

# Issues integrating urban data and citizen participation

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## Abstract

The smart city concept goes beyond expanding technology, including sustainability and citizen well-being. The growth of available datasets provides rich material for public management. However, the potential of this information is underused due to its breadth and complexity. One key challenge is associating it with qualitative research. To address this challenge, within the scope of a PhD research, a set of interviews were carried out with professionals working in the area of smart city and public development in three European cities. The aim was to identify issues and solutions in projects with urban data and citizen participation and better grasp their approaches. Some of the converging aspects highlighted pointed to the difficulty in engaging citizens in participatory processes, which requires different communication for diverse audiences. On the uncovered assets, lessons learned from adaptation to online workshops after the pandemic were also relevant to these processes. The overall insights gathered in this initial phase will guide the designing and testing of novel processes using emerging technologies in the future iterations of this research.

Keywords: Smart City; Citizen Participation; Urban Data; Co-Design.

## Introduction

Cities are complex systems that present many layers in their services. With the increase of technology solutions developed and their implementation across many cities, the amount of data grows, giving birth to the wide concept of smart cities. However, this concept is not only associated with technologies but also refers to citizen well-being and human perspectives, requiring the application of service design processes for integrating all these elements (Meroni & Selloni, 2022).

Using urban data is a complex process, and it is not uncommon that it is not combined with qualitative data, consequently losing the contextualisation of the information gathered. Also, bringing citizens to participate in co-creating urban services is a challenge. To explore this hypothesis, we decided to identify the issues related to citizen participation in practical urban projects, applying a qualitative approach and running semi-structured interviews across three European countries from August to October 2022.

A total of nine professionals, who have worked on projects with citizen participation, were interviewed. Our goal was to understand how they managed the data available and citizen participation, and which processes they applied to that purpose. The participants acted in different scopes of service design, such as academia or the public sector.

This paper presents an initial literature review, defining the smart city concept and identifying issues in urban data, followed by the role of service design (hereafter SD) and how SD processes use data in their research phases. Later, we detail the interview methodology and summarise and discuss the main findings, followed by a conclusion highlighting the next steps for the current research.

## Urban Data and Smart Cities

The smart city trend has emerged in an increasingly connected world. However, this concept is also associated with sustainability and citizen well-being. The expanded digital data available brings rich material for public management, which must integrate into qualitative research data and citizen participation for more practical use (Oliveira & Campolargo, 2015).

In recent years, smart cities have grown, referring to information and communication technologies to stimulate economic development and increase programs for urban management (Kitchin, 2015). There are many mixed definitions of smart cities, and some of the characteristics encountered in the literature converge, but there is no consensus. The concept emerged in the 1990s with new technologies as an alternative to traditional planning modes (Fernandez-Anez et al., 2018).

OECD (2020) defines smart cities as “initiatives or approaches that effectively leverage digitalisation to boost citizen well-being and deliver more efficient, sustainable and inclusive urban services and environments as part of a collaborative, multi-stakeholder process.” Although digital innovation remains central to the



concept, the organisation believes a human-centric approach is the key to making a city smarter.

Technological advance has enabled the generation of a large volume of urban data, but this information is often not widely exploited and could be used in solutions for the city (Kitchin, 2014). Sensors could capture data, allowing the government to make better-informed decisions (Kitchin et al., 2015). Data management can be an issue in smart cities and the big data application in public policies (E. Innes & Booher, 2000). Thus, we need to understand how to better use this data by bringing it into context.

Urban digital data help understand how people experience cities. However, the lack of citizen participation as part of decision-making processes limits the analysis and becomes focused on technological aspects instead of the demands of the population. For this reason, Oliveira and Campolargo (2015) use the term “Human Smart City” to state that new technologies are not an end but should involve citizens in co-creating solutions for collective social change.

This concept recognises a smart environment for smart living with smart governance. Engagement between citizens and government is critical to the Human Smart City. Therefore, the city government should foster an urban innovation ecosystem that applies co-design and social innovation co-creation. The involvement of citizens in idea generation is essential to build an environment of trust. If citizens actively collaborate with the city administration, their capacity to contribute to urban and social issues can increase (Oliveira & Campolargo, 2015).

