TU Delft

Centre for Urban Science & Policy USP

Urban Voices

Citizen Voice: An innovative Open-source Map-based tool for effective public participation

Master thesis

MSc. Complex Systems Engineering and Management

Ioannis Ioannou

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Citizen Voice: An innovative Open-source Map-based tool for effective public participation

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Master thesis submitted to Delft University of Technology

in partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE

in **Complex Systems Engineering and Management**

Faculty of Technology, Policy and Management

by

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To be defended in public on August 19th, 2022

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TU Delft

“Από ομονοίης τα μεγάλα έργα”

“With collaboration come the great achievements”

Democritus, 460-370 BC

Acknowledgements

This thesis report marks the end of my exciting and at the same time challenging CoSEM journey. Thesis life over the past months has been quite enlightening, bringing on the way exciting discoveries but also backstops, that seemed at first unapproachable. However, proper guidance throughout the whole process, together with hard work, lead me to the finalization of my thesis project and my graduation from TU Delft and the CoSEM programme.

At this point, I would like to express my gratitude to all the people that helped me realize my thesis project successfully- each of them in their own way. First of all, I would like to deeply thank all the participants of my research; the urban practitioners that participated in the interviews and the workshops, for all their fruitful input and discussions, and, of course, all the people that devoted time to respond to my survey.

Also, I would like to thank my graduation committee, for all their guidance from the very beginning of my thesis journey. Special thanks to my advisor Juliana Goncalves, for her substantial support and kindness throughout the whole process. My first supervisor, Trivik Verma, who believed from the beginning in the potential of this research, posing me fruitfully challenging questions, that made my research stronger, and expand my way of thinking outside the box. I would like to deeply thank the rest of the members of my graduation committee, my second supervisor and committee chairperson, Haiko van der Voort, and Claudiu Forgaci and Roy Bendor, as my external supervisors, for their constructive feedback and input, with which their inspired me to strive for the best possible outcome for my thesis project.

Conducting my research, meant getting the chance to be also part of an inspiring team, the CUSP team, which I would like to thank for all the discussions and knowledge I had the chance to gain from them over the past months.

Finally, I would like to deeply thank my family and friends that supported me in so many ways, while conducting my thesis project, and also, my partner, Elina, for being a leading light in my life, who always supports and believes in me.

I.Ioannou

Delft, August 2022

Executive Summary

Cities around the world constitute complex systems, as set of sub-components that are connected and interact with each other. Due to this inherent complexity of cities, there are numerous emerging challenges that need to be tackled in urban management. In those complex environments, various-interest groups of people collaborate and compete to achieve their goals and interests, constituting a vital part of urban planning. Involving citizens in urban planning and decision-making processes cannot be considered without the actual involvement of a variety of stakeholders, including citizens, as it is fundamental to outline and grasp their diverse perspectives, values and needs.

The advancement of technology, and the abiding need to keep citizens engaged, have imposed a critical shift in the way that urban planning confronts the increasingly complex issues of modern society. The evolution of Information and Communication Technologies (ICT) offers citizens a way to digitally participate in urban planning-design procedures, overcoming limitations that come with in-person participation, including, physical presence, and time and space constraints. Public participation in urban planning also comes with various challenges related to the level of its effectiveness and the need for shifting towards more bottom-up, rather than top-down approaches, in order to engage more people in decision-making.

While many methods, tools and technologies have been developed over the years, that focus on enhancing citizen engagement and the effectiveness of public participation at large, there seems to be an evident gap in substantial and two-way collaboration among the urban stakeholders, who are relevant to the issue at hand. Therefore, there is a need to understand why this is a case, acknowledging that urban stakeholders are involved in participatory procedures with different perspectives, in terms of motives, needs and values.

This thesis project aims to hark the perspectives and needs of the urban stakeholders, translating them into a conceptual design of a digital public participation platform. Next to that, except for the importance of the platform itself, as a tool, the focus was also given to participation, as a process, considering that such a platform could and should act as a means to promote effective public participation rather than a stand-alone solution.

Therefore, the objective of this research is twofold; the aim is to develop the conceptual design of a (digital) public participation platform, aiming to enhance citizen engagement and provide guidelines to facilitate (more) effective public participation in urban planning. In order to reach the objective, the following research question was formulated: *Which characteristics need to be included in designing a public participation platform so that it can enhance citizen engagement and facilitate more effective public participation in urban planning?*

Due to the nature of the research and its aim of proposing a design for a digital platform, a design science research approach was chosen. Hevner's (2007) Design Science Research Cycles have adapted accordingly for this research. The context of the study was thoroughly examined in order to fulfil the relevance cycle. For the rigor

cycle, a literature review on existing theories, methods and frameworks related to public participation and digital platforms was conducted. Next to that, the concept of effectiveness was explored, in order to frame effectiveness for the context of this research, as well as scientific findings related to digital public participation. In addition, scientific findings regarding important components/elements that should be taken into consideration when designing a public participation platform as well as factors that can influence public participation were collected and included in this theoretical background of the research.

The developed theoretical framework constitutes the core of the research, directing its later stages of data collection and analysis. Data collection was conducted using multiple methods, including workshops, semi-structured interviews, and questionnaires (survey), while data analysis was conducted inductively, so as to identify all the emerging patterns and their interrelations.

After the data collection, data analysis was followed, which was conducted separately from the data derived from each of the used data collection methods and was based on five themes that emerged: *General findings; (De)Motivational factors for public participation; Characteristics; Technical requirements; Technological features*. Retaining the five core themes of the data analysis, the analyzed results were then critically synthesized.

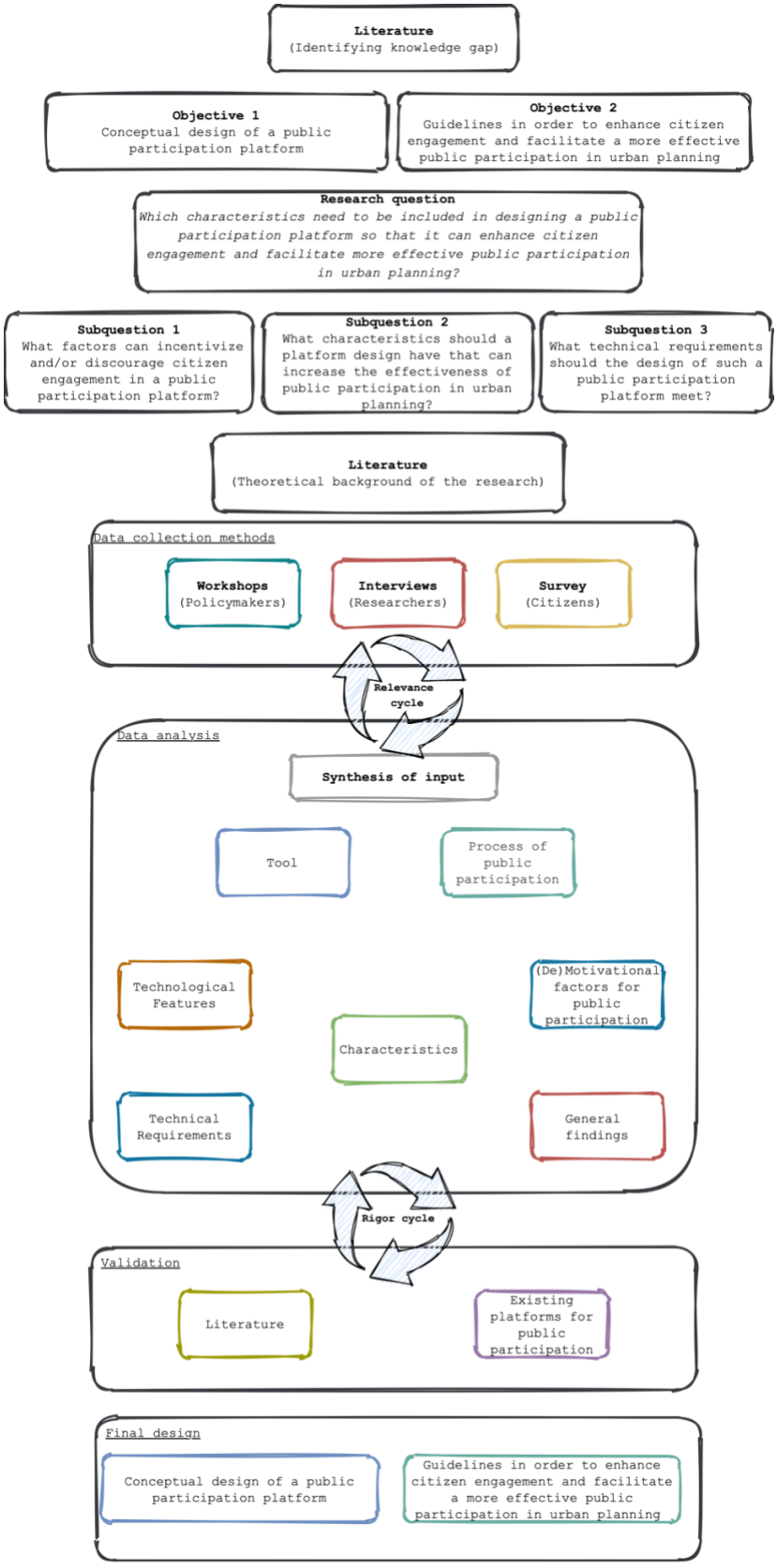
The synthesis was conducted in both qualitative and quantitative terms, so as to provide a holistic overview of them. For the qualitative analysis, the input for the five themes was critically synthesized, providing the final list of general findings (de) motivational factors, characteristics, technical requirements, and technological features, combined from the workshops, the interviews, and the survey. The quantitative analysis was conducted, so as to eliminate the complexity that the multiplicity of the expressed perspectives leads to, combining all the qualitative inputs and subsequently translating them into quantitative results.

The characteristics, requirements and technological features were evaluated based on the data obtained from policymakers, researchers, and citizens and each component was evaluated based on a three-level scale: *not important/slightly important; important;* and *very important*.

The analyzed and synthesized results were then combined in order to produce the main outputs of this research and reach its objective, providing an overall answer to the main research question of this study. First, a trifold validation of the results, related to the past, present and future, was developed, in order to fulfil the rigor and design cycle of the design science research, establish a grounding in the knowledge base, and attain a continuous assessment and refinement.

Building upon the results of the evaluation, two main research outputs were produced; for the platform itself as a tool, a conceptual design that was based on the different views of the urban stakeholders (qualitative and quantitative analysis), along with the results of the validation (the second "type" of the executed validation related to the existing digital platforms of public participation), in light of scientific literature (theoretical background), while for the process of public participation in general, a set of guidelines, providing general recommendations on how to enhance citizen engagement and the effectiveness of public participation, that was based on the

different views of the urban stakeholders (qualitative and quantitative analysis), in light of scientific literature (theoretical background).



This thesis concludes with some important final remarks for the conducted research. These include some general conclusions, the limitations of the research and

recommendations for future research, and the research relevance (scientific, societal and relevance with CoSEM). Lastly, the author's overall reflections on the research are presented, marking the end of this thesis project.

Important note

The results of this work will be part of the requirements and the conceptual design of the Citizen Voice project of the Centre for Urban Science & Policy (CUSP). Citizen Voice is part of the SPRING project, an initiative between TU Delft, Erasmus University and Erasmus MC that focuses on interdisciplinary research on substantial societal challenges and aims at bringing together various actors, including universities (of applied sciences), organizations, municipality, and residents in the city of Rotterdam, and create an impact on the improvement of citizens' wellbeing and health in underprivileged neighbourhoods.

This thesis project, per se, does not constitute the conceptual design of Citizen Voice, as Citizen Voice consists of a team of researchers, developers, and scientific staff that work in all stages of the platform creation. This thesis project intends to provide input to the Citizen Voice project. It is also important also to clarify that some parts of this thesis project were conducted in close collaboration with the Citizen Voice team (preparation and execution of the workshops), while some others were executed exclusively by the author (data collection, data analysis, synthesis, research outputs). Lastly, it is important to mention that the interaction and cooperation with the Citizen Voice team were substantial and supportive throughout all the steps towards completing this research.

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1. Introduction

1.1. Problem introduction

Cities constitute complex systems, being defined as sets of components/subsystems that are linked together through connections/interactions (Batty, 2009). For Healey (2006), the urban environment is considered "a complex mixture of nodes and networks, places and flows, in which multiple relations, activities and values co-exist, interact, combine, conflict, oppress and generate creative synergy" (p. 1). Practitioners, researchers, and decision-makers around the world use various methodologies and tools, in order to manage complex urban challenges. In those complex environments, various-interest groups of people collaborate and compete to achieve their goals and interests. Concurrently, urban planning and decision-making cannot be considered without the actual involvement of a variety of stakeholders, including citizens. The involvement of citizens is essential, so as to understand the diverse needs and values of citizens, as well as to enrich the urban design with local knowledge (Rambaldi, Kyem, McCall, & Weiner, 2006). Public participation has been proved a key aspect of urban design, planning and decision-making to capture such local knowledge (Afzalan, Sanchez, & Evans-Cowley, 2017).

The recent technological advancements, along with the need for citizens to participate in decision-making, impose a critical shift in the way that urban planning confronts the increasingly complex issues of modern society (Albino, Berardi, & Dangelico, 2015; K. C. Desouza & Bhagwatwar, 2012). Emerging technologies have become centre stage for policymakers, due to the possible impacts that could bring to society (Rotolo, Hicks, & Martin, 2015). These technologies can bring innovative solutions to improve public participation but may also pose new challenges and ethical issues - such as privacy and safety- that could adversely impact people's rights and freedoms. The evolution of Information and Communication Technologies (ICT) offers to citizens a way to digitally participate in urban planning-design procedures, overcoming limitations of the existing procedures such as physical presence, time and space constraints (Hudson-Smith, Evans, Batty, & Batty, 2002; Zhao, Lin, & Derudder, 2018).

There are many challenges with regard to the effective use of public participation in urban planning, such as ensuring inclusiveness and that citizens' input is taken into account in the decisions (Brown & Kyttä, 2014). On top of that, policy-making and urban planning processes have still been top-down with citizens being under-represented or even excluded. However, within urban environments, processes cannot be simply considered top-down, since they "centre around collective action, both in formal government arenas and in informal mobilization efforts, which seek to influence the socio-spatial relations of an urban area, for various purposes and in pursuit of various values" (P. Healey, 2006, p. 1).

Taking all that into consideration, this thesis project's goals are to develop the conceptual design of a (digital) public participation platform, aiming to enhance citizen engagement and provide guidelines to support effective public participation in urban planning.

1.2. Academic knowledge gap

While many methods, tools and technologies have been developed, aiming to enhance citizen engagement and improve the effectiveness of urban planning and decision-making procedures, there seems to be an evident gap in substantial and bidirectional collaboration among involved stakeholders (Ertiö, 2015; Williamson & Parolin, 2013). In other terms, public participation is rendered as not effective. Therefore, there is a need to understand why this is a case, acknowledging that urban stakeholders are involved in participatory procedures with different perspectives, in terms of motives, needs and values.

This research aims to contribute to fulfilling urban stakeholders' needs by taking into consideration those different perspectives and translating them into design requirements for a public participation platform. The multiple perspectives of various interest groups will be considered during the design process in order to develop a conceptual design for a digital public participation platform. Furthermore, except of the importance of the platform itself, as a tool, the focus was also given to participation, as a process, considering that such a platform could and should act as a means to promote effective public participation rather than a stand-alone solution.

Lastly, it is worth noticing that ensuring citizens' engagement in decision-making and urban planning processes is an evolving process. Following the evolving development of urban contexts, stakeholders' needs, values, and priorities might change throughout time. Therefore, it is crucial to develop adaptive participation methods, that can respond to any potential changes (Kahila, Broberg, Kyttä, & Tyger, 2015).

1.3. Research objective and research questions

Based on the identified academic knowledge gap, the objective of this research is to reinforce citizens' engagement in urban planning, establishing a conceptual design of a digital platform for public participation. In relation to the conceptual design, a set of guidelines will be created in order to achieve more effective public participation in urban planning issues. To reach this objective, the following research question was formulated:

Which characteristics need to be included in designing a public participation platform so that it can enhance citizen engagement and facilitate more effective public participation in urban planning?

In order to answer the aforementioned research question and achieve the research objective, three sub-questions were formulated:

1. What factors can incentivize and/or discourage citizen engagement in a public participation platform?
2. What characteristics should a platform design have that can increase the effectiveness of public participation in urban planning?
3. What technical requirements should the design of such a public participation platform meet?

2. Context and inspiration of the research

2.1. Citizen Voice

At this point, it is necessary to clarify the collaborations and synergies that were made in relation to this thesis project. The results of this work will be part of the requirements and the conceptual design of the Citizen Voice project of the Centre for Urban Science & Policy (CUSP). CUSP is a transdisciplinary research group focusing on urban research, planning and policy for justice and equity in the urban context. For the Citizen Voice project, CUSP is working on developing an open-source and map-based public participation tool, so as to enhance the engagement of communities in planning and urban development processes. Considering citizens' input in relation to their needs, and experiences as fundamental for such processes, Citizen Voice aims to provide a communication channel for the citizens, including them in all the stages of urban development projects.

Citizen Voice is part of the SPRING project (Societal Progress & Resilience for healthy Individuals and Generations), together with the other six pilots. SPRING is an initiative between TU Delft, Erasmus University and Erasmus MC that focuses on interdisciplinary research on substantial societal challenges. SPRING aims at bringing together various actors, including universities (of applied sciences), organizations, municipality and residents in the city of Rotterdam, and create an impact on the improvement of citizens' wellbeing and health in underprivileged neighbourhoods.

It is important to mention that this thesis project, per se, does not constitute the conceptual design of Citizen Voice. Citizen Voice consists of a team of researchers, developers, and scientific staff that work in all stages of the platform creation. This thesis project intends to provide input to the Citizen Voice project. In addition, aggregated results of this study will be carefully shared with the collaborators in accordance with the human research ethics checklist and the data management plan of this thesis project.

At this point, it is important also to clarify which parts of this research were executed exclusively by the author, distinguishing them from the parts conducted in collaboration with the Citizen Voice team. With regards to the data collection of this research, the preparation and execution of the workshops were organized by the Citizen Voice team, in close collaboration with Veld Academie, while the author was involved as a team member. The data collection from the workshops, together with the other data collection methods that were used, were exclusively conducted by the author. Lastly, it is worth noticing that the interaction and cooperation with the Citizen Voice team were substantial and supportive throughout all the steps towards completing this research.

