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Geography of human smart city

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Table of Contents

i. Abstract	4
ii. Introduction	5
1. Problem definition: from smart city to human smart city	9
1.1 Critiques to the Smart City approach.....	10
1.1.1 The leading role of private technological firms	10
1.1.2 Technology as the end-point	11
1.1.3 City as a machine that can be monitored with data.....	12
1.1.4 Lack of attention to citizens	12
1.2 New focus.....	13
1.2.1 Human smart city.....	14
2. Smart city characteristics: Scale and type of intervention	17
2.1 Scale of intervention: Neighborhood or City scale	17
2.2 Type of intervention: Bottom-up or Top-down?	18
3. Smart city governance model	21
3.1 Collaborative/participatory governance.....	21
3.2 E-Governance.....	22
3.3 Triple Helix Model of partnership	24
3.4 Quadruple Helix Model of partnership	25
3.5 Partnership models and smart city governance	27
3.6 Need for participatory governance.....	29
3.6.1 Bringing citizens to the center of attention	29
3.6.2 Bridging the gap of top-down and bottom-up approaches	30
3.7 Requirements for participatory governance.....	31
3.7.1 Government transformation.....	31
3.7.2 Overcoming barriers to participation	32
3.8 Smart people in smart cities	33
3.9 Smart people: Social control or democracy.....	35
3.10 Creating smart people through participatory governance.....	36
4. Urban data	37
4.1 Open data.....	38
4.2 Data collection, Co-creation, Co-design and empowerment.....	39
5. Citizen participation	43
5.1 Citizen participation models	44

5.2	Participation in data formation.....	46
5.2.1	Citizen science.....	47
5.2.2	Crowdsourcing.....	48
5.2.3	Citizen sourcing.....	50
5.2.4	Crowdsensing.....	51
5.2.5	Concerns about data privacy.....	52
5.2.6	Redistribution of power in citizen participation.....	53
5.2.7	Scale of data collection.....	53
5.3	Citizens' collaboration with engineers: Collaborative Engineering.....	54
5.3.1	Participatory (service) design for smart city solutions.....	56
6.	About trust.....	60
6.1	Citizen's trust toward the government.....	61
6.2	Governments' trust toward citizens.....	63
6.3	Reaching higher levels of trust.....	64
7.	Common participatory initiatives.....	67
7.1	Urban living labs.....	67
7.2	Generative sessions.....	69
7.3	Hackathons.....	70
7.4	Design jams.....	70
7.5	Concluding thoughts on co-creation and co-design methods.....	71
8.	Key Performance Indicators for smart cities.....	72
8.1	CITYKeys key performance indicators for city and project-level analysis.....	73
8.2	CitiVoice framework to assess citizen participation in smart cities.....	81
8.3	Concluding thoughts on the assessment frameworks.....	86
9.	Discussion.....	88
10.	Conclusion.....	95
11.	Bibliography.....	97

Table of figures

Figure 1: Quadruple Helix in the participatory domain	26
Figure 2: Building the 4th P into Public-Private-People Partnership (4P) based urban development .	27
Figure 3: Smart city governance model	29
Figure 4: Arnstein’s ladder of citizen participation.....	45
Figure 5: Living lab in the quadruple helix scheme.....	68
Figure 6: CITYkeys indicator framework	75
Figure 7: Using CitiVoice to assess citizen participation in Namur, Mons and Brussels.....	86
Figure 8: Conceptual framework of Human smart city.....	93

i. Abstract

Smart cities are cities where technological innovation and urban planning converge, and Information and Communication Technologies (ICTs) become the engine of economic growth. Technology was seen as a saviour to help tackle ever-increasing sustainability challenges faced by cities due to rapidly growing urban life. However, the smart city paradigm, although being an important step in the right path, failed to achieve sustainable results while totally ignoring citizens. This failure has led scholars to call for a new focus for smart city, being the human smart city where technology is not the end, but a means to an end and citizens are the main actors of smartness. Many scholars have tried to define this new concept, proposing various methods through which the human aspect of smart cities could be revived and in doing so, have coined many terminologies. Although being a crucial step, the multitude of studies and terminologies on this matter has led to a scattered and confusing concept which lacks coherence. There has never been a study seeing together the various ways in which a human smart city can be achieved. The aim of this research is to provide a comprehensive framework of principles of human smart city to fill this gap in literature and create a coherent pathway for achieving a human smart city. This is carried out through a review of literature regarding this concept, and the final result is a coherent geography of human smart cities that can be used as a set of guidelines to incorporate while developing smart projects. This conceptual framework helps maintain the focus on citizens as active and equally important actors in the smartness of cities. Based on the findings, a human smart city should aim at maximising citizen engagement by removing the barriers to participation, and create a full participatory environment with the interaction of public institutes, private firms, knowledge institutes and people, leading to a share governance model for smart cities.

Keywords: Human smart city, ICTs, Collaborative governance, Citizen participation

ii. Introduction

With the growth of urbanisation and the ever-increasing growth of urban lifestyle, many cities around the world have faced issues. As predicted, by 2050 more than 75% of world's population will live in cities (Bakıcı et al., 2013). This means that the urban life is becoming more and more complex and challenges such as overpopulation, excessive energy consumption, resource management and environmental protection have to be dealt with (Eremia et al., 2017). The growth of urban population means higher energy consumption, waste and greenhouse gas production, social inequalities and poverty, segregation, social polarization and many other urban related issues. This has led to more attention towards the pillars of sustainability, including social, environmental and economic sustainability (Bouzguenda et al., 2019). Governments are required to remedy these challenges, as well as to find out how to create better services for this rapidly escalating urban population. With the advances of technology, a new hope for a better solution to tackle these challenges emerged. Technology, determined to ease up our lives, was seen as a potential to facilitate urban issues as well. Information and communication technologies became prevalent in economy, environment, mobility, governance and social and physical infrastructure of cities. Hence, technology found its way to urban planning and led to the creation of the concept of Smart City. By way of a definition, smart city is any form of technological innovation in urban planning (Yigitcanlar et al., 2019). In smart cities, Information and Communication Technologies (ICTs) became the engines of economic and urban growth as well as tools to reach a more sustainable urban development. Technology-driven innovation became a common tool to help remedy urban issues.

This new concept of smart city immediately received a lot of attention from scholars. Different potentials of the smart city approach to tackle urban sustainability issues and to ensure a better service provision for citizens were widely recognized. However, the concept gained distance from its original purpose. Technology, which was supposed to be a means of urban planning to aid the surge of urban challenges, became the end-point itself. The use of technology in urban planning heralded new market opportunities for technological firms to develop and sell technologies to municipalities. On the other hand, municipalities began a competition for achieving the title of "smart" which often came with funds from organizations such as European Commission funds

for European smart city projects. In this way, cities with budgetary shortfalls could run a smart city project, win the title “smart” as well as receive funds they need for their development projects. This meant that cities in search of smartness became the consumers of tech solutions offered by technological firms, and the giant technological firms such as IBM and CISCO took the leading role in smart city initiatives. Where are the citizens? Good question. Smart city, once seen as a saviour to remedy urban issues and better serve citizens, totally lost its original scope. The “Human” aspect of smart city was totally overlooked. That is why it immediately received serious widespread criticism by many scholars. The failure to address sustainability issues, overlooking citizens, the leading role of technological firms and the overall loss of scope of the concept were among the areas of criticism. The title of the article by Zubizarreta shows this failure of the concept in the most clear and interesting manner: “Smart city concept: what it is and what it should be” (Zubizarreta et al., 2016)

In an attempt to find an answer for the question “what a smart city should be”, many ways and methods were developed so as to bring back the citizens to the central position in the smart city discourse. The concept of “Human smart city” was raised in an attempt to highlight the direction toward which a smart city has to be oriented: Citizens, their well-being and their quality of life. A focus on citizens’ wellness will in turn bring about results with regard to environment and business quality, and will give the smart city back its initial role as a tool to help achieve higher sustainability. However, achieving a human smart city is not as easy and straightforward as defining it. Many scholars have identified areas in which citizens can be engaged and participation and shared governance be achieved. This happened with a high tendency of scholars to coin new terminologies, and the multitude of these terminologies have created a confusion with regard to their relationships and hierarchies. In fact, there has never been a study trying to put these elements all together and create a conceptual framework to clear up the confusion created by the many terms that scholars have used to address the issue.

The aim of this research is to fill this gap in literature by creating a geography of human smart city, a conceptual framework which summarizes the main principles of human smart city to incorporate while developing smart projects. The organization of this research is as follows:

The first chapter of this study will focus on the problem definition, the emergence of smart city paradigm and its loss of focus, leading to less and less attention to citizens, while more and more to technological solutions, which turned the concept into a buzzword. This loss of focus led to many criticisms by scholars, addressing the failure of smart city to aim for citizen engagement as well as a fruitful interaction among stakeholders with the leading role of public institutions. By acknowledging the failure of smart city and the critiques, the new direction of the concept, reaching to the human smart city notion is discussed. This chapter lays the foundation of the research carried out in this study.

The following chapters will focus on different areas of smart city where citizens have to be seen, and how they can play an active role in each stage. That being said, chapter 2 focuses on the characteristics of a smart city, with regard to the scale and type of intervention. The question is whether a local bottom-up approach can better identify and fulfil citizens needs than a top-down city scale approach. Chapter 3 is with regard to one of the most important, yet overlooked aspects of a true human-centred smart city, which is its governance and partnership models. The research question here is to identify different approaches to smart city governance and find out which will better include citizens and better respond to their needs. Plus, different partnership models have been discussed and their relationship with governance have been scrutinized.

As smart cities rely heavily on ICTs and data, chapter 4 focuses on the relationship of citizens with data, and how they can benefit from big data networks, as well as how they can participate in data collection. This chapter also highlights privacy issues with regard to data.

The most important feature of a human smart city should be the extent to which citizens participate in the creation and development of smart solutions. Chapter 5 discusses the importance of citizen participation, as well as different models and initiatives aimed at maximising citizen engagement in smart cities.

A main barrier to citizen participation is the lack of trust between citizens and public officials. This is a reciprocal relationship, meaning that in order for participation to take place, both citizens and public officials need to earn each other's trust. Chapter 6 is

dedicated to the issue of trust, its relevance and importance in the smart city discourse as well as way in which distrust can be overcome.

By removing the barriers to participation, various methods in which participation can take place among stakeholders in a 4P partnership have been proposed in literature and practice. Having said that, chapter 7 discusses common participatory processes and environments in which participation can take place among citizens and other stakeholders.

To ensure that the smart city projects are in the right path or have led to the right and desired results, as well as to be able to compare different smart projects with each other, there is need for a set of indicators to monitor and assess the progress of smart city initiatives. Chapter 8 discusses two important and very different Key Performance Indicators (KPIs) to understand how they assess and ensure the “human” aspect of smart cities.

As mentioned earlier, literature suggests many ways in which human smart city can be achieved, often by offering new terminologies by scholars. However, as there has never been a study on the relationship of these terminologies, this study tries to fill this gap in the literature by proposing a comprehensive framework for human smart city which can be used as a guideline of principles that should be incorporated while developing smart projects. Chapter 9 discusses the findings of this study as well as the proposed framework for human smart city.

1. Problem definition: from smart city to human smart city

To better understand the smart city phenomena that has recently been subject to heated debate, it is necessary to define it, or at least try to define it. A review of literature clearly suggests that there is no single definition, but the term has been defined in various ways based on the specific viewpoints of the researchers (Yigitcanlar et al., 2019). Simply defined, a smart city is the convergence of two main elements: technology and the city (Bouzguenda et al., 2019). In other words, any form of technology-based innovation in urban planning and management of cities is defined as a smart city approach (Yigitcanlar et al., 2019). This way of defining smart city is in some way reducing the concept to solely technological. In fact, this issue has led to approaches in smart city which have been heavily criticised due to the high prominence of technology and a complete lack of attention to other important issues, which will be deeply discussed in further chapters. Some scholars have also highlighted the word “Smart” and how ambiguous it can be. For instance, Broccardo et al. (2019) has stated that the term "smart" has many diverse connotations, leading in a multitude of alternative terms such as "intelligent city," "knowledge city," "ubiquitous city," and "sustainable city." The lack of a single, widely accepted definition of the concept has clearly left it a "fuzzy" and ambiguous concept. Or as Trindade suggested, “Smart cities are heavily criticized as being just a buzz phrase” (Trindade et al., 2017).

Although the concept lost its scope and developed into an ambiguous term, it was initially promoted as a means of tackling important social, environmental and economic challenges. The starting point of the smart city concept goes back to the sustainable challenges that cities all around the world face. Cities have always tried to deal with social sustainability challenges (such as segregation, growing social tensions, urban conflict and violence, social polarization and rising urban poverty levels) as well as environmental sustainability challenges (including local traffic problems, air pollution, increased solid waste generation, high energy consumption and issues related to climate change). With the advances of technology, its numerous potentials to help overcome these challenges have been acknowledged. Some have even considered

technology as a saviour to help remedy the sustainability issues (Yigitcanlar et al., 2019). As a result, new opportunities for sustainable growth of cities emerged and some scholars called for new solutions to address the urban issues with the aid of technology (Bouzguenda et al., 2019, Melis, 2017). However, although the aim was to find innovative solutions to combat sustainability issues, there was much stronger attention to environmental aspects and less or even no attention was given to social dimension (Yigitcanlar et al., 2019, Marsal-Llacuna, 2016). Additionally, smart initiatives focused so heavily on technology that the main goal was forgotten. A definition of smart city put forward by Romanelli and Metallo identifies a smart city approach as one which uses technology to improve the overall quality of life and fulfil the needs of citizens while promoting sustainable development (Romanelli et al., 2019). This definition highlights three pillars: Use of technology, Fulfilling the needs of citizens and promoting sustainable development. However, instead of using technology as the means to serve citizens and enhance their quality of life as well as promoting sustainability, technology itself became the goal. The smart city approach only used technology and totally forgot its main purpose of serving citizens' needs. Consequently, the concept received a multitude of criticisms by a great number of scholars and researchers.

1.1 Critiques to the Smart City approach

A review of literature reveals 4 main areas of criticism; As the smart city approach encompasses technology, the increasing role of technological firms in promoting smart initiatives is one area of criticism, as such approaches are in favour of the technological firms themselves. Another area of criticism is with regard to the lost scope of smart city and the technology which became the end point. Some have also criticised this approach due to the concerns rose by increasing amount of data in smart cities. Lastly, and most importantly, the fact that citizens as the key point in every urban intervention and phenomenon have been totally ignored and left aside by smart city initiatives have been heavily criticised.

1.1.1 The leading role of private technological firms

With the advent of Smart city idea and the high hopes in technology as the “saviour” to remedy the contemporary urban issues and with the rise of demand in such technologies, new market opportunities emerged for the ICT industries whose

technologies could be used by cities (de Oliveira, 2016). Private technological corporations have taken the lead in the development of smart cities, with the goal of selling their technology (OECD, 2019). Companies like CISCO and IBM, rather than the government, often lead public-private partnerships with the goal of developing and implementing technological solutions through which they can sell their technologies. This strong desire in creation and management of highly technological (new) cities run by private companies turned the smart city paradigm into a corporate storytelling (Certomà and Rizzi, 2017). Although this is a very important criticism to the smart city paradigm, not all initiatives promoted by technological companies lead to a failure.

However, as such interventions are costly for cities and cities are under great pressure from tech companies to initiate complex and costly smart urban initiatives, some scholars argue that better results can be achieved with less investment in technology, and that such heavy investments usually fail to address social challenges (Gleeson and Dyer, 2017). Limited local (and even central) government budgets ask for more cost-effective as well as viable solutions to urban problems. With the leading role of technological firms in smart city initiatives, the cost of technological needs for a smart city initiative are high and in favor of the ICT firms, while the offered solutions are usually not all-inclusive.

1.1.2 Technology as the end-point

Another common area of criticism to smart city approaches is with regard to the role of technology in such initiatives. Scholars criticize the fact that technology, which was initially supposed to be a means to achieve a solution has become the solution itself (Bouzguenda et al., 2019). Some have even criticized the tendency of cities to show off their technological solutions by using terms such as “technological euphoria” (Engelbert et al., 2019) or “technological fetishism” (Certomà and Rizzi, 2017). Technologies are there to help better address citizens’ needs and enhance their quality of life. Therefore, it is important that problems are clearly defined and solutions are presented taking into account the citizens as the main beneficiaries. However, when a smart city project is viewed just as a matter of technological innovation and implementation, the commercial pressure of ICT industries to scale and replicate the technological solutions and increase their sales ignores context-specific problems in favor of a one-size-fits-all answer (Certomà and Rizzi, 2017). To escape this pitfall of

tech-centric approaches, it is argued that a smart city approach should divert its attention from the introduction of new technologies and start looking for a different regime of use and control of existing technologies that can make cities smarter (Certomà and Rizzi, 2017). No one denies the benefits that technology can bring to solve problems or the extent to which the use of technology can facilitate implementation of solutions. However, it is important to bear in mind that technical improvement of city infrastructure and data-driven solutions, although important, are not end-points in themselves (Gleeson and Dyer, 2017, Certomà and Rizzi, 2017).

1.1.3 City as a machine that can be monitored with data

Smart initiatives and technological innovations deal with information and data. Data plays a prominent role in such initiatives, and even though it helps understanding the problem and finding a solution, it raises several concerns. Some have criticized the increasing role of and interest in data and its rising significance in urban planning. This new approach to urban planning sees the city as a machine that can be monitored in real time, and controlled at a distance (Certomà and Rizzi, 2017). This view to the city and urban issues as a machine has led to the simplification of complex urban issues, and as a result to solutions which ignore some important aspects of the urban reality. The three-step approach to all urban issues, namely Data collection via sensors, data transmission through wired and wireless means, and data crunching to identify problems often lead to inefficient and insufficient results (Schuler, 2016). This approach, in fact, leads to the increasing use of technology in order to collect, transmit and crunch data, and mainly favors the tech firms themselves as the producer of such technologies. In fact, one of the reasons why this three-step view to all urban issues has become part of the smart city paradigm is the result of the leading role of technological firms who pursue not the interests of the citizens but the increase of their sales. However, some scholars have raised the question of “How much data do we really need” and whether the collection of data in large scale and creation of big data networks can really serve the well-being of citizens and is compatible with citizen-centrality or not (Gleeson and Dyer, 2017).

1.1.4 Lack of attention to citizens

The fourth area of criticism to the smart city paradigm encompasses all the other criticisms mentioned earlier. The fact that tech firms have taken the leading role in the

development of smart city initiatives, the problem of having technology as the end-point and not a means to the end, and the increasing reliance on data collection, transmission and crunching to solve urban issues all lead to one question: where, in the smart city paradigm, are the citizens? The fact that smart city initiatives tend to ignore citizens completely has been a major criticism and considered the biggest failure of this approach. Some have even argued that not only smart initiatives fail to engage citizens, they also ignore other social sustainability factors (Yigitcanlar et al., 2019, de Oliveira, 2016). This is a big failure to the smart city approach, as it was initially developed to help tackle sustainability issues. Many scholars agree that the undivided attention to technological aspects resulted in citizens being set aside from the discourse (Engelbert et al., 2019, Schuler, 2016, de Oliveira, 2016, Monfaredzadeh and Krueger, 2015). The objectives achieved through a smart city approach are narrow in utility efficiency, and seldom focus on human needs (Gleeson and Dyer, 2017). According to the critics, too much effort has been directed towards technology in the implementation of smart city initiatives while the participatory element, or even the human element, is largely missing (Åström, 2020).

Overall, all the areas of criticism reach the same destination: the missing element is a very important one; citizens. This lack of human centeredness in smart city and focus on the use of cutting-edge technology as a means of city branding is turning the cities to machines. What we have to bear in mind is that “Cities, whether smart or not, are merely ghost towns without people” (Schuler, 2016).

1.2 New focus

As a result of the heavy criticisms received due to the lack of attention to human element in smart city paradigm, today the focus is increasingly shifting toward the citizens, and “Human Smart City” is becoming more and more prevalent in literature. Although many smart city texts mention the role of people, It often appears as if it was introduced as a second thought after someone noticed it had been omitted (Schuler, 2016). In most smart city documents, people are seen and considered. However, it is obvious that the effort is made just to push the term “people” within the reports so as to avoid criticism. Mostly, people are seen as sensors to collect data (Marsal-Llacuna, 2016) or consumers who receive the end-product and not involved in the co-creation (Schuler, 2016). These considerations of people and citizens in smart city initiatives

are not adequate, they tend to be beautiful on paper and weak in action. Almost all smart city projects have a chapter called “people” in which they describe how their project is engaging and benefiting the citizens. Yet, the solutions and results of the projects are always a number of data collecting sensors.

