal data and use of data more widely in relation to the smart city concept. Residents were asked a series of questions to probe their general experiences with personal data in the city, and later the perceived risks of data collecting technologies in the city, how they felt about sharing data in exchange for improved municipal services, and finally, what role data collecting technologies, if any, should play in a city. Despite the variety in knowledge and responses, the themes of the desire for awareness, personal risk assessment, and trust in public entities emerged.

c. Awareness of Data Use

When asked about their individual experiences about the use of personal data in the city, each participant displayed a unique idea about how personal data was being collected and what it was being used for. While no participants explicitly associated personal data in the city as something entirely positive without at least some expressed form of hesitancy, the majority of participants shared an ambiguous opinion that largely depended on the context. The principal pattern identified regarded the level of awareness of what exactly constitutes personal data, or lack thereof, and which kinds of data were being collected and the related varying levels of concern.

Some types of personal data collected at certain points such as the monitoring of noise decibels, traffic levels, or mobility were expressed as being permissible and potentially beneficial for the wider community. One resident, a 38 year-old IT consultant, points to the value of personal data in its potential to optimise public services and make life easier for all residents

explaining it "plays an important role in managing the city. Especially in areas like transportation or traffic or in government services, knowing the user experience to make it more accessible and easy depends a lot on the types of data available from a wide number of sources." (Interview with STH_14). Moreover, the mini-survey portion asked residents to think about specific situations related to data collection, where ten out of fifteen residents felt they did not need to be consulted by the municipality before the installation of air quality or traffic monitoring sensors in the District. Out of these residents, this type of data was described as being essential to the functioning of the city and beneficial for all residents. Out of those who claimed that they would want to be consulted, they cited civic principle as the reason. For example, the desire to be informed at all times about the explicit and measurable outcomes, and that the municipality should not have the freedom to implement any kind of data collecting technology without the consultation and approval of its residents who have the most to lose in the equation (Interview with STH_16).

Along the same lines, another resident drawing from her experience in the digital marketing sector recognises the value from a monetary standpoint arguing that "most people might not know that their personal data is actually worth quite some money to the people who want to sell them things and know about their behaviours, likes, interests, activities, etc." (Interview with STH_7). Both comments from these two residents represent a spectrum of assigned value to personal data, where on one side, data is perceived as a potential benefit for the public good through resource optimisation and provision of services while and on the opposite end, select interests potentially capitalise off of a flow of updated and widely available information.

d. Who... or What Can I Trust?: Insecurity & Risk in the Smart City

Evidently, insecurity plays a large role in the trade-off between convenience and improved services on one hand, while maintaining one's own privacy on the other (van Zoonen, 2016). Heightened insecurity was expressed as continuously collected data of one's everyday lifestyle habits, movements, and commercial preferences were perceived as being potentially invasive and even harmful to individuals. All participants regardless of age with the exception of one, were aware that they regularly 'give up' personal data in some capacity, especially while using public services such as the metro, Wi-Fi hotspots, or health services. This sense of loss of

privacy was a repeated concern that was expressed but difficult to articulate for residents as there is a lack of knowledge surrounding when data is being collected and the interests of data users. As interactions take place through a multitude of devices and moments in their lives without human contact, residents found it difficult to assess when they were most vulnerable.

Concurrently, residents expressed ambiguity or doubt whether forms of personal data were being used at all by the municipality or any external entity, if any, as the differentiating boundaries behind socio-technical assemblages become increasingly difficult to differentiate (Wilson, 2011; Wood, 2013). For example, one 28 year old female resident confirmed this anxiety that "it is a loss of privacy, which is a hard concept to explain. Just the use of data for controlling or for doing something that can be harmful and we as residents are not conscious of" (Interview with STH_11). While another resident, a civil servant, highlighted the main problem being the lack of education about what is done with collected data, that as residents "we almost have no idea where it goes or who is collecting it. It is some sort of black box" (Interview with STH_13).

This lack of awareness leads into the second emerging theme that was of personal risk assessment in relation to one's own data use within the context of a data-driven smart city. Decisions of residents on the possible trade-offs between staying 'on' or 'off the radar' were mostly made without substantial information. Residents distinguished their form of personal risk assessment based on whether their information was being collected and used by a public versus a private entity, or based on personal judgement of ethics and trust within a particular situation. The majority of residents expressed trust in public institutions as a key factor in determining whether personal data was at risk for any reason and made a clear distinction between the use of data by private entities versus the municipality.

Private institutions were perceived as collecting data not for the common benefit of the residents, but rather to advance their own set of commercial interests, promote consumption, and to generally deceive residents with misinformation. At the same time, inherent trust in public institutions was challenged by several residents who wondered whether the municipality would be competent enough and equipped to handle their personal data and could be trusted to use it for the improvement of their communities. The dividing line between the municipality as a protector, looking out for the interests of its citizens and the private entity, looking to maximise their advertising and profit margins is blurred in this version of a data-driven Madrid (Söderström,

Paasche & Klauser, 2014; Kitchin, 2016). As long as whatever happens behind the technology, who is using the data and for what aims remains unclear to residents, they will remain risk averse and make uninformed choices about sharing data. One resident captures this tension by relating the experience of consenting to the use of cookies and personal data:

> If you don't check the box, then you cannot access the service, so it makes me think, are you really asking my opinion? It doesn't feel like a question. So it should be something said before and explained and if you don't agree, can you still have access to that service? (Interview with STH_11).

The intangibility of data and the ubiquity of devices such as mobile phones, smart watches, and cameras makes it difficult for residents to know when information is being collected at a particular moment. Some residents argued that the handling of the pandemic made this line even more unclear, and challenged the idea of trust in the municipality to handle anything appropriately. One 51 year old resident questioned the handling:

> What purpose a city like Madrid has then and governed by a party that looks out a lot for the merchants and businesses, for the companies and not so much for the citizens or that you give your data for the benefit of an economic benefit and instead of a social benefit (Interview with STH_1).

While among the mini-survey responses who were asked whether they would like to be consulted before personal data could be sold by the municipality, the idea was universally rejected, citing concerns that the municipality should never be profiting or aiding external entities with the collected data. Alternatively, if data were to be made public and open access, still only two out of sixteen would be comfortable with the idea. Another resident pondered a similar concern about the replicability of her personal data and the blurred lines between what is accessible between public and private entities arguing that what "could be used by others to their or my own advantage or disadvantage raises questions of ethics and trust. I think that dressing up data by describing it as smart is a dangerous distraction" (Interview with STH_16).

Thus, even considering the fact that data could purportedly be announced as a way to heighten the quality of life of residents through readily available data and resource optimisation, residents still felt suspicious about the true intended outcomes as they couldn't foresee the results and felt they would need to take personal responsibility to adjust their own behaviors in order to protect their own sense of their personal data. The same resident concluded: "show me how my information can, and will, make a positive, constructive difference to the quality of life of my neighbours and the wider community and I am more than happy to share it."

Only a single resident felt they faced no risk at all with exchanging personal data in exchange for smart services. While among the remaining fifteen that felt at risk, over half across the age and occupation spectrum highlighted the handling of data as the principal point of risk, where data could potentially subject to some of the following mentioned outcomes: exploitation of personal data to be bought and resold, exposure to corruption and manipulation for political aims, policing and surveillance, subjection to cybercrime and hacking, and finally, potentially deepening inequalities among vulnerable and less urban populations.

Overall, in their role as providers of much valued data, residents of the smart city are primarily unsettled by the end use of their collected data and the identity of the users 'behind the camera,' which are mostly perceived as remaining non-transparent and impermanent. The expressed insecurity during the interviews forced residents to consider a growing lack of accountability in a still materialising digital world where one finds it increasingly more difficult to opt out or disconnect from.

e. Local Perspectives of Smart Cities Concept

Within the interview overview, residents were introduced to a basic definition of an ICT enabled smart city as employed by Richter et. al (2019), but it was mentioned that non-technological interpretations were also valid. Out of the fourteen participants who answered affirmatively that they were familiar with the concept, only five felt that they had made use of some kind of smart initiative or had some kind of tangible experience with the concept. Out of these five, only two had some interaction in Madrid itself, through the citizen participation platform 'Decide Madrid,' while the other resident related it with a car sharing platform. The remaining three residents had some limited experiences with smart cities while living or traveling abroad in other smart cities such as Barcelona, Vienna, Singapore, and London, all

being highly technological experiences dealing with mobile applications, sensor technologies, efficiency, and even fantastical, through a pilot activation experience.

Among the fourteen residents that were familiar with the concept, their perceptions mainly revolved around an idea of improved quality of life through interactive technologies or characteristics of Smart Mobility and Governance dimensions, and lastly non-technological interpretations. Lastly, no one in this group related a specific entity engaged in smart city development, other than the municipality itself.

Emphasising the feature of interactivity enabled by ICT as a foundational element for making the city smart and allowing for a more tailored form of living (Albino et. al, 2015; Orłowski & Romanowska, 2019), one 34 year old resident imagined living becoming "easier because everything that surrounds you interacts in a more direct and personal way with each citizen" (Interview with STH_2) while another resident of 18 years of age similarly suggested that its a city "where everything is connected and accessible and custom to each resident to make their life easier and better" (Interview with STH_18). Furthermore, this theme of interactivity was mentioned to be connected to other service provisions by over half of residents who were familiar with the concept through the continuous monitoring of environmental indicators such as noise, traffic, pollen, electricity, and additional processes of digitalisation that somehow made technology more friendly, customised and efficient for the individual inhabitant. Although here technology is seen as a facilitator of improved environmental conditions through automatised processes, the applicability stops there and limitations are acknowledged. These ideas correspond to a multi-pronged improvement of resident quality of life across several areas (Giffinger et. al, 2007) and the reduction of environmental pollutants and intelligent urban resource management that makes life more pleasurable and healthy (Millard et al. 2014).