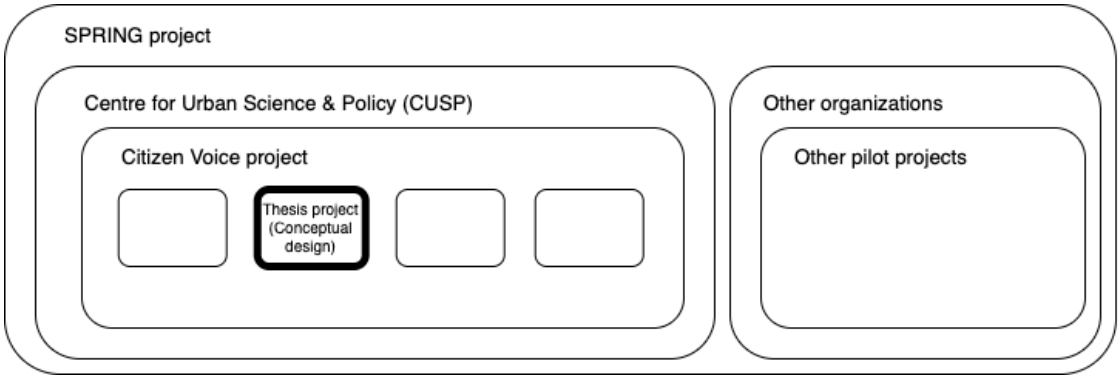

Figure 1: Thesis project in relation to collaborators

2.2. Public participation as an ancient theatre

While many different digital tools for public participation have been developed taking advantage of the recent technological advancement, citizens' engagement remains a complex problem. Public participation tools, digital or not, cannot be considered silver bullets. Therefore, there is a need to understand the system with the different components, as well as the relations among them.

At the preliminary exploratory phase of this study, metaphors constituted an inspiration and influencing factor with regard to the approach used in this study. First, a digital public participation tool can be (metaphorically) considered as a microphone in a big room which gives people the ability to empower their voices. Depending on the microphone's position in relation to where people stand in the room, people closer to the microphone can be heard easily, while people far away are excluded. Next to that, another important parameter is the condition of people's voices. Some of them may have a louder voice than others, while some may have speaking disabilities; some of them may want to be heard and some others do not. From a technological point of view, some ways to balance all these issues should be to add more microphones, equalizers, or even more technically capable tools.

Figure 2: The ancient theatre of Epidaurus, Greece. Source: https://www.tiqets.com/en/mykines-attractions-c263088/tickets-for-mycenae-nafplio-epidaurus-day-tour-from-athens-p980680/

Another metaphor that helps to understand the problem of public participation in depth is the design of the ancient theatre in Epidaurus Greece. The capability of such a theatre to amplify the speech of the actors has been phenomenal. The sound pressure level remains quite the same for the people seated in the first rows and last rows; almost 60 meters away (Lokki, Southern, Siltanen, & Savioja, 2013; Psarras et al., 2013). This is the reason that many ancient theatres have been studied by many acoustic researchers worldwide. This acoustic result was achieved without any use of technology, as the theatre was constructed in the late 4th century BC. Some of the factors that contributed to this accomplishment include the selected topographic location, the geometry of the

theatre, the materials used and the inclination of the steps that helped the reflections of the sound (Lokki et al., 2013).

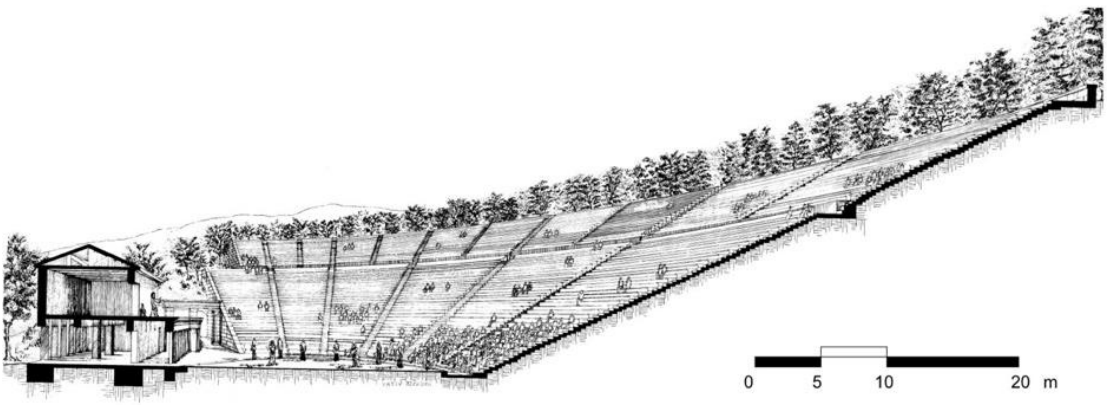

Figure 3: Design of the ancient theatre of Epidaurus, Greece. Source: Photo by Victor F. V. Gamboa on Pinterest.

These two metaphors try to allegorically explain that giving voice to the people is not only a matter of technological advancement. For the Epidaurus theatre example, for instance, this was achieved without any use of technological means. The process of designing the theatre, the methodologies and the theories that were applied contributed to this outstanding result. While the focus of this study is to identify characteristics that need to be included in designing a public participation platform, the selected approach was intentionally chosen to be more inclusive and comprehensive. Similarly, to the two metaphors, the digital tool of public participation (platform) was approached in a holistic way, including the overall process of public participation. The focus was not only on the tool itself but also on the environment where this tool will be placed. Public participation was considered a process that needs theories, methodologies, tools, models, technology, and many more to work. Understanding all these different components and their connections was essential in the process of devising this study.

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3. Theoretical background

The developed theoretical background was chosen to be divided into two core parts, providing the context of this research, as well as critical points related to it, as derived from the scientific literature. The first part is related to public participation. The concept of public participation is outlined, presenting an overview of the concept with different typologies found in the literature, and providing at the end the selected definition of the concept within the context of this research.

Next to that, the notion of effectiveness is presented, in relation to public participation, in order to provide again a definition of what is considered effective public participation for this research. Lastly, in this first part, the evolution of public participation and its shift to the digital era is presented. The second part of the theoretical background is focused on the information derived from scientific literature regarding the design of existing platforms, including key elements, features, and characteristics of those platforms.

3.1. Unfolding the concept of public participation in urban planning

Public participation has been proven fundamental in urban planning and decision-making procedures. It constitutes a means for authorities, policymakers and planners to effectively respond to urban challenges, including citizens in their decision-making processes (Afzalan et al., 2017). Public participation is particularly complex, as a process (Gordon, Schirra, & Hollander, 2011), and there is a need to precisely and carefully design it (Gordon & Manosevitch, 2011). However, public participation is often treated as a "compulsory task" that is typically executed, without taking into consideration the complexity of the urban issues at stake (Gordon et al., 2011).

In the context of participatory planning, citizens -and various interest groups- constitute a core group of stakeholders, along with decision-makers and urban designers. An intrinsic characteristic of participatory planning is that the design process constitutes a way of communication, consultation, and interaction among those stakeholders that have a direct interest in the design issues at hand, being able to produce credibility, trust and commitment to contributing to solving those issues (Empel, 2008; Innes & Booher, 2004).

Engaging people in urban planning and the shaping of inherent urban spaces has been a central point of discussion already from the late 1960s, identifying a critical need of institutionalizing and systematically involve citizens in planning, at various levels and scales (Seltzer & Mahmoudi, 2013). Jane Jacobs (1961), a famous activist and writer, highlighted in her book "The death and life of great American cities" the need to actively involve people in urban planning, as the users of public space. Since Jacobs, there have been various attempts to contextualize public participation, leading to the creation of various typologies.

In 1969, Arnstein (1969) explored the levels of participation through a ladder typology. For Arnstein, public participation is "a categorical term for citizen power…the redistribution of power that enables the have-not citizens, presently excluded from the political and economic processes, to be deliberately included in the future" (p. 216). For Arnstein (1969), participation is a means for people to raise their voice, and, therefore, get power in decision-making. According to her typology, there are eight

distinct levels (rungs) for public participation in planning, highlighting that each rung corresponds to a different level of citizens' power to shape the end outcome of a planning process. More specifically, the first steps of the ladder refer to *non-participation* and *tokenism* in citizen participation, while the higher rungs represent strong citizen power. The author concludes that there is a need for power redistribution among unrepresented citizens and powerful stakeholders such as officials so as to achieve community goals.

Another typology of public participation in relation to planning was introduced by Pretty (1995). Similarly to Arnstein, Pretty (1995) highlights with his typology the need for actively engaging people in decision-making and shifting the power from authorities to them (Cornwall, 2008). Seven types of citizen engagement have been identified by Pretty, each of which has different features. The participation types range from *manipulative participation*, which is only a pretext, and when people have no power or influence in decision making, to *interactive participation*, which is seen as a right, to *self-mobilization*, when people do take initiative independently, without, however, getting the overall power of the process (Pretty, 1995).

It is interesting to see that even though those two typologies see public participation in relation to planning through the same lens, their endpoints are quite different. From Pretty's self-mobilization, it is clear that the motivations of those involved in a participation process are a fundamental factor influencing the type of participation, but it is for sure not the only one, while for Arnstein the highest level of public participation is directly related to people's control and power on the process (Cornwall, 2008).

Public participation and the form it can take in planning processes can vary, depending on who are the actors that invite for participation and those who are invited to it. White (1996) identified four different forms of public participation, namely *nominal*, *instrumental*, *representative*, and *transformative*. For each of those public participation forms, the reasons for those facilitating participation and those who are addressees of the results of the process can significantly vary. For instance, in nominal public participation, the facilitators of the participation process are motivated by legitimation, in the sense that it is important for them to prove to the public that they do take action, while those who are receiving the results of the process, inclusion is their primary stimuli for participating, intending to have some possible advantages from their participation (Cornwall, 2008; White, 1996).

More recently, Falco and Kleinhans (2018) identified, conducting a systematic review of academic literature, three ways of citizen engagement: information sharing (unidirectional way of communication among decision-makers and citizens), interaction (bidirectional communication among the parties) and civic engagement, collaboration and involvement (bidirectional communication among the parties, that leads to concrete measures of policy making).

It is worth mentioning that, in general, public participation and citizen engagement are two terms that are used in the literature interchangeably, having the same denotation. However, there have been recorded attempts of framing citizen engagement as slightly different from what is considered public (citizen) participation. The bidirectional aspect of the communication between the involved parties in a

participatory process, as cited above by Falco and Kleinhans (2018) has been the focal point for this distinction.

Citizen engagement requires this bidirectional (two-way) communication "between government and citizens; among citizens; and among citizens and civil society groups" (Sheedy, Mackinnon, Pitre, Watling, & Networks, 2008, p. 5). For Dobos and Jenei (2013), participation is different from engagement, as the former is mostly focused on "providing and gaining information, assistance and support from citizens" (p. 1086). The authors consider public participation as the conventional one-way of exchanging information between governments, while citizen engagement entails interaction among the involved parties. Public hearings serve as an example of this one-way information exchange that Dobos and Jenei (2013) are referring to. This form of public participation is often linked to Arnstein's tokenism, in the middle levels of participation, while they seem to often fail to engage the public in the decision-making process (Gordon et al., 2011).

Cornwall (2008) brings together these two terms highlighting that the existence of different typologies regarding public participation makes it clear that different types of participation imply different levels of engagement, which may significantly differ. In other words, public participation entails citizen engagement, in different forms and levels, depending on the way one initially frames public participation. Taking this into account, within the context of this research, the terms of public participation and citizen engagement was chosen to be used interchangeably, focusing on the two-way communication among the involved parties in a planning process.

3.2. Defining effective public participation

In contemporary urban planning, it is clear so far that public participation and citizen engagement in urban planning-related processes are highly valued and acknowledged. A wide range of engagement strategies has been developed in different contexts, focusing on a clearly identified aim for peoples' involvement in such processes (Empel, 2008; Gordon et al., 2011). Success and what constitutes public participation successful have been reviewed in scientific literature and are related to the extent to which power in decision-making is actually given to people, rendering them able to raise their voices and express their needs (Gordon et al., 2011).

On the contrary to success, the effectiveness of public participation in urban planning has been explored to a lesser extent (Empel, 2008). There have been attempts, however, in framing effectiveness, by providing indicators and frameworks for evaluating effectiveness (see Brody, Godschalk, & Burby, 2003; Empel, 2008). For the context of this research, and in order to be able at the end to reach its objective, is important to frame effectiveness, and defining its connotation. In this context, effectiveness was chosen to be associated with *inclusiveness* and *equality*.

Both inclusivity and equality have been recognized in scientific literature as "ideal" in urban planning theory as well as in urban practice. However, contemporary urban reality has been proved particularly complex, rendering those two characteristics "difficult to realize in today's societies that comprise diverse and multiple publics" (Bond & Thompson-Fawcett, 2007, p. 449). While urban planners have been recognized as initiators of inclusive and equitable processes, being able to include and/or exclude different citizen groups, and there have been many attempts to facilitate such processes, in reality, those seem to fail, as there are still particular groups

that may be marginalized, disempowered and excluded (Bond & Thompson-Fawcett, 2007). It is worth mentioning that inclusivity is context-dependent; it is important to clarify well in advance the reason why inclusivity is important, within what context and for what reasons (Lee, Woods, & Kong, 2020).

In the context of this research, inclusivity refers to the extent to which citizens are included in a participatory process and its "argumentative arena" (Bond & Thompson-Fawcett, 2007, p. 451). The diversity and representativeness of the engaged citizens and/or groups constitute an indicator of the level of inclusivity that a participatory process can achieve (Ianniello, Iacuzzi, Fedele, & Brusati, 2019). There is the possibility, as already documented in scientific literature, of having groups of citizens that are difficult to approach and engage in decision-making due to a variety of reasons, including temporal, logistical, economic, or cultural (Albrechts, 2002; Bond & Thompson-Fawcett, 2007). The challenge of proofing a participatory process for being inclusive is "to prevent those not present for being absent" (Patsy Healey, 1997, p. 275).

In addition, as Hung (2015) underlines, those people/groups that end up participating in a decision-making process, are those who have a high interest in the issue at hand, that are often "more socioeconomically advantaged" in relation to the rest of the urban population (p. 515). Therefore, it is important, when intending to facilitate an inclusive participatory process, to provide a space for all the interested/relevant stakeholders to express their needs and views, putting aside their individual interests for a broader common good (Campbell & Marshall, 2000). Next to that, less wealthy citizens/and groups should be encouraged to be engaged in collaborative decision-making, providing them with the means to do so, namely sharing information openly with all, and providing support to those in need (support for those that may not have the knowledge to reflect upon this information) (Ianniello et al., 2019).

Equality is also an important indicator for defining effectiveness, within the context of this research. It is related to the equal, in terms of equivalency and well-structured distribution, of information and power to the involved stakeholders in a participatory process. For Ianniello et al (2019), equality can be achieved by engaging the stakeholders in the long run, and in-depth. Next to that, fairness pertains to the spectrum of equality as defined in the context of this research and is related, to the "opportunity for all interested or affected parties to assume any legitimate role in the decision-making process" (Webler & Tuler, 2000, p. 568); Ensuring the fairness of a participatory process means ensuring that "everyone has an equal chance to make their voice heard and to shape the final decision (Webler & Tuler, 2000, p. 570).

All in all, inclusiveness, and equality, with all the perspectives that each one of them entails, define what is considered to be effective public participation, in the context of this research (see Figure 4). Table 1 below provides an overall description of what is considered effective public participation, including its intrinsic characteristics and advantages (adaptive from Bond and Thompson -Fawcett's (2007) communicative participation.

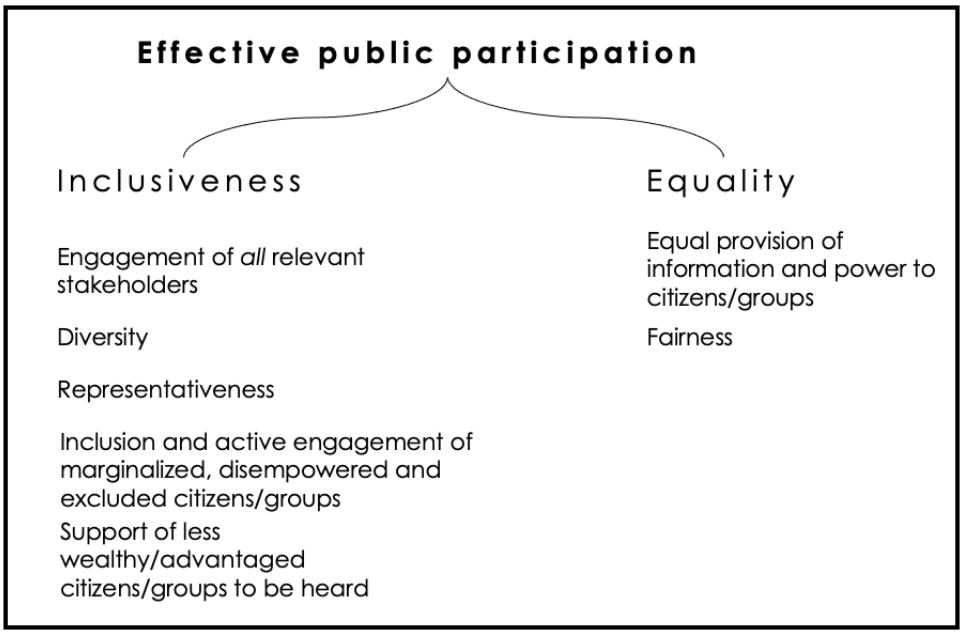

Figure 4: Delineation of effective public participation

Table 1: Overview of the characteristics and advantages of effective public participation

Characteristics	Advantages
Inclusive, providing equal access to the participatory process	Common understanding upon the process by all the involved citizens/groups
Representative	Conflict management upon different interest more feasible
Equal opportunities for citizens/groups ot participate	Common interest in favour of individual (self) interest
Ensure balance of power among the different groups	Sense of ownership upon the outcome of the process

3.3. From conventional participatory planning to the new digital era of public participation

As already mentioned, public participation constitutes a fundamental element of urban planning and decision-making. Ensuring actual engagement of citizens in planning processes can result in decisions and policies of better quality, shared responsibility for them as well as the enhancement of their acceptance, and consequently trust in the institutions (OECD, 2004). Over the last decades, technological advancement utilization has offered alternative methods for engaging citizens in a digital way, gradually fulfilling the demand for more "human-centred design elements" that include collaborative and participatory features (Brown & Kyttä, 2014; Charalabidis, Alexopoulos, Vogiatzis, & Kolokotronis, 2019; Lock, Bednarz, Leao, & Pettit, 2020, p. 1).

An essential characteristic that boosted the transition of conventional methods of public participation into digital was the evolution of Information and Communication Technologies. The utilization of ICTs in public participation has been centre stage in scientific debate for decades, as mobilizing factor for increasing the "democratic deficit" worldwide (mostly in the United States and Europe) (Macintosh & Whyte, 2008). ICT first appeared as a concept in the 1980s. At the end of this decade, Gillespie and Williams (1988) and Castells (1989) attempted to explore the impact this concept can have on social structures, paving the way for further research on the "spatial impacts" of it (Afradi & Nourian, 2020). According to Black and van Geenhuizen (2006), ICT can be defined as a concept with three separate layers: tools, services dependable on ICT, and infrastructure.