Turning data open and accessible is crucial for the service design process. The project Decode results, funded by the European Union, highlight the need to move towards a data commons model, where data can be shared transparently and securely for public value while maintaining personal and collective control (Bass & Old, 2020). Meanwhile, in another European-funded project, the Open4Citizens, the results emphasise data’s democratising power and design’s role in supporting open data as a resource (Morelli et al., 2018). Furthermore, open data can complement traditional qualitative research methods, providing scale and access to a digital footprint of human activity (Kun, Péter; Mulder, Ingrid; Kortuem, 2018). By embracing open and accessible data, service designers can unlock the potential of data to enhance the user experience, improve service efficiency and drive innovation. The following section presents how the SD process manages data and how it could be a tool for complex problems.



## Research phase in the Service Design process

Human factors and ergonomics methods offer an approach for capturing the human requirements of urban form, with a suite of accessible methods and the means to explore the inherent complexity of cities (Stevens & Salmon, 2019). The authors believe that in a world with desired smart cities, we need to explore the potential for new processes of urban development.

When the system is a city, the designer changes their perspective from human-centred to citizen-centred. Mulder (2015) believes that unpredictable futures need a citizen-centric design. For her, architecture must embrace meaningful design with a new city-making paradigm, combining top-down public management with bottom-up social innovation. Therefore, the citizens are in the cities' hearts, so they must be at the heart of the changes.

Developing an urban service project requires considering two aspects; first, services are complex and second, they need a design-oriented culture. Meroni and Sangiorgi (2011) argue that services are hybrid artefacts that cannot be reduced to simple mechanical entities, as they are composed of places, systems of communication and interaction, human beings, and their organisations. Services are permeated with human activity, making them largely un-designable. However, this complexity and unpredictability necessitate a new, service-oriented design culture and practice to solve complex problems effectively. With the growth of cities, any tactic that only addresses parts can not achieve sustainable long-term improvement.

The SD process has a divergent and convergent approach, creating and reducing options. First comes the research phase, where knowledge is generated through research methods to focus, organise and extract meaningful information. Then the ideation phase, with the creation of many opportunities that are filtered through decision-making processes to arrive at several promising ideas. Moreover lastly, the prototyping and implementation phases, exploring and building potential solutions, and then focusing again through evaluation and decision-making (Stickdorn et al., 2018).

A crucial phase is the research step, which generates knowledge about the problem. In this human-centred approach, the information collected gives a more complete and contextualised picture of the service. Research with users is essential in SD, and it is not easy to propose a service without listening to users and discussing and testing the proposal with them (Meroni & Sangiorgi, 2011).

SD usually begins by investigating existing user or customer needs, but data collection can happen at various phases. According to Stickdorn et al. (2018), the



process is inquiring and inquisitive, using multiple research techniques to explore the “how and why” (Stickdorn et al., 2018, p.46). Understanding needs, rather than going straight to a ‘solution,’ would make true innovation possible.

One way to minimise researcher bias is combining different data forms with mixed methods. As SD integrates several layers of interaction, exploring other moments of the service experience with a wider variety of user data sources is essential. The design process presents several paths, and the participatory approach is constant in citizen-centred design. Co-design in smart cities is fundamental for social innovation. This way, citizens can act by collaborating with urban services.

One advantage of this concept is that the co-design and co-creation of solutions make the processes of municipal administration lighter and more transparent. However, a challenge ahead is involving the public sphere in civic life. City administrations need to build trust with the community and encourage citizen collaboration. Therefore, it is crucial to identify the different needs of the community. The city administration should not receive feedback from a few citizens, but listening and talking to all groups is essential (Mulder, 2018).

So, a central issue is a failure to communicate with the population. Generic messages, which try to reach everyone, reach only a few failing their initial purpose. Therefore, when not relating to various motivations of the public, the government does not speak to anyone (Frascara, 2000). Meanwhile, participation in public processes is crucial for meeting all social groups’ needs.