To truly achieve a citizen-centred and even citizen-led smart city project, we need to be clear about what we want technology to do for our cities. A good starting point is to ask what technology would look like if it served the people (Gleeson and Dyer, 2017). Many scholars have called for new technological and smart approaches with citizens at the center, and the importance of listening and including citizens in the discourse (Melis, 2017, Schuler, 2016, de Oliveira, 2016). There is an increasing and urgent need not only to review the concept of smart cities but also to consider a much wider frame of reference where the citizen is placed at the center of urban challenges, and is facilitated to read the city in terms of its complexity and multiple scales (Gleeson and Dyer, 2017). This new direction of debate regarding the smart city paradigm has one main question to answer: Can citizens’ well-being fully benefit from the costly interventions of the smart city movement? And if so, what role for citizens should be considered? (OECD, 2019).

1.2.1 Human smart city

As a response to all the criticisms to the smart city approach, new dimensions that were left out of this concept gained importance. Above all, the forgotten role of people as the main target and beneficiaries of urban interventions received a lot of attention by many scholars. A prime example of an effort to reform the smart city paradigm and place the people at the center of attention is the definition of “Human smart city” put forward by de Oliveira (2016):

*“Human smart cities are those where **governments engage citizens** by being open to be engaged by citizens, supporting the co-design of technical and social innovation processes through a peer-to-peer relationship based on reciprocal trust and collaboration. It is a city where **people are the main actors of urban smartness**. It adopts services that are borne from **people’s real needs** and have been **co-designed** through interactive, dialogic and collaborative process. **Co-creation** initiatives are at the heart of human smart city concept” (de Oliveira, 2016).*

This definition has 4 main points:

- 1- A key characteristic of a real smart city initiative should be the citizen engagement by the government and the public authorities who have the leadership of the projects. This enabling role of the government has been considered very crucial in the success of a smart city approach in terms of their human-centeredness (OECD, 2020)
- 2- As mentioned earlier, the leading role of private tech firms in their pursuit of higher sale of their technologies has been heavily criticized. This definition calls for a major change and identifies the main actor of urban smartness as the citizens whose needs determines what technologies can be used, and not the other way around.
- 3- Another important critique was to the lack of attention towards the needs of citizens. How can technology help if it does not directly respond to citizens' needs? If citizens' needs are not taken into account, then why should such a costly intervention exist at all? De Oliveira clearly refers to this lack of attention and calls for services which are borne from people's real needs.
- 4- In the mainstream smart city approach, citizens are the recipient of the services and tech solutions designed by the leading authority (in most cases the tech firms in collaboration with governments in pursuit of the adjective "SMART"). However, Human smart cities are those where citizens are not just the recipient, but the co-designers and co-creators of the services as well. The active role of citizens is of highest importance in human smart cities (Schuler, 2016).

Ideally, a human smart city approach should lead to a city where the citizens play the central role in shaping the city and in ensuring its weave of infrastructure would respond more directly to their needs (Gleeson and Dyer, 2017). When speaking of infrastructure in smart cities, the focus should not only be on the physical and technological infrastructure. In fact, one of the main and indispensable part of a human smart city is its social infrastructure, such as intellectual and social capital (Castelnovo et al., 2016). The problem begins when this intellectual and social capital is set aside from the smart city projects. Considering the fact that citizens 'needs and their unique requirements differ from place to place, some suggest that there cannot be a standard model conceptualizing a Smart City. Each city must

create its own original smart solutions with due consideration of what can bring the most satisfaction to the citizen's needs (Trutnev and Vidasova, 2019). Therefore, in order to develop a smart city approach in which the unique requirements of citizens are considered and the resources of the local governments used, we need a clear understanding of what concepts create a smart city. Therefore, in the following chapters I have tried to discuss the elements surrounding the smartness discourse with a focus on not the technologically smart city, but the human smart city (which may or may not include the massive use of technologies!). In this attempt, the final aim of the research is to create a "Geography of human smart city".

2. Smart city characteristics: Scale and type of intervention

While discussing human smart cities, it is important to understand in which scale and which kind of process can citizens be better served. A smart city initiative can take place at a local, city or even regional scale. It can also take the form of a top-down or bottom-up approach.

2.1 Scale of intervention: Neighborhood or City scale

As discussed earlier, human smart city calls for a more comprehensive citizen engagement in all phases of the smart city projects, including co-design and co-creation of services. When asking citizens about their needs, they will list issues regarding their neighborhood due to the fact that the immediate relationship of citizens with city takes place at neighborhood level (Gleeson and Dyer, 2017). Many researchers believe that it is at the local level where the citizen engagement can form in the most effective and efficient way. Even in terms of the three pillars of sustainable development (which are the initial drivers of smart city paradigm), Castelnovo et al. state that the local level is often where the tensions between a system of multiple interactions and frequently conflicting views regarding the three pillars of sustainable development can be managed (Castelnovo et al., 2016). This importance of local approach lies in the importance of context in delivering results which enhance citizen's quality of life. As cities have various cultural, social, political, organizational and technological contexts, it is impossible to have an off-the-shell solution for Smart Cities that embraces all this variety of settings. Therefore, it is demanding to design Smart City solutions properly adapted to the local context (Lopes, 2017). Citizens' relationship with the city initially occurs at the neighborhood scale. A controversial issue in smart city projects is whether to adopt a local approach or to consider the city scale. Some scholars advocate the use of neighborhood scale which is well-suited for forming a culture of engagement. Others criticize the tendency of governments to consider urban scale which ignores the neighborhood scale, thus faces difficulties in attracting citizen participation and often fails. In the words of Gleeson and Dyer:

*“**Bottom-up** neighborhood initiatives can release a surge of creative thinking generating confidence and a feel-good factor which strengthens local community capital and creates the capacity and confidence to challenge the **top-down** city narrative” (Gleeson and Dyer, 2017)*

In their comparison of city or neighborhood scale of interventions, Gleeson and Dyer highlight another controversy: should a smart city project take a bottom-up approach or a top-down one?

2.2 Type of intervention: Bottom-up or Top-down?

The question of whether urban planning interventions should be a result of an authoritative top-down approach, or be derived from the specificities of the local scale in a bottom-up approach has been a matter of debate. It is argued that there is often a breakdown between top down and bottom-up planning in practice. This issue of bottom-up or top-down intervention is also very relevant in the smart city paradigm. In fact, one of the criticisms of the smart city initiatives has been the top-down approach to future city development based on a techno-centric smart City agenda. Some scholars state that it is the responsibility of urban planners to develop alternative frameworks and Processes to promote a citizen centric bottom-up approach as opposed to solely top-down planning of smart cities (Gleeson and Dyer, 2017).

Some have even considered these two types of intervention as opposed to each other, creating lists of pros and cons and advocating for one rather the other. For instance, Grey et al. posit that the top-down approach has become increasingly centralized, depoliticized, and expert and managerial driven. In contrast, bottom-up planning is based on public participation in the decision-making process, greater accountability for local authorities and skepticism around technical expertise. Semeraro et al. highlights the incompatibility of the two approaches due to the fact that they can produce conflict and fragmentation in the built new environment vision between different urban levels and stakeholders (Semeraro et al., 2020).

Currently, the most common approach to urban planning and design is a top-down model, in which planners are seen as "experts" who present a proposal and then share it with others, mostly decision-makers who can approve or reject the plan. This leads to disagreements among stakeholders about how to use urban space, environmental

protection, inhabitants' interests, labor conditions, economic development, and urban identities. As opposed to this, some argue that the planning of urban space must be viewed as a "public affair," with the goal of imagining the proper use of urban spaces while taking into account the socio-ecological and cultural context of reference, as well as resolving conflicts between stakeholder groups over choices or preferences in the use of destination of the urban space. An important aspect for a successful urban transformation plan is evaluating the citizen's "awareness, value judgments, behavior, and attitudes" in relation to urban space. However, public participation may not always yield a mutually acceptable solution, especially when the interests of stakeholders are diverse and conflicting (Semeraro et al., 2020). Over-reliance upon people's participation has been proved to not help achieving proactive planning issues (Roy and Ganguly, 2009).

What can clearly be seen here is the existence of two conflicting views: the proponents of the top-down approach who criticize the over-reliance upon citizen participation and ignoring the role of planners as experts, against the supporters of the bottom-up initiatives who increasingly seek public participation. However, having one approach an ignoring the other will not lead to any good. In fact, there is a general consensus among researchers that top down and bottom-up approaches need to be reconciled, and narrowing the gap between the two is the real challenge (Grey et al., 2017). Both approaches are required for sustainable and equitable planning, and urban planning needs to combine bottom-up and top-down approaches, including stakeholder's participation with strategic spatial planning at different urban levels (Semeraro et al., 2020). Mixing the two approaches will not lead to a maximum consensus among the involved actors and stakeholders, but will provide a moment of confrontation to better address social issues in urban planning and design. It is proposed to have a combination of a bottom-up and top-down methodology capable of developing a participated urban plan, harmonizing the various stakeholders' interests that act at the different administrative levels and integrating ecological and socio-economic components in the context in which it is inserted (Semeraro et al., 2020). This proposal, as a matter of fact, argues for a top-down approach based on bottom-up results: Top-down participation, using the bottom-up information can drive the choice and help decision-makers overcome an excessively deep-rooted view of conservation of the urban space that administratively slows down the urban regeneration process. This

would arguably help speed up the decision-making process by helping decision-makers become more aware of the transformations that are introduced in the urban context: “doing the right thing in the right place”. This can be useful to produce a better acceptance of urban plans reducing the likelihood of conflicts between different experts or people that participate in the processes of planning development. The combination of bottom-up and top-down participation methods can be a tool through which urban planning can drive the transformation or evolution of urban spaces at different institutional levels. It can increase the interactions between citizens in a vision that “unites and inspires” to develop urban quality space helping the decision-makers to identify hypotheses of territorial development that is more suitable on the basis of present and future scenarios of economic, environmental, and social evolution (Semeraro et al., 2020). Bottom up approaches can address people’s needs in a true way and top down approach for proactive planning strategy is desirable also in the plan formulation stage (Roy and Ganguly, 2009). Therefore, the main aspect for the success of the bottom-up and top-down approaches is the creation of feedback between scientific knowledge derived from experiences and studies not directly connected to the characteristics of the study area and non-scientific visions deriving from those who live in the area, who express their opinions and advice based on their own life experiences (Semeraro et al., 2020).

On the topic of having the two approaches together, Astrom (2020) state that public managers should promote participation from below, but make sure to deliver on goals set from above (Åström, 2020).

But in which way can this gap between top-down and bottom-up approaches be filled? Some believe that this can be achieved through participatory governance. Other have also referred to the role of data in smart cities and argue that if used appropriately, data can help bridge the gap between top-down and bottom-up processes. The question is how can this data inform decision-making, and Foster better public participation in complex and highly bureaucratic planning processes (Grey et al., 2017). Additionally, what is the role of governance in bridging this gap?

3. Smart city governance model

One key aspect of a smart city is its system of governance within which partnerships take place. This chapter discusses various partnership and governance models and the relationship between the two.

3.1 Collaborative/participatory governance

According to Belissent (2010), governance is the core of smart city initiatives. When discussing the governance of smart cities, different terms are often used, namely Collaborative governance, smart governance, e-governance, participatory governance etc. The aim is to include citizens in the agenda, not just in the implementation and design phase, but also in a broader sense at the governance level. Participatory governance and citizen involvement (under different stakeholder roles) are key concepts in many smart city frameworks (Castelnovo et al., 2016). Many have tried to clearly identify what type of governance a smart city should have. For instance Bartenberger and Grubmüller-Reigent (2014) suggested the term “collaborative governance” as the desired governance for the smart cities (Castelnovo et al., 2016). Broccardo et al. state that in order for a city to become fully smart, Collaborative governance is the preferred type of governance (Broccardo et al., 2019). Effing and Groot (2016) recognize participatory governance as the essential aspect of every smart city (Effing and Groot, 2016). A review of literature suggests that the terms smart, participatory and collaborative governance are used to refer to the same kind of governance and is often used interchangeably. For instance, Broccardo et al (2019) defines a smart city as a city with smart collaboration in which the smart city governance appears to rely on participatory mechanisms and collaboration among several actors. Smart governance may comprise several different aspects, among which participation in decision making and use of internal and external resources which recall the concept of collaborative governance. In fact, a collaborative/participatory governance model has been considered a tool to support smart cities (Broccardo et al., 2019).

This amount of attention to participatory and collaborative governance poses the question of what good this kind of governance does in the smart city paradigm? According to Fischer (2012), participatory governance is a variant or subset of

governance theory which puts emphasis on democratic engagement, in particular through deliberative practices and seeks to deepen citizen participation in the governmental process (Fischer, 2012). As can be clearly seen, the emphasis on citizen participation at the governance level is dominant in this type of governance. This can be seen as a part of efforts to put the citizens back at the central position in the smart city discourse. A definition of collaborative governance by Ansell and Gash (2008) highlights this point clearly:

“(It is) a governing arrangement where one or more public agencies directly engage non-state stakeholders in a collective decision-making process that is formal, consensus oriented, and deliberative and that aims to make or implement public policy or manage public programs or assets” (Ansell and Gash, 2008)

In order to achieve collaborative or participatory governance, it is necessary to transform current governmental practices. The transformation, however, is only as regards how governance is exerted, that is, through collective decision-making processes that include both public and private actors and that, in the case of smart cities, are enabled by ICTs (Castelnovo et al., 2016). The role of ICT here as an enabler and facilitator requires another kind of transformation rather than that of governance. For sociable smart cities that embrace both community driven innovation and technology-driven innovations, society also needs to transform into a more participative domain where participatory innovation takes place (Van Waart et al., 2015).

The role of ICT as an enabling agent for the smart city governance and the prevalence of technology has led to another term used by some scholars: smart city E-governance also widely referred to as e-gov.

3.2 E-Governance

With the increasing role of digital technology, its role not only as a means to an end in smart city projects but also as a tool for delivering smart city governance became increasingly important. The e-governance model, also referred to as smart city governance, is an inclusive definition of governance relying on good governance such as open (i.e. transparent), accountable, collaborative (i.e. involving all stakeholders)

and participatory (i.e. citizens' participation) principles and on Electronic Government (e-Government) (Lopes, 2017). Smart city governance enabled by ICT (e-gov) is about crafting new forms of human collaboration through the use of ICTs to obtain better outcomes and more open governance processes (Meijer and Bolívar, 2016). However, early definitions of e-gov were primarily linked to the use of ICT and was mainly technology driven. In fact, the same technological euphoria or fetishism can be seen in the early concept of e-governance model. The traditional notion of e-governance is simply the provision of services by government through digital means. However, more recently, this definition has widened and enhanced and is considered as the use of digital technologies by government agencies to facilitate effective decision making and improve public policies in the local communities by transforming relations with citizens, businesses and other arms of government. The result should be better service to citizens, more effective government, enhanced local democracy and improved decision making process (Deakin and Al Waer, 2011). It is obvious that the new definition (as opposed to its traditional one) has a clearer focus on citizens as not only the consumer of smart city services, but as an actor involved in the development process from early stages. Kumar (2015) describes the aim of this model of governance which is also referred to as "online governance" in this way:

"The aim is to use ICT to deliver services and programs, provide government information and to interact with the citizen. This results in a user-friendly relationship with citizen, business and state. The objective is to engage, enable and empower the citizen, and should result in the efficient and swift delivery of goods and services to citizens (G2C), businesses (G2B) and other governmental agencies (G2G) and enhance their interactions" (Kumar, 2015).

There are two important points in this definition of aims and scope:

- 1- Kumar highlights the fact that ICT is "used" as a means to deliver services, and this is in direct response to the critiques who blame smart city initiatives as technology driven with ICT as the end point, and not the means to an end.
- 2- The relationship that e-governance is seeking to construct is among citizens, businesses and the state. Thus, it is creating a public (the state) private (businesses) people (citizens) partnership known as the 4P or quadruple helix model of governance, which will be discussed further.

Castelnovo et al. (2016) also highlights the role of e-governance in facilitation public service interaction between government, citizens and other stakeholders, which will enable citizen participation, and ensure inclusiveness and equal opportunity for all (Castelnovo et al., 2016). We can see that there is an emphasis in creating partnerships through governance as a means of enhancing interaction and a better design and delivery of smart services. These partnership models include a public body (government or state) and private body (businesses and stakeholders) and is called the 3P model (Public Private Partnership). Some also refer to it as the Triple Helix Model.

3.3 Triple Helix Model of partnership

Mainly, there are two views to the type of partnerships formed as a result of governance structures, one considers citizens as consumers of services, while the other sees them as not just consumers but co-creators who are actively involved not only in the use of designed services but also play an important role in designing and delivering the smart solutions.

The first viewpoint which reduces the role of citizens only as the users of the end product was the result of the first partnership model known as the 3P (public private partnership). The application of pervasive technologies in a city means that all people will, consciously or unconsciously, interact with technological systems. For consumer markets, a close collaboration between industry and government (as described in the tripe helix model) might be sufficient for product or service innovations (Van Waart et al., 2015). Literature suggests that there are some scholars who argue for the 3P model as an effective and fruitful form of participation mode, while many are opposed to it. With regard to the arguments in favor of this model, public private partnerships are seen as a win-win situation that benefits all participants, both public and private sectors, as well as the general public in the long term. This is due to the fact that many governments are facing budgetary pressures from the growing demand of services and are not able to handle the pressure without forming partnerships with the private sector and businesses. Public-Private Partnerships (PPPs) are considered as one solution for producing quality, cost-effective public services and are seen as a possible approach for increasing public services' diversity and quality, and at the same time, using taxpayer's money more effectively. On the other hand, those who argue against

this partnership model highlight its weakness in limiting the role of citizens only as end users and consumers of the services reached as a result of the PPP model. It is argued that there is a noticeable lack of the crucial end-users' perspective in the urban development process for creating more desirable living environments, and they posit that the end-users' perspective should be included in the PPP-based urban development processes for more desirable living environments (Majamaa, 2008).

This limited role of citizens considered by the 3P model has led to lots of criticism with the aim of recognizing citizens as a more active and determining agent in the service design and delivery and not just the consumer. These criticisms led to another more developed partnership model known as the 4P or Quadruple Helix model of partnership, taking into account not only the public bodies, businesses and academia, but also people as the 4th P in the model.

3.4 Quadruple Helix Model of partnership

As discussed earlier, in response to the lack of attention to citizens, not as the end user but as an active stakeholder in the design and implementation phases, another viewpoint was formed which saw citizens are seen as co-creators of services. This view posits that a successful smart city is a sociable one which has a meaning to its citizens. To achieve this, a strong position for citizens in the design process is required to address people's values. In a real smart city project, however, this does not often happen. In contrast, in such projects people are less free to choose to interact with pervasive technologies in the urban context. To legitimate and justify urban innovation towards smart cities, the important role of citizens (civic society) should be acknowledged. This is where the shortcoming of the 3P model is most obvious, and efforts to include people as a more active stakeholder were made. For example, Carayannis and Campbell (2012) describe how the triple helix can be extended with a fourth helix to a quadruple helix that acknowledges the important role of the (media base and culture based) public or civil society. The fourth helix represents and warrants the humanity aspects in the smart city development process in the participatory domain (Van Waart et al., 2015). Figure 1 represents the quadruple helix model that takes place in the participatory domain. The actors involved are the State as the public body, Industry and businesses as well as academia and universities as the private bodies (it is worth mentioning that in some cases public universities are

contributing to this model), and the civil society as the 4th P forming the Public Private People Partnership.



Figure 1: Quadruple Helix in the participatory domain (Van Waart et al., 2015)

The introduction of the 4th P (people) in the 3P model of partnerships enhances this previously criticized model and its weaknesses in various ways. There are several benefits to the 4P model. The 4P-based urban development process can be innovative and end-user oriented, customer-centered, and interpretative by its nature, as the development processes according to theories of innovativeness generally should be. In this model of partnership, the urban developers, both public and private ones, benefit from the early inclusion of people in PPP-based urban development processes and PPP-projects at the real estate level. In addition, end-users, through Public-Private-People Partnerships (4Ps) can have a stronger influence on their living environment than they would have had if they were considered only as potential customers of the developers. In this process both the public and the private sector can integrate participation with place making and learn earlier what it is that their customers - the fourth "P" - really desire. Moreover, research suggests that the inclusion of the end-users' perspective in Public-Private-People Partnership (4P) based urban development process gives flexibility and benefits to all stakeholders and could be a method to create desirable living environments and neighborhoods. In fact, Public-Private-People Partnerships (4Ps) make participatory development possible, and gives an opportunity to take consumers opinions and needs into an alternative to traditional communicative planning processes (Majamaa, 2008).