The rise of ICT, as a concept, has been proven beneficial for urban planning, being able to bring innovative solutions and enhance cities' "smartness", effectiveness, and response rate to problems (K. Desouza & Bhagwatwar, 2014). Next to that, through ICT, citizens have been better engaged with participatory procedures (Albino et al., 2015; Hanzl, 2007; Macintosh, 2004; Mukhtarov, Dieperink, & Driessen, 2018). In urban planning, and decision-making, in particular, ICT has increased the popularity of such technological means, since more and more cities worldwide make use of them in order to engage people in planning-related processes (Angelidou, 2014); a new "era of democracy" is, thus, emerging, "that is capable of levelling up the transparency of governmental action, the political participation of citizens and the collaboration between governments and citizens" (Wirtz, Weyerer, & Rösch, 2019, p. 567).

These approaches aim to enhance the democratization and transparency of decision-making, as well as enable a broader public participation (Afzalan et al., 2017). Digital public participation makes it easier for citizens to participate in the process of design and decision-making, overcoming limitations of conventional procedures, such as time and space and participation constraints (number of participants) (Brown & Kyttä, 2014; Rambaldi et al., 2006). OECD (2004), emphasizing the utilization of "technology-enabled" participation, provided an overview of the benefits of e-engaging citizens in urban planning and decision-making processes (p. 33) (see Figure 5).

Advantages of utilizing technology for citizen engagement

- More accessible and easy to understand information for the targeted audience
- Reach and engage with a wide(r) audience
- Enable more in-depth engagement of the targeted audience that lead to more informed engagement
- Support online meditative debate among institutions and citizens/groups
- Ensure transparency and openness of the urban planning and decision-making processes
- Ensure uninterrupted improvement of the urban planning and decision-making processes through evaluating and monitoring

Figure 5: Advantages of utilizing technology for citizen engagement. Adapted from :(OECD, 2004).

For Desouza and Bhagwatwar (2014), Digital Participatory Platforms, the so-called DPPs, offer the possibility of participating in decision-making remotely, controlling when and for how long one wants to engage with the process. DPPs, according to Falco and Kleinhans (2018), can be defined as "a specific type of civic technology explicitly built for participatory, engagement and collaboration purposes that allow for user-generated content and include a range of functionalities" (p. 3).

Besides providing a definition of DPPs, the authors underlined that this type of digital public participation seems very promising for achieving two-way interactions among institutions and citizens/groups. DPPs can potentially enhance the interactions among those actors, leading to "collaboration and co-production" of solutions and ideas (Falco & Kleinhans, 2018, p. 2). Designing and facilitating appropriately such platforms -"returning data to citizens, and to the city"- can result in citizen empowerment, improving citizen engagement and participatory planning in general (Lock et al., 2020, p. 9).

Another well-known approach for digital public participation is the Public Participation Geographic Information System (PPGIS). PPGIS is a field in the science of Geographic Information Systems (GIS) that aims to increase public engagement through the utilization of geospatial technologies in the public (Kemp, 2007). PPGIS is a method that eliminates the gap between experts with technical knowledge and citizens with local knowledge, working as a linking part of open dialogue, mutual learning, and co-creation (Brown & Kyttä, 2014). Using those systems, the needs and the experiences of the public can be translated into spatial local knowledge that will help to confront the increased challenges of urban planning and decision-making.

While digital public participation using such platforms, has many opportunities, it is worth noticing that there are also many challenges while using them, along with criticism. With regards to participants, the size of the targeted audience, as well as the sampling methods used to engage them, compose critical aspects of the quantity and quality of engagement (Brown & Kyttä, 2014). In addition, bias related to participants' selection, as well as the level of accuracy and precision of the obtained data can impose important issues. Furthermore, the willingness of people to participate in this way can be influenced importantly by time, effort, and the level of applicability of their suggestions (Brown, 2012).

Falco and Kleinhans (2018) identified the digital divide as one important challenge when using such platforms. Next to that, the need to train people for using those platforms and adapting to new technologies, due to digital illiteracy is an important limitation that needs to be taken into consideration, along with the required costs for this new technology, the training, relevant infrastructure and data storage (Falco & Kleinhans, 2018).

Moreover, the context of each case at hand, in terms of the socio-political environment and the involved stakeholders, is an important issue that could pose serious challenges to (Brown, Reed, & Raymond, 2020). Lastly, it is important to highlight those technological tools and methods that developed to foster digital public participation should not be considered as the ultimate goal per se, but rather a means

to achieve it (Brown & Kyttä, 2014). Figure 6 below presents an overview of the aforementioned challenges related to the use of DPPs in public participation.

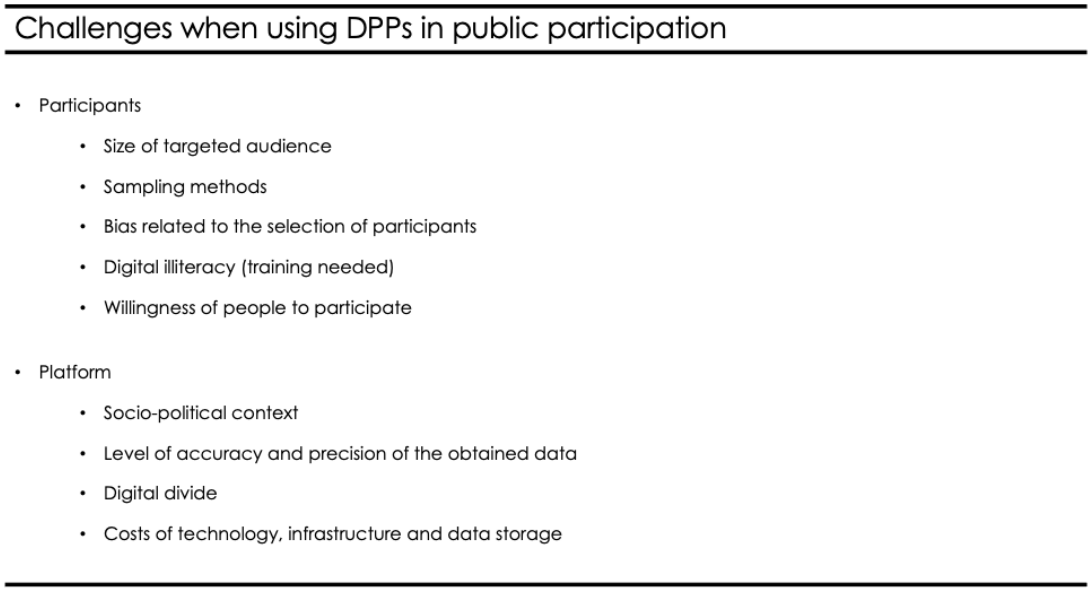

Figure 6: Challenges when using DPPs for digital public participation.

3.4. Important components of DPPs

Prior to initiating the data collection of this research, it was critical to explore scientific literature regarding important components/elements that should be taken into consideration when designing a public participation platform. It is important to mention that presenting such components/elements in this section does not indicate that these are the only ones existing in the scientific literature. However, these acted as the starting point for the data collection that followed, so as to identify through it more of those components and elements.

Next to that, it is worth noticing that the components presented in this section can act at the same time also as influential factors for citizen engagement (as presented in the next section 3.5), which is related to the process of public participation in general and not the platform as a tool per se. However, it was chosen to present the findings separately, considering those components/elements as more tangible and design related.

In the context of this research, components/elements of a digital public participation platform, it is meant the design of it, for example, technological features, characteristics, intended type of engagement, and user experience. Those components, shape the overall design of a platform and constitute a fundamental factor for its overall success in increasing citizen participation (Thiel, 2016).

Social media can be considered a means to attract a broader audience to urban planning and decision-making processes (Williamson & Ruming, 2020). Nowadays, social media are broadly used in various aspects of people's lives, being centre stage for many scholars and disciplines (Wyatt, Bier, Harris, & van Heur, 2013). Steinmetz et al (2021), referring to MacAfee (2007), defined social media as "online platforms that integrate features enabling users to produce content and publish it for public viewing allowing multi-directional dialogues…" (p. 87).

Using social media, channels for massive information exchange can be created. In planning, this can be proved particularly beneficial, since it can enhance people's interaction and common visioning for the future of the urban space and the overall urban development (Williamson & Ruming, 2020). Next to that, with the use of social media citizens can engage in all the phases/stages of a planning or decision-making process. Therefore, besides information exchange, mass collaboration and (co)production can also be achieved (Linders, 2012). However, it is important to notice that the use of social media comes also with some challenges that need to be taken into consideration. When aiming for inclusive participation, the possibility of having population groups that may not equally have access to social media (or any), or to the internet in general, is a reality that planners and facilitators should consider (Steinmetz et al., 2021). For Steinmetz et al (2021), the embedded "noise", as they call it, in social media can be a considerable challenge, since publishing photos of daily activities that in any other circumstances would seem "mundane…are often glorified and often celebritised" (p. 88).

Gamification is another component/element that can be used in the design of a participation platform. Thiel (2016) defined gamification as "the use of game aspects in non-game contexts" aiming to "enhance services by creating gameful experiences" (p. 229). In urban planning, gaming has gained particular attention in scientific literature since it can enable a playful context for exploring and shaping the urban environment. Using games when designing a participation platform can enable users to interact with the game environment and experiment with the alternative modelling and cyberspace realities (Poplin, 2014).

Poplin added on that, highlighting that in planning and governance, games can significantly help, since citizens can explore and analyze "very concrete and specific problems", having the chance to "investigate variables in very complex settings and situations (Poplin, 2014, p. 5). For Ritterfeld, Cody and Vorderer (2009) games can help people learn and delve more into this urban complexity, enhancing their enjoyment of using such a playful environment. The authors underlined that gaming can be also a motivating factor for people to engage with a planning process, as well as enhance responsiveness since the gamified environment allows the provision of instant feedback to the platform user (Ritterfeld et al., 2009).

The use of maps in digital participatory platforms can also boost citizen engagement and collaborative decision-making for urban planning-related issues, as it can integrate citizen knowledge, needs, values, preferences, and past experiences (Rall, Hansen, & Pauleit, 2019). The use of digital maps, compared to hard copy, provides infinitive flexibility in terms of the ways a map can be displayed, while has added value to various stages of a decision-making process, including the increase of the users' understanding of technology, the increase of the transparency and objectivity of complex decisions, broader ideas generation and better conflict management (Gordon et al., 2011; Sieber, 2006).

Similarly, to social media, though, the use of maps in digital participation platforms comes also with challenges that need to be taken into account. These include the fact that produced maps and visualizations can lead to "undue authority and persuasiveness" to policy decisions-"so much that an untrained public may lack the aptitude or tools to question or contest these GIS-backed proposals effectively"

(Gordon et al., 2011, p. 510). It is important to mention, that designing a DPP in such a way that is easy to use for the user, using visuals and formats that are easy to be grasped by the users, can help overcome such challenges, increasing users' engagement in a planning or design process (Gün, Demir, & Pak, 2019).

A three-dimensional model (3D) is another important component of a DPP. According to Hanzl (Hanzl, 2007), this is the "most effective form of presentation of planning decisions" (2007, p. 291). Lock et al (2020) added on that, underlining that using 3D models and environments is an effective way, in terms of costs, for communicating urban data in a real-life-like setting, rendering them more realistic.

Designing a digital participation platform as an open-source tool is fundamentally important. Over the last decades, particularly after the last decade of significant development, open source tools provide a vigorous alternative to proprietary software in the planning (Yap, Janssen, & Biljecki, 2022). Referring to Barn's "Platform Urbanism" (2020), Batty (2021) highlights that designing open source digital platforms provides the possibility of using, producing and sharing data, resources and ideas "across much wider markets and urban spaces than at any time hitherto" (p. 596).

Next to that, developing a fun-to-use platform is also very important, referring to the enjoyment that engagement in such a platform can bring to its users. In digital communication, enjoyment is referring to the "positive response of individuals towards media technologies and content" and is also often cited as pleasure (Poplin, 2014, p. 5), while it is worth mentioning that it is considered a critical factor of success in digital participation (Panopoulou, Tambouris, & Tarabanis, 2014).

3.5. Factors influencing citizen engagement in DPPs

As mentioned in the previous section, besides the elements and characteristics of a digital participation platform's design, that may influence citizen engagement, there are also other aspects that can influence public participation in general, process-wise. This section presents an overview of such aspects and factors reported in scientific literature. Again, this tracing of characteristics and influential factors at this stage constituted the basis of the data collection that followed which provided a broader and more informed overview of them.

To begin with, there are various factors that can influence citizen engagement in digital participation platforms. This influence can be both positive and negative since there are factors that can act as motivations for citizens/groups to use such a platform, but also discouraging factors that need to be taken into consideration. Regarding the motivating factors, these are related to different perspectives of digital participation. Citizens, when participating in decision-making and problem-solving for urban public issues, need to be highly motivated and committed to the process, so as to maximize its end results (Hutter, Füller, & Koch, 2011).

Enjoyment and fun, besides being important elements of a DPP's design, also constitute important factors that influence people's motivation to participate. Getting virtually engaged in such a platform for co-creation can be considered more fun and enjoyable, and, thus, "perceive it as rewarding instead of pure effort" (Hutter et al., 2011, p. 3). Hutter et all (2011) delved more into this rewarding factor, focusing on intrinsic motivations that can be perceived by the users as rewarding, namely political interest, knowledge sharing, or idealism. Monetary rewards, however, such as prizes

and compensations, are equally important for the users, since their need for such rewards seems to be equivalent to their effort and time spent engaging in a co-creation process (von Hippel, 2007).

People's individual need for "dealing with his or her environment" is also considered as motivating factor (intrinsically) for people to get engaged, along with satisfaction and curiosity (amongst others) (Deci & Ryan, 2013; Hutter et al., 2011, p. 4). Next to those, other personal values and self-driven motivations have been reported as important for the users, including personal development and reputation (Hutter et al., 2011).

Moreover, seeking information can also be seen as a fundamental motivating factor. According to Galegher, Sproull and Kiesler (1998), studies have shown that relevance is very important; by relevance it is meant the information that an individual perceives as relevant to themselves, in terms of context, environment, or problems. Lastly, it is important to mention that the information that is shared on such platforms, is not only important for people to get engaged with them, but also important for planning decisions in general. The sharing and integration of knowledge from different angles - experts and citizens- can result in the development of a common knowledge base that can possible render planning decisions "more effective and socially acceptable" (Pfeffer, Baud, Denis, Scott, & Sydenstricker-Neto, 2013, p. 261).

As cited earlier, along with the motivating factors that influence citizen engagement, there are also discoursing ones. As such, Ianniello et al (2019) identified the lack of available information and the quality of the collaboration that can be achieved with digital participation. Next to that, the authors highlight that misbalanced dynamics of the involved stakeholder groups can potentially hinder citizen engagement. The lack of trust in the institutions (government) in decision-making processes renders another reason why citizens do not engage (Iorio & Kumagai, 2020). This lack can consequently lead to limited accountability and performance of such processes since trust and citizen engagement are "mutually reinforcing" (Iorio & Kumagai, 2020; Putnam, 2000, p. 137).

Focusing on youth, Pietilä, Varsaluoma and Väänänen (2019) identified various limitations in engaging in digital environments for decision-making. According to the authors, low-quality communication between youth and the facilitators is one important limitation, along with the limited (or absent) interest in engaging. Next to that, they highlighted that their perception that their contribution will not be taken into consideration, and thus, may have a limited impact on the whole process, is another important discouraging factor, that is aligned with Iorio and Kumagai's (Iorio & Kumagai, 2020) aforementioned lack of trust in the institutions.

4. Research approach and methodology

The developed theoretical framework constitutes the core of the research, directing its later stages of data collection and analysis. Data collection was conducted using multiple methods, ensuring the research's intertextuality and sources' multiplicity, while data analysis was conducted inductively, so as to identify all the emerging patterns and their interrelations. In addition, conclusions were drawn based on the results of the data analysis and their synthesis, providing eventually answers to the initial research questions.

4.1. Research approach

Due to the nature of the research and its aim of proposing a design for a digital platform, a design science research approach was chosen. The reason behind this choice is the intention to create an innovative product/artefact by addressing the research through the creation and evaluation of the artefact (conceptual design of the platform). Design science research, as a discipline, is oriented to the creation of successful artefacts (Peffers, Tuunanen, Rothenberger, & Chatterjee, 2008), seeking to "create innovations that define the ideas, practices, technical capabilities, and products" (Hevner et al., 2004, p. 76).

Three design science research cycles are required in order to produce an artefact: relevance, rigor and design cycle (Hevner, 2007) (see Figure 7). The first cycle links the environment with the activities of design science. The Rigor cycle establishes a connection between the design science activities and the existing knowledge. The last cycle is centered on the iteration of the building design, artefacts and processes and their continuous evaluation. Overall, there are two processes included in the design cycle (building, evaluation), and four types of design artefacts (constructs, models, methods, instantiations) (Hevner et al., 2004; Peffers et al., 2008). For this research, a model was chosen as the most suitable design artefact. Models depict the relationship between problems and possible solutions, aiming to provide a better understanding of them in real-life settings (Hevner, 2007).

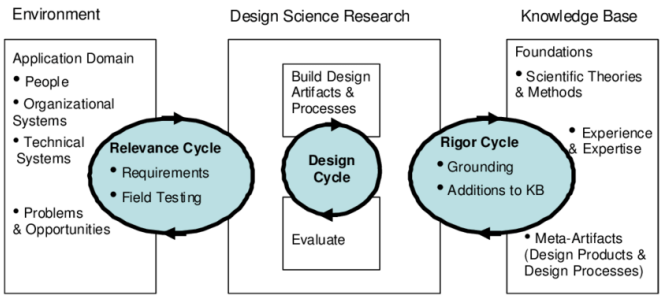

Figure 7: Design Science Research Cycles. Source: (Hevner, 2007)

The Design Science Research Cycles were adapted accordingly for this research. The context of the study was thoroughly examined in order to fulfil the relevance cycle. Consequently, the environment was outlined, including citizens (end users), institutions, organizations, government structures and technologies. For the rigor cycle, a literature review on existing theories, methods, frameworks, and models related to public participation and digital platforms was conducted. As for the design cycle, artefact building was transmuted in the proposed platform design, while for the evaluation the results derived from the data collection were used to assess and refine the platform

design. The figure 8 below illustrates the design science research adopted in the context of this study.

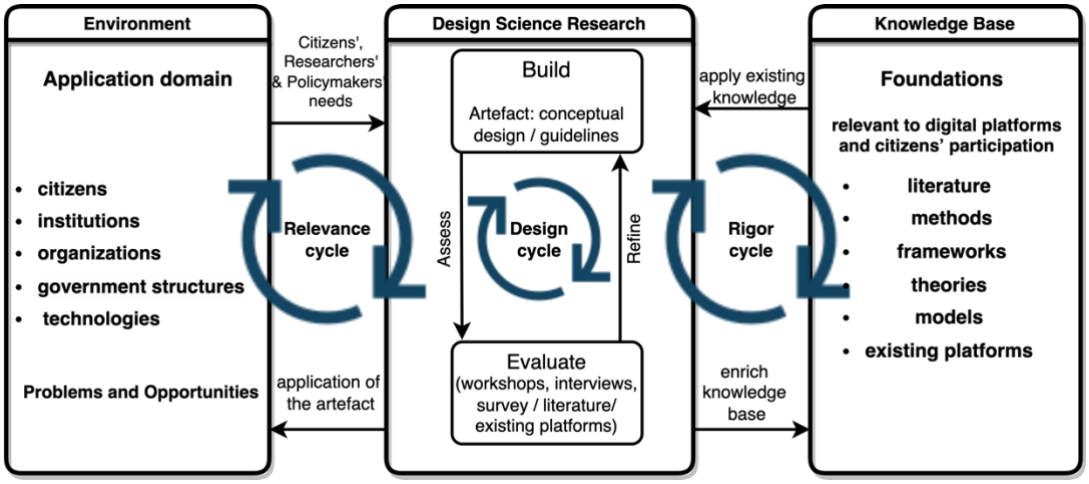

Figure 8: Design Science Research Cycles of the study.