According to Gidlund (2012), practitioners in public processes for social innovation often struggle with whom to listen to, how to include citizen input and the limits of their formal positions. Also, certain social groups can be excluded from participation, as public authorities may not see their input as profitable. Meanwhile, Manzini and Cipolla (2019) argue that mainstream city projects prioritise marketability over the complex social fabric of communities, whereas socially driven projects prioritise collaboration that empowers individuals and communities.

Finally, Cipolla et al. (2017) emphasise the importance of empowering all groups in social innovation processes to meet everyone’s needs, particularly those who have been excluded and discriminated against in the past. A co-design process could open up a dialogue with different stakeholders, and through this participatory approach, citizens get involved and empowered, changing the relationship with the city. Therefore, this research intends to raise the related issues using urban data and citizen participation. We believe this integration can bring solutions, aiming for changes toward a more sustainable society in the long term.





## Interviews with experts working in the field

We conducted nine interviews to explore citizen participation and urban data and gather current challenges and assets in SD processes. The focus was recruiting professionals that have worked on projects with citizen participation. The projects had similar characteristics: for cities and with different types of stakeholders' involvement.

The interviews were semi-structured to gather information from participants regarding their professional experience, workflow in the office, and specific project-related queries, followed by inquiries on challenges or suggestions regarding the SD process. The interview questions remained consistent for all participants. However, during the study, the analysis of initial interviews revealed the need to include questions about the pandemic's impact on the workflow and projects of the participants. Therefore, we revised the script in subsequent interviews and included questions about online workshops, workflow, and project management changes in the pre and post-Covid-19 era.

All in-person interviews lasted about one hour and took place between August and October 2022 in Copenhagen, Berlin, and Oslo (Table 1). The interviews were conducted in the interviewees' work environment to gather insights about their practice and learn about their team. It was valuable, as the discussed projects often involved professionals in different sectors of the organisation. Another advantage of presential interviews was that the researcher could see and experience some physical tools they developed towards their practice (Figure 1). Some meetings were individual, and others were in a group if the professionals worked together. The interviewees acted in universities or municipalities' partnering organisations.

Sector	City		
	Berlin	Copenhagen	Oslo
Academia		5	1
Municipality	1	1	1
<b>Total</b>	<b>1</b>	<b>6</b>	<b>2</b>

Table 1. Summarise the participants' characteristics



The interviewees who worked in academia were researchers acting in SD labs with projects focused on the city. The interviews covered aspects of their work and background research experience. They were professors or PhD students. The government sector participants did not specialise in SD but worked as project managers with service designers on the same team. Due to time and geographic limitations, we visited only three cities: Berlin, Oslo, and Copenhagen.

Berlin is the capital of Germany and has 3,570,750 inhabitants. As part of the “Smart Cities Model Projects” program, Berlin has developed a new smart city strategy focusing on participation, people, and social good. The plan highlights that it has not had a purely technological focus and instead has moved toward co-design and inclusion, actively dialoguing with Berlin’s diverse urban society. With this idea, Berlin received funding from the Federal Ministry of the Interior to be a Smart City model project.

At CityLAB Berlin<sup>1</sup>, the administration and urban society collaborate on developing solutions for the city guided by the principles of SD. They prioritise incorporating user perspectives early in their processes and employ agile, co-creative, and user-centric methods to achieve their goals. The interviewee was the project manager responsible for Smart City and Participation area.



Figure 1. A tool with urban data visualisation in the CityLAB Berlin. Photo by the author

<sup>1</sup> <https://citylab-berlin.org/en/start/>

The second city visited was Oslo, Norway's capital, with 1,071,062 inhabitants. The European Commission awarded Oslo as the European Green Capital title for 2019. They measured 12 indicators, including efforts to reduce greenhouse gas emissions, improve the quality of air and water, environmental innovation, access to green areas, biodiversity, and green mobility. The Governing Mayor's Office set up a secretariat to plan and execute the year in cooperation with all municipal services, other public actors, academia, organisations, and the business community. The challenge was to make quick decisions while safeguarding the need for broad participation and ownership in all parts (The City of Oslo, 2019). The interviewee was the project manager responsible for this secretariat. In Oslo, we also talked with an academic from AHO, The Oslo School of Architecture and Design. His research focuses on designing experience-centric services.