Figure 2 shows a comparison of the two models of partnership (3P vs 4P). As can be clearly seen in the PPP-based model, the direct partnership takes place between the public and private bodies, and they interact with people as the end-user and consumer of services developed as a result of Public Private Partnership. However, the 4P model represents a partnership with 3 corners: Public, Private and the civic society all work together in the development process, and the role of citizens is no longer seen as merely the consumer of services.

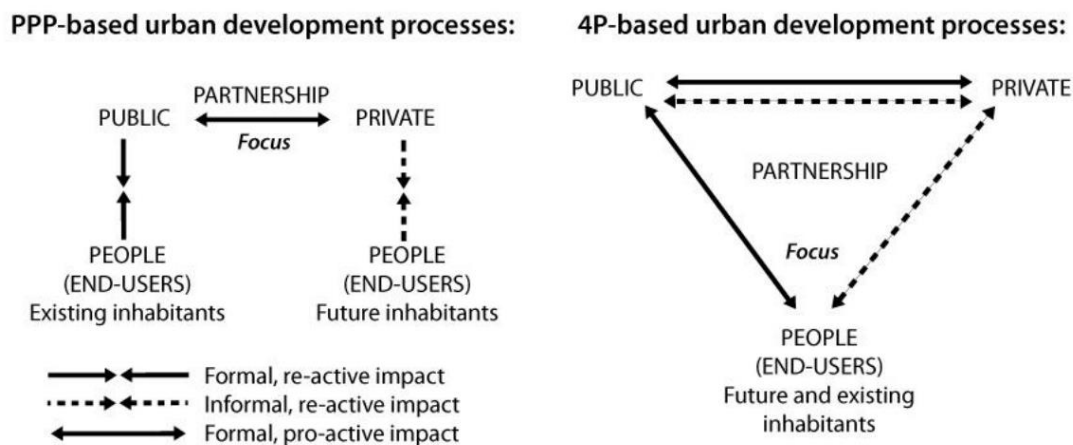


Figure 2: Building the 4th P into Public-Private-People Partnership (4P) based urban development (Majamaa, 2008)

3.5 Partnership models and smart city governance

In the context of smart cities, the ability to build collaboration and partnerships is often referred to as a component of smart city governance and a key to have success. A smart city needs collaboration across departments and with communities making various stakeholders involved in the decision-making process with particular attention paid to the relationship between city government and its citizens. Thus, the smartness of governance may be intended to be built on the participation of multiple actors and on collaboration with public and private organizations and knowledge institutions finalized to realize smart city initiatives (Broccardo et al., 2019). Clearly, the 4P model aims to achieve this collaboration necessary for a successful smart city governance. Thus, we can say that a good smart city governance takes full advantage of the Public-Private-People Partnership model to achieve the desired level of participation of multiple stakeholders. National and international actors, the local government, local associations, not for profit organizations, community representatives and citizens, lobbies and private organizations are all categories of actors who may play a role.

These multiple actors have specific interests and know-how and can differently contribute to smart initiatives and collaborations. For instance, governments may be regulators, funders and/or coordinators of smart city initiatives. Citizens may be involved directly in the work of government in response to their call for more transparent, accountable and effective administration. Their involvement can reshape the governance of a city through participatory mechanisms as the living labs, which keep the users continuously involved in making better products and services. These processes of democratization and empowerment can recognize to the citizens the opportunity to express opinions on policies, participate in boards and public hearings, shaping collaborative dynamics and actions (Broccardo et al., 2019).

Considering all the above-mentioned discussions surrounding what a smart city governance should be composed of, several key components of a successful smart governance can be identified:

- As a smart city governance seeks citizen centeredness and citizen participation, it requires to take place within the boundaries of the participatory democracy, meaning that every stakeholder (whether public, private or the civic society) should be able to participate in development processes.
- Within the realm of the participatory democracy, all stakeholders should be able to interact and should be empowered enough to affect decision making. Therefore, Citizens, Government, Private businesses and Knowledge institutes should be able to form partnerships leading to a successful and all-inclusive governance model.
- With the advances of technology and its potential role as facilitator and catalyser of governmental processes and smart initiatives, new forms of collaboration through ICTs help form easier and more productive partnerships and as a result, a more inclusive governance.

Therefore, we can conclude that Smart City governance is the ICT-enabled interactions of Government, Citizens, Private bodies and Knowledge centres (quadruple helix model of partnership) in the participatory domain. In other words, it is an ICT-enabled participatory governance, also known as E-governance. Figure 3 synthesise all the discussed elements and shows what a smart city governance model is composed of.

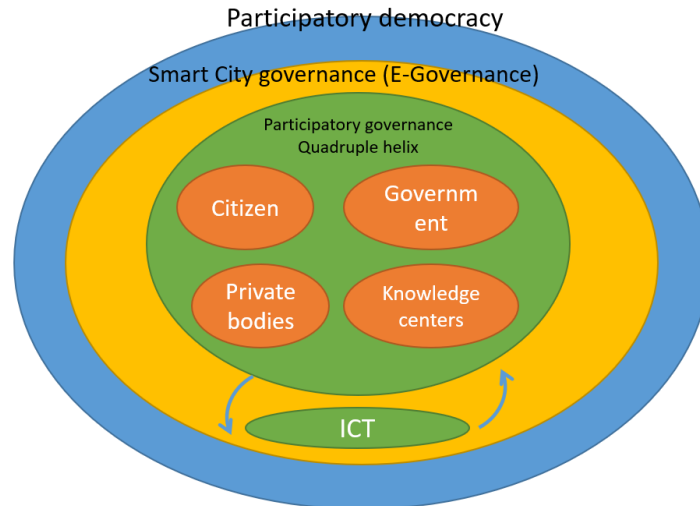


Figure 3: Smart city governance model (Author's interpretation)

As a central element in this model, Participatory governance is seen as the domain in which partnerships take place. This domain is of great importance in the smart city governance model, as it can have profound effects in the smart city governance. However, the question is that why is there a necessity of having participatory governance, and what good can it do?

3.6 Need for participatory governance

A review of literature reveals the importance of a governance model which enables full participation and seeks citizen engagement as a means to achieving human smart cities. Many scholars have highlighted the need for participatory governance, and they fall mainly in two categories:

3.6.1 Bringing citizens to the center of attention

The first and most noted category of reasons why participatory governance is a vital and inseparable part of smart city governance is with regard to increasing focus and attention to the missing human element in the smart city paradigm while highlighting the fact that technology alone will not lead to smartness of cities. Effing and Groot (2016) posit that in order to become a "smart city," cities are increasingly facing obstacles in terms of participatory governance. The best cities to live in around the world are not those with the most advanced technological layers, but rather those that foster an environment in which inhabitants, businesses, and government work together to create a lively and sustainable city (Effing and Groot, 2016). The role of

governance in citizens engagement is beyond doubt. The importance of governance in bringing smart city concepts to citizens cannot be overstated. It makes the decision-making process more transparent and allows for greater citizen participation in the implementation, monitoring, and evaluation of these projects (Castelnovo et al., 2016). Smart governance can promote effective city governing towards a Smart City by interacting with technologies, people, policies, best practices resources, social norms, and information. As a result, smart governance is at the heart of each Smart City program (Lopes, 2017).

3.6.2 Bridging the gap of top-down and bottom-up approaches

Another group of reasons why a smart city needs a collaborative governance model is due to the importance of the type of approach a smart city needs to adopt. As stated earlier in this research, one common area of confusion and debate is whether a smart city initiative should start from a local level building its way up, or it should take place at urban and regional levels. However, it was commonly agreed upon that neither of these approaches are able to fully address the complexity of the issue and the two approaches need to be reconciled. Participatory governance, thus, is seen as a solution through which the gap between bottom-up and top-down initiatives can be bridged. Often in the smart city projects, citizens are engaged, yet in a top-down manner. Despite the fact that citizen engagement is a key component of smart city governance, scholars, experts, and leaders are increasingly agreeing that traditional top-down methods for governing the complex interplay of technological knowledge, political constraints, and value conflicts that underpin public value creation and management are no longer adequate to meet the current demands of public decision-making. It is both valuable and vital to develop a new type of public engagement. Traditional citizen participation in policy decisions is encouraged through recommendations and signals that follow a typical top-down decision-making process. The municipality shapes public services first, and citizens are then involved through a mix of online and offline programs that collect their feedback, criticisms, and suggestions to improve the services. ICTs, particularly social media, are used to increase the number of people who participate in public debates and to offer a voice to those who would not normally participate in person. More recent trends indicate that citizens are becoming more involved in their city's government and are taking a more active role in the production and maintenance of public value. This is accomplished

through social innovation and multistakeholder codesign, co-funding, co-delivery, and product and service co-evaluation. This is a novel strategy in which citizen participation emerges organically from the bottom up, without the need for abstract solutions. (Castelnovo et al., 2016).

Knowing why participatory governance is important in smart city is the first step. However, now there is another question: what are the requirements for a participatory governance model?

3.7 Requirements for participatory governance

A review of literature suggests two main requirements for cities (smart cities in particular) in order to have the ability and capacity to adopt a participatory governance model.

3.7.1 Government transformation

When a city decides to move toward taking the adjective “smart” and being recognized as a smart city, the governance structure needs to change accordingly. Otherwise, the smartness will only be due to the use of technology, which will lead to failure as discussed earlier. But to what extent should the governance undergo change? Meijer and Bolivar (2016) recognize 4 different notions of governance differing on the basis of their level of transformation:

1. No need for transformation: smart governance is considered as the governance of a smart City. The government in charge of a smart City is called a smart government
2. Smart decision-making: not restructuring government institutions but restructuring decision making
3. Smart government administration: e-government that uses IT to integrate and interconnect information, processes, institutions and physical infrastructure to better serve citizens. This requires a transformation of internal organization.
4. Smart urban collaboration: transformation of internal and external organization. More community-based e-governance (Meijer and Bolívar, 2016)

It goes without saying that to make a city smart, government transformation is essential (Meijer and Bolívar, 2016). However, what happens most of the time is that cities, by implementing tech-based solutions, call themselves “Smart city” without any

change in the governance. This is the first notion of governance transformation by Meijer and Bolivar. On the contrary, what really needs to be done for a city to be a smart city is the government transformation towards a more community-based e-governance. Here, the difference of a “real smart city” and a tech-based city calling itself “smart” is evident. Robert G. Hollands (2020) has written an article ironically called “Will the real smart city please stand up?” which on the one hand is funny as it is derived from the hip-hop song from American artist Eminem, but on the other hand is addressing the fact that cities, claiming to be smart are not all smart cities (Hollands, 2020). Several transformations are required for a city to be considered smart. Governance is frequently used in the smart city literature to refer to citizen engagement and stakeholder collaboration. To build a smart city, government structures and operations may need to be transformed to some level (more or less significantly) (Castelnovo et al., 2016). We should shift our focus from "better urban governance outcomes" (wealth, health, and sustainability) to "better urban governance processes" (citizen involvement, open forms of collaboration) (Meijer and Bolívar, 2016). In this process of transformation and transition, the involvement of citizens and other non-governmental actors is essential. Smart citizens play a crucial role in smart cities by their participation in smart governance (Effing and Groot, 2016).

3.7.2 Overcoming barriers to participation

Another requirement for having a participatory governance model is to activate full citizen engagement and participation. To do so, the obstacles on the way of participation has to be overcome. Recognizing citizen participation and citizen centeredness in a smart city highlights the importance of this requirement. Overall, literature suggests two issues to citizen participation in participatory governance:

- 1- Lack of competence: in order for people to engage in policy-related discussions, they need to increase their knowledge of the subject under discussion on the one hand, and negotiate with policy makers and deal with complex policy issues on the other hand. This issue is quite relevant, as marginalized groups of society who might benefit the most from participation might not have the required competence to do so. However, there is evidence to suggest that even those with less formal education can participate with high levels of competence (Fischer, 2012). However, most initiatives that try to engage citizens ignore the

less literate who actually benefit the most from engaging in decision making. The focus group, especially in smart city initiatives, are usually the young who are capable of understanding technology and how it works, as most often engagement takes place via digital tools. Here also, the competence is very relevant as digital technology has made new forms of participation and without the required technological and digital competence, participation is hindered. This is the common issue of digital divide that takes place due to the fact that some citizens have higher digital literacy than other, and those who do not have are left behind in the citizen engagement processes.

- 2- Lack of incentive to bear the costs of participation: public participation has its own costs (time, energy, whether what they do leads to any results, etc.) and most people are unwilling to pay the cost, unless the costs of engagement are outweighed by the possibility to benefit from it (Fischer, 2012). Therefore, it is important not only to conduct citizen participation processes that bring about fruitful outcomes, but also to make people aware about the benefits of participation.

According to the above-mentioned discussion, participatory governance has to give people sufficient competence to be able to engage in participatory processes on the one hand, and to make sure that such processes have fruitful results and that the results outweigh the costs of participation on the other hand. Some scholars refer to this as "Making citizens smart". Citizens with enough competency to engage in participation and that are well informed about its importance are seen as "smart citizens" or "smart people". In fact, a very important aspect of smart cities and smart governance is smart people. But the question is: who are smart people?

3.8 Smart people in smart cities

Some researchers have attempted to shift the focus of the debate on "smartness" from "smart cities" to "smart citizens." Their recipe entails empowering individuals through the use of smart technologies and e-participation tools, which would necessitate a high level of trust in citizens on the part of planners (Åström, 2020). The issue of trust itself is a very important and determining factor in reaching a citizen centered smart city, which will be deeply discussed further on in this research. However, one of the goals

of smart city initiatives is to improve people's smartness. Smart people are a key asset for smart cities because they provide a meaningful resource on which programs to make cities smarter can rely. Smart, educated, and informed individuals can become active users and interact with smart city efforts, in addition to contributing to a city's competitiveness, which is an engine for economic growth. They can make or break these initiatives by embracing and using the (smart) services made accessible to them, as well as engaging in the city's governance and management (Castelnovo et al., 2016).

There is a dire need for clarification here: as mentioned above, smart cities aim at making people smart. Smart people are the engine behind smart cities. However, what do we mean by "smart"? what are the components of this "smartness" of people? Does it relate to the level of literacy and education, or does it mean those with higher IQ? What needs to be clarified here is that Smart does not imply skill in solving mathematical or logical puzzles. We don't mean individuals with a high IQ when we say smart people. Addressing major societal issues necessitates a concerted effort from all segments of society. Climate change, for example, is a problem that cannot be tackled merely by a group of knowledgeable elites, but rather necessitates a communal will and action. Schuler maintains that when we talk about smartness, we're talking about the traditional equivalent of wisdom, or what he refers to as "civic intelligence" (Schuler, 2016). Smart cities are not only about ICT, energy and transport infrastructures: Smart cities are about smart citizens, who participate in their city's daily governance, are concerned about increasing the quality of life of their fellow-citizens, and about protecting their environment (Craglia and Granell, 2014). People are at the heart of smart cities. Apart from smart and sustainable economies, smart mobility, smart environment, smart governance, and smart living, one of the key elements of smart cities is smart people/smart citizens. Smart citizens, on the other hand, are a crucial enabling condition for smart cities: there can be no smart city without smart citizens, and citizens can contribute to making cities smarter even if they do not live in towns that are adopting smart city projects. Consider, for instance, activities aimed at making cities more environmentally sustainable, which is a key goal for smart cities. Every such program has an impact on residents' lifestyles, whether directly or indirectly, and it is judged a failure if citizens are unwilling to change their lifestyles in response. Citizens, on the other hand, can help make a city more environmentally

sustainable (i.e., smarter) by voluntarily adopting acceptable behaviours, even if the city has not taken any action that would define it as a smart city. A smart city must implement steps to boost entrepreneurship, increase human capital investment, promote the use of ICT-based learning aids in schools, and manage and promote the city's cultural assets in order to make inhabitants smarter (Castelnovo, 2016).

To measure citizen smartness, scholars suggest using indicators such as the education level of citizens; the foreign language, computer and internet skills; the participation in life-long learning; the percentage of people working in education and in knowledge-intensive sectors; the patent applications per inhabitant; the voter turnout in elections and the share of female city representatives. The level of smartness can also be assessed by considering the level of qualification; the affinity to life-long learning; the social and ethnic plurality; the people's flexibility, creativity, cosmopolitanism/open-mindedness and the participation in public life (Castelnovo, 2016).

As discussed, smart citizens need to adopt to a smart lifestyle, and have competencies to behave in a smart manner (let's not forget the definition of smart here). Some argue that this enforced smartness forces people to behave in a certain way and penalizes those who do not. Therefore, concerns have risen as to whether making people smarter is contributing to the level of democracy, or is becoming a way of social control.

3.9 Smart people: Social control or democracy

As previously stated, the fundamental motivation of the Smart City movement was the need to address sustainability issues. Smart cities have the potential to produce more long-term results. Persuading individuals to change their behaviors in order to foster environmentally sustainable cities, or encouraging them to "participate" in making cities smarter, is one strategy to achieve sustainability in smart cities. Policies aimed at making cities more environmentally sustainable, on the other hand, simply 'manipulate' or 'cure' residents for their proclivity to engage in non-sustainable behaviors. Social control, sanction, incentive, exhortation, and cajolery are used to encourage citizens to adopt smart and sustainable behaviors. Smartness becomes an area of social control through the manipulation of lifestyles toward green consumerism, which, disguised as citizen involvement and participation, makes intrusion into a

person's private life relatively natural (Castelnovo, 2016). Therefore, this issue and concern, which is definitely a relevant one, has to be taken into account when discussing “smart people” and making citizens smarter in a smart city. One way that scholars advocate for in the case of making citizens smart in a smart city is through the use of participatory governance.

3.10 Creating smart people through participatory governance

As mentioned earlier, citizen smartness requires citizen competence to engage in policy-related discussions and negotiate with policy makers and deal with complex policy issues. According to Fischer (2012), Participatory governance is seen to contribute to three factors: The development of communicative skills, citizen empowerment, and community capacity building.

- 1- In the case of citizen competence and development of communicative skills, participatory governance seeks to assist people develop their own abilities to negotiate with public policy-makers. This is extremely important as citizens not only need a hint of political knowledge and jargon, but also the ability to negotiate for what they need and desire.
- 2- Regarding citizen empowerment, participatory governance seeks to empower citizens, emphasizing political rights, social recognition and economic redistribution. This issue is critical for participatory governance as it has little or no meaning if citizens are neither capable nor empowered to participate.
- 3- As per the community capacity building, participatory governance helps to connect and enable competent individuals in local communities build together the kinds of “social capital” needed for joint problem-solving (Fischer, 2012)

Participatory governance, thus, helps smart cities to bring citizens back to the center of attention as well as narrowing the gap between top-down and bottom-up participatory processes. To be able to adopt a participatory governance model, there a need for government transformation and to overcome the barriers of participation. In this way, participatory governance can help make citizens smarter by giving them the required capacity and knowledge to be able to take part in and influence decision making. Another determining factor in smart cities is the ability to use urban data to foster citizen participation and to give more attention to the human element of smart cities.

4. Urban data

There is no denying the fact that data plays an important role in problem definition, analysis, finding solutions and decision making. The more accurate and abundant data would definitely help more precise decision making. However, data is raw and needs to be processed to turn into information, and then based on the information, decision making can take place. Consequently, not all data is useful, but those processed to information can be. Nowadays, with the advances of technology, more and more data are gathered in massive databases. In order to be able to use data, first it is important to understand different kinds of data available in urban planning. Overall, data can be classified according to size (big or small) as well as openness of access (open data vs classified data). Grey et al. (2017) defines three categories of data:

- **Small data:** Surveys and qualitative methods used to collect data at a smaller scale in contrast to big data. This involves data produced in studies with limited scale and Scope using non-continuous collection and designed to answer very specific questions.
- **Big data:** Enabled by advances in ICT, big data is typically generated in large volumes and is often the by-product of ICT systems, rather than primary data gathered to investigate a particular phenomenon. It is characterized by quantity and frequency and therefore many data types may be described as big data if they are available in large volumes and at a high velocity.
- **Open data:** data that is freely available to all users in a usable file format. data are open when they are available to everyone and free for use and reuse (Grey et al., 2017).