4.2. Research methodology

In figure 9 below, an overview of the research approach and methodology that were used is presented. Conducting a literature review so as to identify the knowledge gap was the initial step taken. Then, the core objectives of this study were established, and the main research question was formulated, being divided into three sub-research questions. Next, the theoretical background was developed in order to define the core concepts related to this research, providing its context and establishing the knowledge base.

Three different data collection methods were then conducted, namely workshops, semi-structured interviews, and questionnaires. These methods targeted to different types of respondents - policymakers, researchers, and citizens respectively- in order to fulfil the relevance cycle of design science research. The input of these methods was combined and analyzed, focusing on the proposed conceptual design of the tool and the process of public participation overall.

Five core themes were derived from the analysis, namely technological features, requirements, characteristics, de(motivational) factors and general findings. The first two themes constitute the conceptual design of the platform while the last two the guidelines related to the process of public participation. The core theme characteristic was applied in both objectives. In order to fulfil the rigor cycle of the design science research, a validation using similar platforms for public participation, as well as input from scientific literature was used. Lastly, after the refinement of the results, the final design was proposed, intending to achieve the objectives of this thesis project.

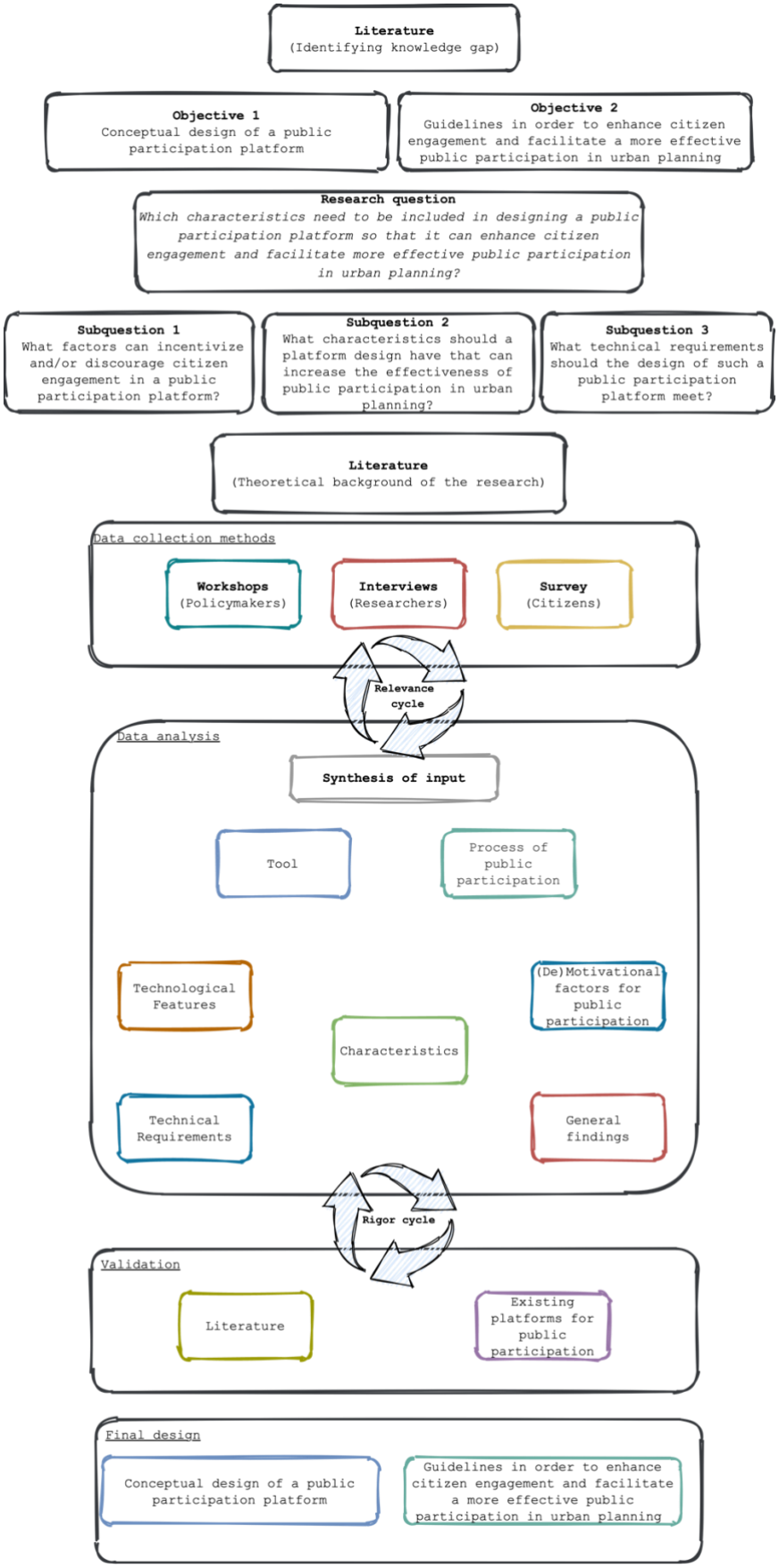

Figure 9: Overview of the research approach and methodology

4.3. Data Collection

The data collection process of this research included semi-structured interviews, workshops, and questionnaires. The questions and objectives of each method were continuously evolving and interacting with each other. Next to that, they have adapted accordingly, based on the context (type of data collection method and the target group (interviewee, questionnaire respondent or workshop participant) at hand, following an evolutionary process.

Furthermore, the fact that the selected methods were conducted at different -and sometimes parallel- times, also influenced the way the questions were posed, as well as the researcher's point of view. More specifically, literature findings were used in order to prepare the questions that were posed in the first workshop (see Theoretical Background). Next, the results from the first workshop in combination with literature were used in order to develop the interview guide. Following the same process, the results from each of the next interviews and workshops were used to develop the questions for the questionnaire. In the figure 10 below, the co-occurrence of data collection methods is presented.

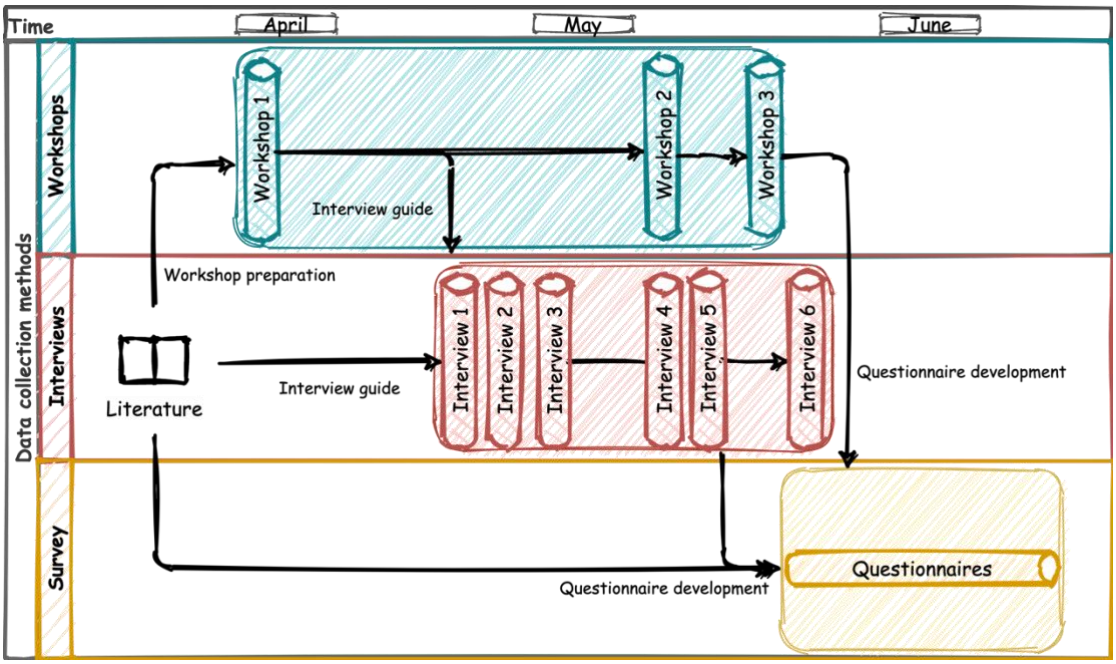

Figure 10:Co-occurrence of data collection methods

In general, the literature review was executed simultaneously with the data collection methods and continuously supported and shaped them. Lastly, It is important to mention that the core aim of the data collection, remained intact, in order to fulfil its aim of providing answers to the main research questions of the study.

4.3.1. Workshops

The results of scheduled workshops were used as primary data for this research. Workshops, as a research methodology, are centered around a topic/sector at stake,

for which valid and reliable data are intended to be obtained, promoting "genuine participation" (Ørngreen & Levinsen, 2017). Within the overall context of the SPRING and Citizen Voice projects, a series of workshops were held in collaboration with external partners. The aim of those workshops was the data collection and exchange of knowledge with regard to the identification of general characteristics, technical requirements and features required in designing a public participation platform. Furthermore, factors that can incentivize and or discourage citizens' engagement, existing challenges in public participation and current tools were discussed.

In total, three workshops were organized, over the course of 8 weeks, either online or in a physical setting (see Table 2 for more information). All the workshops targeted experts' input. The experts of the first and second workshops were mainly policymakers, more specifically strategy policymakers, district managers, corporate strategists, and data experts. The third workshop was mainly targeted at researchers, practitioners, academics, and policymakers, who have been in the process of designing the pilots of the SPRING project.

Table 2: Overview of conducted workshops

	Date	Organizers	Participants (sectors represented)
Workshop 1	29-03-2022	Veld Academie in collaboration with Citizen Voice project	Policymakers: strategy policymakers; district managers; corporate strategists; data experts
Workshop 2	10-05-2022		
Workshop 3	20-05-2022	SPRING project	Researchers; practitioners; academics; policy makers

It is worth mentioning that those workshops were not specifically organized for this research, and the core discussion was not specific to its objectives. However, they were centered around the Citizen Voice project's objectives and other similar tools for public participation. Therefore, due to their high relevance to this research's aims, the results of those workshops were chosen to be observed and documented in "personal thick notes", and further analyzed (Ørngreen & Levinsen, 2017), together with the materials shared by among the participants during workshops. The thick notes documented during the workshops included also literal quotes of the participants, that were later used for the analysis of the obtained data and the presentation of the analysis results. The first workshop provided useful input with regards to sub-research questions, while the results of the second and third workshops, served also as validation for the (so far) obtained data since they were conducted and (some of them) in parallel with some of the semi-structured interviews.

It is worth noticing that aggregated results will be provided from the three workshops to assure topic relevance as well as to safeguard the data exchange between collaborators. Since conducting expert workshops entails using the personal information of the participants, the human research ethics application in Appendix A was conducted to identify and eliminate any potential ethical concerns and risks.

4.3.2. Interviews

Semi-structured interviews were also chosen to be conducted, in order to build on a definition of effectiveness for urban governance, as well as for identifying enabling and discouraging factors of citizens' engagement in public participation. In order to gain a holistic perspective on those two topics, the interviews were chosen to be conducted with experts and actors related to them. Potential interviewees were identified, in order to be approached for an interview. Those were:

- Researchers (with a background in citizen participation)
- Academics (in the domains of urban planning, public participation, digital platforms related to public participation, decision-making, governance, GIS, participatory GIS, and public participation tools)
- Urban Planners
- ICT scientists and specialists
- Governmental officers
- Institutional actors

In order to maximize the relevance of the obtained data and information, the potential interviewees were chosen to be approached based on their roles, expertise and knowledge of the researched topic via a purposeful sampling (Kumar, 2014). The interview invitations were sent via email. In total, 21 invitations were sent to representatives from all the sectors mentioned above. Table 3 below presents an overview of the conducted interviews and the interviewees.

Table 3: Overview of the conducted interviews of the research.

Position of the interviewee	Field of expertise of the interviewee	Date of the interview	Duration of the interview
Researcher/urban planner (R/UP)	Urban data science	02-05-2022	00:39:46
Doctoral Researcher (DR)	Urban planning and climate resilience	03-05-2022	00:44:42
Senior Researcher (SR1)	Participatory design and place-making	06-05-2022	00:39:03
Postdoc Researcher (PR)	Urban resilience	11-05-2022	00:37:18
Senior Researcher (SR2)	Urban planning	12-05-2022	00:41:14
Assistant Professor (AP)	Systems engineering and Geographic Information Technologies	25-05-2022	00:37:10

For the interviews, an interview guide was developed, including three main themes, namely: the importance of public participation in urban governance, the definition of effective public participation and digital platforms for public participation. The interview guide was a living document throughout the period of conducting the interviews. The questions and/or the focus of the interview were slightly (re)directed based on the interviewee's profile, in order to adjust them on the interviewee's background, position, and expertise and consequently maximize the relevance of the obtained information. It is worth noticing, though, that besides those adjustments, the

core of the interview was not changed, in order not to affect the overall aim of the interviews.

All the interviews were conducted online, based on the preference and/or availability of the interviewee. The online interviews were conducted in English via Microsoft Teams, and the meetings' transcription was automatically generated after the call after all interviewees gave their consent. All the derived data from the interviews were anonymously managed for the follow-up data analysis of the research (see chapter 5. Results)

4.3.3. Survey

An equally important data collection method that was used, was the distribution of questionnaires to citizens (potential end-users of a public participation platform). Assessing the respondent population and the way that the respondents might prefer to participate in the research, an online survey was developed (Kumar, 2014). For that purpose, the online software Qualtrics was used, and the survey was developed (in English) and further analyzed with this software.

The core themes that the survey touched upon were kept the same as the other two data collection methods (semi-structured interviews and workshops). However, the questions were adapted in a way that was clear and easy to understand for the respondents, using simple terms with no technical terminology. Next to that, the questions had a sequence that is easy to follow, while available features of the Qualtrics software were used, in order to make the questionnaire easily readable and attractive for the respondents (Kumar, 2014). Single- and multiple-choice questions were included in the questionnaire, as well as open questions that required short answers from the respondents. The intention was to keep the survey short, with an average 6 min respond time. It is important to highlight that for the single- and multiple-choice questions, the input derived from the interviews and the workshops shaped the given answers among which the participants were asked to choose.

With regards to the type and geographical distribution of the study population, these were intended to be great in scope, with no specific restrictions. This choice aimed at obtaining data from respondents of different ages, backgrounds, incomes, or places of residence, and, therefore, enhancing the inclusiveness of the research.

The questionnaires were distributed in various ways, including the distribution of a link via email to potential respondents, and a QR code that was published and promoted on the researcher's social media network. Considering the inclusiveness that was intended to be ensured with this data collection method, the questionnaires were also chosen to be distributed offline, targeting underrepresented groups of the respondent population. These groups included older people with limited or no access to smartphones and social media, and people willing to participate with language barriers.

The collection of questionnaire responses was open for 4 weeks in total, and, overall, 261 questionnaires were collected. The analysis of the results, along with the outline of the respondents' profiles will follow in the next chapter of the research results (see chapter 5. Results).

4.4. Data Analysis

Data analysis in qualitative research constitutes an iterative and systemic process. As such, it requires continuous data (re)examination, as well as good and trusted techniques for the organization, management, and analysis of the obtained data (Silverman, 2015). The obtained data of this research were inductively analyzed, and, thus, patterns and interrelations emerged among the findings. Based on those, the findings were grouped in a way that led to the development of overall conclusions and consequently the provision of answers to the research questions of the study.

After the completion of every interview, the transcription was automatically generated by Microsoft Teams. The transcribed text was afterwards carefully checked for potential inconsistencies, in order to secure the maximum level of a literal transcription. Any interruptions during the interviews (e.g., interviewee talking to a third person, or internet connection issues of both sides causing pauses in the discussion) were kept in the generated transcription text but were purposefully not analyzed further.

The analysis of the transcribed interviews was conducted using the online software ATLAS.ti. The software used, supported the systematic and organized analysis of data, using codes. Two types of codes were used for the data analysis in this research: focus and open coding (Silverman, 2015). The focus codes used were based on the research question of the study, namely the core topics that were covered in the interviews. All the results obtained from the open coding, namely the codes that were not predefined and occurred from the input and statements of the interviewees, were then clustered into the focused codes (themes).

The same focused codes were used for the analysis of the data derived from the workshops, so as to allow for further comparison and synthesis of the derived results. With regards to the analysis of the data obtained from the questionnaires, these were analyzed in two stages, using mixed research methods (quantitative and qualitative). First, the data were summarized and aggregated using the Qualtrics software.

These processes of summarization and aggregation of the data helped identify the patterns in the data, using statistics (aggregations of frequency distribution and cross-tabulation technique). The emerged results from the statistical analysis were then qualitatively analyzed based on the focused codes used for the analysis of the interviews and the workshops. The way the data from all the methods were analyzed is presented in more depth in the following chapter.

Figure 11 below presents an overview of the way the obtained data were processed and analyzed. The input obtained from the workshops and semi-structured interviews was transcribed and initially analyzed, leading to the creation of 251 quotations in total. These quotations were then translated into 59 different codes, which after refinement (merging, for instance, two similar codes or deleting overlapping ones) were reduced to 45 codes.