Likewise, mobility was highlighted as a key feature of smartness for four residents under the age of 30. Public transportation more specifically was mentioned, and is evidently still an important theme as all sixteen respondents answered affirmatively to using either bus, metro, or Cercanías as their typical mode of transportation in Madrid. The theme of interactivity was still applied as a necessary feature by these participants that explained how transportation should be connected to other municipal services that ensure an optimised system that is not only sensitive to resource optimisation and energy use, but also to the needs of a diverse population of residents. Efficiency in the form of enhanced and more organised modalities through

continuously updated schedules and making public transportation systems more ‘friendly’ and tailored to the habits of different populations. One resident contrasted their experience in Madrid with a stay in Vienna recalling that “there are share points for e-bikes, e-scooters, or cars handled within an app that is part of the smart city system,” reiterating a potential opportunity how different groups of people such as those with disabilities, elderly, and students can have multiple options for transportation that suit their needs for different purposes (Interview with STH_12).

While just two of the residents were previously unfamiliar with the term “smart cities,” they were still able to make an educated guess. Both gave a similarly technologically based interpretation of the concept with having something to do with mobile phones and improved accessibility to municipal services and quality of life for all the city’s inhabitants made possible through technological intervention (Interviews with STH_8 & STH_15). At the same time, STH_15 was quick to articulate that the concept of smart could overlook the root issues of urban problems explaining that “technology is not always a solution maker, for some things yes, but I think mostly we don’t actually need it as much as we think we need it.”

Along the same line of thought, one participant who was familiar with the concept argued that it is just another way of conceiving about how people can live together in the best way possible explaining that “giving it a name and particularly one that uses the word smart is nonsense. It is simply applying another layer to an already unstable, antiquated, corrupt and corruptible system” (Interview with STH_16). This speaks to what Sadowski & Pasquale (2015) describe as the label of ‘smart’ being a floating referent that induces a positive spin on a wide array of urbanisation efforts and makes it even more difficult for residents to voice opposition to such proposals. A 67 year old resident and regular user of the Decide Madrid platform agreed with this superficiality, explaining that the platform does little if anything to ensure resident participation and decision-making, lamenting that “we participate in meetings, we make allegations to projects, we denounce, we propose, but with very little success, it is a shame” (Interview with STH_4). She added that such inclusive and participatory mechanisms along with technological interventions, using smart rubbish bins as example, are mainly performative to ensure Madrid appears on smart cities rankings and in reality, does little to address the concrete problems that they were designed to address.

f. Resident Expectations for Smart City Madrid

After being asked about the smart city concept more generally, residents were asked to contemplate their ideal expectations for the smart city concept if it were to be further applied in Madrid in relation to the local problems that they felt their communities faced. Subsequently, residents were then asked to foresee which potential barriers or problems their communities could face in addressing these identified problems discussed during the interview.

In relation to the discussed expectations, residents again described a wide variety of visualisations in terms of the amount of described detail and depth. While one participant did not provide any response, five of the residents simply could only describe a list of characteristics similar to those discussed in previous sections, although some patterns were still identified from their comments. Overall, these residents preferred a techno-solutionist vision of the smart city where efficiency and balance could be provided for residents through an easily managed solution as described by Hollands (2015). This could manifest as an all in one card that takes individual preferences into account, simplifying areas such as mobility to bureaucracy, to more generally solving issues in the city seamlessly 'in the background' through automatically overseeing pollution levels and more generally working towards solving issues and working for the benefit of its residents. Contrastingly, among the residents that could provide a richer description of characteristics of their idea of a smart city, the expectations are grouped into two extremes: Mass Data Collection and a Non-Technological Approach.

One 51 year old resident, an IT specialist, supported the increased interaction of data and massive collection of data from mobile phones, albeit exclusively anonymised data, that can be represented as from the individual and municipal level based on a particular theme (Interview with STH_1). Two other residents gave a similar representation where sensor technologies that collect data could meticulously manage the working of their daily life such as water and electricity usage, heating, traffic, etc. to ensure sustainable and economically beneficial practices both for the individual and wider community. One imagined benefit included a two-way flow of information where residents can "produce and share our own energy resources, instead of having to pay a water or energy company, we can directly produce these energy resources" (Interview with STH_9), while another imagined automated processes that notified her of the available solar energy levels for optimal appliance and electrical use (STH_10).

And yet, these technologically oriented visions were not approved by all participants. The plurality of residents pointed to a more human-oriented approach that completely forgoes the use of technology and instead focuses on 'the community, 'the neighbourhood,' or in-person communication as the gold standard for their envisioned smart city. One resident wished for a self-determining and caring community that emphasises "the health, education and welfare of the community at the centre of decision-making" and acknowledges the importance of demonstrating clear and consistent benefits for the needs of the community before adopting any kind of processes or technologies. She reiterated that "layering a data gathering technology platform over a crumbling system won't fix it" (Interview with STH_16).

Instead, other residents pointed to a reconfiguration of their space not to be wired with more screens, sensors, and efficiency or 'everyware' (Greenfield, 2013) as the principal aesthetic; but rather a space that was tailored to the needs of the people living there, that instead encouraged human exchange, opportunities for communication, and access to nature and green spaces. A resident of the tourist-saturated Sol neighborhood called attention to the many plazas and public spaces entirely occupied by private businesses or in the evening by people without homes, and hoped for more distributed green spaces that can be accessible by residents in the Centro. Similarly, a longtime resident pointed out for elderly residents, the challenge of being isolated and alone during the pandemic revealed the importance and lack of a "more natural environment, places for exchange and communication with other residents" (Interview with STH_14). Likewise, a more recent resident hoped for a Madrid where "human life is not forgotten...where things are done more for everyday life, not for being a machine of efficiency" (Interview with STH_11).

Overall, residents preferred a multi-faceted vision for a Madrid Smart City where technologies could play a role if they are firmly in the service of residents, optimising certain technical functions, but simultaneously recognising the limitations of technology and value of local knowledge structures (McFarlane & Söderström, 2017), where further solutions are considered that take into account the many preferences, needs, practices, and use values of a diverse community (Taylor et. al, 2016; Verrest & Pfeffer, 2018).

g. Obstacles for Becoming Smarter

Despite the range in expectations of the smart city and different ideas of the characteristics that make it, almost universally all the residents identified the struggle against the Ayuntamiento de Madrid, as characterising both the biggest gap between the existing Madrid and the idea of achieving a so called 'smart city,' and the biggest obstacle for addressing and overcoming urban problems facing their communities. Furthermore, the Madrid municipality is perceived by residents as catering to a select few interests, namely the tourism and hotel lobbies at the expense of long-term resident livelihoods and is directly culpable for enabling or exacerbating interconnected problems that residents identified as the most concerning in the Centro District such as access to affordable housing, resident displacement and homelessness, noise pollution, and lack of innovation. Overall, all of these issues are perceived as resulting in an eroding sense of community and plummeting quality of life in the District, the opposite of what a smart city should entail.

Half of the residents identified noise pollution in the Centro district as the biggest problem facing the community. Most viewed it as a symptom of a myriad of problems, mostly connected to the conflict over space, that are almost always traced back to the tourism and hospitality industries which are perceived as saturating the Central neighborhoods with spaces of consumption while simultaneously snuffing out the possibility for long-term residents to build a community, or what one active resident explains what "we call the alcohol industry...The massification of use directed at tourists is causing us residents to see ourselves a little cornered" (Interview with STH_1).

Excessive noise in the Centro District was also naturally associated with other forms of pollution in the form of vehicle traffic, the constant presence of filth, and even public health violations, and were all linked by residents to the lack of consideration for the permanent community of residents living there who call the space home and have no other alternative than to suffer the consequences. Thus, we could say that across the board, Centro residents were thoroughly dissatisfied with 'the state of the street.' One resident asserted that the only consideration is given to landlords profiting off of tourist flats and AirBnBs "at the expense of the livelihood of everyone essentially - long term residents, the old people, immigrants, people living in the street. It makes it less attractive to live here over time" (Interview with STH_15). She added that the fact that the neighborhood was almost always filled with tourists and those

without a “personal connection” to the neighborhood who felt free to trash their urban playground without limits, was a recipe for a constantly unpleasant environment which she described as “mentally exhausting to experience this everyday.”

h. Residents vs. Madrid

Overall a lack of trust between the municipal government and the residents that they represent is at the root of the situation. With nearly universal consensus, fifteen residents referenced at least in part, the municipality as the main barrier between Madrid and the achievement of a city that they would consider smart, citing conflict of interests between ensuring wealth and political gains by catering to a select commercial interests while sidelining the requests of residents. One resident plainly summarised a common feeling about being held back by an antiquated political agenda that “is still managed today with the same criteria as 30 years ago, supporting the immediate wealth of some and, supported by the government: real estate, hospitality. A total lack of innovation” (Interview with STH_4). Most residents resonated with this sense of the idea of ‘lack of innovation’ in the sense that the municipality only concerns itself with the short term wealth gains rather than thinking of a medium or short term strategy, plainly stating that Madrid could not possibly be characterised as smart. One 58-year resident explains that this lack of foresight means “Madrid is not a smart city, at the moment, there is no political will for it, only the commercial interests of a few prevail, citizenship is abandoned” (Interview with STH_3) while another highlighted the few opportunities for residents to effectively organise in the middle of a Disneyland-esque District where ‘smartness’ is only applicable for landlords and private businesses interested in maximising their profits (Interview with STH_7).

Consequently, the idea of creating an updated and authentic platform for community participation was vital for most residents who felt the inability of the municipality to address issues outside of the realms of tourism and wealth generation were being continuously ignored. Although the existing citizenship participation platform was discussed twice by two separate residents over the course of the interviews, both felt it was wholly symbolic and essentially their perspective and concerns fell upon deaf ears. Another resident user discredits the platform explaining that the city has “democratised” the stage for residents before approving projects, “but in the end they will go ahead with what benefits their personal interest or connections best. If

they had listened to residents a lot of the problems there are, probably wouldn't be here" (Interview with STH_15).