As data can be used as the basis of decision making and problem and solution processes, the level of openness is extremely relevant. Smart cities use technologies to collect data. But if the only people having access to this data are the technicians, then all the criticisms to smart city such as technology as a solution and not the means (Bouzguenda et al., 2019), data collection as the end-point of smart projects and city as a machine to be controlled by data (Certomà and Rizzi, 2017), simplification of urban issues to data collection, transmission and crunching for every problem

(Schuler, 2016) and many others come true. In fact, scholars have raised the question of whether or not more and more data can create better living conditions in cities (Gleeson and Dyer, 2017). In response to all the criticisms, scholars have sought to bring back citizens into the central position in smart city discourse. Therefore, as an active stakeholder (recognized by the 4P model of partnership and empowered by the participatory governance model) citizens also need to have the capacity to influence decision making and to do so, they need to have access to data. Thus, the concept of big data in smart city became open data, accessible to everyone in various usable formats. However, what are the characteristics of open data, and in what way can open data contribute to human smart cities?

4.1 Open data

To understand how open data works and how can smart cities benefit from it, first we need to know what open data is, or more specifically, what do we mean by “Open”. Grey et al. (2017) identifies three qualifying criteria for open data:

1. legally open and free from restrictive licensing
2. Socially open, where information supports collaboration
3. Technologically open, where the data files are available in non-proprietary formats (Grey et al., 2017)

Clearly, the openness factor makes sure that everyone, with no legal requirements, can have access to data. Plus, data is available in different formats that can be used by the mainstream technology available to people so as to avoid exclusivity of data. Research suggests that the availability and accessibility of both big and small data through open data formats presents a real opportunity for urban planning. The identification, collection, sharing, and analysis of relevant data is critical to people-centered planning and urban design. However, the main question is how can big and small data promote better decision-making with greater public participation in collaborative urbanism? (Grey et al., 2017). Without a clear answer to this question, data collection only has a technological side and turns the city into a machine.

Apart from the benefits of openness of data, there are some who argue against it. Concerns regarding the politics of urban data, data ownership, data control, and data convergent access arise while discussing open data, including who controls the

system, who owns the data, and what the implications are for democracy (Gleeson and Dyer, 2017).

An example of the use of open data in urban planning is the case of London Datastore, which uses open data to increase citizen engagement and social innovation. It makes available more than 600 public data sets connected together and openly available to developers and users for generating innovative services for the citizens of London. To date, several thousand developers have registered to use the data sets and have already created hundreds of applications, reaching millions of active users (Castelnovo et al., 2016).

Overall, the role and importance of data in urban planning cannot be denied. However, it should be made sure that is freely accessible to all, does not violate personal rights and does not undermine democracy. Data should in fact serve to empower citizens and engage them in the entire process, from data collection to co-problem discovery, co-problem definition, co-design and creation and co-delivery (known as the 4Co-Ds by (Kyakulumbye et al., 2020)).

4.2 Data collection, Co-creation, Co-design and empowerment

As discussed earlier, data plays a significant role in identifying citizens' needs, troubleshooting, finding a solution, implementation and monitoring. If used properly, it can activate full citizen engagement. Scholars argue that urban data can potentially empower citizens, giving them a more active role to play in the entire process. However, how can this be done? What do we mean by empowerment? The term "empowerment" was originally used in management literature to describe workers' engagement in firm decisions about future product development as well as their perception that they have the ability to influence the company's future (Certomà and Rizzi, 2017). We can define citizen empowerment as citizens' engagement in city decisions concerning future developments and the idea that they have the power to determine the city's destiny by substituting "workers" with "citizens" and "business" with "city". More often than not, citizen empowerment takes place only partially, meaning that it does not fully enable citizens and engage them in every aspect of the process. A common critique is that citizen empowerment is understood as placing citizens' needs at the core of smart city projects by letting people obtain information and provide solutions to pre-defined problems. As a result, empowerment is defined

as participation in top-down projects that are chosen from among those problems that can be solved by technology rather than those that have a significant impact on citizens' lives. Residents are considered active to the extent that they participate in the achievement of city goals that they did not help define, and there is no practical way for citizens to contest the goals (Certomà and Rizzi, 2017). This partial empowerment will only engage citizens in Co-delivery of solutions, while they will not play any role in the Co-problem discovery and definition part. However, As previously said, true empowerment occurs when citizens participate both in identifying issues and evaluating solutions (The requirement for a double bottom-up participation of citizens: the first during problem definition, the second during solution identification) (Certomà and Rizzi, 2017). The reason why citizens often don't have the capacity and required competence to engage in participatory processes and play an active role in decision making is because of their lack of understanding of data. The average citizen, in particular, has a poor relationship with data, viewing it as abstract, unclear of its neutrality in terms of personal liberty, and pessimistic about its ability to become a daily resource accessible via user-friendly channels (Gleeson and Dyer, 2017). A viable solution to this problem can be seen in data collection. If data is gathered and provided by citizens, then this relationship between citizens and ever-increasing data can be strengthened. This is the key to citizen empowerment through data, and to their full contribution and engagement in the 4Co-Ds. As a matter of fact, another reason why this full engagement of the 4th P (people) does not happen is due to the ambiguity of the 4Co-Ds. Co-design, co-creation, and co-production are buzzwords that refer to including consumers and producers in the development of products and services. Despite certain distinctions made to give them varied meanings, they are generally described as broad phrases that could cover actions carried out at various stages of project development and involving people with varying degrees of participation (Cantu and Selloni, 2013). To address this ambiguity and help make clear what happens in each stage and what can citizens bring about as added value, various definitions were offered by scholars. For instance, in one definition co-creation is defined as the "systematic process of creating new solutions with people-not for them; involving citizens and communities in policy and service development". It goes beyond traditional participatory methods to find new ways to solve complex (environmental, social, and economic) problems in cities. In reality, by empowering local civic actors and encouraging strong partnerships, co-creation moves the focus from centralized

governance to a more shared decision-making approach in urban regeneration. This embedding of co-creation in urban-planning strategies to adopt a user-centred approach and co-designing method frequently occurs in a spatial medium, the so-called Urban Living Labs (ULLs), which serve as the "enabling environment" for co-creation. ULLs are not a new phenomenon. Many researchers have described them as "real-world labs for experimental research with edges between research institutions, society, and government." As a result, Living Labs combine societal and technological components in a cooperation between industry, citizens, government, and academics. Some particularly define ULLs as "spatially embedded sites for co-creation of knowledge and solutions by conducting local experiments" (Mahmoud and Morello, 2021). These local experiments with citizens will lead to their participation in a higher level, beyond simple surveying and filling questionnaires and engaging them in the entire cycle of participatory processes. However, embedding co-creation into decision-making routines remains a challenge that necessitates overcoming practical obstacles such as breaking decision-making silos and managing the costs of continuous day-to-day activity of back-and-forth dialogue between owners, authorities, and stakeholders, which is time, effort, and money intensive (Mahmoud and Morello, 2021). In fact, although in co-design end-users are in a relative strong position, it's not common practice yet to have all stakeholders equally represented in the design process. The move from user-centred to co-design is the change in roles and activities of the researcher, designer and user: the roles of researcher and designer are merged and the passive role of the end-user became an active role of the user as expert of his experiences (Van Waart et al., 2015). The gap between trained and professional designers and planners on the one hand and the general public with no expertise on the other is bridged by Co-design processes. Some have defined codesign as the combination of creativity of trained designers and people not trained in design in the design development process (Van Waart et al., 2015).

All the above-mentioned discussion had one aim: to identify the role of data in citizen empowerment, and as a result, the full participation of citizens in Co-problem discovery, Co-problem definition, Co-Design and creation, and Co-Delivery of solutions. However, as argued, there is a very poor relationship between citizens and data, and one way to enhance this relationship is through data collection by citizens. Literature suggests various ways in which different projects engage citizens in data

collection and use. The following chapter focuses on participation and different methods of participatory data collection.

5. Citizen participation

Before discussing different ways in which citizens can participate in the 4Co-Ds as argued, it is important to understand why it is important that citizens participate in the first place. Citizen engagement has evolved as an essential way to increase responsiveness, transparency, and accountability in public policy decision-making over the previous two decades. It is believed that citizens' participation in decision-making at all levels gives critical feedback to administrative institutions, and hence is a significant instrument for improving government performance and citizen satisfaction. Therefore, participation can lead to higher quality of life for the citizens as well as better governance as a result of the feedback from the citizens. In fact, it is argued that participation of citizens in government administration and policy serves to elicit preferences for public services and improve government performance (He and Ma, 2020).

This is especially important in the case of smart cities. As smart cities should aim at enhancing quality of life and fulfilling citizens' needs through smart initiatives, both governance and citizens benefit from full participation. Some even argue that full participation can lead to smartness of cities, even without the use of tech-solutions. Without necessarily implementing smart initiatives, as argued, smart cities should build increasingly strict and shared relationships with residents, involving them in the choices and decision-making processes of urban policy (Romanelli et al., 2019). The most important benefit, overall, is that only through full citizen participation can governments understand what citizens' real needs are. The truth is local governments are concerned about how to involve and integrate residents in the smart city development process since without them, governments and industrial technology providers will struggle to grasp what kind of future city is envisioned (Van Waart et al., 2015).

Now that the benefits of full citizen participation in the entire decision-making process is clarified, it is important to analyze different methods in which this level of participation can be obtained. Many researchers and scholars have focused on the issue of participation, the areas in which citizen participation can be most beneficial and the ways in which this participation can occur. Castelnovo (2016) maintains that

the most obvious sense in which citizens can be said to participate to the public life is by taking part in consultation exercises supporting the city government in the decision-making and planning processes (Castelnovo, 2016). It is not just through consultation exercises that citizens can engage in decision-making. Citizens can also participate in the implementation of public programs and services as co-implementers who make significant resource commitments, as true co-production relationships normally demand. But what resources can citizens provide and what is the added value of their resource commitments? As argued, citizens, as co-implementers, contribute time, skills, and effort, as well as compliance and information, to service development and delivery. In the context of smart cities, information is the most important resource citizens may give to value co-production (Castelnovo, 2016).

When we speak of participation, it is not only about asking citizens what they like or filling questionnaires to find out their needs. If that was the case then all the smart city initiatives are perfectly citizen oriented, while this is not true as we saw in the criticisms smart city received. It is crucial to highlight in which area participation takes place, to what extent citizens are empowered to influence decision making, and do citizens have sufficient competence to negotiate with public policy makers and stakeholders? To do so, many scholars have made an effort to create models of participation, among whom we can name Arnstein (1969) as well as Rowe and Frewer (2005).

5.1 Citizen participation models

Arnstein (1969) introduced a ladder model that conceptualized participatory mechanisms into information, communication, consultation, deliberation, and actual decision-making. Rowe and Frewer (2005) similarly distinguished citizen participation into communication (one-way transfer of information from the government to the public), consultation (two-way flow of information between the government and the public), and participation (some degree of dialogue between the government and the public) (He and Ma, 2020). In this research, we are going to focus more on the idea and model of participation put forward by Arnstein, and there are several reasons for that. For starters, it is one of the most widely mentioned academic and grey literature works on citizen engagement. Second, and perhaps more importantly, Arnstein's classification regards participation as meaningful only to the degree that it includes a

redistribution of power; otherwise, participation is "an empty and frustrating activity for the powerless," according to Arnstein (Castelnovo, 2016).

But what is the idea behind Arnstein's ladder of participation? Well, to reflect the model cities' community experiences in connection to how local governments treated public engagement, Arnstein designed an eight-rung ladder. The ladder, she claims, depicts the disparity between powerful and powerless citizens, as well as the gaps that exist between them. The lowest rungs (non-participation and tokenism) reflect little to no citizen power in the citizen participation process, whereas the upper rungs (degrees of citizen power) represent greater citizen power. She claims that by redistributing power, community organizations will be better equipped to achieve their goals (Lauria and Slotterback, 2020). Figure 4 Shows the ladder of participation presented by Arnstein (1969).

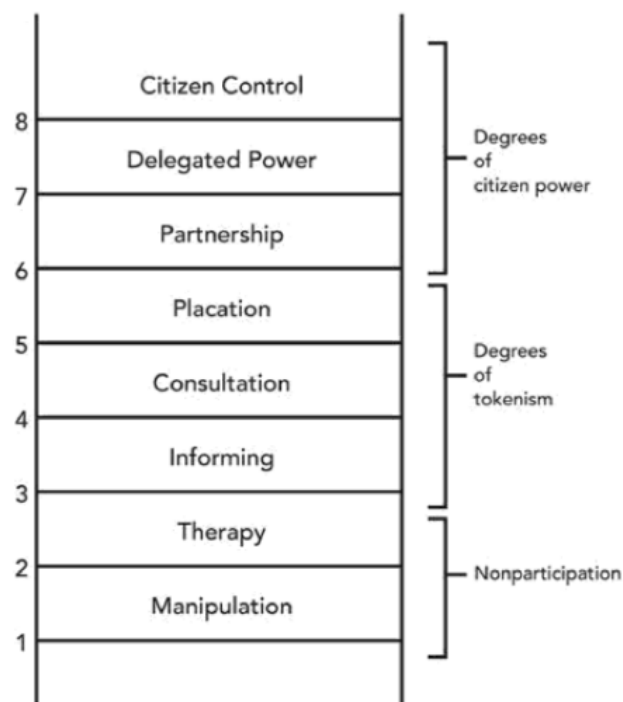


Figure 4: Arnstein's ladder of citizen participation (Lauria and Slotterback, 2020)

As can be seen, the first step towards participation and citizen engagement is the manipulation of citizens by the project leader. More often than not, the leader of smart projects are technological companies who try to run sale campaigns by promoting smart city solutions and their proposals are often embraced by city officials as it would bring them the fancy "smart" adjective. Of course, the European union funds are also to blame, as they are incentivizing the pursuit of smartness by means of fund provision,

while not making it mandatory to pursue the smart city as a citizen centered and citizen led process. Municipalities with limited budget want to use these opportunities and therefore, provide project proposals which although have been well developed and no one is denying that, pay little to no attention to citizens. In this case, citizens are only names mentioned on documents just to say that they too are considered, and as if someone had noticed it is missing from the documents, and so why not mention them. However, what Arnstein argues is that Manipulation of citizens is not even participation. That is why she considers this stage as “non-participation”. As citizens are given a more active role to play (or as Arnstein puts it, are given more power) they reach higher levels of participation and get closer to the real concept of citizen participation. The informing stage is another very common mainstream in smart city approaches, where citizens are only informed of the decision being made by officials. They have no power to influence the decisions. The most common, however, is the consultation stage where citizens take part in the discussions surrounding the smart city projects, yet for them to be able to fully participate, they have to be given more power to be able to not only affect decision making, but also take part in the 4Co-Ds as discussed. Ultimately, Arnstein maintains that if citizens are given all the power, the highest level of participation will take place, what she calls Citizen Control. It is important to mention that her model was not deemed perfect and in fact received many criticisms. A widely recognized problem with Arnstein’s model is her framing of citizen participation as a struggle for power between government officials and community activists (Lauria and Slotterback, 2020). However, the most obvious message it tries to convey is that participation is meaningless if citizens are not empowered. The question here is how can citizens be empowered? Can data, their collection and use for problems identification and offering solutions be a way of empowering citizens? There are in fact a number of attempts to make this happen. Citizens are becoming more engaged and empowered by taking part in data formation initiatives.

5.2 Participation in data formation

As discussed, citizens have a poor relationship with data, seeing them as abstract and useless. As data plays a key role in smart cities, it is of wide significance to engage citizen in data collection and to enhance their understanding of data. Certain initiatives have been proposed to engage citizens in data collection, namely citizen science, crowdsourcing, citizen sourcing and crowdsensing.

5.2.1 Citizen science

As mentioned earlier, The ordinary citizen, in particular, has a poor relationship with data, viewing it as abstract, unclear of its neutrality in terms of personal liberty, and pessimistic about its ability to become a daily resource accessible via user-friendly channels (Gleeson and Dyer, 2017). Citizen science is a field developed to make citizens more active in collecting data and understanding it. The UK Environmental Observation Framework defines citizen science as “volunteer collection of biodiversity and environmental data which contributes to expanding our knowledge of the natural environment, including biological monitoring and the collection or interpretation of environmental observations” (Craglia and Granell, 2014). Citizen Science is the general public's participation in scientific research activities, in which citizens actively contribute to science by their intellectual effort, surrounding information, or tools and resources. Participants offer researchers with experimental data and resources, propose new ideas, and help to shape a new scientific culture. Volunteers gain new knowledge and abilities, as well as a deeper understanding of the scientific activity, while offering value. Science-society-policy interactions are improved as a result of this open, networked, and trans-disciplinary scenario, leading to more democratic research based on evidence-informed decision making. Citizen Science has a variety of definitions, some of which focus on more traditional features, such as understanding Citizen Science as a method of involving volunteers from the general public in scientific projects during data collecting and analysis. Others define it more generally as the general public participating in scientific research, which encompasses scientific activities such as questioning, hypotheses creation, and findings interpretation. The current debate over the concept of citizen science focuses not only on the scope of activities, but also on what constitutes "volunteers" and how to put together citizen science teams (Consortium, 2013). Some scholars have categorized citizen science projects into three main types: contributory projects (mostly data collection); collaborative projects (data collection and refining project design, analysing data, disseminating results); and co-created projects (designed together by scientists and public where the public shares most or all of the steps in a scientific project/process). For example, Roy et al. (2012) recommended expanding the 2011 definition of citizen science beyond the contributory model to move towards collaborative and co-created models which would engage volunteers in scientific thinking and in all the steps of the

scientific projects (Craglia and Granell, 2014). Although one can infer from these definitions that citizen science is about data collection, it in fact is not. Citizen science projects are more than collecting data: they are about raising awareness, building capacity, and strengthening communities. Unfortunately, to date there seems to be little synergy between citizen science and smart cities initiatives, and there is little interoperability and reusability of the data, apps, and services developed in each project (Craglia and Granell, 2014).

As discussed earlier, bottom-up initiatives in smart city are very crucial (not to rule out top-down approaches). A bottom-up process will only exist if community members are motivated enough to self-organize and engage with the planning and design process. Community engagement can be strengthened through citizen science or local mapping exercises, supporting greater agency and control for local community members. Data collection and idea sharing processes, such as Citizen Science projects have been considered beneficial for participatory Governance. In fact, they can broaden appreciation of sustainability challenges in the Urban context and encourage innovative forms of collaboration (Grey et al., 2017). Thus, recognizing such processes is very helpful. Another very common data collection process is called Crowdsourcing.

5.2.2 Crowdsourcing

Another participatory process through which citizens are delegated power to is crowdsourcing. This process is of particular importance to smart cities. In fact, it is argued that crowdsourcing can turn smart city movements from being citizen-centered to being citizen-driven (Certomà and Rizzi, 2017). The difference between a citizen-centered approach and a citizen-led approach is another very interesting topic. A citizen-centered approach is a one in which citizens are considered as the ultimate goal of a project, and their well-being and quality of life is what should be achieved as the project outcome. However, a citizen-led approach is a one in which citizens are taking part in the design and implementation of solutions, and they take the lead. This in fact demonstrates a higher rung in the Arnstein's ladder of citizen participation, meaning that citizens are given more power and not only are the center of the project, but also have a leading role and engage in co-design and co-delivery of the solutions. However, to better understand what crowdsourcing really involves, one has to look at

the definitions in the literature. It is defined as an act of outsourcing a task to a target population of potential contributors in the search of solution to complex problems. It is thus a valid option when the search is intrinsically constrained by the inadequateness of a single locus of knowledge. A variety of processes can be classified as crowdsourcing processes as long as they rely on citizens' technological agency and are carried out using personal ICTs for collective peer-production, recording, measuring, and reporting environmental problems, sharing opinion, ideas, and experiences, elaborating data, and creating open innovation (Certomà and Rizzi, 2017).

Similar to Citizen Science, Crowdsourcing is a bottom-up initiative, and in contrast to top-down techniques, it involves citizens from the definition of the aim to the verification of the results (Certomà and Rizzi, 2017). The fact that citizens become involved in data collection and the identification of problems (the so-called Co-problem identification) has proven extremely beneficial. Research suggests that problems that arise from citizens through crowdsourcing is often different from those decided by public administration in a top-down manner (Certomà and Rizzi, 2017). Therefore, on the one hand it shows that giving a more active role to citizens is necessary and should be considered as an inseparable part of any smart city approach, and on the other hand it shows the weakness of decisions taken for citizens, and not with them. Often the knowledge required for problem identification is tacit, meaning that it is hard to be obtained due to the fact that it is not codified. Tacit knowledge is rooted in context, experience, practices and values and is hard to communicate and obtain (Oragui, 2020). This type of knowledge is also referred to as "local knowledge" by Jacobs (1961) which she defines as ordinary people's perceptions of their immediate surroundings. She also pointed out that no single expertise can replace the distributed contextual knowledge required for the smooth operation of complex metropolitan systems (Moroni, 2016). It is argued that crowdsourcing is a preferred tool when the search for solution rests on tacit knowledge (Certomà and Rizzi, 2017). After all, citizens are better aware of what they want, better than anyone else.