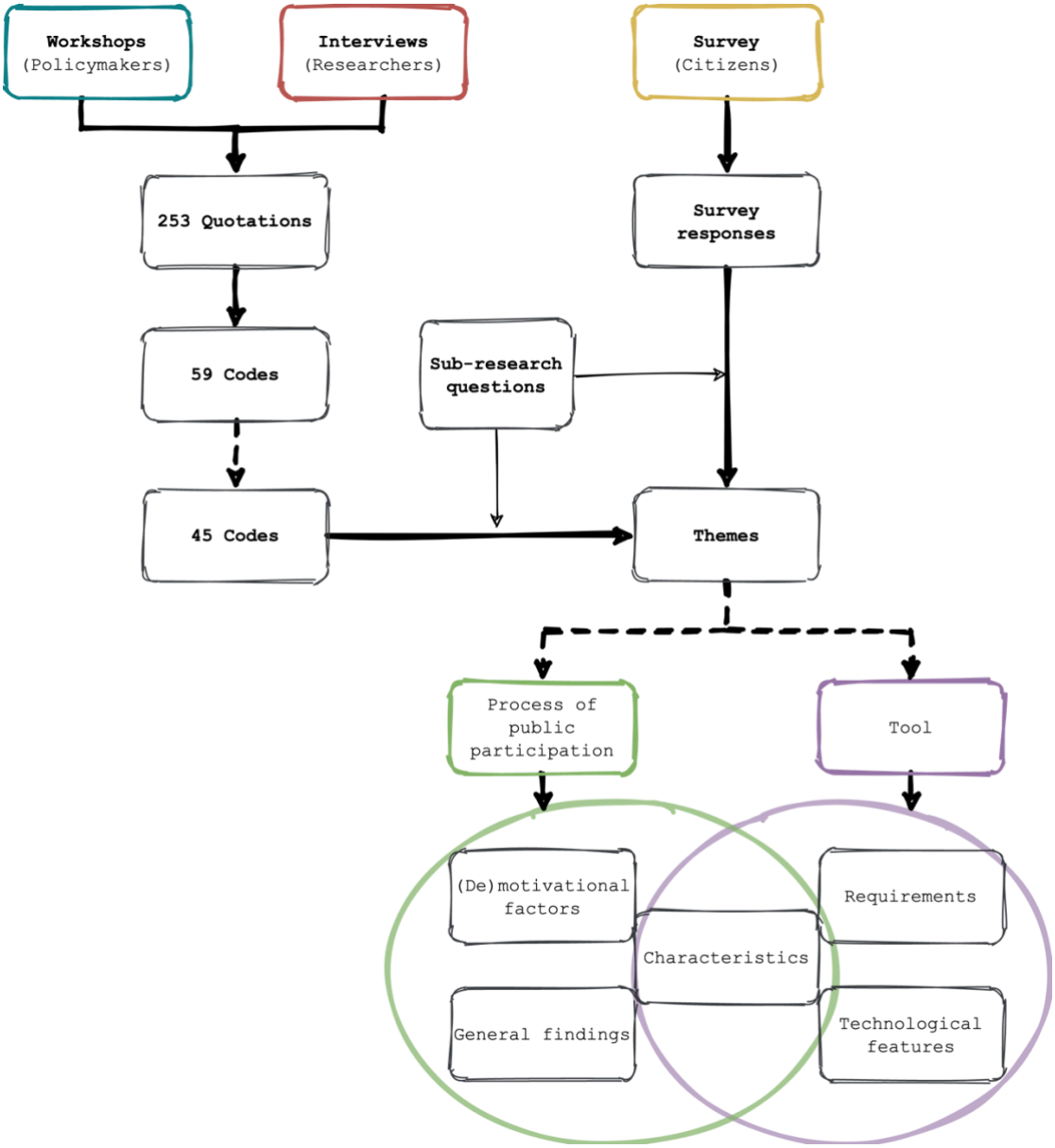

Figure 11:Overview of the way the obtained data were processed and analyzed.

As already mentioned, the sub-research questions were used in order to define the core themes for the codes' categorization. The five main themes of the analysis were combined as shown in figure 11, aiming to explore both the tool itself and the process of pubic participation overall, and consequently fulfilling the objectives of the research. Lastly, the results from the questionnaires were managed and analyzed in a different way as they were easier to manage (mainly closed-ended questions).

5. Results

This chapter presents the overall analysis of the data obtained from the used data collection methods. The results are presented in three sections; one per data collection method, following the sequence according to which they were used (workshops, interviews, survey). Each of the sections is structured based on five main themes, namely the focused codes that were used for the analysis. These are:

- General findings
- (De) Motivational factors for public participation
- Characteristics
- Technical Requirements
- Technological Features

The first two themes are related to the process of public participation while technical requirements and technological features are related to the conceptual design of the platform. The theme of characteristics is related to both tool itself and the process of public participation. For each of the core themes, the related open codes were analyzed. It is worth noticing that for the interviews' results, within each theme, some open codes were divided in clusters (sub-themes) and analyzed as such, due to their relevance and in order to provide more holistic results. Each sub-theme has as a heading the name of the open code that emerged. The same stands for the clusters (the combined open codes), for which the headings include the exact name of the combined open codes, being separated with a slash (e.g., open code 1/open code 2).

Lastly, the quotations included in the results are named based on the type of data collection method. More specifically, quotations obtained from a workshop participant are named as Participant, from an interview Interviewee and from a questionnaire Respondent. For the workshops and interviews, in particular, the quotation's source is also followed by a sequence number, which is related to the date of the date the workshop/interview was conducted (e.g., Participant 3: participant from the 3rd workshop, Interviewee 2: Interviewee of the second interview).

5.1. Workshops

The derived open codes from the workshops were classified into the five main themes, as used also for the analysis of the interviews. The analysis of the results of the workshops is presented per core theme below.

5.1.1. General findings

The fact that people have different ideas, priorities, needs, and desires was highlighted by most of the workshop's participants as a critical challenge with regard to public participation. This challenge imposes the need to understand all these various perspectives, in order to be able to align policies and tools. Furthermore, it is important to understand why citizens want to participate, where they want to participate and in what way. Another aspect that was underlined by the workshops' participants is the need for enhanced collaborations between citizens and other urban stakeholders that can enrich the process of public participation with qualitative data of local knowledge. The strengths and the weaknesses of each neighbourhood from the local citizens' perspective can be very useful in the discussion, evaluation and co-creation of new tools and policies.

Citizens' views and perspectives were reported also by the workshop participants as a factor that can influence the effectiveness of public participation. Understanding the existing situation and citizens' views on that can improve the effectiveness of the process of public participation. In relation to that, it is essential to give emphasis to the way this input is taken from people. As a participant from workshop 3 highlighted: "If it is just a survey, people will skip it. It is about the whole experience. It is important to find the right questions and the way that will help to get fruitful answers."

The importance of experiencing a community feeling when using a public participation platform was also underlined by many participants of the workshops. The strengthening of the social networks, the provision of mutual connections and support structures in the neighbourhood, as well as encouraging residents' initiatives were accentuated as ways to empower the community. As highlighted, a strong community needs to be a long-term goal that comes step by step.

5.1.2. (De) Motivational factors for public participation

Based on prior experience and knowledge of the workshops' participants, the difficulties of citizens using such platforms, as well as discouraging factors for their use were also underlined. For the former, it was mentioned that there have been several cases when citizens face difficulties translating what they want to say, or they do not have the required technical knowledge to properly express their opinions and give their input. In addition to that, people often do not feel that there is a problem they should report, even though the existing situation is problematic; "Sometimes people do not want to change the existing situation. They feel ok with the problems, or they want to emphasize in other things" (Participant, workshop 2).

In terms of the discouraging factors for the citizens' engagement in such platforms, those that were reported by the workshops' participants were barriers related to technology, language, time, communication as well as topic relevance and their concerns related to their contributions' acceptance and use. Moreover, mistrust in the institutions was also highlighted as an important discouraging factor: "Many people talk about involving citizens in policymaking. Citizens are angry with the local municipalities. We need to find an effective way to collaborate with citizens and work together and build mutual trust" (Participant, workshop 2).

5.1.3. Characteristics

With regards to characteristics that a platform should have, the importance of encouraging the dialogue between urban stakeholders in order to achieve a deep connection, as well as to build a knowledge base was highlighted by many of the workshops' participants. In addition, the value of using clear communication among stakeholders was identified. Lastly, contextuality was also pointed out as an important characteristic of a public participation platform since the engagement of stakeholders in such platforms is highly dependent on the context. As a participant of workshop 2 underlined:

> "The selection of people depends on what you want (e.g., Elderly people do not use map features due to privacy concerns). The municipality is interesting to see how people reflect. We want to give people more say in their neighbourhoods. Build a link between citizens and policymakers."

Effective communication and the tone of discussion among the engaged urban stakeholders in a public participation platform have also emerged as important characteristics of the workshops. The language used in such a platform, along with the way it is used can significantly influence people's interactions. As a workshop 2 participant emphasized: "Be aware of the feeling of people when they know that their neighbourhood has problems. There is a need to specify the problem, but people get stigmatized if you do not use the right words".

Moreover, regarding the process of public participation, it was underscored that it is crucial to be transparent and have a moderator. The moderator of the process should clarify urban stakeholders' positions and responsibilities, depict the expected outcomes of the process as well as assure the efficiency of an open and clear relationship among stakeholders.

Additional findings that were revealed regarding the characteristics of the platform were related to the inclusive way of participation, and the importance of understanding the audience and context. More specifically, different users need different ways to incentivize them, in order to participate in the platform. "Depending on the use case, participation has limitations. Depends on what we want to take as a result, from whom we want to take it, and in which context." (Participant, workshop 3). To secure an inclusive way of participation there is a need to create a "toolbox" of participation that can be adaptable to the aforementioned conditions.

The last two outcomes about the characteristics of the platform were related to data. To begin with, the necessity for unifying quantitative and qualitative data was highlighted. A participant from workshop 1 stated that "It is interesting to understand the view of people. We want this subjective information about their neighbourhood, real stories, and history", while a participant from workshop 2 supported this issue as "The combination of qualitative data with data from municipalities, CBS, surveys, and other collaborations could help to improve the tools". Lastly, the frequency of data updates was discussed and revealed that data updates can be proved useful, but this is quite dependent on the type of data: "There is no need to regularly check some data. There is a trade-off between impact and effort in order to decide on the update of data" (Participant, workshop 2).

5.1.4. Technical Requirements

Concerning the technical requirement that the design of the platform should have, the requirement of easy-to-use and user-friendliness was mentioned by most of the workshop participants. In relation to that, the intuitive design was discussed, as it is crucial for securing inclusiveness. Furthermore, the attractive and visually interesting content, as well as the fun-to-use (enjoyable) requirement, were revealed as they can improve engagement to the platform.

Other requirements that were indicated are privacy and security. It was suggested by many participants that need to be clear about privacy and security concerns. The data for users could be open, but at the same time, they need to be secure. Trust, in terms of validation between stakeholders, also occurred as an important design requirement for the platform. The need for users to know that all users and collaborators of the platform can trust each other is key to their willingness to cooperate with each other.

As a final point, the requirement for modular and adaptive design was underscored once again in order to create a flexible tool that can adjust its design based on the environment that will be applied.

5.1.5. Technological Features

In relation to the platform's features, the input obtained from the workshops was not quite extensive, as the discussion was not steered in this direction (especially in workshops 1 and 2). Nevertheless, since the interviews were conducted in parallel, and potential features of the platform were already noted, workshop 3 participants were asked for additional feature suggestions.

Gamification and map features were accentuated as such, as they can improve the understanding of the context, influence the knowledge exchange across stakeholders and incentivize people to participate. In addition, the feature of the language, in terms of language use was underlined. More specifically, the formal or the informal way of using language, and the terminology that is used can potentially influence the users of the platform and possibly exclude people that they want to use it.

Other features that were mentioned include the use of QR codes for distribution and participation purposes and storytelling methods, as a way to illustrate and communicate in a more plausible way. Furthermore, the feature of rewards was discussed, as a way to incentivize people's engagement. Particularly, the use of rewards was suggested, but only selectively. The specification of what is important for each stakeholder and user of the platform could help to find a win-win situation for all involved parties. Finally, the necessity for modular and adaptable features was underlined. Depending on the context and the users, the features need to be adaptable to acclimatize with each use case.

5.2. Interviews

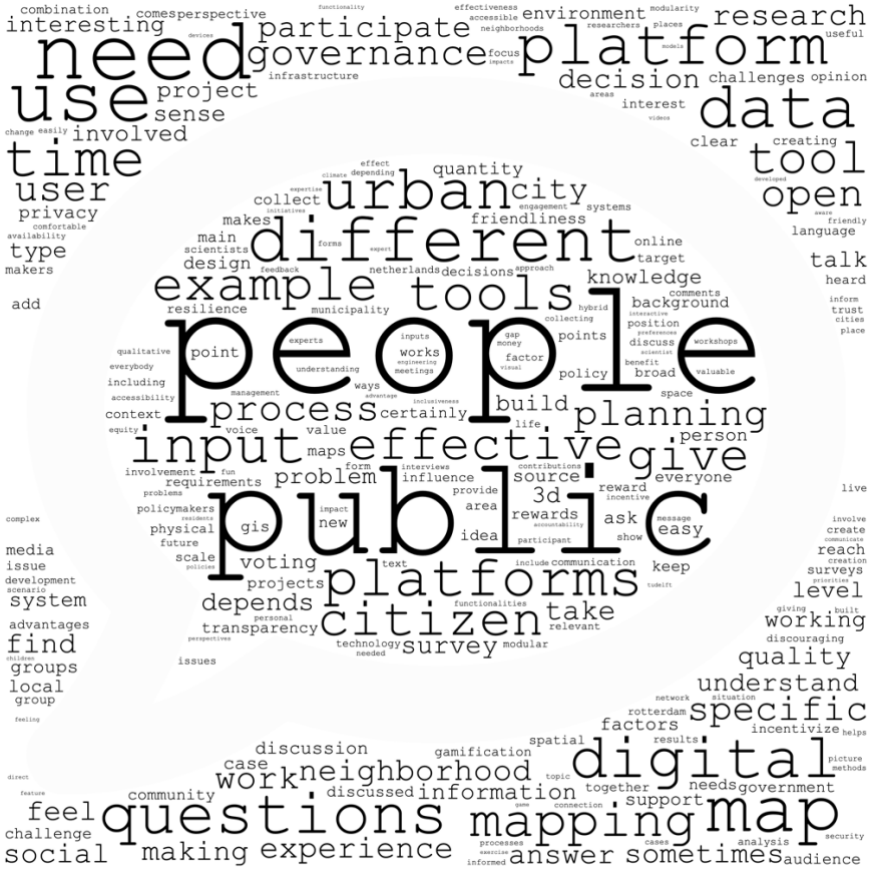

Figure 12: Word cloud with the most used words by interviewees

5.2.1. General findings

Challenges in public participation

The first group of findings is related to existing challenges in public participation. Several interviewees mentioned that the top-down approach to urban governance from governmental bodies entails a real problem. Public participation and top-down governance approach were characterized as contrary terms: "There is a resistance from the desire from policymakers to collect input from citizens and to co-create policies" (Interviewee 4). Another challenge that was underlined is the difficulty and complexity imposed by the inclusion of different perspectives of citizens. As highlighted by Interviewee 3:

> "Different groups, different people and everybody has their own ideas. They have their own conception of what should happen. They usually think about what I want, and they don't maybe think about what's best for everyone. The challenge is how you deal with that and how you make sure that everybody is being included in this process and not the ones that have like the biggest or the loudest voice." (Interviewee 3).

The complexity of the processes and procedures of public participation and the management of the relations among a plethora of involved parties were denoted as fundamental issues: "Public participation and policymaking are complex processes. There are many barriers and challenges on both sides. We certainly need more people skilled in kind of carpenters of these processes." (Interviewee 3). In relation to that, expectation management was identified as an issue:

> "When you do some sort of participatory process, you would need to set the expectations clear so that it's not people don't come in there with expectations that some things would happen. And then in the end they will be even more frustrated than they were before". (Interviewee 1).

Barriers related to public participation, including time, location, and availability were also mentioned as critical issues. Those are analyzed in more detail in the group of findings related to discouraging factors.

Combination of digital tools / In-person participation

Digital tools and traditional methods for public participation were also identified as a group of findings. More specifically, most interviewees highly suggested a hybrid version of participation, including both types. As underlined, public participation tools and methods need to be context-dependent, focused on the audience and serve suitable and tailor-made participation options for everyone:

> "In order to cover a broad spectrum, it's a good idea to include both digital participation tools and offline participation, and then the challenge is also on how to combine these two because you have of course digital divide, you have certain people who are not familiar with digital devices maybe cannot even afford some devices on to participate." (Interviewee 1).

In addition, other issues were also mentioned by the interviewees related to digital tools and physical participation. These included scalability, trust, time, and resources issues as well as the reach, the widespread and the level of participation that can be achieved.

Different people-ideas-priorities-needs-desires

Another group of findings was related to the distinctness of people. As mentioned by many of the interviewees, people have different needs, desires, ideas, and priorities. It is necessary for them to be able to express themselves, in order to secure inclusiveness in public participation.

In addition, expressing their problems from their perspective can enrich the existing quantitative data. There is a need to qualitative understand people as it adds an additional level of data in the current situation: "There are a lot of different groups, different people and everybody has their own ideas. They have their own preferences. They have their own conception of what should happen." (Interviewee 3).

Lastly, the difference between being and feeling included was underlined. As interviewee 3 stated: "…I think that's the challenge that you have all of these different groups and how do you kind of talk to all of them and how do you make sure that everyone is included, and everyone feels included as well." (Interviewee 3).

Effectiveness of public participation

Most interviewees, when asked about the effectiveness of public participation, note that effectiveness, as a term, is quite vague and that there are various indicators for it. Combining digital and analogue participation, merging top-down and bottom-up approaches, and securing everyone's involvement underlined as imperative ways in order to have effective public participation. "Citizens' input needs to be taken in a deep and meaningful way throughout the entire process. So, longevity, long-term engagement of citizens." (Interviewee 4).

Moreover, terms such as sustainability, continuity, transparency, reciprocity, equity and heterogenicity were identified as requirements for the effectiveness of public participation. Last but not least, the difference between the effective outcome and the effective process was underlined. "We need to distinguish between, like the actual outcome of this process, and how effective that outcome was, and then how effective the process was itself." (Interviewee 1).

Quality and quantity of input

Another question that was posed to the interviewees was related to the importance of the quality and quantity of the input people can give to a public participation platform. Most interviewees underlined that input's quality and quantity are equally important. Additionally, many interviewees stated that the two terms in several cases are interrelated and encapsulated in each other: "I think the quality is most important. But for me quality also means quantity. That all perspectives have been included." (Interviewee 3). Another interviewee, focusing more on the importance of the input's quality, mentioned:

> "The most important is to make sure that all participant groups that are affected by this are included in terms of age, gender, and socioeconomic status. So, if those are covered fairly, I think that is the quality that would be most important. If you have a large quantity, but it's only men of a certain age group. That's not participation." (Interviewee 2).

Lastly, as underscored by many interviewees, the discussion on the quality and quantity of people's input is context-dependent; they both depend on the type of project, the tools in use, as well as the knowledge required at the different stages of the planning process.

5.2.2. (De) Motivational factors for public participation

Factors discouraging participation

Factors including digital literacy, time availability, adequate resources and language barriers were highlighted by many interviewees as discouraging for people willing to contribute to platforms for public participation. Next to these, the level of comfort using this type of platform as well as the possibility to get frustrated from technology were also underlined: "Be comfortable with a tool, in order, for example, to mark points on the map it takes time and needs a level of comfort with a computer or an app. I don't think a lot of people would be comfortable with that everywhere." (Interviewee 2).

Additional findings regarding discouraging factors are related to the tone of the discussion; in other words, the way that something is presented to users: "Sometimes it is too complicated. You're showing too many things that they may not want to go through. It must be very clear and reduces their cognitive load." (Interviewee 6).

Furthermore, the unclear communication, as well as the lack of transparency of the process were mentioned as restrains for people's engagement.