The third city was Copenhagen, often well-evaluated in smart city rankings, with a good performance in mobility and environmental aspects (Ekman, 2022; ESI, 2018; Smart City Observatory, 2021). The capital of Denmark has 1,370,131 inhabitants and aims to become a carbon-neutral place (Lee, 2019). The interviewee was a strategic designer from Danish Design Center (DDC)<sup>2</sup>, an organisation that has been in business for over 40 years. DDC believes collaboration is vital to eliminating the silos in the way of innovation. So, they design partnerships where companies and organisations work together across industries to drive green, digital, and social transformations with long-lasting results. In Copenhagen, we also talked with five academics from Aalborg University.

## Analysis and Discussion

The semi-structured interviews were exploratory. As expected in qualitative approaches, the number of interviewees does not need to be excessive, as the research reached saturation after the sixth interview (Saunders et al., 2018).

We used a content analysis approach in the responses collected in this study. Content analysis involves systematically identifying and categorising themes in qualitative data (Marsh, 2018). We grouped the themes from the responses into categories, including accessible data, co-design, engagement, examples, futuring, gamification, service design, social media, and online workshops.

The Notion software facilitated the process of tagging and visualising the insights. This tool allowed for a more structured and organised approach to analysing the data

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<sup>2</sup> <https://ddc.dk/#>





collected from the respondents. The initial results aligned with the early raised hypothesis, indicating that despite the increased available digital data, it is still challenging to use it in the SD process and make it accessible.

### **Accessible Data**

Although there is a growing trend of opening digital data, it is often unstructured and difficult to interpret. Some researchers reported that data owners sometimes aggregate datasets without clearly understanding their potential use, as their primary focus is on addressing other issues. According to Kitchin and Lauriault (2015), the challenge of big data is to deal with abundance, including considerable amounts of data with low utility, that are generated without a specific question in mind or are a by-product of another activity.

The DDC has undertaken a project to identify public data that could promote green values and encourage its use. Companies and data-owning authorities explored new possibilities for linking technology with public data. Despite differences in language, the designer's role was to facilitate and translate this meeting to establish partnerships. The dialogues focused on addressing challenges and determining responsibilities and roles between public and private actors for future work.

Another challenge is selecting what kind of data is essential for that purpose. Sometimes projects involve several cities, and what might be helpful for one may not be valid for another. In this setting, it is necessary to use terminology that all participants understand and access the information. For example, one respondent desired a responsible mediator as an intermediary to oversee data handling and facilitate translation. This intermediary would bridge the gap between the party that generates and opens the data and the one that uses it.

The interviewees working in the public sector did not report this type of issue. As the government is the one responsible for generating large amounts of data through their data collection services, thus being the leading owner of the dataset used, and their role working for the government allows deeper access to the whole process. Consequently, the public workers interviewed described having easier access and a structured department to collect the necessary data. They work in a smoother partnership because these teams work on the specified tasks.

### **Data in the participatory process**

Access to data is crucial for the discovery phase in the SD process. Therefore we wanted to know how the interviewees used the data in the co-design workshops. One interviewee, who is a researcher, reported that before starting the workshop, they first align the participants' knowledge, ensuring everyone is on the same page. Other



respondents highlighted the importance of the dataset owner being present at the workshop so that they could clarify any doubts. At the beginning of the activity, the dataset owner presents the information and works with the groups.

Another way to make the data accessible during the workshop is to send some data before the meeting to help prepare the participants. Sometimes it is too much information to go through during the activity, and sending it in advance is a way to familiarise the participants with the problem. However, this strategy can be ineffective when participants fail to review the information before the meeting, resulting in duplication of work and wasting time for other participants.