Another importance of such participatory processes is with regard to democracy. Increasing democracy is crucial, and as discussed earlier, the governance of a smart city should be within the realms of participatory democracy. Participatory processes such as citizen science or crowdsourcing help enhance this democracy. They are in

fact argued to be a way of internet-equipped direct democracy (Certomà and Rizzi, 2017).

Crowdsourcing has its own drawbacks as well. When the agent is a spontaneous group of citizens, it is more difficult to modularize the problems. However, during the modularization phase, this results in the formation of groups of people who have a common viewpoint and interest. The natural competition between these clusters can help to increase engagement (Certomà and Rizzi, 2017).

5.2.3 Citizen sourcing

Another term which can be seen in the literature with regard to participatory and idea sharing processes is citizen sourcing. It sounds like a combination of citizen science and crowdsourcing processes. Citizen sourcing is defined as the process of gathering citizens' knowledge, ideas, opinions and needs in order to address various types of societal problems that government agencies face. Through citizen sourcing, citizens are allowed to influence direction and outcomes, improve the government's situational awareness and even help execute government services on a day-to-day basis, which enables forms of citizens' participation that can go well beyond simple consultation (Castelnovo, 2016).

As can be seen, the definition of citizen sourcing has some elements of Citizen science (citizens take part in data collection) as well as crowdsourcing (the use of citizen knowledge, ideas and expertise to identify problems on the basis of citizen's local knowledge). In fact, citizen science has a more environmental side to it and is often used to tackle environmental issues. On the other hand, crowdsourcing focuses on outsourcing the tasks to use the knowledge of citizens. The term "citizen sourcing" can be seen as an effort to combine the crucial elements of the two former processes.

Castelnovo (2016) argues that If government agencies are not willing to actually consider and put into practice the results of a citizen sourcing exercise, it will seem like nothing more than rhetoric to citizen participants, which could undermine government-citizens relationships and may be counterproductive if citizens discover that their efforts and feedback has no impact or remain unaccounted (Castelnovo, 2016).

5.2.4 Crowdsensing

With the advances in technology, there are many new ways through which data can be collected. Among all the existing ways of gathering data, technology is the most efficient and can collect huge amounts of data within seconds. In fact, the emergence of big data and open data networks in smart cities was due to the use of technology. However, it is essential to bear in mind that gathering data alone cannot be of any use if the data is meaningless to citizens, and if it cannot be transformed into information.

Exploiting the potential of crowdsensing, i.e., using information produced by sensors carried or set up by citizens, is an alternative technique to collect data throughout huge cities. The citizens' massive use of consumer-centric mobile sensing and computing devices (such as smart phones and in-vehicle sensors) allows individuals to collectively share data and extract information to measure and map phenomena of common interest. Human intelligence and mobility can thus be used to assist apps in collecting higher-quality or semantically complex data that would otherwise necessitate expensive hardware and software. This gives rise to the (Mobile) Crowdsensing movement, which focuses on data collecting, processing, and interpretation and stresses users' and community groups' participation in social networks, documenting many aspects of their life (Castelnovo, 2016).

Crowdsensing use citizen-generated data as the basis of analyses and interpretations required to tackle urban issues. This bears a striking resemblance to the Crowdsourcing method, in which citizens generate the data. However, there is a slight, yet significant difference between asking citizens to help in data collection or using the data citizens collect while running their everyday errands. While crowdsourcing tries to use collective intelligence to solve complicated issues by breaking them down into smaller tasks that the community can do, crowdsensing delegates the work of gathering data to the crowd. As a result, citizens become sensors themselves, constantly collecting real-time data and providing the smart city with different types of information that can be used to better manage the city's systems, to implement user-centered services and to allow a better city experience for people (Castelnovo, 2016).

Considering the above-mentioned argument, we can consider Crowdsensing as an activity in which citizens play the role of sensors to generate real-time data. As the main goal of a smart city is (or let's say should be) the enhanced quality of life and

meeting citizens' needs, what better data can we have than those generated by them as they live their normal everyday life. In fact, some believe that by acting as sensors, citizens enter in a relationship with the smart city's professionalized service providers making a substantial resource contribution (information), which is the characteristic that defines co-production. Citizens as sensors/information providers can thus be considered as co-producers of the services they receive from the smart city (Castelnovo, 2016). On the other hand, some argue that this will again create the distinction of "Us" and "Them" in smart cities (Us being the professionals and stakeholders and Them being the citizens". Smart cities are often heavily criticized because citizens are being used as mere sensors to collect data (Marsal-Llacuna, 2016). Therefore, what matters the most is to always bear in mind that citizens are not the recipients of services, but are co-producers and active in every stage of the process in a 4P model of partnership, and empowered enough to influence decision making.

5.2.5 Concerns about data privacy

Another very important concern with Crowdsensing can be clearly seen in its definition. Crowdsensing uses data that is being generated by their use of mobile devices while they are running their daily errands. This means that citizens are being tracked, and their data are being used without them being aware of it. This raises concern about data privacy. Overall, there are two types of crowdsensing: Participatory sensing or Opportunistic sensing. The former uses data from a mobile sensor node gathered in collaboration with its owner/operator. Therefore, participatory sensing requires the active involvement of individuals to contribute data, for instance by taking pictures, reporting a road closure, sending information on traffic, etc. On the other hand, in the opportunistic sensing applications the data collection stage is fully automated with no user involvement, which lowers the burden placed on users but increases the risk that users are unaware of the information being collected. Because crowdsensing apps could potentially collect sensitive data about individuals, both participatory and opportunistic sensing create major privacy problems (Castelnovo, 2016). In fact, some maintain that this in fact an invasion of privacy to normal life of citizens, and raises concerns about the use of data for reasons other than the one for which it was initially collected. Castelnovo posits that Collecting information from unconscious citizens acting as sensors/information providers reduces citizens' participation to a form of

manipulation (Castelnovo, 2016). Looking again at the Arnstein's ladder of citizen participation, citizen manipulation is the first rung, which she calls the "nonparticipation". The irony here is that by making an attempt to empowering citizens in the process and by seeking a higher level of citizen participation, the suggested solution makes participation weaker than it actually might be. The Arnstein's ladder, in my opinion, provides a good yardstick based on which all citizen participation processes can be measured.

5.2.6 Redistribution of power in citizen participation

Overall, we can conclude that all efforts to gather ideas, information or to engage citizens in decision making processes are only truly participative if they push current participation levels towards the upper rungs of Arnstein's ladder of citizen participation. Even with regard to the role of citizens as data providers, without giving citizens control over the way their personal data are used, and will be used, asking them the permission to collect their data simply amounts to a form of placation, which is still something pertaining more to the rhetoric of participation than to true participation (Castelnovo, 2016). Therefore, true participation should not only see citizens as the central element and end-user, but to see them as an equally important stakeholder in the decision-making processes. The former will lead to a citizen-cantered approach, while the latter is a citizen-led approach, meaning that citizens lead the direction of smart projects and, where necessary, technology can come to aid. This clearly challenges the idea of smart cities as being cities that use technologies for the sake of using them. Technology has to be used only, and if only, it can serve citizens' well-being and can help fulfil their needs. Otherwise, it is just a heavy and inefficient investment and will soon be obsolete, as all technologies are. The only stakeholder who benefits from such initiatives are the tech-companies who increase their sales.

5.2.7 Scale of data collection

Another consideration which is essential to take account of is the scale in which data should be collected. Some argue that a local approach to data collection can help gather more meaningful data. When it comes to gathering data from stakeholders, it is argued that the city quarter or neighborhood scale is the most successful, as it represents a scale at which locals may contribute their local knowledge and skills. This is because the city's neighborhoods, quarters, and districts all have a distinct boundary

that both residents and visitors can recognize. According to Lynch, neighborhoods are structuring components that are found in most cities and act on people's perceptions of the city, making the urban environment more understandable and readable. Furthermore, because the majority of people engage with the urban environment on a daily basis at the neighborhood scale, this scale has a considerable impact on their quality of life. At a scale where participants have a personal relationship with and a stronger cognitive picture of the concerns and plans under discussion, collaborative and participative procedures are more possible (Grey et al., 2017).

While it is generally agreed that data should be collected at the local level, many people have pointed out that data at the community level is sometimes difficult to obtain. At this scale, there is frequently a scarcity of data. As a result, defining the spatial scale at which data is collected is a crucial topic that is frequently overlooked in research. Even though larger-scale planning is more successful or efficient, it is often preferable to collect data at the local level as a starting point. Data at the neighborhood size can also be used to urge authorities to act and identify solutions in the neighborhood. Overall, planning must be underpinned by solid data and local community is often the best database (Grey et al., 2017).

This chapter focused on how, through different initiatives, citizens can play an active role in data collection and generally, in the entire process. The aim is to engage citizens and reach higher levels of participation, especially with regard to urban data. The next chapter will focus on different ways in which citizens can take part in a smart city participatory process. In particular, ways in which citizens can work together with expert designers, engineers, politicians and other stakeholders to design and deliver services.

5.3 Citizens' collaboration with engineers: Collaborative Engineering

The previous chapters focused on how citizens can play an active role in data collection, database creation and understanding data. This chapter will focus on another aspect of citizen participation, that is co-design and co-creation of services. Smart city solutions deal with advanced technological engineering and designs that are often very costly. The design and implementation of these services require special expertise, and therefore is taken care of by expert engineers and designers. However, more often than not, the result of smart cities has been a number of sensors and IoTs

which have received little attention by the end-users (citizens) and this is a clear waste of financial resources. If citizens do not appreciate the tech solutions offered by smart city projects, then the whole concept will again be only a buzzword, as also discussed in the early chapters of this study.

To avoid this, engineering has shifted its scope towards the creation and design of products with better function, lower cost, higher quality, shorter lead-time, and increasing social responsibilities. To do so, production engineers with complementary expertise and resources must work with many stakeholders who have competing interests to reach technical agreements that can simultaneously satisfy multiple objectives. This new field in the engineering literature is referred to as “Collaborative engineering”, which is a human-centered discipline and aims at enabling engineers and engineering companies to work more effectively with all stakeholders in achieving rational agreements and performing collaborative actions across various cultural, disciplinary, geographic, and temporal boundaries (Lu et al., 2007).

The key focus of collaborative engineering is on building collaboration, that is the process of multiple people working together interdependently to achieve a greater goal than is possible for any individual to accomplish alone. However, despite its great importance, collaboration is often taken for granted, overlooked, misunderstood, and poorly accomplished in practice. Collaboration is necessary at every technical and organizational level. The needs for collaborative engineering can be best appreciated by examining the number of collaborative efforts required by large-scale development projects that involve many distributed stakeholders (Lu et al., 2007).

Smart city solutions, as discussed earlier, often deal with advanced technologies and require expertise, but at the same time, for a smart city project to be successful, people’s needs have to be taken into account. This means that by the principles of collaborative engineering, engineers and expert designers have to collaborate with citizens as well as other stakeholders to identify the needs and issues arising from the end-users and try to design and create a solution in response. This creation does not happen along, but all stakeholders, including citizens as the main users, are taking part in the creation and design processes of such services. This is why they are referred to as service co-creation and co-design. In fact, all participatory design-related processes in smart city initiatives can be subgroups of collaborative engineering, such

as service design, urban living labs, hackathons, design jams, etc. In order for the smart solutions to be citizen-centered and expert-led, participatory service design is crucial.

5.3.1 Participatory (service) design for smart city solutions

Two very common terms in smart city discourse are participatory design and service design. Originally, the term "participatory design" referred to workers' right to express themselves and have a say in the design of IT that would become a part of their workplace, rather than relying solely on management to make these decisions. It gradually moved beyond of the workplace, where the empowerment of citizens, patients, and vulnerable groups with regard to technology was considered important (Saad-Sulonen et al., 2020). By definition, participatory design involves the co-design of solutions with the end-user. Therefore, the end-user is no longer the recipient of the solution that is designed for them, but plays an active role in the design process alongside the expert designers. In this way, solutions are designed with and for users. Some believe that this in fact undermines the role of professional designers. In a system where the process of value production is primarily guided by users and their diffuse design capability, the acknowledgment of design as a diffuse capability discredits the role of (professional) designers. However, it should be borne in mind that expert designers' duty in this setting is no longer to generate value, but to enable users' and communities' capacities to define their own solutions (and even needs) and engage them in a participatory process of value co-creation (Saad-Sulonen et al., 2020).

The other frequently highlighted term in smart city discourse is service design. A simple definition of this is the design of services by expert designers. In fact, the focus on Service provision has opened the door for a new discipline, Service Design with the aim of placing the customer at the centre of the experienced service (Saad-Sulonen et al., 2020). Over the years, service design processes have been criticized of not delivering the solution that citizens (as the end-users) really need. Many of the services proposed and designed by the public officials have insufficiently met the real needs of citizens. Therefore, in an attempt to tackle this issue, using participatory design tools and techniques to design services have become increasingly prevalent. This means that the principles of participatory design have aided service design, which

means the end-users (in this case the citizens) also have a say in the design of services. This is referred to as participatory service design. As a matter of fact, in the context of cities the desire for more holistic solutions to urban problems, along with a reaction against a technically-driven approach to such challenges, has resulted in a call for greater citizen engagement with the goal of activating their individual and social potential. This strategy has been linked to social innovation initiatives in order to protect social contexts against technocratic and neoliberal policies that disaggregate and isolate them. Service Design has been investigating into participatory activities that incorporate societal concern and the sensitivity to democracy that is in the genetic code of Participatory Design (Saad-Sulonen et al., 2020). In this new participatory service design field, citizens as the end-users play a more active role in the design process, which is also recognised as Co-design of services.

Overall, there are two prevalent views with regard to the role of citizens in a smart city: as the recipient of services, or as co-producers of services. Citizens are expressly mentioned as direct or indirect beneficiaries of smart city projects in the most often accepted definitions of smart city. However, in addition to this perspective of citizens as passive users of the smart city's services, there is another viewpoint that advocates for citizens to have an active role in achieving the smart city's goals. Citizens, in this view, not only benefit from the services provided by the city, but actively participate in the creation of the smart city (in many forms and modalities). Regardless of how innovative a smart city initiative is, it will fail if citizens do not contribute, at the very least by adopting "smart behaviours" and "smart lifestyle." Collaboration between those who develop and supply services and those who utilize them (citizens) is a necessary prerequisite for smart city initiatives to succeed, and it is one of the fundamental characteristics of co-production of public services (Castelnovo, 2016).

We can better explain the benefit of participatory service design by going back to the Arnstein's ladder of citizens participation. As Arnstein posited, the higher the power citizens have in the decision-making process, the stronger participation we can observe. Participatory service design in fact gives citizens a voice in the design process, which means citizens now have the power to influence decisions about design of services. Therefore, they have become more empowered, and consequently, there is a higher level of participation. As Castelnovo (2016) maintains, when citizens are given back the power to decide whether and how to take part in the implementation

of public programs, they can act as (informed) co-producers in the implementation of smart city initiatives (Castelnuovo, 2016). For citizens to become more and more involved in 4Co-Ds, they need to be given more power to influence decisions, and more power means a higher rung in the participation ladder. However, it is not just about empowering citizens. In order to be able to talk and negotiate with public officials and experts, citizens need to have the competence to do so. The competence and empowerment can take place as a result of participatory governance of smart cities, as already previously discussed.

Another important reason why participation in service design is crucial is with regards to identifying and responding to citizen's needs and what they really want. Despite what decision-makers and service designers believe is in the best interests of citizens, there is a 9-to-1 mismatch between what designers believe customers want and what consumers actually want. As a result, citizens rarely employ innovative services, either because they are not what they require or because they do not believe they can provide value and improve their quality of life (Castelnuovo, 2016). Here is an important point that needs to be emphasized: The issue of trust. Citizens sometimes refrain from using services or even participating in service co-design because of lack of trust to public administration. This, however, will be discussed deeply in the next chapters.

Smart city services are often supply-driven, meaning that the focus is on supplying more and more smart services. This leads to technology becoming the end-point in urban smartness. Contrary to the dominant supply-driven approach, and to avoid some of the problems that affected the success of many e-government projects, smart city initiatives should assume a demand-side approach instead. Research shows that policies in successful smart cities are demand-driven rather than supply-driven, or well-balanced between the two approaches (Castelnuovo, 2016). By taking account of the demands raised by citizens, the to-be-designed services can be identified and developed in a participatory service design process. One big issue here is that sometimes public officials seek citizen participation in Co-designing services, but citizens are not willing to participate. Research suggests that there is a huge latent willingness of citizens to become more involved and to act as public services co-producers (Castelnuovo, 2016). This further highlights the issue of trust, as sometimes citizens don't believe that what they contribute as participants will be taken seriously, and not just for marketing purposes of projects trying to show that they have sought

participation. As this issue is quite relevant to the smart city paradigm, in the following chapter we will discuss trust in all its aspects.

6. About trust

What is the role of trust when discussing citizen engagement? Well, the best way to put it is by taking into account what Corbett and Le Dantec (2018) said about the relationship between trust and citizen participation:

“You can't engage people who don't believe in what you're saying” (Corbett and Le Dantec, 2018)

This is the clearest way to put it. If people do not believe in what public officials say or propose, then there is a lack of trust. This lack of trust is a major barrier to participation. As mentioned earlier, participation has costs (time, energy, etc.) that in order to take place, citizens should be willing to pay them. Citizens have no incentives to bear the costs of participation if they do not believe what public officials have to say (Fischer, 2012). Therefore, trust is a crucial element with regard to citizen engagement. It is especially more relevant when policy comes into play. Most decisions made during smart city projects have political nature, and many have argued that politics and trust don't go together. In fact, as Williams et al. (2009) put it, *“the mere fact that a social relationship has become political throws into question the very conditions for trust” (Williams et al., 2009)*. In a perfect world we can assume that full trust can be reached. However, in reality, no matter how hard one tries, there is always distrust. The main question is whether this distrust is good or bad by nature. Some scholars claim that citizen distrust acts as a healthy and necessary check on government power, while others say that trust is vital for participation (Corbett and Le Dantec, 2018). Thus, the fact that distrust exists ensures some level of control over the initiatives taken and decisions made. However, the extent to which distrust exists is the determining factor. Of course, with high levels of distrust, no participation can be expected, as people will not believe what they say will make any difference, or what the governmental bodies say are true. Therefore, there is no doubt that a high level of trust is essential.

Trust has a special position in smart city discourse. It is often considered as one of the most important factors contributing to the success of Smart Cities. The level of trust between actors has an impact on the interactions between them, which is the foundation for a Smart City's effective development. As a result, it is critical to understand the sources of trust and the extent to which they are present in the smart

city. The desire to participate in the Smart City's strategy development discourse and co-creation of development plans is largely determined by the willingness to trust municipal authorities (Trutnev and Vidiasova, 2019). Smart city projects and e-participation nowadays are high on the priority list for city planners and technological firms putting the New Urban Agenda into action. However, a virtuous loop of involvement and trust is required to gain the benefits of smart cities. While smart cities provide citizens with smart and innovative services, they come at a price. Large amounts of citizen data must be saved, processed, and evaluated in order to achieve “smartness”. The Internet of Things and large data introduce vulnerabilities into smart city services, necessitating a high level of citizen trust. Technology can appear forced rather than inclusive if citizens do not feel included in these changes (Åström, 2020).

Many aspects of trust have been acknowledged in urban planning literature. Overall, the bureaucratic nature of modern planning, its inability to understand and work for individuals, and its bias towards economic interests have all been mentioned as reasons for distrust (Åström, 2020). There are many interpretations of trust in planning literature. One interpretation posits that trust in the authorities is the need of users to trust the ability of the authorities to manage the new service delivery system. Another defines this trust in the authorities as confidence in the technical reliability of the relevant infrastructure and its services. Overall, studies have shown a direct correlation between the level of trust in government and the willingness to use its electronic services. In particular, research shows that the higher the level of trust in the ability of authorities to provide services in an electronic form and the less the worry in the technical reliability of the electronic services system, the stronger the respondents express their intention to use such services (Trutnev and Vidiasova, 2019).

Trust can be seen from two different perspectives: Citizens' trust in government, and governments' trust in citizens.

6.1 Citizen's trust toward the government

The first and mostly highlighted aspect of trust in relationships have been from the viewpoint of citizens and the extent to which they trust and believe what city officials say and do. As discussed in the early chapters of this study, human smart cities are those where governments engage citizens by being open to be engaged by citizens.