There is a discontinuity between the ability of residents to convert their preferences and experiences into a more active form of citizenship where residents actively making decisions about their community, in contrast to an arbitrating platform as a token to frame urban development as scientific and community approved (Shelton, Zook & Wiig, 2015; Zandbergen & Uitermark, 2020). It is here where a critical challenge emerges in the future of a smarter Madrid if residents are to be conceived as instruments providing data to fulfill the achievement of efficiency and economic growth (Cardullo and Kitchin, 2017; Roitman et. al, 2012).

Thus in order to truly attain a Madrid Smart City that could be considered 'smart,' authentic organisation and communication among residents and between the municipality mattered. If their primary role of the resident is to contribute themselves as a data point among many, then their more individual and nuanced concerns outside of the approved dialogue become further diluted and unaddressed (Hollands, 2015; Angelidou, 2017; Mancebo, 2020; Kitchin, 2020). This is lacking, as most residents described feeling largely helpless from doing anything about the problems they faced, and was consequently expressed in social terms about the feeling of the community, in spatial terms of the narrowing access to community spaces, and visual terms in the problems they observed in their daily lives.

i. Proposed Solutions to Local Problems

In the final question for this section, residents were asked to critically think about potential solutions to the many issues that they were asked to identify in the previous discussions. Although residents proposed a variety of solutions, approaching the issues from different vantage points, municipal governance and leadership was viewed as a recurring key element that needs to be revisited if issues were ever to be addressed adequately. More specifically, all participants pointed to a need for renewed mechanisms of external participation and collaboration with the municipal government and highlighted issues that correspond within the dimension of Smart Governance and a call for emphasising more elements of Smart People.

Half of the residents discussed the issue of authentic representation of residents and transparency at the decision making table. One 63-year old resident criticised one existing process of utilizing participatory surveys, a form of voting where residents can weigh in and

‘vote’ on municipal projects calling it a tokenistic way of representing the ideas of residents and instead called for improved transparency pointing out that “few people vote because of time and access difficulties, companies are paid for the analysis of these data, without information on the amount paid” (STH_4). This relates back to the theme of awareness, where more tactical efforts are required in order to actively engage residents of all backgrounds and be given the necessary tools to be able to effectively contribute and participate. This also seems to corroborate the idea that simply arbitrating resident concerns through a technological platform is mostly ineffective when existing concerns continue to be ignored and prior knowledge on how to properly engage with the platform leads to even further barriers to actual participation (Han, Jee, & Jeong, 2021).

Outside of technical mediated access points, there are few opportunities for residents to collectively organise as a recognised administrative force. A third of residents agreed with this existing treatment of participation was highly superficial with one calling the existing process “deceiving,” with collected perspectives being collated and acknowledged and later in the end their input not being “taken into account or they look for some way, of the participating people that seems to take into account, but ultimately do what the economic interests want” (Interview with STH_7). Such smart platforms particularly have important implications for marginal groups of residents, particularly the ones who are in more vulnerable positions, and are even more sidelined from playing a part in the governance of the community, even when it has to do with themselves (Angelidou, 2017; Aanestad, Monteiro & Nielsen, 2007). In thinking about these less represented communities “the students, the old people, the long-time residents, the homeless, the foreigners,” STH_10 directed attention to the need to establish a more inclusive process in order to incorporate their input to address these very real needs and to be able to devise corresponding solutions.

Some residents also expressed desire for achieving a significant increase in both the total number of residents and higher heterogeneity of social groups that better mirrors the variegated needs, perspectives, and population composition that make up the District and the wider municipality. One suggestion by a resident to counteract this exclusion of resident perspectives and enhance accountability and transparency of the municipality was to introduce representatives of neighborhoods and social groups as a lobbying power to limit the over saturation of tourism, political, and commercial interests dominating the Ayuntamiento (Interview with STH_8). While another resident drawing from her experience as a relative newcomer, pointed out imprudent

resource distribution by identifying the consequences of a poor municipal registration system. She argued that the existing system is not adequate equipped to support incoming outsiders, whether students, migrants, refugee seekers, with information on how to register themselves, how to locate and access existing services that they have a right to, and providing a space for dialogic exchange where their doubts can be clarified and matched with corresponding services that address their needs (Interview with STH_11).

External accountability, involving not only more representative groups of local residents but also consultation with external knowledge experts who are outside from the immediate region, specialised in targeted areas of intervention and removed from the existing political structure was recognised as vital for more effective interventions to be made. During the discussion, several residents proposed the development of a more open and public model where integration of outside expertise and collaboration with organisations specialised in particular areas of interest such as mobility, displacement and homelessness, waste management or a multitude of problems that the city could be working to rectify. One resident argues that by cooperating with outside entities "who are not connected to the political parties here or have any particular interest in the country or the city" can serve to limit bias and orient the solutions to the problems facing the communities themselves, rather than concerning themselves with gratifying individual political gains or advocating for a certain set of industries (STH_15).

Nonetheless, even among those who supported initial technological aims, the limitations in application potential were recognised in half of the discussions and remained in a few key areas. Moreover, at least half of respondents identified access to housing, displacement, and homelessness as connected and serious issues facing the District, however, smart cities were not perceived as a potential playing any role in solution development, unlike noise pollution. Even within these areas that were described as potentially benefiting from further data collection and monitoring such as the case for monitoring traffic or noise pollution, some residents felt the smart city concept still avoided addressing the root of the problem. One resident advances this intention further explaining that "technology appears as a solution but when you look closer it's actually not, it's an excuse. We say ok here is this monitor and this camera, and we feel safe or better about the world, but actually the same bad things are happening and nothing is being done" (Interview with STH_15). While a long term resident observes that over the decades, more data has been collected about a number of areas without significant positive impact on the

community. She added that "data may have contributed to individual wealth but it has yet to be demonstrated how it can be used to provide services where they are needed" and reinforces back to the importance of establishing improved cooperation mechanisms and trust among community members through education and streamlining existing services rather than tying to add another layer of technology (Interview with STH_16).

j. Reflections on a Digitising World

In many ways, the COVID-19 pandemic was an abrupt assessment for the idea of a technologically enabled smart city, dramatically forcing residents of urban areas around the world to suddenly adapt their behaviors and the problems facing their communities in a broad way. Thus, wrapping up the interviews, residents were asked to consider how the COVID-19 pandemic had influenced their outlook towards the role of technology and its limitations as a potential solution maker in their communities.

A similar insecurity was identified across the age groups of residents relates to the forces at the wider societal level, which has forced individuals regardless of their preexisting knowledge, habits, and needs for it, to suddenly become an active participant in the digital world in some form. Unlike other forms of general personal data, when asked whether public authorities should consult residents before collecting data to implement public health interventions, only six residents indicated that they needed to be consulted beforehand. Similar to monitoring air and noise levels, the majority of residents perceived their public health data as benefitting the common good with the remaining simply wanting to be informed about how their data will be used. More broadly, almost all participants recognised an accelerated pace of digitalisation and could identify some practical elements that have facilitated their everyday lives and its profound impact on the reception to habitual use of technology by most members of society.

On one hand, there are enormous perceived benefits that are granted to the individual through the maintenance of communication in both the professional and personal realms that facilitated and even allowed for life to continue, somewhat uninterrupted during confinement. One 29-year old resident specified that the wide scale normalisation of digitalised practices in almost everything could eventually have very tangible impacts on the immediate environment of cities, by reducing the stress on infrastructure systems, traffic, noise pollution and so on

(Interview with STH_12). While another indicated the pandemic enabled many to re-dedicate time back to themselves as digitising certain processes and tasks that were once both habitual and mandatory has helped streamline and improve processes that weren't so optimal (Interview with STH_6). It is recognised that most of the participants either were retired or had professions whose functions could be transferred online, thus residents without the ability to telecommute were not examined.

And yet, eleven participants still recognised the limitations of digitalisation as problem solvers, both beyond and within the previously indicated benefits that primarily enabled productivity and communication. Among those who indicated negative consequences, technology was described as an almost unforgiving medium to address long-standing problems that are both facilitating in certain ways, and exhausting and divisive in other ways. Similar to previous discussions, most residents erred on the side of caution perceiving technology as a double edged sword that glosses over the root problems and creates a divide in the ability to create human connection. Several residents described a unique form of dissociation that makes it even more difficult to directly address misunderstandings by creating an environment composed of miscommunication, information overload and isolating distanciation where one resident articulates the "sense that you were doing everything the same, but not getting the same value or quality as it could have been otherwise as in person" (STH_10). These experiences have triggered residents to think more widely about basing their lives and immediate communities on the applications of technology.

For example, one resident interrogated the idea of basing future relationships between community members and between their local forms of governance on technology, arguing that the once utopian expectations of how technology could enrich daily urban life have soured into a reality of an exhausting and frustrating daily experience. She added, by thinking beyond the borders of her own neighborhood arguing that there are more profound implications as not everywhere can sustain universal access to technology and a high level of connectivity, "by doing that you might intensify inequalities for other countries. Not everywhere do you have the support to have this kind of living" (Interview with STH_11). Another resident concluded that technology should cease to be thought of as a "silver bullet" that can resolve all problems and that as a society, we must reconsider the way we collect and use data, instead thinking of it not as

a replacement for other interventions, bur rather just “one tool in a much larger tool kit” (Interview with STH_16).

6. Discussion

This thesis explored the case of resident experts living in the Centro District of Madrid, a city that in recent years has gradually adopted a smart cities approach that seeks to emphasise ICT application and technological innovation to enhance municipal services and quality of life for residents (Ayuntamiento de Madrid, 2018a), by pursuing the following questions: *How do Madrid residents as local experts perceive the smart city concept?; What do residents expect of future versions of smart cities?; Which specified issues are most important to address according to residents living in Madrid?;* and *How do residents living in Madrid perceive the increasing use of digital data?* Moreover, the qualitative thematic analysis of interviews with Madrid residents reveals the following insights in relation to the broader and still ongoing debates surrounding smart cities and considerations for future smart city expansion in the region and beyond.