Despite this difficulty in making the data accessible and understood during the workshop, using data visualisation techniques in the workshops is unusual. Some interviewees reported that they analysed the data beforehand but presented it textually. One researcher highlighted the difference between raw data visualisation in the research phase and mapping visualisation in the analysis phase. These visualisation tools are more common in the analysis than in the discovery process.

The Future City Game, developed by the British Council and cited by a respondent, is an example of a collaborative process that utilises data materialisation. It is a two-day activity to generate ideas to improve the quality of life in cities. Teams identify common challenges facing the city, such as environmental, social, economic, and cultural issues, using a physical pie chart to divide the areas (Figure 2). They then design solutions which are tested and refined with the help of practitioners and community members. (Kahn et al., 2009). This approach enables participants to engage with the data more tangibly and interactively, which can help to stimulate creativity and generate more effective solutions.

Furthermore, these manual tools are ways to facilitate learning. A well-known methodology is Lego Serious Play, where participants use LEGO bricks to create models that express their thoughts, reflections and ideas. The creative process of making something prompts the brain to work differently and can unlock new perspectives. In addition, when all participants have a constructed object in front of them, they can set their issues on the table and have an equal standing (*Introduction to LEGO® SERIOUS PLAY®*, 2020).





Figure 2. Pie chart tool utilised in a co-design process. Photo by the author

### Lessons learned in pandemic time

Despite the utility of these tangible tools, the pandemic forced a shift from physical to virtual workshops. Most interviewees used the Miro tool for online meetings as a digital adaptation of the face-to-face version. While the tool had some advantages, such as pre-digitised information, the process was still highly manual and time-consuming.

Regarding the DDC, the interviewee reported receiving training on optimising the use of visual collaborative software through Miro boards<sup>3</sup>. They went beyond replicating the face-to-face experience and created immersive narratives that guided participants through the boards, transforming them into virtual environments. As a result, they incorporated more rules, breaks, and reflections into the virtual workshop to ensure a smooth and engaging experience for all participants.

<sup>3</sup> <https://miro.com/>

Virtual workshops offer another benefit: they can be conducted asynchronously, allowing each participant to take the time to assimilate the knowledge. The facilitators can also create surveys during the process and download post-its in text format. As the interviewee from DDC pointed out: “We can collect qualitative data in a more quantitative way”.

Some people used Miro not only to carry out the workshop but also to visualise and analyse the data. They said they chose one tool or another depending on who was participating and the purpose of the analysis. They used more Miro when the audience was mainly composed of designers and sometimes an Excel spreadsheet to present to a business audience, for example.

Despite the availability of virtual collaboration tools, some researchers still prefer face-to-face meetings due to the perceived lack of human contact in digital environments, which is crucial to their approach. To address this issue, CityLab Berlin developed a strategy of complementing online sessions with two face-to-face meetings - one at the beginning for introductions and engagement and one at the end for closure and celebration. Also, another researcher reported that the online workshop was not very productive; despite the advantage of having participants from several countries, sometimes they were not fully involved in the dynamics.

### **Citizen participation engagement**

One common challenge reported is the difficulty of including and engaging participants. CityLab Berlin provided an example of how they addressed this by holding dinners to get more participation. Another researcher emphasised the importance of creating an appealing environment that would make people feel welcome and encourage them to participate.

The interviewee from Oslo Municipality explained that they engaged different stakeholders by taking advantage of neighbourhood meetings to reach people who would not usually participate in such activities. Other interviewees reported success in attracting new participants in open-place events already happening in the cities.

There is a consensus among the interviewees that diverse and inclusive groups in society require different approaches and types of communication. It is essential to understand the motivation of each group, adjust expectations, and make the value of participation visible. CityLab Berlin provided an example of a project where they wanted several people to participate, so they contacted potential participants to understand what they needed. Sometimes it was a computer to access the internet or a headset, and immigrants needed a translator. By addressing these specific



needs early on, they understood each demand to guarantee diversity in the sample of participants.