It involves the participation of people in Co-creation and Co-design initiatives and entails interaction, dialogues and collaboration, and citizens play an active and central role (Gleeson and Dyer, 2017, Schuler, 2016, de Oliveira, 2016). Therefore, we can say that a determining factor in reaching human smart city is citizens' trust in government. Any citizen science or smart city project must focus on establishing and sustaining trust. It is necessary to work with the community rather than just for or on it. It is vital not just to take (data, information, and expertise), but also to offer something back to the community that is appreciated (Craglia and Granell, 2014). Government trust is required to enable the collective effort and cooperation required to meet modern society's increasing complexity and risk. Yet, it is distrust in those very institutions that limits and diminishes governance, and with it, citizen engagement opportunities (Corbett and Le Dantec, 2018). Taking a citizen-centric approach entails citizens actively participating in the building of a Smart City, which is only possible if all parties involved are trustworthy. However, because smart cities are typically discussed as projects involving technology providers, engineers, local governments, and universities, the ordinary citizen who votes for politicians, pays taxes, buys products, uses public services, and makes businesses run is unaware of the concept, let alone supportive of it (Trutnev and Vidiasova, 2019). Let's try to clarify this by an example. In a study on health policy reforms in Hong Kong, He and Ma (2020) found that citizens who believe that their opinions about health care reform are considered by the government are more satisfied with health system performance, which, in turn, leads to stronger trust in government. They conclude that engaging citizens in a collaborative manner in political systems troubled by a lack of trust in the state may help to alleviate tensions in policymaking. Plus, when citizens are participating in decision-making and have the power to affect public policy, they are more likely to trust the government, and that citizen participation leads to increased trust in government. Citizens are more likely to trust government when they have the possibilities to involve in and influence policy-making, because they would perceive government to be democratic, legitimate, accountable, and responsive (He and Ma, 2020). It is also argued that the provision of participatory mechanisms to citizens in policy-making enhances the openness, integrity and transparency of government organizations, hence representing an important strategy for improving public trust in state (He and Ma, 2020). Drawing from the literature, He and Ma (2020) categorise

the determinants of trust between government and citizens in 2 groups: Participation thesis and Performance thesis.

- **Participation thesis:** Citizens are more likely to trust government when they are involved in decision-making and are empowered to influence public policy. In this vein, as a key channel for the general public to be informed of (and to influence) the policy process, citizen participation leads to increased trust in government.
- **Performance thesis:** When an individual's experiences with the day-to-day provision of public services are largely positive, he or she tends to appreciate the competency of the government and thus place trust in it. In other words, citizens' level of satisfaction with specific public services, including health care, may increase or erode their trust in government (He and Ma, 2020).

Overall, the success and sustainability of Smart City projects depend on the level of citizen trust in such initiatives and the ability of city governments and partners to ensure transparency and deliver valuable benefits and higher quality of life (Trutnev and Vidiasova, 2019). We should also consider that trust is reciprocal, meaning that it should also be taken into account from the perspective of city officials and the government toward citizens.

6.2 Governments' trust toward citizens

When we discuss citizen engagement, it clearly has two parts to it: first, it is important that citizens are willing to participate and that they trust city officials. On the other hand, if city officials don't trust citizens and question their lack of expertise, citizen engagement will not happen. In fact, city managers often assume that they possess more professional expertise than people, and hence regard citizen engagement in decision-making to be costly and inefficient (He and Ma, 2020). Many scholars have noted the importance of discussing how planners and city officials trust citizens, considering that trust is reciprocal. While there has been a lot of research on citizens' trust in government, there has been very little research on public officials' trust in citizens. (Åström, 2020). This issue of trust from the perspective of government is directly linked to the dilemma of whether to seek citizen participation or not. Citizens are not qualified to participate directly in policy-making, according to arguments against citizen participation, because they lack dedication and expertise, or because

they are only concerned with their own short-term interests rather than the long-term interests of the community. As a result, planners who believe the public lacks the ability to comprehend their actions and present concerns are likely to be less eager to hear what the public has to say. Planners who believe that the public is more concerned with themselves than with their community are likely to be less inclined to expose themselves to the public (Åström, 2020).

The trust in citizens and citizen participation is also determined by institutional arrangements in the governance system. When there is less of a perceived divide between politics and administration, public managers have more trust in citizens. There is less trust in citizens when the perceived distance is greater. As a result, every initiative toward participatory planning must include institutional frameworks that address tensions and differences between managers and politicians in a productive manner (Åström, 2020).

So far, the dynamics of trust both from the citizens and governments' perspectives have been discussed. Greater trust in this relationship means higher levels of participation, and a more citizen-centred and citizen-led smart city approach. However, the question is how this trust in the relationship between citizens and public officials can be strengthened?

6.3 Reaching higher levels of trust

In an attempt to achieve a conceptual framework to describe the different kinds of work that go into building and maintaining trust between citizens and government, Corbett and Le Dantec (2018) propose 8 practices of trust work (the ways in which public officials establish and maintain trust) in 3 stages:

Stage 1: Initiating trust: At this stage, the trust process begins with techniques such as meeting people where they are, community education, goal-setting participation, and setting expectations.

- 1- Meeting people where they are:** This refers to how government officials enter citizens' physical and social lives in order to form relationships. To put it differently, it includes sitting down at their kitchen table and having a conversation with them. Officials remove barriers of power by moving into the environment of their constituents rather than staying in the offices or domains

of municipal institutions. This reduces the physical, social, and spatial distance between individuals and officials.

- 2- **Community education:** This refers to how government officials bridge in gaps in citizen knowledge that are critical to participation. This can be technical knowledge, such as planning or financial terminology, or procedural knowledge, such as assisting locals in knowing a department or civic process well enough to interact with it. This assists in bridging the information gap between citizens and government authorities.
- 3- **Participation in goal setting:** This refers to how government officials involve citizens in setting project, program, and service goals. This is the opposite of how most goals are defined before engaging with citizens. It helps in bridging the gap between people and officials in terms of authority. Goal-setting participation is achieved by having initial, early, exploratory talks in order to shape goals.
- 4- **Setting expectations:** This stage entails honesty and transparency of the government. Early on, citizens have to be informed of what is and is not possible and what are the limitations of the government.

Stage 2: Proving trustworthiness: this stage is composed of 3 practices, namely being present, managing expectations, and shared decision making.

- 5- **Being present:** This is about how government officials maintain a social and physical presence in their communities. Being present continues the relational effort begun previously in meeting people where they are, but this time the focus is on how social proximity develops through time, blurring the lines between "those in power" and "citizens." Regularly attending community activities, keeping ongoing dialogues, and being aware of what is essential outside of the necessities for participation are all methods for being present.
- 6- **Managing expectations:** The emphasis is on how expectations can persist in the face of challenges and setbacks in this later stage of trust building.
- 7- **Shared decision-making:** It continues to close the gap between citizens and public authorities in terms of power. As the trust process progresses, public authorities must defer and allow individuals to share decision-making authority in order to reduce distance in the form of power.

Stage 3- Retaining trust: It is important to note that once formed, we cannot expect trust to continue to exist without taking certain actions to maintain it. This stage is composed of one practice: Sustaining engagement

8- Sustaining engagement: It manages the erosion of trust from temporal distance by repetition and consistency of participation efforts. Public officials believe that it produces predictability and Predictability is significant for trust (Corbett and Le Dantec, 2018).

What Corbett and Le Dantec have tried to put forth follows a very clear logic, that is to eliminate or lower the distance in all its forms. Through 3 stages and 9 practices, they offer a solution to reduce the physical, social and political distance as well as the distance in information, knowledge and expectations. By reducing this distance, they argue, higher levels of trust can be achieved.

Similarly, Trutnev and Vidiasova (2019) have put forward a trust-building framework for smart cities. They maintain that such framework is multidimensional and includes six major components:

- 1- Clarifying Smart City commitment and strategy
- 2- Delivering high quality of communication regarding planned projects, benefits and risks
- 3- Ensuring civic engagement, participative democracy and co-creation
- 4- Demonstrating the capability to innovate and deliver Smart City services
- 5- Ensuring equitable solutions that offer value to all segments of society
- 6- Providing guides and user-friendly apps to facilitate the adoption of new services (Trutnev and Vidiasova, 2019)

By comparison, what Trutnev and Vidiasova suggested are more like general guidelines, while Corbett and Le Dantec have proposed a more detailed action plan. Both, however, are examples of efforts made to increase trust in the relationship between city officials and citizens and consequently, reach more levels of participation. Trust is definitely a very determining factor in the success of participatory processes. As highlighted by Corbett and Le Dantec, it is vital to eliminate or lower the distance in all its forms, whether power or physical distance, between citizens and public officials. There are certain initiatives that are prevalent and help reduce this distance. It is important to know the characteristics and aim of such participatory initiatives.

7. Common participatory initiatives

It is argued that in order to reap the benefits of both community-driven and technology driven innovations, there is a need for society to transform into a more participatory domain, where participation takes place. One big concern for local (and even central) governments is with regard to the methods of engaging and embedding citizens in the smart city development process, as without them it is not easy to identify what needs should be satisfied and what services the desired future city should provide (Van Waart et al., 2015). Co-designing methods, or what Van Waart et al. (2015) calls “participatory prototyping of the future city” are the ways in which participation can take place and the distance between public officials and citizens be reduced. Currently, there are some mainstream methods of participatory prototyping and co-design, namely urban living labs, generative sessions, hackathons and design jams.

7.1 Urban living labs

A very frequently mentioned initiative in smart city approaches toward participation is known as the urban living labs. Living Labs are open innovation environments in real-life settings, in which user-driven innovation is fully integrated within the co-creation process of new services, products and societal infrastructures in a regional harmonized context (the “Open Innovation Functional Region”) catalysing the synergy of SMEs Collaborative Networks and Virtual Professional Communities in a Public, Private, People Partnership (Santoro and Conte, 2009). Literature suggests 5 main characteristics of the living labs:

1. They are an open innovation environment, leading to a full sharing of the IPR (Intellectual Property Rights) of generated results;
2. Experimentation takes place in real-life settings, instead of the closed rooms of research laboratories;
3. The enhancement of innovation quality and value through adopting co-creation methods and tools that leverage the creative potential of individual participants in the trials;
4. The focus is on user engagement, not just involvement as ‘guinea pigs’, to define the strategic direction and the practical management of the experiments

5. The outcome of living labs are new products, services and societal infrastructures co-created with citizens (Molinari et al., 2020)

Urban Living Labs have the potential to release citizens' collective creativity and innovation capacity in order to create more valuable and inclusive solutions to urban problems while also engaging people constructively for the greater good. It is argued that the living lab strategy is a reliable companion to the Smart City concept, particularly in the small to medium sized communities. In fact, in a large number of recorded cases, Urban Living Labs as user-driven, open innovation governance platforms and ecosystems have demonstrated their potential for faster and more sustainable adoption of Smart City solutions. (Molinari et al., 2020).

The official document presented by the European Commission with the title of “Living labs for user-driven open innovation” recognises one main feature of living labs as ecosystems in which a business-citizen-government partnership takes place (European Commission, 2009). Similarly, Santoro and Conte (2009) have identified living labs as part of the public-private-people partnership (4P model). In fact, there is a common consensus that the common trait to all Living Labs is to embed a Public Private People Partnership (PPPP) that adds one more dimension the familiar Triple Helix scheme, coined years ago to describe the cooperation of Research, Government and Industry within a regional or local innovation system. By adding as fourth stakeholder a (formal or informal) representation of Civil society, Living Labs have moved into a Quadruple Helix scheme, as Figure 5 displays.

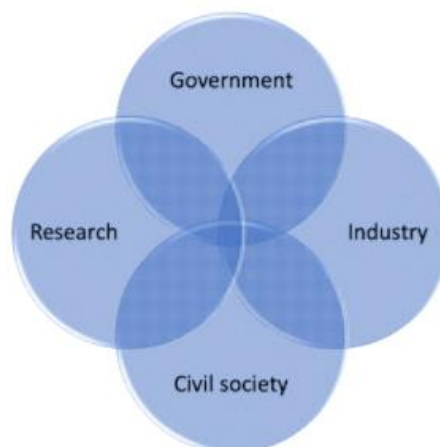


Figure 5: Living lab in the quadruple helix scheme (Molinari et al., 2020)

With regard to the benefits of the Living Lab approach, the European commission document on living labs highlights 4 main advantages for the stakeholders taking part in such a user-driven open innovation methodology:

- **Benefits for citizens:** To be able to have a say in the development of services and products that meet real-world demands, and to work together to reduce costs and improve processes by actively participating in the R&D and innovation lifecycle.
- **Benefits for small businesses:** generating, validating, and integrating new ideas, as well as rapidly expanding their local services and goods to other markets.
- **Benefits for larger firms:** making the innovation process more effective by partnering with other companies as well as end-users, which are rooted in active user experiences
- **Benefits for research actors, the economy and the society:** Stimulating 4P partnerships as flexible service and technology innovation ecosystems; integrating technological and social innovation in an innovative 'beta culture'; increasing returns on investments in ICT R&D and innovation (European-Commission, 2009)

Although the most prevalent settings in which distances are shortened and participation is engaged are urban living labs, there are other co-design and co-creation events through which citizens are engaged in various ways and with different aims. Examples are generative sessions, hackathons and design jams, among many others.

7.2 Generative sessions

Another group of actions aimed at increasing participation and reducing distance is called generative sessions. In the field of co-design, generative sessions are used in context mapping and service design projects. These are mentioned as a designer-led participatory method. Actors are often designers and end-users. The characteristics of context mapping are the sensitizing of participants, the in-depth understanding of motivations in the context of use of people and the making to get in conversation. In generative sessions however, the products made by participants are often not

'possible products' but often visualisations as inspiration for designers to inform their design process (Van Waart et al., 2015).

7.3 Hackathons

Hackathons are a form of co-design in which non-experts collaborate with business owners to produce a product. Hackathons, which originated in the realm of software development, are events where participants produce workable technical prototypes using software and data in a short amount of time (one or several days). As a result, hackathons are technology-driven, with business case owners seeking business solutions or possibilities as well as software developers as participants. Owners of business cases profit from software developers' intellectual resources and recompense them with prizes. This is an example of crowdsourcing in action (Van Waart et al., 2015).

7.4 Design jams

Another type of activities to increase citizen participation are design jams. A service design jam brings together different participants as innovation community in a two- or three-day events for prototyping service innovations. Getting in touch with people (target group) in the real world is often part of the 3-day programme (Van Waart et al., 2015). In fact, design jams help reduce the distance between expert designers and the general public. There are various definitions and examples of design jams. Yet, it is often defined as a collaborative brainstorming activity or event, geared towards generating solutions in a fun and creative environment. Jams can be self- or group-initiated, or planned in advance and facilitated. The format of a jam is flexible to the problem that is being addressed. The Vancouver Design Nerds outline the purpose of a design jam as follows:

1. Collaborative Rapid Idea Generation
2. Participant Empowerment

A Design Jam is an idea factory. It's a fun, fast, creative brainstorming session intended to create a range of diverse visions that address an issue. In the design, architecture and urban planning fields, Jams are employed as one of the many stages of a larger planning, strategy and design process undertaken by the lead design organization and stakeholders involved in a project. By changing the way we think and

interact, we change the way we behave and respond to complex problems, therefore creating the social, urban and environmental transformation we seek (Gakhal, 2020).

7.5 Concluding thoughts on co-creation and co-design methods

At this stage of the research, it must be clear that not all efforts to engage citizens will actually lead to higher citizen engagement, as can be seen in the rungs of Arnstein's ladder of citizen participation. Certain efforts are only on paper, others are engaging citizens to a very low extent, still other may inform citizens yet not engage them. In co-creation and co-design, end-users are often represented but the designer is in lead of the design process (citizens-centred and not citizen-led). In hackathons, for example, software developers (coders and designers) are in the lead of sessions but the relevant company is leading in organising and scoping the goal of the hackathon, and end-users are absent (or maybe just included as observers). Design Jams are often organised by enthusiastic design professionals that invite companies to provide practical case to work on, and end-users are sometimes passively involved as target group. It is also noticeable that in generative sessions, hackathons and design jams there are differences in representation of quadruple stakeholders as active participants (Van Waart et al., 2015).

The lesson to learn from all these initiatives is that in order for them to fully take account of citizens in co-creation and co-design processes, citizens should be seen as an equally important stakeholder in a 4P partnership where businesses, government bodies, universities and knowledge institutes as well as citizens actually collaborate together to reach a common goal. Only through such effort can trust be earned, power redistributed, and efforts optimised. An enabling role of the government, together with active role of citizens under suitable co-creation and co-design settings are the essential ingredients of the human smart city (de Oliveira, 2016, Gleeson and Dyer, 2017, Schuler, 2016).

In the light of the above-mentioned arguments, the importance of monitoring to ensure the effectiveness of smart city initiatives with regard to citizen engagement is obvious. To be able to monitor and assess the effectiveness and efficiency of smart city initiatives, it is essential to propose certain Key Performance Indicators (KPIs) based on which various initiatives can be assessed and compared. The next chapter will discuss the two most common KPIs for smart cities in the literature.

8. Key Performance Indicators for smart cities

According to Sharifi (2019), As the number of smart city projects grows, so does the development and deployment of tools and indicator set for evaluating their success. Assessments of the smart city initiatives can on the one hand evaluate the effectiveness and efficiency of the initiative, and on the other hand can provide a wide range of benefits to various stakeholders. Sharifi (2019) has counted 19 benefits of monitoring for 4 main stakeholders of a quadruple helix model of partnership (Sharifi, 2019). The most important ones for this research are those with regard to citizens. In fact, the ways in which citizens benefit from smart city monitoring are the following:

- Enhanced awareness about the benefits of smart city projects
- Ability to make informed decisions when it comes to future investments
- Motivation to engage in smart city development activities and to communicate their desires and priorities to city authorities (Sharifi, 2019)

The first benefit is with regards to informing citizens of the benefits of the project, and the third one opens the way for participation. The second one, however, has a more individually oriented tone, meaning that it does not affect the community on the whole. The benefits of monitoring are manifold, and there have been many attempts to provide key performance indicators to assess smart city initiatives. Due to the multitude of attempts, there is no clear framework for analyzing the true level and content of what we call "smartness" when it comes to cities, or whether ICTs are genuinely helping to improve people' living standards in urban settings, especially from a research and policy viewpoint (Castelnovo et al., 2016). Sharifi (2019) alone has evaluated 34 Smart City Assessment tools, many of which are so complicated and formula-oriented that deal with smart cities in a mathematical way. A case in point is the assessment framework proposed by Picioroaga et al. (2018) in which their goal is to provide a comprehensive evaluation model for the system of indicators, focusing on energy and environment concerns (Picioroagă et al., 2018). Although evaluating the effectiveness of smart cities with respect to certain outcomes require a mathematical approach (for instance the amount of energy use reduction, or noise reduction, etc.), assessing the extent to which citizens have been engaged and put not just at the center, but act as the leaders require a different kind of assessment, and is often very

problematic to assess. In addition, assessing the effects of each action in its own category makes it very difficult to recognize effects that are only detectable at a whole-system level (Castelnuovo et al., 2016). The difficulties of assessing smart city initiatives also justify why there are plenty of assessment methods, each trying to cover the weaknesses of others. In this research, two very different KPIs are discussed to see how they attempt at assessing smart cities, in particular with regard to citizens. These two KPIs are “CITYKeys” key performance indicators for city and project-level analysis, and “CitiVoice” framework to assess citizen participation in smart city initiatives.

8.1 CITYKeys key performance indicators for city and project-level analysis

The CITYkeys project was funded as a 'horizontal activity' of the Smart Cities and Communities call to develop an indicator framework for smart city project evaluation and thus also support the so-called Lighthouse projects also funded under the same call theme. The ultimate goal of CITYkeys is to support the speeding up of wide-scale deployment of smart city solutions and services in order to create impact on major societal challenges around the continuous growth and densification of cities and the Union's 20/20/20 energy and climate targets. Therefore, CITYkeys aims to facilitate and enable stakeholders in projects or cities to learn from each other, create trust in solutions, and monitor progress, by means of a common integrated performance measurement framework (Bosch et al., 2017).