The majority of residents recognised the potential benefits that could arise out of their District becoming more like the ICT based definitions of the smart city, where municipal services, energy, and resources are intelligently managed to work towards aspiring goals of an improved quality of life for all and healthier and more sustainable environment (Colado et. al, 2014; Caragliu et. al, 2011). Whether it was improving mobility options or contributing to a more healthy, physical environment that reduced forms of pollution, residents could identify some positive elements that could improve their quality of life. At the same time, some of the most celebrated achievements of the officially sanctioned Madrid Smart City, namely in the area of Smart Mobility, contain one of the worst problems that residents could identify: noise pollution (Benevolo, Dameri, & D’Auria, 2016). Moreover, the discussions forced residents to reconsider their own locally contextualised understanding of what constitutes ‘smartness’ while connecting related aspects of personal data and contemplating potential solutions to the most pressing issues facing their communities.

The perspectives of residents were varied and at times in conflict with each other. They expressed visions of a smart city that was transparent and honest with residents, that was responsive and working in the benefit of the needs of its residents rather than working to

maintain a long standing status quo upheld by the municipal government and external entities that are mostly interested in maintaining a constant flow of profit from the hospitality, hotel and related tourism industries that are a constant presence in the District. The wide range of perspectives support the idea that the relationship between the city and residents is a complex reality that cannot be condensed into one diluted expression, and even less, one declaration of a 'smart city.' Notwithstanding, in line with some of the more critical stances in the literature towards smart cities (Hollands, 2008; Hollands, 2015; Greenfield, 2013; Cardullo & Kitchin, 2019), the interpretation of the smart city concept by residents of Madrid Centro included a common understanding that purely relying on technical innovation does not correspond to making a smart city, by contrast, the smartness of the city is derived from the ability to be receptive and accessible to the needs of the community.

In this version of the smart city, whether or not technology is at the root of all functions, the city is expected to still be able to run efficiently and effectively for all residents, while solely ICT-based solutions are not accepted as the definitive remedy for all urban problems and paramount for making it smart (Taylor et al., 2016; Greenfield, 2013). Residents were also primarily concerned with accessibility, from both a social and material standpoint, which is typically an overlooked issue for other stakeholders who are mostly concerned with optimising conditions for economic growth and cutting costs as the final decision makers for smart city initiatives (Cardullo & Kitchen, 2019; Kunzmann, 2020; Mancebo, 2020).

Although among residents there is periodic acceptance of ICT enabled provisions in specified areas such as in the monitoring of traffic or air pollution, there were clearly demarcated limitations in the trade off between the perceived benefits against the perceived risks. As ICT and other forms of digital technologies become a more characteristic and unavoidable mechanism for both residents and their political representatives, the need to fully comprehend the depth of the consequences of their rapid and wide scale implementation, particularly in the areas of our individual wellbeing and democratic abilities, becomes even more compelling. In the idea of a smart city that uses these same technologies as performance and quality of life enhancers through the optimisation of diminishing resources and reduction of environmental hazards and nuisances, the needs and preferences of everyday residents should not be superseded by the end goals and marker of success of having achieved a fully technologically enabled city (Sassen, 2017; Vanolo, 2014; Shepard, 2011). Instead, Madrid residents' expectations are aligned

with the idea that the future development and implementation of further technologies should be seen as just one tool in a wider set of strategies that can accurately assess local problems and achieve improved circumstances for all members of the community with the needs and preferences of residents at the centre, resembling what Trencher (2019) describes as the 'smart city 2.0."

This vision of a smart city is more appropriately characterised as knowledge-intensive smart urbanism (McFarlane & Söderström, 2017) that firmly ensures ICT and data-collecting technologies are in the service of supporting the problems most relevant to their communities, not a set of political or commercial interests. Simultaneously while considering that non-technological solutions are also valid and even more suitable in many cases to the interests of any community, although they may require more resources to identify and implement. Residents recognise that smart services that can be derived from this 'soft domain' are just as critical, if not more critical and necessary, to meeting the needs of the community, especially in relation to their expressed desires for a sense of community and interpersonal relationships with other community members in the city. While technologies can play a role in the smart city, above all residents prioritise the expending of municipal resources in other areas that are not well addressed by technological intervention as well (Hollands, 2015; Townsend, 2014) such as access to affordable housing, mitigating overtourism, resident displacement, and addressing the homeless population to name a few possible problem areas. Thus, it can be stated that an increased focus on digitally mediated practices and platforms should not compromise nor replace the need for high-quality physical spaces and human contact that enhance the livelihood of residents by allowing interactivity and plentiful opportunities for accessibility at the individual, community, and municipal levels.

Additionally, there is a vital need to more closely examine both the existing and future adoption of new technologies that may have unintended consequences for residents in terms of their ability to effectively participate in their municipal governance, form bonds of connection and solidarity among other members of their communities, and overall quality of life. These unintended consequences are already typically less examined in smart city research, which mostly focus on elements of innovation in terms of economic growth and confined political motives while mostly ignore residents' perspectives and level of awareness of the gradual technological transitions taking place around them (Trencher, 2019; Yeh, 2017; Joss, Cook &

Dayot, 2017). Increasingly, these consequences may become even more pertinent to future smart cities development as recently developed norms surrounding acceptable data collection and privacy practices are constantly being developed, revised, re-negotiated and normalised as a result of the COVID pandemic era and expand well beyond the purview of public health to other realms of digitalisation more widely (Kitchin, 2020; Kunzmann, 2020).

Involving the use of digital data, among this section of Madrid residents, the level of awareness of elements surrounding a digital transition is considerably low and contributes to a sense of mistrust and uncertainty surrounding their personal data. As the end users of smart city services have established safety, security, and support for dramatically upgraded forms of public regulation of digital security (van Zoonen, 2016), this translates to need for increased education efforts by part of the municipal government to actively inform residents of their rights while also supporting more regulation efforts that protect more vulnerable populations from the potential threats to the individual and wider municipality. Most residents felt uncomfortable with the black box idea of having to utilise smart technologies without awareness of the details of the types of data being collected and the identity of the users of their data. If smart cities services were more aptly regulated and equipped with robust privacy features together with a targeted effort to educate residents on how to properly use such technologies, willingness and confidence in smart cities would be stronger (Yeh, 2017).

This is reflected in the conservations with Madrid residents as more would be more willing to incorporate smart city technologies into their communities on condition that the precise needs and results are clearly demonstrated while personal information and privacy rights are guaranteed by the public authorities collecting data. This thesis adds nuance to the calls for further research into future models of a smart city that rethink the related ideas of citizenship, inclusion and sustainable practices that are meant to progress towards the benefit of public good and suggest the need for a consistent ethical structure that can guide future smart city design and implementation practices that avoids the conception of residents as objective and quantifiable units (Kitchin, 2020; Barassi, 2019; Townsend, 2014). In a revised expectation for the smart cities, residents should not be resigned data points or simple receivers of particular smart initiatives, but should be included at the table as relevant stakeholders and co-creators who are typically a source of grassroots ideas removed from technological or corporate interests (Cardullo and Kitchin, 2019; Mancebo, 2020). Moreover, grass-roots ideas and practices could

potentially widen the scope for marginalised members of the community, who may not have the necessary capital, access to technology, or time to actively participate, and thus are pivotal for making a truly smart city (Aanestad, Monteiro & Nielsen, 2007; Verrest & Pfeffer, 2018; Sonn and Lee, 2020).

Based on these conversations, residents expect a more tailored version of a smart city based on a foundation of transparency and clear principles guided by a municipality that is committed towards ensuring the ongoing socio-technical transition takes into account the interconnected interests of the local realities facing urban communities while balancing these interests against those of additional stakeholders. Rather than focusing on privacy concerns and issues of trust in the municipality to address their interests which can inhibit the achievement of successful smart city initiatives, transparency in the form of well communicated and publicly available smart city indicators, decision plans, and follow up with results to accurately demonstrate progress would be worthwhile and effective for convincing residents of the potential value of future smart city plans.

7. Conclusion

This thesis intends to contribute to the gap in smart city research that calls for a more nuanced understanding of the preferences and perceptions of local residents surrounding the smart city concept more widely and its many potential services within a specific context, in this case, the Centro District of Madrid. Following an exploratory approach that was motivated by a qualitative research design, the results led to valuable insights, however are not representative of the entire population of the District or the wider municipality of Madrid. While there is plenty of research in the domain of smart cities that tend to focus on the concrete benefits of smart city services and the potential elements that contribute to their usage (Komninos & Mora, 2018; Yeh, 2017), this study intended to build on a string of studies that center around the stated preferences, expectations, needs and perspectives of residents in different contexts (Thomas et. al 2016; Ji, Jieh-Haur, Hsi-Hsien & Yu-Ching, 2021).

The results of this thesis indicate that the smart city interpreted by Madrid Centro residents is far from a one-dimensional ideation. One where most would have chosen to focus on an improved quality of life through strengthening mechanisms for community development, improving transparency and accountability of municipal administrators to respond to

interconnected concerns such as noise pollution and practices related to over tourism, rather than advocating for an urban space laden with ICT-based solutions. Residents questioned the effectiveness of data collection and technological intervention in their ability to address the most relevant issues identified and were apprehensive about the roles that digital technologies play in the current and future smart city of Madrid. Their lack of awareness about the intricacies of data collection regarding its intended purpose, what types of data, the users behind this collected data, and their seemingly invisible outcomes revealed a certain anxiety that forced them to ruminate on the trade off between interconnected services and their personal privacy. Overall, the Smart City Madrid perceived by residents as it is today is far from what they would expect.