Furthermore, the top-down approach of urban governance, political considerations and distrust in the institutions were considered as discouraging factors by many interviewees:

"I think people already have bad experiences with participation because it was done in wrong way. Municipalities just pretended public participation, but they do not really involve people in a complete way." (Interviewee 5).

"A discouraging factor would be who's employing the projects. If it is a political party, for example, that I don't trust. So, credibility of the people who is approaching you." (Interviewee 6).

Lastly, other factors that were mentioned to a lesser extent by the interviewees were the lack of interest, the different priorities that each has and the lack of knowledge base among urban stakeholders.

Factors incentivizing participation

Another group of findings was related to factors that can incentivize citizen engagement in public participation and more specifically to digital platforms for public participation. A key factor that was underlined by many interviewees is the use of rewards. Monetary or not, rewards constitute a way of encouraging people to participate. Rewards can have many forms, including financial compensation, gift, discount code or a certificate. "I think rewards help if you want to have their participation. But rewards also must be carefully used, because you don't want to use the reward as bait to influence or manipulate the opinion of the citizen." (Interviewee 2).

Besides rewards, intrinsic motivations also constitute factors that can incentivize people to engage with a public participation platform, according to the interviewees. People are more willing to get involved if they feel that their opinions have actual influence. As Interviewee 1 stated:

> "I would say that the actual influence is a factor, so that people feel that by contributing, they can change something. Like the feeling of self-efficacy. So that you that you see your contributions realize or having an impact or creating a discussion."

Moreover, having social skills, such as a sense of empathy, solidarity concerns and awareness regarding existing social problems constitute ways of empowerment for public participation. In addition, interviewees mentioned that the personal development of people, as well as selfish motivations, could also act as encouraging factors.

Specifically for digital public participation platforms, interviewees indicated that appealing and simple user interface are significant factors in order to attract more people. Next to that, the languages that the platform uses and the way they are used is crucial for engagement. In relation to these, the whole user experience, and the way that users are addressed constitute other factors of empowering citizens' participation.

Furthermore, the use of social media and the gamification of the platform were underlined as ways to catch the attention of people, however, age and other limitations need to be considered:

> "Gamification features or social media can help these platforms to attract more people. But it depends on the people, for children and younger people, this is easier because that's sort of the media which they grew up with." (Interviewee 1).

The feeling of ownership, relevance, community building and making knowledge accessible were also identified as incentives for engaging in a public participation platform. Problems that people experience in their everyday life and strong social connections between them could act as incentives: "I think we should not only focus on the individual incentives, there's also some kind of solidarity incentives or, community incentives that people have." (Interviewee 5). Lastly, it is worth mentioning that, as reported by one interviewee, the reputation that can be reached when engaging in such a platform could also be considered an incentive for (some) people.

5.2.3. Characteristics

Build knowledge base between stakeholders / Dialogue between stakeholders / Inform well the relevant stakeholders / Contextuality of stakeholders' involvement

The dialogue between stakeholders and the building of a knowledge base were outlined by many interviewees as important characteristics. In relation to these, informing well the relevant stakeholders, and using effective communication channels were identified. As Interviewee 2 highlighted:

> "Sometimes the public doesn't always understand the pros and cons, or scientifically of or the long-term impacts of something like something that inconveniences me on a short term is something that would not support… So, I think participation also is essential to kind of build this knowledge base and inform better the relevant stakeholders."

Lastly, many interviewees underlined that the involvement of stakeholders depends in the context:

> "Depend on like the issue that's at hand, how much you do you like to involve them. For some projects may you need probably participation from very tailored groups because you want to get the input of young people for instance." (Interviewee 1).

Transparency of the process

Transparency, effective communication, the tone of the discussion among the involved stakeholders in a public participation platform, as well as the existence of a moderator managing the process were also underlined as important characteristics of such a platform. The transparency of the process was characterized as a potential factor of engagement, acceptance of policy interventions, and fulfilment of users' needs:

> "Do it right from the very beginning of, like who to address, when to address them, how to address them up until the end, where you have like their data in

some sort of form and what to do with the data and how to transfer that and how to bring the process to an end or how to keep the dialogue engaged." (Interviewee 1).

"All these participation tools have their limitations in terms of how much you can actually say, how much you can really influence the process. But sometimes this is just not really explained properly. So, I think this must be very clear when people join in the platform. Most citizens where totally fine if the municipality makes a different decision than what they want. As long as it is explained. Like why do we do it? And if they come with a good explanation, it's no problem. We are also people. We totally understand that not everything what we want is possible, but usually they don't explain and then it just gets very frustrating. They spent their time without knowing, like, what they can expect." (Interviewee 3).

The tone of the discussion / Effective communication / Moderator of the process

With regards to the effectiveness of communication and the tone of the discussion, many interviewees underlined that having clear communication can increase the users' involvement. Moreover, the efficiency of the whole process can be enhanced, and the user's satisfaction can be improved. As Interviewees 2 and 3 mentioned:

"So, it should be clear what are the rules. And I think this must be communicated clearly up front. So, communication is a key." (Interviewee 3).

"Effective would be something that communicates the message well. So, any method that communicates the message well is well done. That's an effective tool, so number one would be getting the message across." (Interviewee 2).

In relation to these, the tone of the discussion and the need for a moderator of the process were pinpointed by the interviewees. Both were remarked as discouraging factors:

"The whole tone of the debate, I would say so if you're on the platform and you're able to read comments of other people and then you see like sort of, OK, this is not how I want the discussion to be. On the Internet or either in real life, so you like if there are bots or if it's like just certain people who are just way too different… So, if the tone of the discussion is not right, that might also be discouraging." (Interviewee 1).

"I would say moderation is very important and that needs to be done by someone…There needs to be someone, who is like the leader for facilitating the process and making sure that the discussion goes in the right direction." (Interviewee 3).

Inclusive way to participate

Additionally, findings that were revealed with regard to the characteristics of the platform were related to the inclusive way of people's participation. As already mentioned, the design and the features of the platform need to respect users' different skills and capabilities. Moreover, the representation of people needs to be proportional and inclusive:

> "Another challenge is that some groups are very easy to include or very easy to find because they are properly organized. But there are also people that are very difficult to find. While you do want to include them as well, because maybe they are the ones that are never included or that are rarely being heard… Make sure that all the participant groups that are affected by this are included in terms of age, gender, and socioeconomic status…I think inclusiveness comes to my mind immediately. I mean you need to have inclusion, but you also have to check whether people feel included, which can be two different things." (Interviewee 3).

Understand the audience and the context / Toolbox of participation

Another characteristic that was underlined by the interviewees was the understanding of the audience and the context. In relation to the requirement of modular design, the platform needs to be adaptable to various environments. Different people have different needs and ideas. The identification of people participating, as well as the context that the platform will be applied, can be a factor of success: "I think all these groups need a different type of way to participate, A tailor-made way of participation needed. Suitable for them that fits their skills and that fits their time and interest." (Interviewee 3).

In relation to that, the characteristic of toolbox of participation was highlighted by many interviewees. Having a platform that can work as a tool case and depending in the problem that needs to be solved, the appropriate tool can be selected. The modular design and the adaptive features were underscored as ways to secure a design like this:

> "I think there's like this huge toolbox of things that you could do and then you would need to design it in a way that you sort of take people from where they are, give them incentives on why they should participate, what's there, like, benefit of participating and then try to write, send the right format for that. If it has a spatially connection, it truly makes sense to add a map. If it's. If it's like other dimensions, you would probably need to add other things." (Interviewee 3).

As one interviewee described it in one phrase: "Basic survey works as effectively as a sophisticated mapping survey." (Interviewee 2).

5.2.4. Technical Requirements

Attractiveness / Use of visuals / Interesting content / Fun-to-use

A group of findings related to the requirements of the platform is connected attractiveness, use of visuals, interesting content, and fun-to-use (enjoyable). Most interviewees underlined the necessity of the platform design to have appealing visualizations and user interface in general:

> "I think the more visual it becomes, the more you're able to look at things on a map on any sort of like, interface. Even a physical paper if it is printed, I think

becomes more and more interesting…If they can see things happen even in a hypothetical world, they can understand better." (Interviewee 2).

Moreover, the need for attractive and content interesting design was mentioned, as it can encourage people's participation and long-term engagement:

> "Generally, make it attractive. The public likes things that look good and they don't spend their time in like drab and boring things. So, make it visually interesting for them to also be interested in looking at your portal. Then kind of use that as like an attraction factor. Also, make sure it's content is interesting." (Interviewee 5).

Lastly, another interviewee pinpointed the need to have a platform that people can have enjoyment: "So, a tool that really has its own that it's fun to use. And I think that map-based surveys are fun to use compared to a normal survey." (Interviewee 4).

Easy to use- User-friendly / Intuitive

Two more crucial requirements that were underscored by the interviewees are easy-to-use or user-friendly and intuitive design. The majority of the interviewees highlighted the necessity of the easy-to-use requirement, as it constitutes a success factor for the platform:

> "Easy-to-use it is an important requirement for the design. Don't design it and then think of the audience. You need to keep in mind how to design it in order to be easy for people to use it. So that's I think is a golden rule of anything that you want people to use." (Interviewee 2).

In addition to the engagement factor, it was underlined that the lack of user-friendliness could affect the quality of the input: "And then the user-friendliness I think is part of that engaging quality. But if they don't understand how to use it, then that also interferes your data quality." (Interviewee 4).

Moreover, the need for the platform to be easily understandable by people, taking into consideration the digital literacy, disabilities of people and in general the characteristics of the users:

> "The design and the features of the public participatory tools should be easy-to-use and user-friendly. Because not everybody has the same level of digital knowledge and this could be discouraging, even if I want to participate, if I cannot really navigate through the tool is impossible…I would say absolutely user-friendliness and the amount of information that you have on screens at one time is something very important, like not overload people with information and let's say questions or whatever you're asking from them. But like, have it sort of presented hierarchical way." (Interviewee 2).

Open Data for participants / Verification

Another important requirement that was underlined by many interviewees was the open data for the platform's users. People prefer to have access to their contributions and to the general results of the process. Especially citizens prefer a transparent process where they can understand 'who says what'. Next to that, interviewees pinpointed that there is a trade-off between open data and privacy:

> "Then of course also open data like that everyone can see the contributions, so you also need to have some sort of moderation probably because things happen online and then you have actually this tradeoff between openness and privacy." (Interviewee 1).

Furthermore, adding user verification to the platform was also mentioned as a way to prevent bots and people with multiple accounts. On the contrary, verification is remarked as a factor that can potentially discourage people from participating in such a platform:

> "Having a system where you need to log in and verify your credentials, verify your ID and then people can trace back the comments back to you, has obstacles that are there which shape this platform in a way where you would have a lot more hurdles to participate." (Interviewee 1).

QR codes and anonymous links were also suggested in order to deal with these tradeoffs, as they cannot trace back who received them. However, the issue of excluding people even with these methods was highly remarked.

Trust among stakeholders

In relation to the open data and privacy concerns, several interviewees underlined the need for trust among stakeholders. The validation of urban stakeholders and the definition of relationships among them can increase the transparency of the process, as well as its trustworthiness:

> "Nowadays some people don't trust, or they don't feel comfortable to give all their information to them. And I think this issue of trust is also happening within public participation platforms. So, a safe environment for some people is needed that the municipality is present and that there's that you know who is who." (Interviewee 3).

Privacy / Security

The next group of findings in relation to the requirements was related to security and privacy. Many interviewees highlighted that they are both essential for the design of the platform. The data privacy of people participating in the platform, as well as the security of data usage and storage, were discussed: "It is important to make sure that the information that I'm sharing is secure." (Interviewee 3). Anonymization of input was proposed as a possible solution; however, this can have implications for the whole process:

"There are a few thoughts that come to my mind, so in terms of like public participation platforms, I think one of the issues or one of the challenges there, it's just difficult to address because of this anonymity and security kind of things." (Interviewee 5).

Furthermore, many interviewees underlined that citizens do not feel comfortable sharing their personal data and this can be a discouraging factor for their participation:

> "For many people giving all this information would not feel safe. So, I think that you need log in in way that they can verify you are really you, but your ID remains anonymous. So, I think this would be needed because you want to know that the people who are on the platform are really your neighbors in a sense, but, I would also not feel comfortable as a citizen to just write with my

> name what I think about something, especially if it's maybe negative or if I feel this is not the general opinion." (Interviewee 3).

In relation to that, something that was also remarked is that some people are more aware of privacy requirements, especially in the European Union with the GDPR regulations. Lastly, the barriers that these requirements can pose were mentioned:

> "Maybe it's for example, some questions that are not personal and people do not have to be too scared about the data. If it's not ethically concerning or harming someone and still providing a lot of valuable information we need to reconsider. Sometimes data are super secured. And I think that's also, with privacy in my opinion. It becomes bureaucratic and time-consuming." (Interviewee 5).

Open source

In relation to openness, many interviewees highlighted the importance of having an open-source platform. This requirement was underlined, as having an open-source platform could make it customizable and a base for other tools. According to some of the interviewees, if the platform is designed as an open-source tool, then it could contribute also to the scientific community, as well as to the public knowledge (knowledge for all):

"I think that each tool is kind of built for its own priorities, and that may not be the priority of the scientists only. So that leads me to think, yeah, certainly open source is a nice way to go because then you can customize." (Interviewee 4).

> "If I want to create a public parks tool, I will first look into open-source material or software or tool that should be easily modifiable for my purposes. It's likely that I need to add or subtract things or redesign it based on my study. So those would be very important because if it's not modular or modifiable or open source, then they do not offer something more except themselves." (Interviewee 6).

Additionally, the importance of open source was connected to the funding of the tool:

> "Generally, I would say it's public money for public code. So, whenever you have something funded by the public, like a participation system that the city uses and then especially if you have algorithms in that system which are aggregating certain contributions of people's opinions. Then you must choose open source." (Interviewee 1).

Modular design

Lastly, the modular design of the platform was characterized as a fundamental requirement from most of interviewees. Concerning this issue, it was highlighted that the overall design of the platform needs to be modular in order to make the platform flexible in changes.

Having different modules that can be added or subtracted from the design, can make a tailor-made tool that can be applied for tailor-made solutions. Last but not least, the adjustment in the user and the environment was underlined as essential for the success of the platform: "I think it's about like having a sort of a toolbox that you can you choose what tool you want each time." (Interviewee 1).

5.2.5. Technological Features

Gamification

Gamification features for a public participation platform were pointed out by many of the interviewees since they may benefit the process in several ways. As interviewee 3 stated:

> "In terms of gamification, I think it can be helpful, because maybe people find it more fun, but I think it can also help them to understand, to step in the shoes of somebody else or to understand like, what is the limitations of the government, for instance. So, I think it can also help to for citizens to better understand why some decisions have been made."

While the enjoyment of games was mentioned by many interviewees, concerns related to the potential exclusion of specific age groups was highlighted, for example, older people or people with no experience with games. Lastly, in relation to the rewards feature, it was mentioned that games can have intangible rewards that can increase the engagement of users: "A game about a neighbourhood and people were playing in their neighbourhood as avatars and creating different spatial scenarios for their neighbourhood. You could have something like a reward within the game itself." (Interviewee 4).

Social media

For some interviewees the feature of social media was considered necessary for advertising and reaching a broad audience:

"Social media can be quite effective in terms of really having targeted outreach to communities." (Interviewee 4).

"I think for some citizens it can also just be social, so they want to meet other people from their neighbourhood. And I think this can also happen through digital public participation If it's more like a social media kind of thing." (Interviewee 3).

It is worth noticing that this feature was not mentioned by many of the interviewees. However, in the context of this research, it was considered an important input, and it was, therefore, chosen to be included in the analysis of the results.

3D Models / Lidar scanners

Other features identified by the interviewees were three-dimensional (3D) models and lidar scanners. With regards to 3D models, those were characterized as enhanced maps where people can easier understand the environment:

> "When we're talking about digital twins, maybe even 3D model where you can be in the model and then you can see in 3D space some annotations directly where they should be….Like, if you, let's say people want to find out the new park design and then you would have like 3D models of different flowers and plants from other parts of the city that people can actually place there, then this could also be useful." (Interviewee 1).

In relation to that, LIDAR scanners were also suggested as a new way of data collection from citizens:

"LIDAR scanners which are built in the new iPhones and iPads and probably they're going to be part of larger consumer electronics soon, could actually 3D scan a place and then have this sort of 3D model part of the data that you collect." (Interviewee 1).

Audio recordings / Wearable technology

Audio recordings were also pinpointed as a feature that can be used for the platform. The convenience and briefness of collecting speech messages were underlined. However, data privacy, as well as problems related to automated text analysis were posed by several interviewees:

"I think it would be really great to have functionality where you could, knock on somebody's door, get permission and then collect audio." (Interviewee 4).

> "So that you can just like talk and because that's probably very convenient, but then you have other problems on the back end, like translating that back to written text to analyze it. Then you have all sorts of like do you want to send it to servers and how does that affect data privacy and so on of people involving them? How do they give informed consent?" (Interviewee 1).

Lastly, wearable technology, such as smartwatches were proposed as a way of data collection with similar concerns of data privacy: "You can ask interviewees to use wearable tools like watches and stuff to collect the data. This can help in understanding behaviours and patterns." (Interviewee 6).

The modularity of the features depends on the context

The modularity of the platform's features was characterized as essential by many interviewees. In relation to the requirement of modular design, as previously presented, the features per se need to be modular and adaptable in different circumstances. Additionally, the modularity of the features was underlined in relation to who urban stakeholder uses the platform (e.g., researcher, policymaker, citizen), as well as to what are the special needs of each user:

> "I don't think that there's like a one size fits all solution to all these processes. There could be certain elements which you could add to a process. If you want to especially involve more elderly people, then make the buttons larger for instance." (Interviewee 1).

The same feature needs to have different versions, depending on the people they will use the platform:

> "Or maybe even having it like adapted to the people who use it. So, you have like different versions and then you might even want to involve children if it's for playground planning, and then you would probably need a more playful approach to this practising." (Interviewee 5).

Maps

An important feature that was discussed in depth and highlighted as essential by many interviewees was the mapping feature. Maps can benefit citizens, researchers, and policymakers, with the addition of new layers to the physical world. The spatial dimension of the contributions with points, segments and polygons can stimulate a certain type of analysis that otherwise would not be possible:

> "We see clusters of certain topics appearing in certain areas and then you could also do certain data analysis that you couldn't do without this geolocation of the data. So, I think that's an advantage that you have that you can pinpoint certain aspects or certain topics on very concrete places in the city." (Interviewee 1).

In addition, interviewees underlined that using mapping features can help when comparing the overview with the focus on specific areas, as well as can improve the collection of temporal data.

Another group of findings with regards to mapping features was related to the enhancement of understanding of urban stakeholders. Interviewees emphasized also on the understanding of the direct environment which can bridge the knowledge gap between stakeholders and render answers of users more informative:

> "Maps can help in understanding the impacts of projects for sure. I think the spatial component helps in any way if you're able to integrate it in a digital platform or as a physical map or just put it out in a neighbourhood for people to look at it. That helps a lot in this knowledge gap, not just the answering of the survey, but just improving the knowledge levels of the citizens so they can answer the survey better." (Interviewee 2).