As mentioned earlier, there is a wide range of Smart City Assessment (SCA) frameworks each of which presents a different set of criteria for assessment and monitoring. There are two reasons why CITYKeys is chosen as the case here: Firstly, as Sharifi (2019) found in his research, CITYKeys was one of the frameworks with the highest percentage of inclusion of relevant indicators (Sharifi, 2019). Secondly, as the majority of indicators in the CITYKeys frameworks are derived from existing indicator frameworks (selection based on 43 existing frameworks), it also acts as a representative of most existing SCA frameworks. Therefore, by analysing CITYKeys, we are also indirectly having a look at 43 other frameworks of smart city assessment and monitoring.

The CITYKeys assessment framework includes indicators for assessing smart city projects which serve to assess or evaluate single projects. They indicate the difference the project has made, by comparing the situation without the project with the situation after the implementation of the project. These indicators focus on monitoring the evolution of a city towards an even smarter city. By taking into account the wishes of cities and citizens with regard to smart city projects and indicators, the indicators are arranged in an extended triple bottom line sustainability framework, including the themes people, planet, prosperity, governance and propagation. Under the main themes subthemes conforming with major policy ambitions have been identified. Under these subthemes in total 99 project indicators and 76 city indicators have been selected.(Bosch et al., 2017)

The CITYkeys assessment method and the indicators are to be used to evaluate the success of smart city projects and the possibility to replicate the (successful) projects in other contexts. As main themes, pillars of sustainability known as 3Ps are taken into account, namely social sustainability (**People**), environmental sustainability (**Planet**) and economic sustainability (**Prosperity**). The extent to which smart city projects are able to have an effect on social, environmental and economic indicators forms the core of the evaluation. However, this is not enough to determine the success of a smart city project. Success is also determined by How projects have been - or will be - realised in various contexts. The **Governance** of developing and implementing urban smart city projects is a determining factor for high scores in People, Planet and Prosperity indicators. Finally, the ability of individual smart city projects to be replicated in other cities and contexts determines its ultimate effect in achieving European goals with regard to energy and CO2 emissions. Under the **Propagation** category, smart city projects are evaluated to determine their potential for up-scaling and the possibilities for application in other contexts. Overall, there are 5 main themes of indicators followed by relevant subthemes, as presented in Figure 6 (Bosch et al., 2017).

People	Planet	Prosperity	Governance	Propagation
<ul style="list-style-type: none"> • Health • Safety • Access to (other) services • Education • Diversity & social cohesion • Quality of housing and the built environment 	<ul style="list-style-type: none"> • Energy & mitigation • Materials, water and land • Climate resilience • Pollution & waste • Ecosystem 	<ul style="list-style-type: none"> • Employment • Equity • Green economy • Economic performance • Innovation • Attractiveness & competitiveness 	<ul style="list-style-type: none"> • Organisation • Community involvement • Multi-level governance 	<ul style="list-style-type: none"> • Scalability • Replicability

Figure 6: CITYkeys indicator framework (Bosch et al., 2017)

As the focus of this research is on the “People” aspect of smart cities, we will take a closer look at this theme and its relevant subthemes. As defined by CITYkeys, The **People** side of sustainability refers to the long-term attractiveness of cities for a wide range of inhabitants and users. Aspects include quality of living for everyone, especially for the most vulnerable citizens, education, health care, social inclusion, etc. The 6 subthemes are defined as follows:

1. **Health:** improving the quality and accessibility of the public health system for everyone and encouraging a healthy lifestyle
2. **Safety:** lowering the rate of crime and accidents
Access to (other) services: providing better access for everyone to transport, amenities and affordable services in physical and virtual space
3. **Access to (other) services:** providing better access for everyone to transport, amenities and affordable services in physical and virtual space
4. **Education:** improving accessibility and quality of education for everyone
5. **Diversity and social cohesion:** promoting diversity, community engagement and social cohesion to increase the sense of community.
6. **Quality of housing and the built environment:** encourage mixed-income areas, ensure high quality and quantity of public spaces and recreational areas, and improve the affordability and accessibility to good housing for everyone.

Apart from this, evidence of citizen engagement and participation can be seen under theme “**Governance**”. It is defined as a contribution to a successful process of project implementation as well as to a city with an efficient administration and a well-

developed local democracy, thereby engaging citizens proactively in innovative ways. Subthemes are:

1. **Multilevel governance:** Increasing support for smart city initiatives by providing smart city policies and budget at different government levels.
2. **Organisation:** Facilitate the implementation of (integrated) smart city policies by improving the organisation of the project/city with regards to the composition, structure and quality of the project team/city administration; the quality of the implementation process; sound leadership by the project leader(s) and city politicians; transparency of the organisation.
3. **Community involvement:** increasing citizen participation and enhancing the active involvement of end-users, the community and professional stakeholders in city developments

Here, the third subtheme accounts directly for citizen participation. By going deeper to see how the CITYkeys framework assesses each indicator, two different sets are identifiable: city indicators and project indicators. Firstly, by starting from the project indicators, Table 1 shows the theme, subtheme, indicator and the explanation of the indicators.

Themes	Sub-themes	indicator	explanation
people	Health	Improved access to basic health care services	The extent to which the project has increased accessibility to basic health care
		Encouraging a healthy lifestyle	The extent to which the project encourages a healthy lifestyle
		Waiting time	Percentage reduction in waiting time due to project
	Safety	Reduction of traffic accidents	Percentage reduction of transportation fatalities due to the project
		Reduction in crime rate	Percentage reduction in number of violence, annoyances and crimes due to the project
		Improved cybersecurity	The extent to which the project ensures cybersecurity
		Improved data privacy	The extent to which data collected by the project is protected
	Access to (other) services	Access to public transport	The extent to which public transport stops are available within 500m
		Quality of public transport	The perception of users on the quality of the public transport service
		Improved access to vehicle sharing solutions	Improved accessibility to vehicle sharing solutions
		Extending the bike route network	Percentage increase of the length of cycling roads

		Access to public amenities	The extent to which public amenities are available within 500m	
		Access to commercial amenities	The extent to which commercial amenities are available within 500m	
		Increase in online government services	The extent to which access to online services provided by the city was improved by the project	
		Improved flexibility in delivery services	The extent to which flexibility in delivery services was improved by the project	
	Education	Improved access to educational resources	The extent to which the project improves accessibility to educational resources	
		Increased environmental awareness	The extent to which the project has used opportunities for increasing environmental awareness and educating about sustainability and the environment	
		Improved digital literacy	The extent to which the project has attempted to increase digital literacy	
	Diversity and social cohesion	People reached	Percentage of people in the target group that have been reached and/or are activated by the project	
		Increased consciousness of citizenship	The extent to which the project has contributed in increasing consciousness of citizenship	
		Increased participation of vulnerable groups	The extent to which project has led to an increased participation of groups that are not well represented in the society	
	Quality of housing and the built environment	Diversity of housing	Percentage of social dwellings as share of total housing stock in the project area	
	Quality of housing and the built environment	Connection to the existing cultural heritage	The extent to which making a connection to the existing cultural heritage was considered in the design of the project	
		Design for a sense of place	The extent to which a 'sense of place' was included in the design of the project	
		Increased use of ground floors	Increase in ground floor space for commercial or public use due to the project as percentage of total ground floor surface	
		Increased access to urban public outdoor recreation space	Increase in public outdoor recreation space (m2) within 500m	
		Increased access to green space	Increase in green space (m2) within 500m	
	Governance	Community involvement	Professional stakeholder involvement	The extent to which professional stakeholders outside the project team have been involved in planning and execution
			Bottom-up or top-down initiative	Has the project idea originated from the local community?

		Local community involvement in planning phase	The extent to which residents/users have been involved in the planning process
		Local community involvement in implementation phase	The extent to which residents/users have been involved in the implementation process
		Participatory governance	Share of population participating in online platforms

Table 1: List of project indicators with regard to “People” theme (Bosch et al., 2017)

As can be seen in Table 1 various aspects of citizen participation and well-being have been addressed. With regard to “Education” subtheme, the indicators take into account the extent to which the project enhances digital literacy of citizens, which is a critical basis for citizen participation. As discussed earlier, citizens need to be given the sufficient competence to have the ability to participate and negotiate with other stakeholders to affect decision-making. However, the competence is not only with regard to digital literacy. An essential part of the competence is citizens’ ability and knowledge to participate in policy-related decision-making, which hasn’t been addressed (Fischer, 2012). Under subtheme “Diversity and social cohesion”, percentage of people reached would present an insight into the extent of participation, yet to what level does this participation take place, considering the Arnstein’s ladder? Is it only citizen informing, manipulation, consultation or a full citizen-led participation? The indicator is quantitative, yet there is a need for a more qualitative indicator as well. Increased consciousness of citizenship is a key indicator, as a sense of citizenship will trigger true participation (Gleeson and Dyer, 2017). Increased participation of vulnerable groups is again an important indicator which ensures the that all groups are being represented, yet again this is also quantitative. Under “Governance” subtheme, some key elements of citizen participation have been indicated, including the involvement of ideas and actions from local community, both in the planning phase and implementation phase. In fact, co-creation and co-design as well as co-implementation have been considered.

Overall, out of 99 project indicators, 10 directly responds to the requirements of a human smart city. This narrow share of 10% shows the little attention towards monitoring this important aspect of smart cities. But before jumping to conclusions, it

is also important to take a look at the indicators at city level. Table 2 presents city level indicators for the assessment of smart cities under CITYkeys framework.

Themes	Sub-themes	indicator	explanation	
People	Health	Access to basic health care services	Share of population with access to basic health care services within 500m	
		Encouraging a healthy lifestyle	The extent to which policy efforts are undertaken to encourage a healthy lifestyle	
	Safety	Traffic accidents	Number of transportations fatalities per 100.000 population	
		Crime rate	Number of violence, annoyances and crimes per 100.000 population	
		Cybersecurity	The level of cybersecurity of the cities' systems	
		Data privacy	The level of data protection by the city	
	Access to (other) services	Access to public transport	Share of population with access to a public transport stop within 500m	
		Access to vehicle sharing solutions for city travel	Number of vehicles available for sharing per 100.000 inhabitants	
		Length of bike route network	% of bicycle paths and lanes in relation to the length of streets (excluding motorways)	
		Access to public amenities	Share of population with access to at least one type of public amenity within 500m	
		Access to commercial amenities	Share of population with access to at least six types of commercial amenities providing goods for daily use within 500m	
		Access to high-speed internet	Fixed (wired)-broadband subscriptions per 100 inhabitants	
		Access to public free Wi-Fi	Public space Wi-Fi coverage	
		Flexibility in delivery services	The extent to which there is flexibility in delivery services	
	Education	Access to educational resources	The extent to which the city provides easy access (either physically or digitally) to a wide coverage of educational resources	
		Environmental education	The percentage of schools with environmental education programs	
		Digital literacy	Percentage of target group reached	
			Diversity of housing	Percentage of social dwellings as share of total

	Quality of housing and the built environment		housing stock in the project area
		Preservation of cultural heritage	The extent to which preservation of cultural heritage of the city is considered in urban planning
		Ground floor usage	Percentage of ground floor surface of buildings that is used for commercial or public purposes as percentage of total ground floor surface
		Public outdoor recreation space	Square meters of public outdoor recreation space per capita
		Green space	Green area (hectares) per 100.000 population
Governance	Community involvement	Citizen participation	The number of projects in which citizens actively participated as a percentage of the total projects executed
		Open public participation	Number of public participation processes per 100.000 per year
		Voter participation	% of people that voted in the last municipal election as share of total population eligible to vote

Table 2: City indicators for the assessment of smart cities (Bosch et al., 2017)

At the city level, similar to the project level, in terms of education only digital literacy has been addressed and there is no evidence of increasing citizens competence in non-technology related matters. One important section of the project-level indicators was the “Diversity and social cohesion” which is missing from the city level indicators. However, in the governance section, participation is clearly outlined, yet again these indicators are purely quantitative. For instance, Citizen participation indicator shows the number of projects (and not people) which included a form of participation (and which form?). Open public participation is another numerical indicator, showing the number of public participations, yet not highlighting the form of participation which took place. Out of 76 city indicators, only 6 are directly in line with citizen engagement in smart cities.

Overall, about 10% of project indicators and around 8% of city indicators take account of citizen participation and engagement. This is clearly very low, and is also highlighted by Sharifi (2019). In fact, according to Sharifi, CITYkeys pays the most attention to the environmental sustainability factors and the least to social sustainability (Sharifi, 2019).

Low attention to people is not only limited to the CITYkeys framework. In fact, a comparison of 34 frameworks by Sharifi (2019) shows that people have received the least amount of attention compared to other elements such as economy, governance, environment, living, mobility and data (Sharifi, 2019). Table 3 Shows the statistical analysis of Sharifi on the subject.

	Mean (%)	Median (%)	Min (%)	Max (%)	Std (%)
Economy	18.2	16.7	0	38	9
People	6.44	6.56	0	17	4
Governance	13.2	12	2	33	8
Environment	18	20.3	0	33	11
Living	15.8	17.1	0	33	9
Mobility	21	20.5	7	43	8
Data	7.29	2.82	0	87	15

Table 3: Distribution of indicators related to each theme across the 34 frameworks (Sharifi, 2019)

This lack of focus on people in the assessment of smart cities have been addressed in the literature, and some have proposed methodologies of assessment which are solely focused on citizen engagement. For instance, Simonofski et al. (2019) have proposed a framework of assessment only with focus on citizen participation indicators called CitiVoice framework (Simonofski et al., 2019).

8.2 CitiVoice framework to assess citizen participation in smart cities

In an attempt to provide an evaluation framwrok to assess citizen participation in smart cities, Simonofski et al. (2019) developed and proposed a framework based on reviewing literature from different research areas as well as summarizing the relevant enablers of citizen participation. The main questions behind their effort were to identify various methods of citizen participation in a smart city as well as finding a way to evaluate the level of participation. They presented the final result as the CitiVoice framework. CitiVoice consists of three main categories of citizen participation, 8 subcategories and 18 criteria.

1- **Citizen as democratic participants:** the criteria in this category aim at verifying that citizens' opinions indeed have an impact on decision-making. It includes three main subsections:

1-1- **Citizens' selection:** it is necessary to make sure that the citizens involved in the process are adequately representative for the population

and are inclusive of various groups and minorities. To ensure this, three indicators are presented:

1-1-1- **Representativeness of participants:** checks the number of citizens involved and the description of their profiles in order to avoid overrepresentation of a certain class, gender, neighborhood, and so on. This representation could be obtained through basic statistics about the population to ensure the representativeness of each sub-group

1-1-2- **Offering of support for group process:** the participation process can be costly in terms of resources, money, and time, which can lead to an overrepresentation of a certain social group having the time and money to participate. This indicator focuses on reducing the time and money consuming nature of the decision-making process.

1-1-3- **Presence of competent facilitators:** this indicator checks that the participation activities are handled by competent and unbiased group facilitators who will ensure the objectivity and relevancy of debates. Since citizens may not be used to participate in this kind of meetings, these facilitators should also ensure each voice is heard

1-2- **Agreement on the goals of the smart city strategy:** as sometimes, participation can take the form of citizen manipulation, it is important that citizens also have a voice in determining the goals of smart city strategies. To ensure this, two indicators are presented:

1-2-1. **Evidence that citizens helped to define goals and objectives:** this criterion ensures that citizens engage in the goal setting of the strategy

1-2-2. **Citizen-oriented goals and objectives:** this indicator checks that the goals of the smart city are citizen-oriented and take the human capital of the city into account.

1-3- **Correlation between participation activities and achievement of goals:** this subcategory makes sure that activities lead to the determined goals, so as to avoid citizen manipulation. There are three indicators to ensure this:

- 1-3-1. **Formalization and transparency of the course of action:** this indicator checks if the course of action has been formalized and is transparent so that the decision-making process is clear to all actors involved.
 - 1-3-2. **Evidence of interaction between citizens and other actors:** this checks if the smart city actors decided to include citizens in the decision-making process of their strategy.
 - 1-3-3. **Evidence of the influence of citizen's input in priority setting of projects:** this indicator checks that the citizens were not only passive actors.
- 2- **Citizens as co-creators:** citizens can be co-creators in order to propose better solutions and ideas and to decrease the risk of failure early in the process. There are 3 subcategories:
- 2-1- **Direct interaction:** this subcategory focuses on various ways of getting citizens' inputs. It consists of 2 criteria:
 - 2-1-1. **Application of traditional techniques:** it checks if techniques such as conducting focus groups or interviews with experts and users, town hall meetings, testing usability, functionality, and accessibility, encouraging real-time comments and suggestions, and developing and adhering to measures and standards of service quality, are being used.
 - 2-1-2. **Application of citizen-centric requirement engineering method:** requirements engineering increasingly tries to reflect as accurately as possible the goals, needs and expectations of the users who are, in this case, the citizens.
 - 2-2- **Living lab:** through the living labs, the early engagement of citizens in the development process is checked. Thanks to these labs, the needs, expectations and ideas of citizens about the smart city projects can be explored. This subcategory is composed of 2 indicators:
 - 2-2-1. **Development of a Living lab strategy:** checks whether the living lab strategy aims at putting the citizen at the center of its implementation.
 - 2-2-2. **Organization of citizen-oriented activities:** as the description of strategy and planning is not enough, this criterion verifies that the living lab was built to enhance citizen participation in the smart city.

2-3- **Online platforms:** when there is the limitation of time and space in a participatory process, citizen participation can be enhanced by centralized online platforms and social media analysis. This subcategory has 2 indicators:

2-3-1. **Presence of an existing or specifically designed online platform:** this indicator checks that the online platforms used by the smart city are described. These platforms can be of any type (hybrid systems, social media, centralized platform, application...) and they can be existing or specifically designed ones.

2-3-2. **Use of platform by citizens and impact on public life:** this criterion checks that the platform has a real-life setting. This can be ensured by monitoring the number of citizens involved in the platform and its impact on the public life.

3- **Citizens as ICT users:** in the post-implementation phase, the citizens can also participate as ICT users by proactively using the smart city infrastructure to make them feel surrounded by technology and to enable them to participate more easily. Under this theme, there are 2 subcategories:

3-1- **infrastructure:** this subtheme is primarily with regards to the use of ICT tools in smart city, that can serve the wellbeing of citizens. It involves IoT and other relevant facilities. There are 2 criteria for this subcategory:

3-1-1. **Presence of ubiquitous computing components:** this indicator lists all computing elements that could effectively lead to an increased participation of citizens.

3-1-2. **Development of innovative ICT-based projects:** checks that innovative, or new citizen-oriented applications can be mapped to the framework. This includes any innovative application that makes the citizens feel surrounded and supported by technology as well as motivated to engage in other applications.

3-2- **Open data:** this subcategory is with regards to all publicly produced data that is diffused without restrictions. It stimulates the government to act as an open system and interact with its environment and thus, to welcome opposite views and ask for feedback. It involves several domains, such as traffic, weather, public sector budgeting, tourist information, etc. there are two criteria for this subcategory:

3-2-1. **Implementation of Open Data strategy:** this criterion checks the policy of the city concerning the availability of public data. However, the publication of open data will not automatically lead to citizen participation because it demands considerable transformations of the public sector and skills for the citizens to use this data.

3-2-2. **Use of Open Data by citizens:** this criterion checks the different uses of the available datasets by the citizens.

The proposed evaluation method, composed of 3 themes, 8 subcategories and 18 criteria are shown Table 4.

Citizen participation	Citizens as democratic participants	Citizens' selection	1. Representative group of citizens	
			2. Support for group processes	
			3. Competent and unbiased group facilitators	
		Agreement on the goals of the smart city strategy	4. Evidence that citizens helped defined goals and objectives	
			5. Citizen oriented goals and objectives	
			Correlation between participation activities and achievement of goals	6. Formalization and transparency of the course of action
		7. Evidence of interaction between citizens and other actors		
		Citizens as co-creators	Direct interaction	8. Evidence of the influence of citizens' input in priority setting of projects
	9. General techniques applied			
	Living lab		10. Type of requirement engineering method applied	
			11. Living lab strategy and planning	
	Online platforms		12. Citizen-oriented activities organized	
			13. Use of an existing or specifically designed online platform	
	Citizens as ICT users		Infrastructure	14. Number of citizens that participate on the platform and impact on public life
				15. Ubiquitous computing components
		Open data	16. Innovative ICT based projects	
			17. Open Data strategy	
			18. Use of Open Data by citizens	

Table 4: CitiVoice framework (Simonofski et al., 2019)

The author claims that this evaluation method can be used both as ex-post evaluation to assess smart city strategies, as well as ex-ante evaluation. Each criterion can be given a score of 0/0.5/1 to quantify the state of each smart city with regard to the assessment method. An example of implementation of this framework is shown in Figure 7 where three cities of Namur, Mons and Brussels are assessed.