A form of smart city development that can be characterised as more resident centric requires decision makers in technology, academia, municipal administrations, public officials more broadly, and other relevant stakeholders to empathise and respond to members of their publics, in order to ensure smart services and initiatives concretely correspond to the needs and preferences of the inhabitants of cities. Without a clear and detailed understanding of these preferences and needs, municipal administrators will not be able to reach the stated goals of typical smart city ambitions that aim for an improved quality of life, efficiency, and almost utopian way of urban life.

From an economic standpoint, a resident centric orientation can minimise the loss of investments into smart technologies, initiatives, and practices that are not even in line with the expectations of residents and still fall short of addressing most of the persistent urban and community development problems identified by residents in the first place. Instead, following these needs and preferences can support municipal administrators in their decision making processes when deciding on what and how to allocate resources and investments for services that are actually in demand by residents (Lin, Zhao, Yu, & Wu, 2019). Overall, whether residents are reduced to simple data points or not, without them, smart cities would not be functional or generate any kind of intrinsic or extrinsic value. Thus, going against the critical view that municipal administrators are actively seeking to silence residents, another perspective that assumes these same administrators actually do have an inherent interest in ensuring residents are recognised could be reignited.

Future studies could also investigate possibilities for smart city technologies or initiatives that encapsulate more formal participation mechanisms that ensure residents are not sidelined

from both public service provision and more entrepreneurial projects taking place in their communities. At the moment, digital platforms and existing participatory mechanisms do not allow for sufficient civic engagement in municipal or private sector projects, falling under the radar for most residents. Furthermore, residents' specified preferences for solutions outside the purview of technological intervention point to a need to rethink what constitutes 'smartness' and that urban services could be developed in a 'non-smart' way involving grassroots thinking, restructuring in relevant policy areas, or other non-ICT based solutions.

Lastly, as urban regions around the world adapt to a post-pandemic reality, future studies could examine and compare how the preferences and needs of residents living in smart cities have changed in response to the evolving circumstances. As distinct cities, regions, and countries will have varying degrees of ICT penetration and access, socio-cultural habits of technology use, expectations of their governments, and a whole range of additional context-specific variables, the results of this study cannot not apply to other regions of the world. Further research exploring the construction and application of smart services, particularly those involving non-ICT solutions, and their reception by local inhabitants would be highly intriguing and worthy of further inquiry.

8. References

Aanestad, M., Monteiro, E. & Nielsen. P. (2007). Information Infrastructures and Public Goods: Analytical and Practical Implications for SDI. *Information Technology for Development*, 13(1), 7-25. and Star, S. L. (1999). The Ethnography of Infrastructure, American Behavioral Scientist, 43 (3):377-391.

Albino, V., Berardi, U. & Dangelico, R. M. (2015). Smart Cities: Definitions, Dimensions, Performance, and Initiatives. *Journal of Urban Technology*, vol. 22, no. 1, pp. 3–21.

Aletà, N., Alonso, C., & Ruiz, R. (2017). Smart Mobility and Smart Environment in the Spanish cities. *Transportation Research Procedia*, 24, 163-170.

Alsaawi, A. (2014). A Critical Review of Qualitative Interviews. *European Journal of Business and Social Sciences*, 2014, Vol. 3, No. 4.

Angelidou, M. (2017). The Role of Smart City Characteristics in the Plans of Fifteen Cities. *Journal of Urban Technology*, 24:4, 3-28, DOI: 10.1080/10630732.2017.1348880

Anthopoulos, L.G., & Tsoukalas, I.A. (2006). The Implementation Model of a Digital City. The Case Study of the Digital City of Trikala, Greece. *Journal of E-government*, 2(2), 91-109.

Arroub, A., Zahi, B., Sabir, E., & Sadik, M. (2016). A literature review on Smart Cities: Paradigms, opportunities and open problems. *2016 International Conference on Wireless Networks and Mobile Communications* (WINCOM), 180-186.

Ayuntamiento de Madrid. (2021). Población extranjera en la ciudad de Madrid. Población extranjera por País de nacionalidad y Distrito de residencia [Data Set]. *Estadística del Ayuntamiento de Madrid.* https://www.madrid.es/portales/munimadrid/es/Inicio/El-Ayuntamiento/Estadistica/Areas-de-informacion-estadistica/Demografia-y-poblacion/Poblacion-extranjera/Poblacion-extranjera-en-la-ciudad-de-Madrid/?vgnextfmt=default&vgnextoid=c289d54944580510VgnVCM2000000c205a0aRCRD&vgnextchannel=9ce23636b44b4210VgnVCM2000000c205a0aRCRD

Ayuntamiento de Madrid. (2020a). Distritos en Cifras (Información de Distritos): Indicadores demográficos por Distrito. [Data Set]. *Subdirección General de Estadística: Explotación estadística del Padrón Municipal de Habitantes.* https://www.madrid.es/UnidadesDescentralizadas/UDCEstadistica/Nuevaweb/Demograf

%C3%ADa%20y%20poblaci%C3%B3n/Indicadores%20Demogr%C3%A1ficos/C5000121.xls

Ayuntamiento de Madrid. (2020b). Distritos en Cifras (Información de Barrios): Mapas de Distrito y Barrios. [Data Set]. *Subdirección General de Estadística: Explotación estadística del Padrón Municipal de Habitantes.* https://www.madrid.es/UnidadesDescentralizadas/UDCEstadistica/Nuevaweb/Territorio,%20Clima%20y%20Medio%20Ambiente/Territorio/Mapas%20de%20dist%20y%20bar/Centro/Distrito%2001%20-%20Centro.pdf

Ayuntamiento de Madrid. (2020c). Distritos en Cifras (Información de Barrios): Población por Grupo de edad y Sexo a 1 de enero de 2020. [Data Set]. *Subdirección General de Estadística: Explotación estadística del Padrón Municipal de Habitantes.* https://www.madrid.es/UnidadesDescentralizadas/UDCEstadistica/Nuevaweb/Distritos/Distritos%20en%20cifras%20barrios/01%20-%20Centro/D01T0220.xls

Ayuntamiento de Madrid. (2020d). Distritos en Cifras (Información de Barrios): Características generales por Barrio. [Data Set]. *Subdirección General de Estadística: Explotación estadística del Padrón Municipal de Habitantes.* https://www.madrid.es/UnidadesDescentralizadas/UDCEstadistica/Nuevaweb/Distritos/Distritos%20en%20cifras%20barrios/01%20-%20Centro/D01T0120.xls

Ayuntamiento de Madrid. (2019a). Estudio Sociodemográfico de los Barrios de Madrid-Ligados a los Planes Integrales de Barrio (PIBA). *Departamento de Estudios y Evaluación Territorial Área de Coordinación Territorial y Cooperación Público-Social del Ayuntamiento de Madrid.* https://transparencia.madrid.es/UnidadesDescentralizadas/UDGParticipacionCiudadana/Publicaciones_Fondo_Documental/Estudio_Sociologico_Barrios_PIBA/Estudio_PIBA_2019_I.pdf

Ayuntamiento de Madrid. (2019b). Mapa Estratégico y Plan Operativo de Gobierno 2019-2023. *Ayuntamiento de Madrid.* https://transparencia.madrid.es/FWProjects/transparencia/PlanesYMemorias/Planes/PlanGobierno/Ficheros/MapaPOG_2019-2023_marzo_1786.pdf

Ayuntamiento de Madrid. (2019c, September). Avance de la Estrategia de Sostenibilidad Ambiental Madrid 360. *Ayuntamiento de Madrid.* https://www.madrid.es/UnidadesDescentralizadas/UDCMedios/noticias/2019/09%20septiembre/30Lunes/Notasprensa/Presentación%20Madrid%20360/ficheros/Avance-Estrategia-Sostenibilidad-Ambiental-Madrid-360.pdf

Ayuntamiento de Madrid. (2018a). Innovación y Ciudad Inteligente. ¿Qué es una Smart City? - Todo sobre las casas inteligentes. *Ayuntamiento de Madrid.* https://www.madrid.es/portales/munimadrid/es/Inicio/Actividad-economica-y-hacienda/Innovacion-y-Ciudad-Inteligente/?vgnextfmt=default&vgnextoid=dbc90a25fedc4510VgnVCM2000001f4a900aRCRD&vgnextchannel=138d31d3b28fe410VgnVCM1000000b205a0aRCRD&idCapitulo=10137468

Ayuntamiento de Madrid. (2018b). Acuerdo Junta de Gobierno Madrid Central. *Ayuntamiento de Madrid.* https://www.madrid.es/portales/munimadrid/es/Inicio/Movilidad-y-transportes/Madrid-Central-Zona-de-Bajas-Emisiones/Informacion-general/Madrid-Central-Informacion-General/?vgnextfmt=default&vgnextoid=a67cda4581f64610VgnVCM2000001f4a900aRCRD&vgnextchannel=088e96d2742f6610VgnVCM1000001d4a900aRCRD

Ayuntamiento de Madrid. (2017). Ciudad de Madrid, Procesos de Participación Ciudadana Realizados en la Ciudad de Madrid Junio 2015–Julio 2017. *Decide Madrid.* https://decide.madrid.es/system/informes/01.texto_informe_participacion_ciudadana.pdf

Ayuntamiento de Madrid. (2011). Vía inteligente en la Puerta del Sol - Ayuntamiento de Madrid. *Ayuntamiento de Madrid.* https://www.madrid.es/portales/munimadrid/es/Inicio/Actualidad/Noticias/Via-inteligente-en-la-Puerta-del-Sol/?vgnextfmt=default&vgnextoid=7d18196f5f974310VgnVCM2000000c205a0aRCRD&vgnextchannel=a12149fa40ec9410VgnVCM100000171f5a0aRCRD.