Moreover, the visualization of multiple perspectives that can make the information more tangible and the interactivity of maps that can present not only the existing situation but also different scenarios were mentioned by many interviewees as important features.

The potential hindrances and issues related to mapping features were also derived from the interviews. An issue that was mentioned by several interviewees was related to citizen maps and the fact that they are useful only on small scales. When the area becomes less identifiable, it is harder for a citizen to understand large(er) scales and provide meaningful information.

In addition, landmarks were suggested as a way to assist people to orient themselves. In relation to that, the characteristic of inclusion in the understanding of the map was mentioned. Not everyone can read a map and, thus, there is a need to ascertain that colour code and other features of a map are considered the disabilities of people:

> "So, visualization is important. One of the things that most people neglect is colour blindness, for example. So, it should be accessible to everyone. I mean not only related to colour code, but also dyslexic people. And you know those sorts of disabilities, the tool should also be robust enough to accommodate those." (Interviewee 6).

Lastly, the issue of potential misinformation was remarked on since maps can intentionally or not present the information in a wrong way.

Rewards

Rewards were another essential feature identified by many interviewees. As already discussed, rewards (monetary or not) can incentivize people to participate in the platform: "I think compensation is a big factor. So, can you compensate people in

what form? Like either financial compensation or other sorts of rewards that people get for participating in the system" (Interviewee 1).

Many interviewees pinpointed that financial rewards can indeed work:

> "I think there can also be just financial incentives because I always think I'm a researcher. I also get paid to do this kind of work. So why are these people not being paid, especially if they are doing something that's not completely clear yet, whether it's really impacting their life." (Interviewee 3).

On the contrary, some interviewees highlighted the drawback of biased opinions, if monetary rewards are used:

> "If the government wants to build a road and they offer a reward just for answering the survey. Because the government is doing such a nice thing for me and offering me some incentives, some rebates, and some gift cards, my tendency is to say yes do it because it's a great project and this government is nice. That's a bias of response." (Interviewee 2).

Additionally, several interviewees underlined that in many cases people do not expect compensation for their participation, but other motivational factors can incentivize them:

> "…like voting, for instance, right, everybody votes. What's the reward for voting? The reward for voting is that you get a government of your choice, but there's no other tangible reward to it. The government incentivizes voting by asking people to vote because it helps the larger picture of democracy. So, I think the same thing applies also to projects like this. "(Interviewee 2).

5.3. Survey

5.3.1. Profile of the respondents

The results derived from the survey provided additional input for the analysis of this research. As cited, overall, 261 responses were obtained. With regard to the respondent population and the profile of the respondents, the majority of them were women. The most dominant age group was 25-34 (45%), followed by the groups 18-24, 35-44 and 45-54, with 15%, 13% and 14% respectively. Respondents from 55 years old and older were comparatively less represented in the study population, with percentages less than 10%.

The majority of the respondents have a master's degree (MSc), followed by people who obtained a bachelor's degree (BSc) (25%). A considerable percentage of 17% of the respondent population represents high school graduates, while 11% of the respondents have a Doctor of Philosophy (PhD). With regards to the annual income of the respondents, almost a third of them earn less than 20.000€, followed by those who earn from 20.000€ up to 39.999€ (32%). 20% of the respondents earn from 40.000€ up to 59.000€, while the rest 15% of the respondent population stated that earn 60.000€ and more. Lastly, with regards to the city of residence of the respondents, their responses varied among cities of different European countries, including the Netherlands, and Greece which were the most dominant, but also cities from Australia, the United Kingdom and Canada. The figure below presents in a world cloud the cities of residence that were reported by the respondents.

Figure 13: Word cloud of the cities of residence that were reported by the respondents

An interesting finding derived from the questionnaires is that digital (online) participation in planning processes was the most dominant response (43%), followed by hybrid ways of participating (those that include both digital and physical participation). Physical (in-person) participation gathered a significantly lower percentage (10%), implying a shift to online engagement in planning processes, while it is worth noticing the same percentage was reported from respondents that are not willing to participate by any means in such processes.

5.3.2. General findings & (De) Motivational factors for public participation

The respondents were asked to provide their ideas regarding the motivating and discouraging factors that can influence their engagement in a public participation platform. Regarding the former, the feature of easy-to-use was proved as the most dominant response (27%), followed by the availability of relevant information related to the planning decision at stake. The relevance of the topics covered by such a platform to the respondents' daily life, concerns and needs was also highlighted by the respondents, reaching 17%, while the power to influence the planning decisions was also among the most chosen responses (12%).

It is worth noticing that gamification elements of such a platform and monetary rewards were the least stated motivating factors (4% each). Lastly, from the additional (open) suggestions given by the respondents, motivating factors reported were also: the provision of information regarding the other involved stakeholders in the platform and the planning decisions, the provision of updates after a planning decision is finalized, the perception of the given input to the platform (from the citizens) will be taken into consideration, rendering their participation meaningful.

The latter statement was also highlighted as a discouraging factor for the respondents' participation in an online platform, being their most dominant response (19%). This result implied that distrust for decision-makers, regardless of the country or city of residence, is evident. Next to that, lack of interest from the citizens' side was also reported as an important discouraging factor for the respondent population (18%).

5.3.3. Characteristics

Concerning the characteristics that can enhance the effectiveness of a public participation platform, transparency, efficiency, and responsiveness were reported as the most preferred characteristics (20%, 15%, and 145% respectively), followed by trust (13%0 and accountability (10%). While equity, in terms of equal access to the application, and consensus orientation were reported as the least important characteristics.

It is worth mentioning that respondents also added their own suggestions of characteristics that can boost the platform's effectiveness. Among those suggestions, the originality of the ideas presented in such a platform was mentioned, as well as the provision of information regarding prior successful planning decisions. The context was also highlighted, in terms of the background of a planning decision, helping citizens to understand the reasoning behind such a decision. It is important to mention that context was also suggested by some respondents, as having a negative connotation. As reported, the provision (or not) of multiple languages in such a platform can influence its effectiveness.

5.3.4. Technical Requirements

Concerning the requirements of the platform design, privacy (19%) was proved as the most essential according to the respondent population, followed by security, accessibility, and user-friendliness (17% each). Transparency was also distinctive among the responses, with 13%. It is worth noticing that developing the platform as an open-source and modular are requirements that respondents did not consider essential for a public participation platform (6% and 2% respectively).

5.3.5. Technological Features

Lastly, the features that are essential for a public participation platform were also reported by the respondent population. More specifically, voting was the most dominant response (23%). Ranking and map interaction followed with 16% each, while the feature of the open question was also considered important (15%). Furthermore, the option of uploading pictures concerning a specific problem/area was reported by 10% of the respondents, in contrast with the possibility of uploading videos or audio recordings which were among the least preferred options (5% and 1% respectively).

For this topic, there were also additional suggestions provided by the respondents. These include the option of answering multiple questions and submitting suggestions (open feedback). Lastly, it is worth noticing that the combination of the platform's function with physical interaction among the stakeholders was also suggested; public hearings and workshops, so that the citizens can provide their input. As stated by a respondent "physical meetings are much more personal and would underline the seriousness and valuation of an individual's opinion".

5.3.6. Crosstabulation analysis

In addition to the previous analysis of the questionnaires, the crosstabulation technique was used in order to identify the relationships between different categorical variables. This method was selected as it can investigate the data in a more comparative way and discover patterns and correlations that otherwise would not be detectable. Furthermore, the datasets are more manageable, and the detection of complex links is less time-consuming. The variables of gender, age, education level and income were compared with the core questions to reveal correlations between them.

Question: In the city that you live, in what way do you prefer to participate in city planning?

Starting with the preferred way that citizens want to participate in city planning, women had a preference for a hybrid version of participation in contrast with men that chose online participation. In addition, the majority of the respondents that they do not want to participate in city planning were males (65%), while females constitute the main respondents in the in-person participation (58%). With regards to age, an interesting finding was that in-person participation percentages for people 45 and older are higher in relation to other age groups. Moreover, 62% of the respondents that do not want to participate were in the age group of 18-34. In the same option, the percentage of Doctor of Philosophy was 27%, significantly higher than the other options that ranged from 4%-10%. The majority of respondents who want to participate physically have an education level of bachelor's degree and lower (65%). Lastly, the percentage of people that earn less than 20.000€ is significantly higher in the option of in-person participation (62%) in relation to the other options (27%-34%).

Question: Which of the following characteristics do you believe would make public participation in your city more effective?

With regard to characteristics related to the effectiveness of public participation, there is a balance between women and men for each characteristic. An outlier on this was the characteristic of inclusiveness, where women had a preference with 61%. Respondents with age 45 and older, had a preference for the characteristics of trust, efficiency, and consensus orientation, while people with higher education selected inclusiveness and accountability as more important characteristics. Lastly, in relation to income, respondents with 40.000€ and less chose equity as the most important characteristic (68%).

Question: If an application for public participation would have been developed for your city, which of the following characteristics would motivate you to use it?

In the question of characteristics that could motivate citizens' participation, the gamification of the platform was mostly highlighted by men (58%), while women's most chosen characteristic was the feeling of ownership (57%). Social media, gamification of the platform and monetary rewards are characteristics that were mainly selected by people between18-34 years old, while older people emphasized the feeling of ownership, finding information and relevance. Moreover, the characteristic of gaining authority and power in the decision-making process was chosen by people with higher education, while people with education level high school and less underlined the importance of social media and ownership characteristic. Lastly, people with the highest incomes chose relevance as the most important characteristic, while monetary rewards and social media were the main characteristics chosen by people with lower incomes.

Question: If an application for public participation would have been developed for your city, what would discourage you from using it?

With regards to the factors that can discourage citizens' participation, digital literacy was one that was mainly underlined by men (61%), while no significant statistical relationships were identified in relation to the age of the respondents. Regarding the respondents' education level, digital literacy was highlighted by people with lower education as the most discouraging factor. Lastly, concerning the income level of respondents, lack of access to technological tools was the most popular option for people with lower income, while for the people with an income of 60.000€ and more, lack of interest and time availability were the most discouraging factors.

Question: If an application for public participation would have been developed for your city, how would you like to participate and interact within this application?

Regarding the ways that citizens would like to participate and interact with platforms of public participation, women showed a preference for storytelling and uploading pictures. In relation to age, interacting in a 3D environment was the most selected option for people betweem18-34 years old, while older people had a preference for storytelling and traditional methods, such as replying to open questions and voting. Moreover, storytelling was the most selected option for people with a lower level of education. Lastly, no connection emerged between respondents' income and selected features.

Question: If an application for public participation would have been developed for your city, which of the following characteristics do you believe would be essential to be included?

With regards to the requirements of platform design, open source was mainly selected by women (60%), while in the other requirements there was a balance, in terms of respondents' gender. Open source and accessibility were the most selected options for people between18-34 years old, while older people showed a preference for user-friendliness and security requirements. In relation to the education level of the respondents, open-source and modularity requirements were selected by people with higher education, while user-friendliness and availability were chosen by people with lower education levels. Lastly, no important correlations occurred in relation to respondents' income.

Greece vs the Netherlands

Another interesting way to compare the results of the questionnaires was the country of residence of the respondents. The majority of respondents live in the Netherlands (53%), while residents of Greece follow with 32% and the remaining 15% in other countries worldwide. A comparison between respondents from Greece and the Netherlands was made in order to identify emerging patterns in the data. With regards to the way that citizens want to participate in city planning, digital and hybrid versions had similar percentages for both countries, while physical participation was higher for residents of Greece in comparison to the Netherlands (15% and 8% respectively). In addition, people that do not want to participate at all were more in the Netherlands (11%) than in Greece (6%). With regards to characteristics related to the effectiveness of public participation, efficiency was underlined by 64% of residents of Greece, while the same characteristic has 47% in the Netherlands. Another alteration was related to the characteristic of inclusiveness between residents of Greece and the Netherlands (27% and 54% respectively).

Regarding the characteristics that motivate citizens' participation, an important dissimilarity was that the characteristic of finding information was relatively higher for residents of Greece in relation to the Netherlands (71% and 58% respectively). Furthermore, the percentage of the Netherlands in the feeling of ownership, as a characteristic, was doubled in relation to Greece (34% and 17% respectively). With regards to the factors that discourage participation, the preference for in-person participation was 28% for the residents of Greece while for the residents of the Netherlands was 17%. This difference validates the previously mentioned inclination of Greeks to physical participation. Other dissimilarities were related to the factors of lack of access to technological tools (Greece 44%, Netherlands 23%) and of distrust (opinions will not be taken into consideration) (Greece 50%, Netherlands 65%).

With regards to the ways that citizens would like to participate and interact with platforms of public participation, the feature of interacting in a 3D environment was 25% for residents of the Netherlands while for the residents of Greece was 34%. In addition, the storytelling feature was higher for the Netherlands in relation to Greece (25% and 13% respectively). Lastly, dissimilarities in relation to the requirements of platform design were associated with user-friendliness (Greece 54%, Netherlands 70%) and transparency (Greece 34%, Netherlands 58%).

6. Synthesis

In this chapter, the results from the different data collection methods that were used are critically synthesized and presented. As already discussed, the variety in the data collection methods was chosen so as to gain input for this research from multiple perspectives and involved parties in a public participation platform. More specifically, policymakers were mainly included in the workshops, researchers in the interviews and citizens in the survey. The subsections in this chapter, as the previously presented results of the analysis, follow the structure of the five core themes, general findings, de(motivational) factors for public participation, characteristics, technical requirements, and technological features.

6.1. Qualitative synthesis

6.1.1. General findings

General findings were analyzed with regard to the whole process of public participation. Starting with the **challenges of public participation**, the top-down approach in urban governance, the complexity of merging all different perspectives of people, and the management of the (many) involved stakeholders were highlighted as important challenges mainly by researchers and policymakers. With regards to the **effectiveness of public participation,** combining digital and physical participation, merging top-down and bottom-up approaches, and securing everyone's involvement were underlined by researchers as imperative ways to have effective public participation. Furthermore, terms such as sustainability, continuity, transparency, reciprocity, equity, and heterogeneity were highlighted as requirements for effective public participation by researchers. In a similar question related to effective public participation, transparency, efficiency, responsiveness, trust, and inclusiveness were reported as the most preferred ones by citizens.

The **combination of digital and physical participation** was highlighted by researchers as public participation tools and methods need to be context-dependent, focused on the audience and serve suitable and tailor-made participation options for everyone. For citizens, the hybrid version of participation was the second most selected option, as they gave emphasis on digital participation. It is worth mentioning that physical (in-person) participation gathered a significantly lower percentage and most of the responders had lower educational levels. In addition, scalability, trust, time, and resources as well as the reach, the widespread and the level of participation that can be achieved are trade-offs that were underlined by researchers related to digital tools and physical participation. Moreover, the **differentiation of people-ideas-priorities-needs-desires** was underlined by researchers in terms of inclusiveness in the process of public participation. Lastly, the **quality and quantity of input** were underlined as equally important by researchers as the need for input is context-dependent.

Table 4 below presents an overview of all the identified general findings, as derived from all three data collection methods that were conducted.

Table 4: Overview of General findings

General findings	
Challenges in public participation	• Top-down approach in urban planning • Different perspectives of people raise complexity for the platform • Management of the (many) involved stakeholders
Combination of digital tools and in-person participation	
Community feeling	
Different people, different ideas, priorities, needs and desires	
Effectiveness of public participation	
Quality and quantity of citizens' input	

6.1.2. (De) Motivational factors for public participation

With regard to factors that can incentivize citizen involvement in the platform, **monetary** and **non-monetary rewards** were underlined as critical by policymakers and researchers. In addition, the careful selection of rewards was underscored by researchers, in order to avoid biased opinions. On the other hand, monetary rewards were denoted as an unimportant factor in relation to their participation by citizens. Moreover, **intrinsic motivations**, the **feeling of ownership** and having **social skills were** highlighted by researchers as encouraging factors. Similarly, **gaining authority and power in the decision-making**, feeling of ownership and **relevance** were among the five most selected options by citizens. Specifically, people with the highest incomes chose relevance as the most important characteristic and the characteristic of gaining authority and power in the decision-making process was chosen by people with higher education.

Easy-to-use, as a requirement, was highlighted as a significant encouraging factor by researchers and policymakers, as it can secure inclusiveness. Similarly, easy-to-use was the most nominated factor by citizens, with 27%. In addition, the use of **social media** and the **gamification** of the platform were underlined as motivational factors by researchers, however, age and other limitations need to be considered. In contrast, the same factors were among the three less popular options by citizens and were mainly selected by people between 18-34 years old.

Moreover, the **languages** that the platform uses and the way that they are used were highlighted as crucial for engagement by researchers and citizens in their open suggestions. In addition, **community building** and making **knowledge accessible** were highlighted by policymakers and researchers. The factor of accessible knowledge was also accentuated by citizens in their open suggestions, as well as in choosing the motivational factor of **finding information** as the second most important.

Regarding discouraging factors of citizens' participation, **time unavailability**, **lack of interest** and **concerns related to contributions' acceptance and use**, were underscored by policymakers and researchers. In parallel, the same factors were the three top selections by citizens. Other factors that were highlighted by researchers and policymakers were **lack of digital literacy**, **mistrust in the institutions**, **inadequate resources**, and **language barriers**. These factors were also underlined by citizens. More

specifically, the lack of digital literacy was a factor that was mainly underlined by men and by people with lower education. Furthermore, the lack of access to technological tools was the most popular option for lower-income people. Additional discouraging factors that were underlined by researchers were the **frustration from technology**, **the tone of the discussion**, as well as the **lack of transparency in the process** as restraints for people's engagement. Lastly, the **top-down approach to urban governance** and **political considerations** were highlighted as factors that can negatively influence people's involvement.

Table 5 below presents an overview of all the identified factors that can incentivize or discourage citizen engagement, as derived from all three data collection methods that were conducted.

Table 5: Overview of factors that incentivize and or discourage citizen engagement

De(motivational) factors for public participation	

Factors incentivizing public participation	• Rewards
	  o Monetary
	  o Non-monetary
	• Personal development
	• Selfish motivations
	• Simple and easy-to-use interface
	• Social media
	• Gamification
	• Feeling of ownership
	• Relevance
	• Community building
	• Accessible knowledge
	• Reputation

Factors discouraging public participation	• Lack of digital literacy • Lack of time • Inadequate resources • Language barriers • Discomfort with using such a platform • Frustration from technology • Tone of discussion • Top-down approach to urban governance • Political considerations • Distrust in the institutions • Lack of interest • Different priorities • Lack of knowledge

6.1.3. Characteristics

With regards to the characteristics of the platform, the importance of encouraging the **dialogue between stakeholders**, and **building a knowledge base** were underscored as important characteristics by policymakers and researchers. In relation to these, **informing well the relevant stakeholders** and using effective communication channels were also characterized as essential characteristics of a public participation platform.