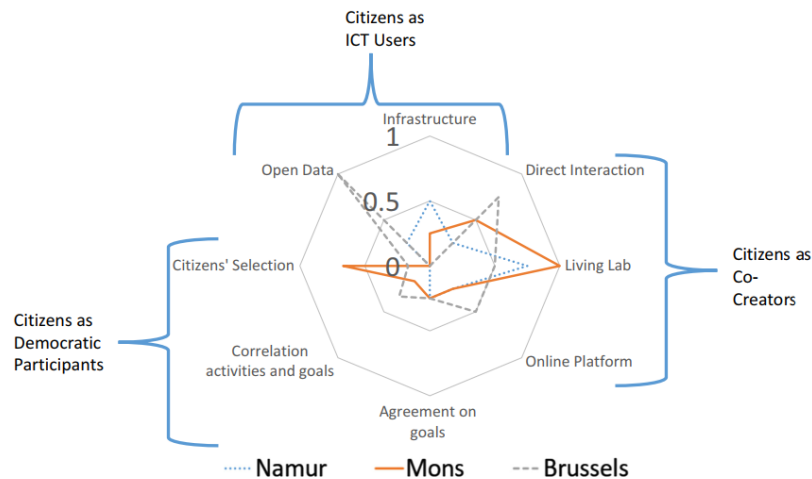


Figure 7: Using CitiVoice to assess citizen participation in Namur, Mons and Brussels (Simonofski et al., 2019)

8.3 Concluding thoughts on the assessment frameworks

By means of comparison, when taking a look at the indicators proposed by the CITYkeys framework we can clearly see that quantification is quite easier than that of CitiVoice. While CITYkeys focuses on percentages, numbers and per capita information, CitiVoice rather “checks” the existence of certain elements, and the scoring (0/0.5/1) can be seen as purely subjective. Overall, the CitiVoice covers a much wider range of indicators to make sure a project is citizen oriented. However, I believe it can better serve as a guideline than an assessment framework, as quantifying the indicators are rather subjective. As discussed earlier, assessing and monitoring smart city initiatives is not an easy task, and this fact alone justifies the existence of multitudes of assessment frameworks. In general, the aim of these frameworks is to assess the progress of smart city initiatives, achievement of goals and track citizen engagement. The discussed frameworks are both defined by scholars, experts, researchers and governments. However, if the aim is to achieve a human smart city where citizens are not only subject to change, but are agents of change, then the indicators can also be derived from citizens. Both sets of indicators are sort of imposed by their advocates. However, to make sure the results of a smart city initiative will benefit citizens, the indicators can be obtained through a co-creation process of all stakeholders together with citizens. In this way, Citizens alongside other stakeholders will ensure the achievement of project goals through co-monitoring of smart projects. This accounts for a higher citizen power level in Arnstein’s ladder of participation and further empowers citizens in the entire process of change, from the early stage of problem definition to the very last stage of project monitoring. This is in fact missing from both sets of indicators discussed above. However, it is worthwhile mentioning that citizens, in order to participate in a co-creation process to define key performance indicators, require competence. As discussed, politicians and project leaders

don't trust citizens as they lack competence and are unable to see the bigger picture, focusing more on what they want for themselves and not what would best benefit the community overall. Therefore, key steps prior to such a co-creation process in to give the required competence to citizens as well as to enhance trust in both directions: citizen to governments, and vice versa.

9. Discussion

A review of literature by this research reveals the undivided attention focused on the missing role of citizens in the development process of smart cities. Smart cities, as discussed, have been criticized for not paying attention to citizens as the main recipients of services. To tackle the shortfalls of smart city, Human smart city idea was developed with the aim to reinstate citizens in the smart city discourse. Many scholars have attempted to offer solutions to this issue, and in an attempt to so, have devised a multitude of terminologies related to different aspects of smart city and different initiatives that can help reinstate citizens in the smart city paradigm. However, there has been no study on trying to find out the relationship between the terminologies, and by doing so, create a framework on how to bring back citizens into the discourse. This multitude of terminologies have also led to the ambiguity of the concept, and when discussing smart cities, many different definitions according to various viewpoints exist, each of which claim to be the “correct” definition of smart city. The same is true for the human smart city concept. To reinstate citizens in the smart city paradigm, many attempts were made each of which with a different and often innovative idea, further adding to the complexity of the existing challenge. A conceptual framework in this regard is crucial for understanding how a smart city can be citizens-centred and citizen-led, considering the multitude of solutions, suggestions and terms by scholars. Additionally, many scholars have only criticized or pointed to the existing issue without coming up with suggestions. As discussed, it is easiest to criticize the lack of citizen participation in smart city, easy to define human smart city, yet difficult to reach it in practice. To fill this gap in the literature, a conceptual framework showing how to reinstate citizens in the smart city to achieve a human smart city is proposed. This has been carried out with literature review of more than 55 articles, books, websites and documents to create a list of principles to follow and try to incorporate while addressing smart city projects. This framework can act as a guideline for reaching a human smart city and to take action. It can be a roadmap with which smart city initiatives can take steps forward while ensuring the achievement of goals as well as citizen participation. This framework can clear up the confusions surrounding the multitude of terms, as it sees different terminologies in relation to one another, as well as their correct hierarchy

in the development process. Plus, It can also be used as the basis for developing a set of indicators so as to assess and monitor the project development.

The first step in the process of developing this framework was to define the concept of smart city. A basic definition is the convergence of technology and urban planning. However, what this definition lacks is the interplay of the many actors involved in the development process of the smart city, the most important of whom being the citizens. A human smart city needs to position citizens as an active stakeholder in the smart city paradigm. The interactions among stakeholders in a human smart city should take place in the participatory democracy realm, with the scope of promoting democracy through democratic negotiations and interactions among stakeholders. This interaction, in the case of smart cities, is facilitated by Information and Communication Technologies (ICTs). However, most partnerships in the smart city initiatives take place among the private and public bodies, leading to a triple-helix model of partnership in which citizens are overlooked. A citizen-centred smart city will seek to incorporate citizens in the stakeholder interactions, resulting in a quadruple helix model of partnership.

However, to reinstate citizens in the partnerships among stakeholders, there are certain barriers. Citizen participation can take place if citizens have incentives to bear the costs of participation, being time, money, energy, etc. Participation will only take place if the benefits outweigh the costs.

Citizens, as active stakeholders in the smart city development process have to negotiate with other stakeholders, engage in political decision making and as these interactions are enabled by ICTs, are required to have adequate digital know-how. However, citizens often lack the necessary skills to do so and therefore, another barrier to citizen participation is their lack of competence. This is especially relevant when participation relies on the use of technology, and not all citizens have the adequate digital literacy, leading to a digital divide among those who have the required digital know-how and those who do not.

Another major barrier to citizen participation in decision making is with regard to citizen empowerment. If citizens are to participate in decision making, they need to have enough power to influence, reject, change or approve the proposals of other stakeholders as well as to voice their own. This requires them to have adequate

political power in the development process and some knowledge of the technical issues regarding the problem. Additionally, citizens are expected to be able to see the bigger picture and put community benefits first while voicing their opinion. This is extremely crucial as many of those against participatory planning believe citizens see no further than what they need for themselves and not the community.

Last but not least, no participation will take place if citizens cannot trust the public officials. If they know or feel that what they say makes no difference in the final decisions, then they will not be willing to participate. Trust, then, is another barrier to participation which has to be earned. The issue of trust is reciprocal, meaning that governments and public officials also have to trust citizens on being capable to understand and engage in decision-making processes as well as being able to see the bigger picture of society as a whole, and not just seeking personal desires.

By overcoming the barriers to citizen participation, the real and functional quadruple helix model can be achieved, and citizen engagement in smart cities can be realised. There are two main areas in a smart city where citizens can and should participate:

As smart cities use ICTs as their basis, and ICTs generate vast amount of data, citizens have to be able to understand, use and help collect data. As discussed earlier, citizens often have very poor relationship with data, seeing them as abstract and useless. A human smart city engages citizens to help formulate necessary data.

One way in which citizens can help in data collection is through their use of technological devices and social media. Citizens' posts on their social media, their physical location and movements through GPS technologies can be used to collect data. In this way, citizens are actually being sensors for data collection without being aware of it. This, in literature, is called "Crowdsensing" which is the act of collecting information from citizens' devices that they use or carry throughout their daily lives. This, however, raises concerns about data privacy and ownership which have to be taken into account as data is being collected sometimes without the permission or even awareness of the user. Plus, relying only on this method of data collected undermines the role of citizen as a co-creator of data and sees them as sensors for collecting information.

Another way in which citizens can actively participate in data collection is through their direct (and not passive) collaboration in data collecting initiatives such as Citizen

Science (collecting data and resources and proposing ideas to researchers and expert designers), Crowdsourcing (outsourcing a task to citizens in the search of data and resources to help solve complex problems) and Citizen sourcing (gathering citizens' knowledge, ideas, opinions and needs in order to address various types of societal problems). These initiatives see citizens as a co-creator of data and builds on community and collective knowledge which will help find the problems and provide solutions more accurately. These initiatives are of wide significance especially when finding and tackling issues relies of tacit knowledge.

Apart from participation in data and resource provision, citizens can actively work with engineers, designers and experts to reach a solution. For engineers to develop tech-based solutions that would serve their end-users (in this case citizens) they can benefit from having the end-user alongside them in the development process. This collaboration between citizens as end-users and engineers as expert designers is referred to as "Collaborative Engineering". The result of this is the engagement of citizens in Co-creation and Co-design of services and leads to participatory service design. This collaboration can take place under many settings, such as Urban Living Labs (open innovation environments where co-creation process of new services, products and societal infrastructures take place), Generative sessions (used in context mapping and service design projects), Hackathons (technologically-driven events with the aim to develop software solutions and with the collaboration of designers, business owners and end-users), and Design jams (an event which brings together different participants as innovation community for prototyping service innovations).

If the entire process is carried out effectively, citizens will work together with public official, business owners, expert designers and knowledge institutions to help define problems, find solutions, implement and monitor them. This collaboration of all actors, from public institutions to private businesses to universities and finally to the general public, results in the collaborative and shared governance model, which should be the final goal of a smart city. To become a smart city, as discussed in literature, transformation of governance model is crucial and inevitable. Collaborative governance enforces and is enforced by smartness of cities. Cities, in trying to become smart cities, will have to aim for achieving collaborative governance, and collaborative governance helps reaching smartness.

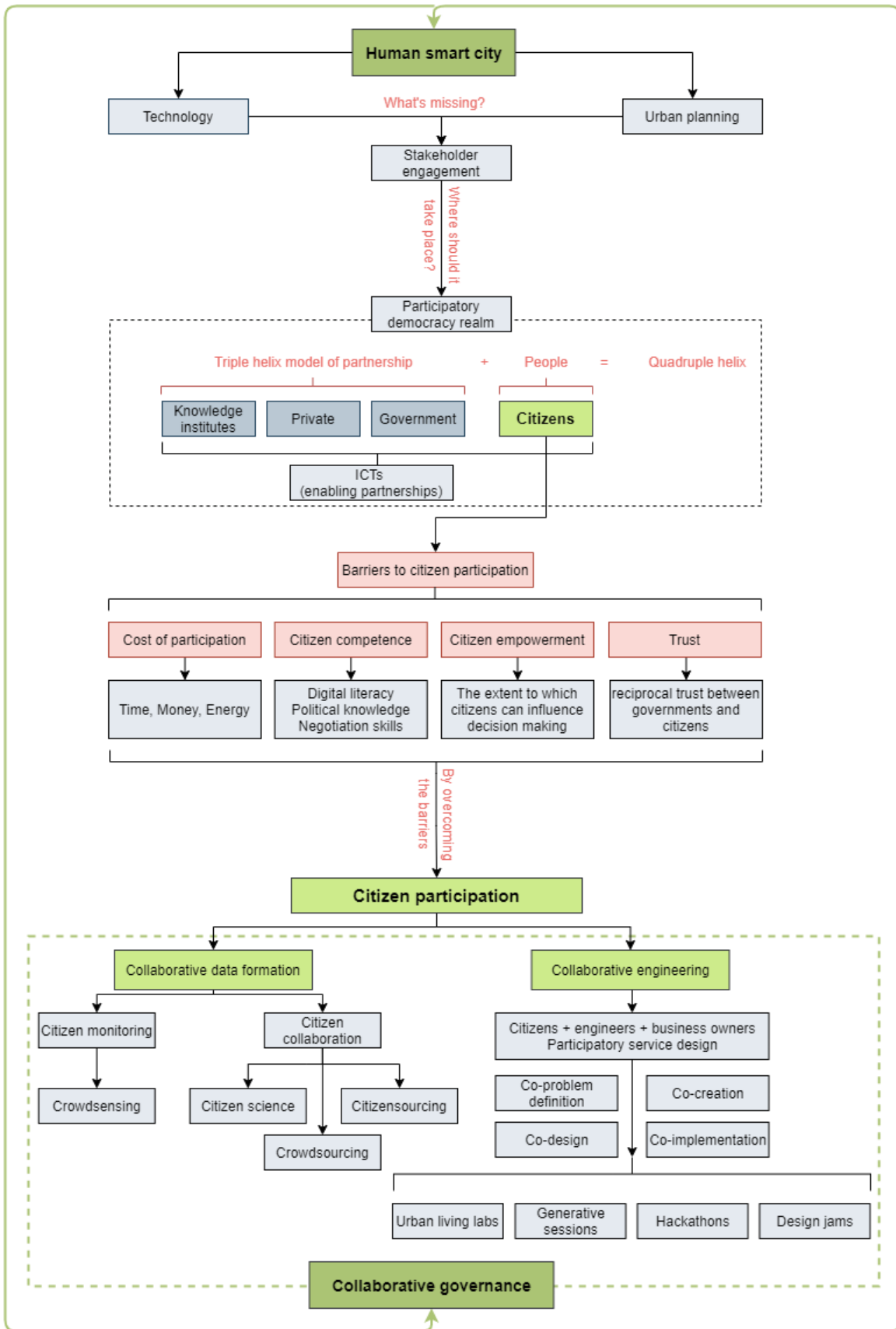


Figure 8 represents the conceptual framework of Human smart city. This framework summarises the main principles to incorporate while developing smart initiatives and

can act as a guideline to keep citizens in the discourse, reaching a shared governance model.

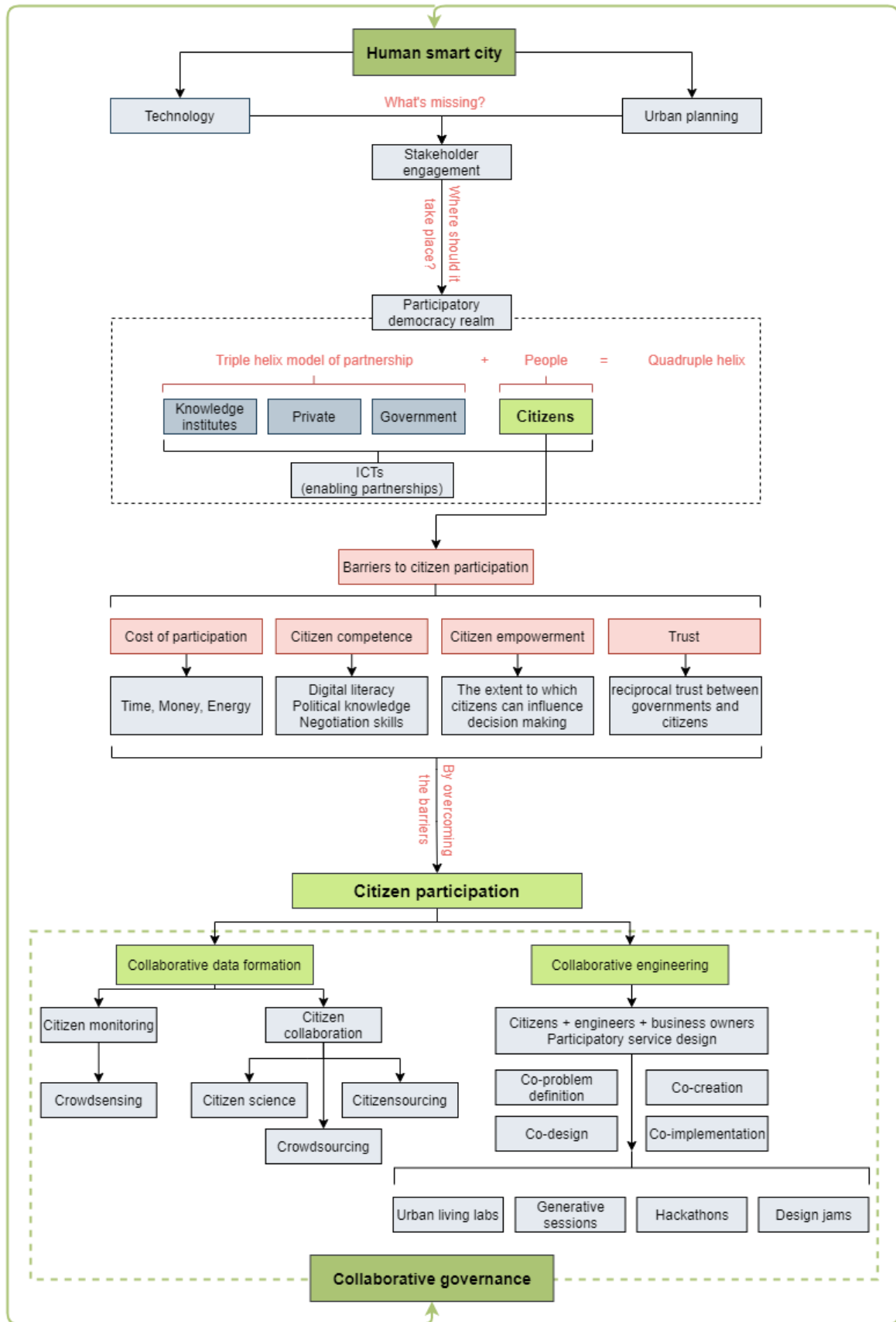


Figure 8: Conceptual framework of Human smart city (by author)

This proposed framework clarifies the relationship of the multitude of terms surrounding the human smart city paradigm. It helps in removing the ambiguity of the terms and, considering the lack of a practical approach to smart cities, can be seen as a crucial step to reduce the distance between theory and practice. It is a guideline which shows the necessary elements and principles to incorporate in the development of smart city projects. By providing a clear geography of the human smart city notion, the proposed framework can also be used as the basis for the development of key performance indicators in order to assess and monitor the development process of smart city initiatives while ensuring the active role of citizens in the entire process. The development of such KPIs can also take place as a result of a co-creation process in which citizens together with other stakeholders develop indicators and help in monitoring the project progress. This will lead to shared governance model which is a crucial step in achieving human smart cities.

10. Conclusion

The rapidly increasing urbanisation has led to a surge of urban issues such as higher energy consumption, more greenhouse gas emissions, more poverty and social segregation, etc. Social, environment and economic sustainability challenges became an insoluble problem for cities. Technology has been seen as a way with which sustainability challenges can be tackled and thus, it found its way to urban planning, leading to the concept of smart city. Although being a necessary step in the right direction, smart cities soon failed to deliver sustainable outcomes, and instead of focusing on enhancing quality of life and citizen well-being, led to a buzzword with no aim but to incorporate tech solutions to solve urban issues. Many smart projects ended up being a list of sensors, not helping to tackle social sustainability challenges. Solutions to complex issues were simplified to data collection, transmission and analysis with the aid of ICTs and they were not in line with the reality of the issues. These shortfalls led to criticisms and scholars called for a new approach to smart cities, seeing people as the main actor of smartness and technology only as a means of achieving it. Human smart city, thus, was born and many scholars tried to offer solutions to reinstate citizens back into the discourse of smartness. In doing so, many new terms were coined and scholars suggested various ways of achieving human smart city, yet the multitude of these suggestions and terms has led to the ambiguity of the concept and lack of coherence. That said, the goal of this study was to address this gap in the literature by providing a comprehensive framework of human smart city principles and a clear roadmap to attaining a human smart city. This was accomplished by a review of the literature on the subject, with the end result being a coherent geography of human smart cities that may be utilized as a set of recommendations for developing smart projects. The proposed conceptual framework helps in keeping the focus on citizens as active and equally important participants in city smartness. According to the findings, a human smart city should aim to maximize citizen engagement by removing barriers to participation and creating a fully participatory environment with the interaction of public institutions, private firms, knowledge institutes, and people, resulting in a smart city share governance model.

What is next? The proposed framework can be further developed in order to form a set of Key Performance Indicators based on which smart city initiatives can be assessed in terms of citizen engagement and shared governance, and can result in cross-comparability of smart cities and smart project.

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