Ayuntamiento de Madrid. (2009). La población 'flotante' de Madrid [The Floating Population of Madrid]. Retrieved from: https://www.madrid.es/portales/munimadrid/es/Inicio/Actualidad/Noticias/La-poblacion-flotante-de-Madrid/?vgnextfmt=default&vgnextoid=2eaf2b653a2e4210VgnVCM2000000c205a0aRCRD&vgnextchannel=a12149fa40ec9410VgnVCM100000171f5a0aRCRD

Bakici, T., Almirall, E., and Wareham, J. (2013) A Smart City Initiative: the Case of Barcelona, *Journal of Knowledge Economy* 4(2): 135–148.http://dx.doi.org/10.1007/s13132-012-0084-9

Banco de España. (2020). Tendencias Recientes de la Población en las Áreas Rurales y Urbanas de España [Recent Population Trends in Rural and Urban Regions of Spain]. *Banco de España.*

https://www.bde.es/f/webbde/SES/Secciones/Publicaciones/PublicacionesSeriadas/DocumentosOcasionales/20/Fich/do2027.pdf

Barassi, V. (2019). Datafied Citizens in the Age of Coerced Digital Participation. *Sociological Research Online*, 24(3), 414-429.

Belanche-Gracia, D., Casaló-Ariño, L., & Pérez-Rueda, A. (2015). Determinants of multi-service smartcard success for smart cities development: A study based on citizens' privacy and security perceptions. *Government Information Quarterly*, 32(2), 154-163.

Benevolo, C., Dameri, R., & D'Auria, B. (2016). Smart Mobility in Smart City. Action taxonomy, ICT intensity and public benefits. 10.1007/978-3-319-23784-8_2.

Berrone, P. & Ricart, J.E. (2020). IESE Cities in Motion Index 2020. *IESE*, Barcelona, Spain. Retrieved from: https://media.iese.edu/research/pdfs/ST-0542-E.pdf

Borja, J. (2013). Revolución urbana y derechos ciudadanos. Madrid: *Alianza Editorial.*

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101.

Calzada, I., & Cobo, C. (2015). Unplugging: Deconstructing the Smart City. The Journal of Urban Technology, 22(1), 23-43.

Cardullo, P., Kitchin, R. (2017). Being a 'citizen' in the smart city: up and down the scaffold of smart citizen participation in Dublin, Ireland. *GeoJournal* 84, 1–13 (2019). https://doi.org/10.1007/s10708-018-9845-8

Cardullo, P., & Kitchin, R. (2019). Smart urbanism and smart citizenship: The neoliberal logic of 'citizen-focused' smart cities in Europe. *Environment and Planning C: Politics and Space*, 37(5), 813–830. https://doi.org/10.1177/0263774X18806508

Caragliu, A., Del Bo, C., & Nijkamp, P. (2011). Smart Cities in Europe. *Journal of Urban Technology: Creating Smart-er Cities*, Guest Edited by Mark Deakin, 18(2), 65-82.

Cecilia, J., Cano, J., Hernández-Orallo, E., Calafate, C., T, & Manzoni, P. (2020). Mobile crowdsensing approaches to address the COVID-19 pandemic in Spain. *IET Smart Cities*, 2(2), 58-63.

Chourabi, H., Nam, T., Walker, S., Gil-Garcia, J. R., Mellouli, S., Nahon, K., ... & Scholl, H. J. (2012). Understanding smart cities: An integrative framework. System Science (HICSS), *2012 45th Hawaii International Conference on,2289-2297*. IEEE.

Colado, S., Gutiérrez, A., Vives, C., & Valencia, E. (2014). Smart city: Hacia la gestión inteligente. *Barcelona: Marcombo.*

Collantes, F. & Pinilla, V. (2019). ¿Lugares que no importan? La despoblación de la España rural desde 1900 hasta el presente, Monografías de Historia Rural, n.º 15, Zaragoza, *Prensas de la Universidad de Zaragoza.*

Constantini, L. (2018, June 7). La ONU premia al Ayuntamiento de Madrid por su portal de participación. *EL PAÍS*. https://elpais.com/ccaa/2018/06/07/madrid/1528383491_645024.html.

Crowe, S., Cresswell, K., Robertson, A. et al. The case study approach. *BMC Med Res Methodology* 11, 100 (2011). https://doi.org/10.1186/1471-2288-11-100

Dalla Corte, L., van Loenen, B., and Cuijpers, C. (2017). Personal data protection as a nonfunctional requirement in the smart city's development. *In the proceedings of the IDP (Internet, Derecho y Política) conference*, Barcelona, June 30 2017.

Decide Madrid. (2021). Retrieved from: https://decide.madrid.es/mas-informacion

Dryjanski, M. Buczkowski, M. Ould-Cheikh-Mouhamedou, Y. and Kliks, A (2020). Adoption of Smart Cities with a Practical Smart Building Implementation. *IEEE Internet of Things Magazine*, vol. 3, no. 1, pp. 58-63, doi: 10.1109/IOTM.0001.1900050.

Dutton, W., Blumler, J., & Kraemer, K. (1987) (Eds.)Wired Cities: Shaping the Future of Communications. *New York: G.K. Hall*

ESmart City. (2019, October 1). El Ayuntamiento de Madrid presenta su nueva estrategia de sostenibilidad ambiental. *ESmartCity*. https://www.esmartcity.es/2019/10/01/ayuntamiento-madrid-presenta-nueva-estrategia-sosteniblidad-ambiental.

Eurostat. (2020). ICT usage in households and by individuals. Households - level of internet access. [Data File] *Luxembourg: Office for Official Publications of the European Communities.* http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_ci_in_h&lang=en

Eurostat. (2014). Statistics Explained. “Glossary Broadband.” Retrieved from: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Broadband

Flick, U. (2014). An introduction to qualitative research (5.th ed.). Los Angeles, Calif. [u.a.]: Sage.

François, M. (2020) Smart city strategies: time to involve people. Comparing Amsterdam, Barcelona and Paris, *Journal of Urbanism: International Research on Placemaking and Urban Sustainability*, 13:2, 133-152, DOI: 10.1080/17549175.2019.1649711

FutuRed. (2015, December 3). RECI y Grupo Tecma Red ponen en marcha la II edición del Congreso Ciudades Inteligentes. Plataforma española de redes eléctricas. Retrieved from: https://www.futured.es/reci-y-grupo-tecma-red-ponen-en-marcha-la-ii-edicion-del-congreso-ciudades-inteligentes/.

Galdon-Clavell, G. (Not so) smart cities?: The drivers, impact and risks of surveillance-enabled smart environments. *Sci. Public Policy* 2013, 40, 717–723.

Giffinger, R., & Gudrun, H. (2010). Smart cities ranking: an effective instrument for the positioning of the cities? (12).

Giffinger, R., Fertner, C., Kramar, H., Kalasek, R., Pichler-Milanovic, N., & Meijers, E. (2007). Smart Cities - Ranking of European medium-sized cities. *Vienna University of Technology*.

Giffinger, R., & Hamedinger, A. (2013). Borders in Metropolitan Development: The Case of Vienna. *Journal of Borderlands Studies*, 28(2), 205-219.

Gobierno de España. (2015). Plan Nacional de Ciudades Inteligentes. *Ministerio de Asuntos Económicos y Transformación Digital.* https://plantl.mineco.gob.es/planes-actuaciones/Paginas/plan-nacional-ciudades-inteligentes.aspx

Graham, S. (2002). Bridging Urban Digital Divides? Urban Polarisation and Information and Communications Technologies (ICTs). *Urban Studies*, 39(1), 33-56.

Graham, S., & Marvin, S. (2001). Splintering urbanism : Networked infrastructures, technological mobilities and the urban condition (1. publ. ed.). London: *Routledge*.

Greenfield, A. (2013). Against the Smart City. New York: Do projects.

Habib, A., Alsmadi, D., & Prybutok, V. (2020). Factors that determine residents' acceptance of smart city technologies. *Behaviour & Information Technology*, 39(6), 610–623. https://doi.org/10.1080/0144929X.2019.1693629

Han, N., Jee, M., & Jeong, K. (2021). A critical review of the smart city in relation to citizen adoption towards sustainable smart living. *Habitat International*, 108, 102312.

Hollands, R. (2015). Critical interventions into the corporate smart city. *Cambridge Journal Of Regions, Economy And Society*, 8(1), 61-77.

Hollands, R. (2008). Will the real smart city please stand up?: Intelligent, progressive or entrepreneurial? *City*, 12(3), 303-320.

Jacobs, J. (1961). The Death and Life of Great American Cities. New York: Random House.

IBM. (2010). Smart Cities For Smarter Growth. Retrieved from: https://www.ibm.com/downloads/cas/8NEWPLZ1

IMD. (2019). IMD Smart City Index 2019. *IMD*, Lausanne, Switzerland. Retrieved from: https://www.imd.org/globalassets/wcc/docs/smart_city/smart_city_index_digital.pdf

IMD. (2020). IMD Smart City Index 2020. *IMD*, Lausanne, Switzerland. Retrieved from: https://www.imd.org/globalassets/wcc/docs/smart_city/smartcityindex_2020.pdf

INE. (2020a). Contabilidad Regional de España. CRE. Serie 2017-2019. [Data File]. *Instituto Nacional de Estadística*. Retrieved from: https://www.ine.es/dyngs/INEbase/es/operacion.htm?c=Estadistica_C&cid=1254736167628&menu=ultiDatos&idp=1254735576581.