Another example of a project developed in Oslo to promote sustainable behaviour was “The My Green Challenge.” The campaign engages Oslo’s residents to change their daily lives regarding various topics, from sustainable food and urban agriculture to recycling and waste reduction. However, the interviewee expressed concerns about the effectiveness of this strategy. While the campaign delivered relevant information to the residents, the interviewee felt insufficient time to participate in the challenge and make significant changes to their daily habits.

A researcher with experience in gamification projects pointed out: “The fact that you put gamification does not mean that people will use it. People do not use it unless there is an incentive”. He added that getting the engagement takes much effort from the parties involved. Oslo Municipality is testing ways to give discounts to people who use more sustainable transport in a mobility app already widely used by the population.

As emphasised by all interviewees, effective communication is essential for participation and engagement. Due to the research, various projects have utilised data visualisation and digital storytelling techniques. For instance, Oslo Municipality has developed a website that presents open data in a didactic manner, contextualised in an editorial context. The general public can access raw data for download and gain insight into what the information represents through a summary.

One of the interviewees pointed out that engaging citizens’ imaginations can be a challenge in participatory processes. “Most citizens think that when asked to provide their opinion, they need to be critical instead of dreaming what they actually want,” they explained. People often want to participate in criticising but do not see the possibility of imagining improvements.

The question, then, is how to balance influence with responsibility. Sometimes, citizens want to influence a decision but do not take responsibility for the change, or they are held responsible but do not have a say in the decision-making process. For the interviewee, one solution is to think of citizen participation as a whole and not just as a specific event. It would require a long-term governance strategy that embeds citizen involvement and takes time to develop.

One notable trend that emerged from the interviews is the increasing use of SD projects to envision the future of cities. One professor interviewed provided an example of an exercise that prompted students to consider the future of their city by asking “What is” and “What if” questions. They recorded what they observed and





imagined how it could be, visualising future scenarios. According to the interviewee, the designer's role is to transform an idea into a tangible artefact or experience.

The collaborative nature of design facilitated through co-creation workshops and the creation of visual or material artefacts supports collaborative meaning-making and learning. Neuhoff et al. (2022) reveal three key features of design-driven futures: it fosters creative spaces for immersion, provides encounters for intra- and interpersonal reflections, and promotes mutual understanding through the visibility of design.

After conducting these nine interviews, we collected many examples of projects and research with different approaches regarding citizen participation and data usage. With the increase of urban digital data, there is a growing potential to collaborate with various stakeholders, including citizens, public sector entities, and private companies. Clearly, the city's future depends on effectively managing all available knowledge and data and utilising it to generate better services for all.

## Conclusion

The interviews show the potential for citizen participation in urban projects. Perhaps there are technological challenges, such as a lack of infrastructure, technical knowledge, and stakeholder engagement, but different approaches can be replicated in other contexts.

Although some projects use data visualisation tools, they rarely apply them in workshops. Usually, they are digital products from research, such as websites for consultation and dissemination of information. While the volume of data has increased due to the online workshops, the data processing and analysis are still primarily manual and lack workflow automation.

It can be a time-consuming and resource-intensive process that may limit the projects. One possible solution to this challenge could be to explore using artificial intelligence and machine learning techniques to automate certain data processing and analysis aspects. It could help to streamline the process, reduce errors, and allow for more efficient use of resources. However, practical testing is still necessary.

Digital tools for online workshops offer new opportunities for immersive experiences. Now, it is possible to reach more people, quantify qualitative data and realise asynchronous activities.



The interviewees also reported social media as a source of information. Sometimes they use it to understand the target audience, but more often, as a tool to communicate with the population. Social media is rich in crowdsourcing data and could have extensive material for analysis. As it has unstructured data, some technical challenges must be overcome to take better advantage of it.

Design projects that predict the future of cities using SD processes are a trend observed in the interviews. Combining big data and co-design can expand the design field with more technological inputs and humanise urban data. This study is part of a broader exploratory research, and the main issues identified will be tested in a participatory process using mixed methods and digital technologies.

Developing the research process with citizen participation could make cities more human-centred and smarter. Besides improving urban development, it would also benefit other research areas to generate broader and more contextualised data, helping practitioners, academics, governments, and citizens in the long run.

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