INE. (2020b). Encuesta sobre equipamiento y uso de tecnologías de información y comunicación en los hogares 2020. Evolución de datos de Viviendas (2006-2020) por Comunidades Autónomas, tipo de equipamiento y periodo [Evolution of Household Data by Autonomous Communities, type of equipment, and time period][Data File]. *Instituto Nacional de Estadística*. Retrieved from: https://www.ine.es/dynt3/inebase/es/index.htm?padre=6913&capsel=7110

INE. (2020c). Encuesta sobre equipamiento y uso de tecnologías de información y comunicación en los hogares 2020. Acciones llevadas a cabo para gestionar el acceso a la información

personal en Internet, por motivos particulares, en los últimos 3 meses, por Comunidades y Ciudades Autónomas y tipo de acción [Actions Taken to Manage Access Personal Information on the Internet, by specific reasons, in the last 3 months, by Autonomous Communities and Cities][Data File]. *Instituto Nacional de Estadística*. Retrieved from: https://www.ine.es/jaxi/Tabla.htm?tpx=39511&L=0

INE. (2020d). Encuesta sobre equipamiento y uso de tecnologías de información y comunicación en los hogares 2020. Evolución de datos de Viviendas (2006-2020) por Comunidades Autónomas, tipo de equipamiento y periodo [Evolution Of Housing Data (2006-2020) by Autonomous Communities, type of equipment, and time period][Data File]. *Instituto Nacional de Estadística*. Retrieved from: https://www.ine.es/jaxi/Tabla.htm?tpx=39483&L=0

INE. (2020e). Encuesta sobre equipamiento y uso de tecnologías de información y comunicación en los hogares 2020. Grado de confianza en Internet por Comunidades y Ciudades Autónomas [Grade of Confidence in the Internet by Autonomous Communities][Data File]. *Instituto Nacional de Estadística.* Retrieved from: https://www.ine.es/jaxi/Tabla.htm?tpx=39519&L=0

INE. (2018). Atlas de distribución de renta de los hogares [Distribution Atlas according to Average Household Income]. *Instituto Nacional de Estadística.* Retrieved from: https://www.ine.es/experimental/atlas/experimental_atlas.htm

INE. (2014). Encuesta sobre Equipamiento y Uso de Tecnologías de Información y Comunicación en los hogares 2014 [Survey Regarding Equipment and Use of Information and Communication Technologies in Households 2014]. *Instituto Nacional de Estadística.* Retrieved from: https://www.ine.es/dynt3/inebase/index.htm?type=pcaxis&path=/t25/p450/base_2011/a2014/&file=pcaxis.

Innes, J. E., & Booher, D. E. (2004). Reframing public participation: strategies for the 21st century. *Planning Theory & Practice*, 5(4), 419–436. https://doi.org/10.1080/1464935042000293170

Ishida, T., Isbister, K., & Van Leeuwen, J. (2000). Digital Cities (Vol. 1765, Lecture Notes in Computer Science). Berlin, Heidelberg: Springer Berlin / Heidelberg.

Ji, T., Jieh-Haur, C., Hsi-Hsien, W., Yu-Ching, Su. (2021). Towards people-centric smart city development: Investigating the citizens' preferences and perceptions about smart-city

services in Taiwan. *Sustainable Cities and Society*, Volume 67. https://doi.org/10.1016/j.scs.2020.102691.

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

Kirimtat, A., Krejcar, O., Kertesz, A., & Tasgetiren, M. Fatih. (2020). Future Trends and Current State of Smart City Concepts: A Survey. *IEEE Access*, 8, 86448-86467.

Kitchin, R., & Dodge, M.. (2011). Code/Space (Software Studies). Cambridge: MIT Press.

Kitchin, R. (2014). The real-time city? Big data and smart urbanism. *GeoJournal*, 79(1), 1-14.

Kitchin, R. (2016). The ethics of smart cities and urban science. Philosophical Transactions of the Royal Society A: *Mathematical, Physical and Engineering Sciences*, 374(2083), 20160115.

Kitchin, R. (2020). Civil liberties or public health, or civil liberties and public health? Using surveillance technologies to tackle the spread of COVID-19. *Space & Polity*, 24(3), 362-381.

Komninos, N. & Mora, L. (2018). Exploring the Big Picture of Smart City Research. *Scienze Regionali*. 17. 10.14650/88815.

Kresin, F. (2016). Smart cities value their smart citizens. In Mamadouh V. & Van Wageningen A. (Eds.), *Urban Europe* (pp. 181-186). Amsterdam: Amsterdam University Press. doi:10.2307/j.ctvcszzrh.25

Kumar, T.M. Vinod & Dahiya, B. (2017). Smart Economy in Smart Cities. 10.1007/978-981-10-1610-3_1.

Kunzmann, K. (2020). Smart Cities After Covid-19: Ten Narratives. *DISP*, 56(2), 20-31. DOI: 10.1080/02513625.2020.1794120

Lara, A. Prado, Moreira Da Costa, E., Furlani, T., & Yigitcanlar, T. (2016). Smartness that matters: Towards a comprehensive and human-centred characterisation of smart cities. *Journal of Open Innovation*, 2(1), 1-13.

Lin, C., Zhao, G., Yu, C., & Wu, Y. (2019). Smart City Development and Residents' Well-Being. *Sustainability* (Basel, Switzerland), 11(3), 676. https://doi.org/10.3390/su11030676

Luque-Ayala, A., & Marvin, S. (2015). Developing a critical understanding of smart urbanism? *Urban Studies*, 52(12), 2105-2116.

Mancebo, F. (2020). Smart city strategies: Time to involve people. Comparing Amsterdam, Barcelona and Paris. *Journal of Urbanism*, 13(2), 133-152.

Martiarena, A. (2021, May 12). El Tribunal Supremo anula Madrid Central. *La Vanguardia.* https://www.lavanguardia.com/local/madrid/20210511/7444921/supremo-anula-madrid-central.html.

Martinez-Balleste, A., Perez-Martinez, P., Solanas, A. (2013). The pursuit of citizens' privacy: A privacy-aware smart city is possible. *IEEE Communications Magazine*, 51(6), 136-141.

Mcfarlane, C., & Söderström, O. (2017). On alternative smart cities: From a technology-intensive to a knowledge-intensive smart urbanism. *City*, 21(3-4), 312-328.

Millard, J., Thaarup, R., Pederson, J., Manville, C., Wissner, M., Kotterink, B., Cochrane, G., Cave, J., Liebe, A., Massink, R. (2014). *Mapping smart cities in the EU*. DOI: 10.2861/3408

Meijer, A., & Bolívar, M. Pedro Rodríguez. (2016). Governing the smart city: A review of the literature on smart urban governance. *International Review of Administrative Sciences,* 82(2), 392-408.

Mora, L., Bolici, R., & Deakin, M. (2017). The First Two Decades of Smart-City Research: A Bibliometric Analysis. *The Journal of Urban Technology,* 24(1), 3-27.

Morozov, E., & Bria, F. (2018). Rethinking the Smart City: Democratizing Urban Technology (pp. 1-56, Rep.). New York, NY: Rosa Luxemburg Foundation.

Noori, N., Hoppe, T., & De Jong, M. (2020). Classifying Pathways for Smart City Development: Comparing Design, Governance and Implementation in Amsterdam, Barcelona, Dubai, and Abu Dhabi. *Sustainability* (Basel, Switzerland), 12(10), 4030.

Orlowski, A. & Romanowska, P. (2019) Smart Cities Concept: Smart Mobility Indicator, *Cybernetics and Systems*, 50:2, 118-131, DOI:10.1080/01969722.2019.1565120

Osorio, M., Jiménez, M., Fuentes, L. (2021). Retos para la integración de las personas inmigrantes en las Smart Cities. *Cuadernos Geográficos* 60(1), 244-262

Richter, C., Taylor, L., Jameson, S., & Perez del Pulgar, C. (2019). Who are the end-user(s) of smart cities? A synthesis of conversations in Amsterdam. In C. Coletta, L. Evans, L. Heaphy, & R. Kitchin (Eds.), *Creating smart cities* (1 ed., pp. 212-231). Routledge.

Roitman, H., Mamou, J., Mehta, S., Satt, A., & Subramaniam, L.V. (2012). Harnessing the crowds for smart city sensing. *Proceedings of the 1st International Workshop on Multimodal Crowd Sensing*, 17-18.

Rommes, E., Van Oost, E., Oudshoorn, N., Green, E., & Adam, A. (2001). Gender in the design of the digital city of Amsterdam. *In Virtual Gender* (pp. 241-263). Routledge.

Sadowski, J., & Pasquale, F. (2015). The spectrum of control: A social theory of the smart city. *First Monday*, 20(7), First Monday, 07/06/2015, Vol.20(7).

Shelton, T., Zook, M., & Wiig, A. (2015). The 'actually existing smart city'. *Cambridge Journal of Regions, Economy and Society*, 8(1), 13-25.

Shepard, M. (2011). Sentient city: Ubiquitous computing, architecture, and the future of urban space. *New York City: Architectural League of New York.*

Siemens. (2019). IOT: Turning the Internet of Things Into Reality. Retrieved from: https://assets.new.siemens.com/siemens/assets/api/uuid:131ac2f9-5e8b-4968-ba2f-734eefccdb50/version:1556633115/turning-iot-into-reality-whitepaper-by-siemens-iot-services-fina.pdf.

Sonn, J., Lee, J. (2020). The smart city as time-space cartographer in COVID-19 control: the South Korean strategy and democratic control of surveillance technology, *Eurasian Geography and Economic*s, 61:4-5, 482-492, DOI: 10.1080/15387216.2020.1768423

Söderström, O., Paasche, T., & Klauser, F. (2014). Smart cities as corporate storytelling. City, 18(3), 307-320.

Stübinger, J, & Schneider, L. (2020). Understanding Smart City-A Data-Driven Literature Review. *Sustainability* (Basel, Switzerland), 12(20), 8460.

Taylor, L. (2018). What can 'disruptive urban technologies' tell us about power, visibility and the right to the city? *International Journal of Urban and Regional Research*.

http://www.ijurr.org/spotlight-on-overview/disruptive-technologies/power-visibility-right-to-the-city/

Taylor, L., Richter, C., Jameson, S., Perez del Pulgar, C. (2016). Customers, Users or Citizens? Inclusion, Spatial Data and Governance in the Smart City. *University of Amsterdam*.

Red Española de Ciudades Inteligentes, RECI. (2019). Retrieved from: http://www.redciudadesinteligentes.es/

Red Española de Ciudades Inteligentes, RECI (2014). Quienes somos. Retireved from: http://www.redciudadesinteligentes.es/sobre-la-red/quienes-somos/ampliar.php/Id_contenido/301/v/0/

Saldaña, J. (2011). Fundamentals of qualitative research. Oxford University Press.

Salinas Arreortúa, Luis. (2016). Transformación de mercados municipales de Madrid: De espacio de consumo a espacio de esparcimiento [Transformation of Municipal Markets of Madrid: From Space of Consumption to Space of Amusement]. *Revista INVI*, 31(86), 179–201. https://doi.org/10.4067/S0718-83582016000100007

Sánchez de Madariaga, I., García-López, J. y Sisto, R. (2018). Informes ODS en 100 ciudades españolas Informe urbano: *Red Española para el Desarrollo Sostenible* (REDS). Retrieved from: https://reds-sdsn.es/wp-content/uploads/2018/10/Informe-ODS-en-100-ciudades-2018-I-Resumen-web.pdf

Sassen, S. (2017, August). Building Smart Cities: Saskia Sassen [Video]. *TED Conferences*. Retrieved from https://www.youtube.com/watch?v=vHuX79hgtCY

Seidman, I. (2012) Interviewing as qualitative research: A guide for researchers in education and the social sciences. *Teachers college press.*

Smith, A. and Martin, P. (2021). Going Beyond the Smart City? Implementing Technopolitical Platforms for Urban Democracy in Madrid and Barcelona. *Journal of Urban Technology*, 28:1-2, 311-330, DOI: 10.1080/10630732.2020.1786337

Tanrıkul, Ali, & Hoşkara, Şebnem. (2019). A New Framework for the Regeneration Process of Mediterranean Historic City Centres. *Sustainability* (Basel, Switzerland), 11(16), 4483. https://doi.org/10.3390/su11164483

Thomas, V., Wang, D., Mullagh, L., & Dunn, N.. (2016). Where's Wally? In Search of Citizen Perspectives on the Smart City. *Sustainability* (Basel, Switzerland), 8(3), 207.

Townsend, A. M. (2014). Smart cities: Big data, civic hackers, and the quest for a new utopia. New York: *W. W. Norton & Company.*

Trencher, G. (2019). Towards the smart city 2.0: Empirical evidence of using smartness as a tool for tackling social challenges. *Technological Forecasting & Social Change,* 142, 117-128.

Trier, S.; Jenkins, T. (2020). Participatory Sensing in the Speculative Smart City. OzCHI '20: *32nd Australian Conference on Human-Computer Interaction.* (pp. 462–470). doi.org/10.1145/3441000.3441079

UNDP. Our Focus Areas: Smart Cities. (2021). *United Nations Development Programme.* https://sgtechcentre.undp.org/content/sgtechcentre/en/home/our-focus-areas/smart-cities.html

Vanolo, A. (2014). Smartmentality: The Smart City as Disciplinary Strategy. *Urban Studies,* 51(5), 883-898.

Verrest, H., Pfeffer, K. Department of Urban Regional Planning Geo-Information Management, & Ut-I-Itc-Plus. (2018). Elaborating the urbanism in smart urbanism: Distilling relevant dimensions for a comprehensive analysis of Smart City approaches. *Information, Communication and Society*, 1-15.

van Zoonen, L. (2016). "Privacy concerns in smart cities", *Government Inf. Quart*., vol. 33, no. 3, pp. 472-480.

World Bank. (2018). Urban population (% of total population). [Data Set]. United Nations Population Division. World Urbanization Prospects: 2018 Revision. Available at:https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS [Accessed 2021]

Wilson, M. (2011). Data Matter(s): Legitimacy, Coding, and Qualifications-of-Life. *Environment and Planning D: Society and Space*, 29(5), 857-872.

Wood, D. (2013). What is global surveillance? Towards a relational political economy of the global surveillant assemblage. *Geoforum*, 49, 317.

Yeh, H. (2017). The effects of successful ICT-based smart city services: From citizens' perspectives. *Government Information Quarterly*, 34(3), 556-565.

Yin, C., Xiong, Z., Chen, H., Wang, J., Cooper, D., & David, B. (2015). A literature survey on smart cities. Science China. *Information Sciences*, 58(10), 1-18.

Zandbergen, D., & Uitermark, J. (2020). In search of the Smart Citizen: Republican and cybernetic citizenship in the smart city. *Urban Studies,* 57(8), 1733-1748.

Annex A. Resident Expert List

Identifier	Age	Gender	Occupation	Neighbourhood	Interview Date	Interview Location
STH_1	51	Male	Information Technology (IT)	Sol	25.07.21	In person
STH_2	34	Male	Digital Marketing	Justicia	29.07.21	Remote
STH_3	58	Female	Retired	Cortes	31.07.21	In person
STH_4	63	Female	Teacher	Embajadores	03.08.21	In person
STH_5	41	Female	Healthcare	Embajadores	03.08.21	Remote
STH_6	51	Male	Industrial Architect	Cortes	04.08.21	Remote
STH_7	29	Female	Digital Marketing	Justicia	04.08.21	Remote
STH_8	18	Female	Waiter	Universidad	04.08.21	Remote
STH_9	67	Male	Financial Consultant	Embajadores	04.08.21	Remote
STH_10	35	Female	Architectural Consultant	Embajadores	05.08.21	Remote
STH_11	28	Female	Student	Sol	05.08.21	Remote
STH_12	26	Male	Student	Sol	05.08.21	Remote
STH_13	29	Male	Civil Servant	Universidad	07.08.21	Remote
STH_14	38	Male	Information Technology (IT)	Palacio	07.08.21	Remote
STH_15	42	Female	Banking	Sol	08.08.21	Remote
STH_16	67	Female	Retired	Embajadores	10.08.2021	Remote

Annex B. Semi-Structured Resident Expert Interview Guide

Introduction

Thank you very much for your participation! The theme of this investigation involves the growing concept of smart cities, and seeks to investigate its application in the context of the city of Madrid. The smart city concept might sound vague, and there are a number of definitions, depending on who you ask and what elements are most important that make something "smart." Generally, the smart city can refer to a city that utilises ICT (information communication technologies) or other forms of technology to optimise itself in areas such as traffic management, public health, or air quality to name a few. However, as you probably have experienced, technology does not always make something "smart," so there can be other interpretations as to what makes a smart city.

Thus, this investigation seeks to elicit the perspectives of actual residents living in Madrid, rather than the municipality, private interests, technology companies, and other entities that typically lead smart city conversations regarding their interpretation of the concept. By answering the below research questions this work seeks to understand: 1) Local Perspectives of Smart Cities; 2) The relationship between Data-Collecting Technologies & The City; and 3) Related issues of Personal Data.

Before we begin, I would like to review the informed consent...

Guiding Research Questions (for reference)

- How do residents as local experts living in (Spanish) smart cities perceive the smart city concept?
- What do residents expect of future versions of smart cities?

- Which issues are most important to address according to residents living in (Spanish) smart cities?
- How do residents living in (Spanish) smart cities perceive the increasing use of digital data?

Section 1: Priming Icebreakers

1. How long have you been living in Madrid and have you seen any changes since then?

2. What do you enjoy most about living in Madrid?

3. Please describe some of the devices that you would use in your daily life (mark "X" or write out response):
    a. Smartphone
    b. Computer (laptop/desktop computer)
    c. Tablet/iPad
    d. Smart watch
    e. Self-tracking gadgets
    f. Other

Section 2: Personal Data & The Smart City

4. What do you think about personal data and the city? For example, could you think of an experience where you felt like you had to trade some form of your personal data for certain services, experiences, mobility, etc. in the city?

5. What risks do you feel you face with the merging of technology [in the field of data collecting, for example] and the city?

6. How do you feel about exchanging personal data for smart city services?

7. What role or potential role do you think that technologies that collect data have to play in the city?

8. Do you think as a resident you should be consulted before when… and why?:

a. Sensors are installed to monitor air quality
b. Sensors are installed to monitor traffic
c. Smart Meters are installed in all Madrid households
d. Collected personal data is made public and open access
e. Collected personal data is sold by the municipality
f. Collected personal data is used to implement public health interventions

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Section 3: Local Experts' Perspective of Smart Cities

9. How do you typically move around the city in terms of transportation? (mark "X" or write out response)

a. By car (driving)
b. By car (ride hailing app)
c. Cycling (self)
d. Cycling (city bike share)
e. Public transport (bus, metro, Cercanías)
f. Walking
g. Other:

10. Are you familiar with the term “Smart Cities?” What does it mean to you?

- If the case of Yes:
- How have you made use of any smart cities initiatives or programs?
- What is your experience with smart cities initiatives or programmes?

11. How would you visualise (expect from) a smart city? What would some of its characteristics or features be?

12. How would a smart city differ from your current city?

13. What are some of the most relevant urban problems that you think the city of Madrid should be addressing?

14. What challenges do you think the city faces in addressing these problems?

15. How do you feel issues facing the city should be addressed?

16. Please rank in order of importance some of the following urban problems that you feel are most relevant to address (use numbers & include any additional responses you feel should be addressed):

a. Water supply
b. Climate change
c. Air pollution
d. Traffic Management
e. Waste Management
f. Urban Sprawl
g. Green Spaces
h. Non-Fossil fuel Energy Resources
i. Public Health

j. Poverty and Social Inequality
k. Crime
l. Transparency in Government
m. E-Government Services
n. Other:

Section 4: Conclusion & Reflection

17. How has the COVID-19 pandemic affected the way you see technology as a solution maker?

18. Do you have any further recommendations for who would be interested in participating in the interview?

19. Collect Basic Socio-Demographic Information:
    a. Name
    b. Age
    c. Gender
    d. Occupation
    e. Neighbourhood