Moreover, **contextuality in the engagement of stakeholders** was highlighted as a significant characteristic of such a platform.

Other important characteristics that were underlined with regard to the process are the **effectiveness of communication**, the **transparency**, and the **need for a moderator** of the process as well as the **tone of the discussion**. These characteristics can increase the users' involvement, user satisfaction, acceptance of policy interventions and the efficiency of the overall process. In parallel with the other urban stakeholder groups, transparency and **efficiency** were characteristics that were mentioned the most by citizens.

The **inclusive way of participation** and the importance of **understanding the audience and context** were underscored as crucial characteristics by policymakers and researchers. The characteristic of inclusiveness was essential also for citizens and was mainly selected by women, implying a potential gap in the gendered equal representation. The identification of the users and the context within which the platform will be used, and the provision of an inclusive way to participate, can ensure the platform's success and enhance engagement. In relation to these, the characteristic of **a toolbox of participation** was highlighted; Having a platform that can work as a tool case and depending on the problem that needs to be solved, the appropriate tool can be selected. This characteristic can secure the inclusion of people and provide tailor-made solutions for the problem at stake. Lastly, the characteristic of unifying **quantitative and qualitative data** was highlighted mainly by policymakers, as it can provide a holistic view that can benefit all relevant stakeholders involved in a public participation platform.

Table 6 below presents an overview of all the characteristics, as derived from all the three data collection methods that were conducted.

Table 6: Overview of Characteristics

Characteristics
Build knowledge base between stakeholders
Dialogue between stakeholders
Inform well the relevant stakeholders
Contextuality of stakeholder's involvement
Transparency of the process
The tone of discussion
Effective communication
Moderator of the process
Inclusive way of participation
Understand the audience and the context
Merge qualitative and quantitative data
Frequency of data updates
Toolbox of participation

6.1.4. Technical requirements

With regards to the requirements of the platform, the **use of visuals, attractiveness, interesting content** as well as **fun-to-use** (enjoyable) requirements were underlined by researchers and policymakers, as they can improve the engagement of the platform. The requirement of interesting content was also highlighted by citizens as the second most motivational factor to participate in the platform was finding information. In particular, researchers underscored that a visually interesting interface in which people get pleasure can ensure elongated visits to the platform and the long-term commitment of the users.

Furthermore, the requirements of **easy-to-use or user-friendly** and **intuitive** design were considered crucial by policymakers and researchers. These two requirements constitute factors of success for the platform, as they can secure inclusiveness and influence the involvement of users and the quality of the input. Moreover, the requirement of easy-to-use or user-friendly was the second most essential together with accessibility and security according to citizens and was mainly selected by older people. Therefore, developing a platform that is easy to use or user-friendly can broaden its target group, making it more attractive to age groups that may be underrepresented in such online decision-making processes.

Privacy and **security** requirements were highlighted by policymakers and researchers as highly essential for the design of the platform. The data privacy of people participating in the platform, as well as the security of datasets, needs to be ensured. Both requirements can affect negatively or positively the involvement of users. In parallel with the other urban stakeholder groups, privacy and security were the most stated requirements by citizens and preferred by older people.

Other requirements that were emphasized by policymakers and researchers include **modular design** and **open-source** requirements. The modular and adaptive design was underscored, as it can provide a flexible tool that can adjust its design based on the environment that will be applied. This flexibility of the platform was characterized as a factor for successful applications. On the other hand, the requirement of modularity was the most unpopular selected option by citizens. In relation to open source, this requirement was associated with the contribution to the scientific community and to public knowledge, as it can help with the creation of other tools. Once again, citizens had an opposite opinion, as open source was the second least selected requirement. It is worth noticing that open-source and modularity requirements were selected mainly by people 18-34 years old.

Other requirements that were underlined were related to **verification** and **open data for the users** of the platform. The importance for the users to have access to their contributions and to the general results of the process was underlined, as it can promote transparency. In relation to that, researchers and policymakers pinpointed that there is a trade-off between open data and privacy. In this context, user verification was underscored as a requirement that can enhance transparency, however, at the same time constitutes a discouraging factor for participation. Next to that, transparency was also considered by citizens as an important requirement. Lastly, **trust among stakeholders** was remarked by all groups of urban stakeholders, as a major factor that influences their willingness to cooperate with each other.

Table 7 below presents an overview of all the identified technical requirements, as derived from all three data collection methods that were conducted.

Table 7: Overview of Technical Requirements

Technical Requirements
Attractive-visual and content interesting
Fun-to-use
Easy-to-use/user friendly
Intuitiveness
Open data for participants
Verification
Trust among stakeholders
Privacy
Security
Open source
Modular design

6.1.5. Technological features

Regarding the technological features of the platform, the **mapping** feature was underlined as an essential component of the platform by policymakers and researchers. Both groups highlighted the benefits of having this feature in such a platform, such as understanding the context, influencing the knowledge exchange across stakeholders and incentivizing people to participate. In the same way, the mapping feature was selected by citizens, as the second most dominant response related to the features of the platform. It is worth mentioning that researchers also underlined considerations and limitations that may arise when using this feature, including the need to consider the disabilities of people and the potential misinformation that can cause.

Gamification is another feature that was highlighted as an important element of the platform. The enjoyment to the user, the understanding of other stakeholders' views and the limitations that policy decisions have, were mentioned as advantages by policymakers and researchers. It is worth noticing that gamification elements of such a platform were the least-stated motivating factor by citizens, implying the need to critically consider such features and understand the needs and preferences of the target group at hand. Furthermore, when gamifying such a platform, concerns related to the potential exclusion of specific age groups (e.g., older people) may occur, as highlighted by researchers. This concern was confirmed by citizens, as the gamification of the platform was mainly selected by people 18-34 years old.

Another key feature that was discussed extensively is the need for providing **rewards** to the platform users. Policymakers and researchers mentioned that rewards can incentivize people to participate in the platform but those need to be carefully selected in order to avoid biased opinions. In addition, researchers highlighted that in many cases people do not expect compensation for their participation but other motivational factors that exist can incentivize them. In relation to that, policymakers underlined that it is important for each stakeholder and user of the platform to find a win-win situation. Researchers, for instance, mentioned that with the gamification of

the platform, intangible rewards can be provided in order to increase the engagement of users. Contrary to the other two stakeholder groups, monetary rewards were the second least stated motivating factor of participation by citizens, and it was selected mainly by people 18-34 years old.

Another feature that was recommended by both policymakers and researchers is the integration of **social media**. The importance of social media, in terms of advertising and reaching a broad audience, was underlined by researchers. The same feature, however, was not considered a motivational factor for citizens as an insignificant amount of people chose it (mainly people 18-34 years old).

Another feature that was mentioned specifically by researchers is **3D models**. Three-dimensional models were characterized as enhanced maps where people can easier understand the environment. However, citizens' replies, to the corresponding question of the questionnaire, preferred more traditional ways of interaction, such as **replying to open questions**, **voting** and mapping interactions. The interaction in a 3D environment was the fifth most popular response and was mainly selected by people 18-34 years old. In relation to 3D models, **LIDAR scanners** were suggested by researchers, as a new way of data collection from citizens.

Another feature that was underlined mainly by researchers is the use of **audio recordings** for data collection. Benefits, including the convenience and the minimization of resources for collecting speech messages, were underlined. However, data privacy and other concerns were underlined. It is worth mentioning that for citizens, this feature was the least-stated way of interaction with the platform. Lastly, **wearable technology** was proposed by researchers as an additional way of data collection with similar concerns of data privacy.

Another feature that was underlined was the **language**, in terms of which languages are used and how are been used. Policymakers underlined that the formal or the informal way of using language, and the terminology that is used can potentially influence the users of the platform and possibly exclude people that want to use it. The language was also highlighted as an important feature by many citizens in their open suggestions, verifying the importance of this feature.

Other features mentioned by policymakers and researchers included the use of **QR codes** for distribution purposes and **storytelling** methods, to illustrate and communicate the topics by such a platform in a more plausible way. Storytelling was the third least stated response by citizens and was mainly selected by (older) women.

The last feature that was underlined by policymakers and researchers was the **modularity of the features** themselves. Depending on the context and the users, the features need to be adaptable to acclimatize with each use case. Stakeholders highlighted the need for modular features in order to serve the various needs of each stakeholder group.

Table 8 below presents an overview of all the identified technological features, as derived from all three data collection methods that were conducted.

Table 8: Overview of Technological Features

Technological Features
Gamification
Social Media
3D Models
QR codes
Lidar scanners
Audio recordings
Wearable technology
Modularity of features (context-dependent)
Maps
Storytelling
Language
Rewards

Figure 14 below illustrates the co-occurrence of applied codes in the conducted workshops and interviews. The general findings and the (de)motivational factors were compared to characteristics, technological features, and technical requirements. This figure includes all the applied codes, however, the titles of some of the codes are not depicted, due to the limited connections that were found. While the depicted connections may seem chaotic, it is clear that the co-occurrence of the codes many times underlines a evident relation between components. For instance, rewards, gamification, and social media show a strong connection with the factors that incentivize public participation.

Furthermore, it is worth mentioning that some contradictions emerged from several co-occurrences of the developed codes. For instance, the technological feature of social media is connected to the two codes of incentivizing and discouraging factors for public participation. This contradiction, among others, was also underlined in the analysis of the results.

In similar comparison graphs as figure 14, the interconnection among different components from different categories is demonstrated. For instance, the technological feature of gamification constitutes a motivational and but also a demotivational factor in public participation. Simultaneously, is connected to the requirement of fun-to-use while fulfilling the characteristic of an inclusive way to participate (younger people's preference).

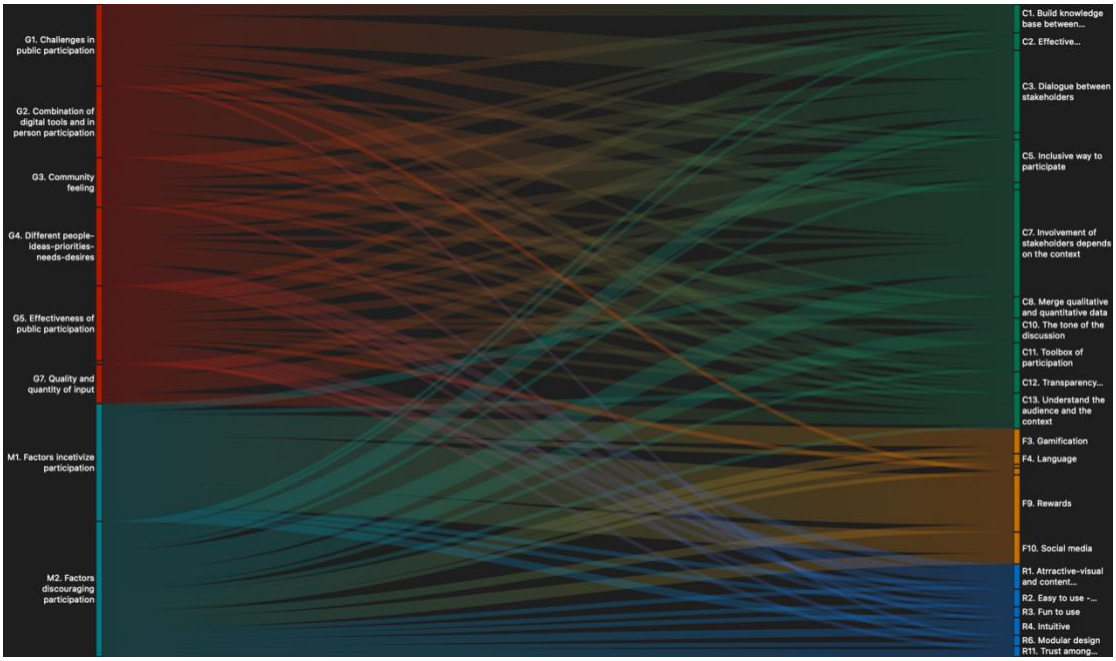

Figure 14: Co-occurrence of applied codes in interviews and workshops (General findings and (De)motivational factors versus Characteristics, Technological Features and Technical Requirements

6.2. Quantitative synthesis

In this chapter the qualitative input from all three data collection methods that were used, will be quantified in order to clarify the commonalities and dissimilarities between different urban stakeholder groups. Some characteristics were essential for some groups and others insignificant. Different urban stakeholder groups had different perspectives on the questions that this research intended to answer. Even within each stakeholder group, variations were noticeable. People have different worldviews, and this is respectable; and at the same time beneficial, since the goal is to understand the complexity of the system and propose different ways to cope with it.

The conceptual design of a public participation platform should be inclusive. The intention of this research is to recommend a conceptual design of a public participation tool that will be added to the "toolbox" of society, focusing on both the tool itself but also on the process. Having this twofold focus, aiming also to explore public participation as a process, can make the placement and application of the tool more efficient.

In order to cope with the complexity of the aforementioned network of urban stakeholders, all the qualitative inputs were chosen to be combined and subsequently translated into quantitative results. The characteristics, technical requirements and technological features were evaluated based on the data obtained from policymakers, researchers, and citizens. Each component was evaluated based on a three-level scale: *not important/slightly important* (1 point), *important* (2 points), and *very important* (3 points) (see Table 9).

Table 9: Evaluation scoring scale

Scale score		
Not important/ slightly important	Important	Very important
1	2	3

It is crucial to mention that this technique was used in order to normalize the results as some topics were not elaborated to the same extent by all the urban stakeholders' groups. In addition, the consensus among all the urban stakeholders was difficult to be achieved, as many dissimilarities between their views and perspectives were identified.

Finally, each component was evaluated based on the three different stakeholders' views and an overall score was assigned to them (sum of the sub-scores). The components that received an overall score equal to or higher than five, were considered fundamental, while those that received a score lower than five were considered supplementary. The results of this process will be analyzed in chapter 7.

The identical technique was also used for the results related to the process of public participation. The general findings, as well as the factors that incentivize and or discourage citizen engagement, were evaluated following the same process. An overview of these evaluations is presented in Tables 10 and 11 below.

Based on the evaluation, the highest rated characteristics were "Build knowledge base among stakeholders" and "Inclusive way to participate" while "The tone of the discussion" and "Moderator of the process" occurred as the least important characteristics. With regards to the technological features, "Maps" and "Social Media" were the most important for urban stakeholders while "QR codes", "Audio recordings", "Lidar Scanners" and "Wearable technology" were the lowest rated. Lastly, regarding the technical requirements, "Easy to use", "Privacy", "Security" and "Intuitiveness" were the most essential while "Open source", and "Verification" were the least rated requirements by urban stakeholders.

While in many components, urban stakeholders' perspectives seem to completely align, for instance, "Effective communication", "Involvement of stakeholders depends on the context", "Maps" and "Easy to use", there are also components where dissimilarities were noticeable. For instance, the technical requirements of "Open source" and "Modular design" were considered important or very important by researchers and policymakers while for citizens these requirements were considered slightly important or not important. In a similar way, the technological features of "Gamification" and "Rewards" were considered important by researchers and policymakers while for citizens these features were considered slightly important or not important.

Regarding the general findings, most of them received high scores, especially by researchers and policymakers. The general findings that were considered as least important were "Problem misconception" and "Quality and quantity of input". The

highest rated factors that can incentivize citizen engagement were "Simple and easy-to-use interface", "Relevance" and "Accessible knowledge" while the least important were "Monetary rewards", "Personal development", "Selfish motivations" and "Reputation". With regards to the factors that discourage citizen engagement, urban stakeholders considered "Lack of time", "Lack of interest" and "Distrust in the institutions" as the most discouraging factors. In addition, "Tone of discussion", "Political considerations" and "Lack of knowledge" were not considered important discouraging factors.

In this case as well, many times urban stakeholders' perspectives agree. For instance, "Non-monetary rewards", "Simple and easy-to-use interface", "Language barriers" and "Social media" received the same scores from each stakeholder group. However, many dissimilarities were noticeable. For example, the motivational factor of "Feeling of ownership" received three points from researchers, two points from citizens and one point from policymakers. In addition, many components were considered important or very important by researchers and policymakers while were considered slightly important or not important by citizens, for instance, "Gamification", "Different people-ideas-priorities-needs", "Management of the relevant stakeholders" and "Community feeling".

Table 10: Evaluation of characteristics, technological features and technical requirements based on urban stakeholders' views

		Policymakers	Researchers	Citizens	Overall Score
Characteristics	C1. Build knowledge base between stakeholders	3	3	2	8
	C2. Effective communication	2	2	2	6
	C3. Dialogue between stakeholders	3	2	2	7
	C4. Frequency of data updates	2	2	1	5
	C5. Inclusive way to participate	2	3	3	8
	C6. Inform well the relevant stakeholders	2	2	3	7
	C7. Involvement of stakeholders depends on the	2	2	2	6
	C8. Merge qualitative and quantitative data	2	2	1	5
	C9. Moderator of the process	2	1	1	4
	C10. The tone of the discussion	2	1	1	4
	C11. Toolbox of participation	3	2	2	7
	C12. Transparency of the process	2	2	3	7
	C13. Understand the audience and the context	2	2	1	5
Technological features	F1. 3D model	1	2	2	5
	F2. Audio recordings	1	1	1	3
	F3. Gamification	2	2	1	5
	F4. Language	2	2	1	5
	F5. Lidar scanners	1	1	1	3
	F6. Maps	3	3	3	9
	F7. Modularity of the features depends on the context	2	2	1	5
	F8. QR codes	1	1	1	3
	F9. Rewards	2	2	1	5
	F10. Social media	2	2	2	6
	F11. Storytelling	2	1	1	4
	F12. Wearable technology	1	1	1	3
Technical Requirements	R1. Attractive-visual and content interesting	2	2	1	5
	R2. Easy to use - User friendly	3	3	3	9
	R3. Fun to use	2	2	1	5
	R4. Intuitiveness	3	2	2	7
	R5. Verification	1	2	1	4
	R6. Modular design	2	3	1	6
	R7. Open Data for participants	2	2	2	6
	R8. Open-source	1	2	1	4
	R9. Privacy	2	2	3	7
	R10. Security	2	2	3	7
	R11. Trust among stakeholders	2	2	1	5

Table 11: Evaluation of General findings and (de)motivational factors in public participation based on urban stakeholders' views

			Policymakers	Researchers	Citizens	Overall Score
General findings	G1. Challenges in public participation	Top-down approach in urban governance	2	3	3	8
		Different perspectives of people	3	2	2	7
		Management of the (many)	3	3	1	7
	G2. Combination of digital tools and in person participation		2	3	2	7
	G3. Community feeling		2	3	1	6
	G4. Different people-ideas-priorities-needs-desires		3	3	1	7
	G6. Problem misconception		2	1	1	4
	G7. Quality and quantity of input		2	2	1	5
(De) Motivation factors in public participation	M1. Factors incetivize participation	Monetary rewards	1	2	1	4
		Non-monetary rewards	2	2	2	6
		Personal development	1	2	1	4
		Selfish motivations	2	1	1	4
		Simple and easy-to-use interface	3	3	3	9
		Social media	2	2	2	6
		Gamification	2	2	1	5
		Feeling of ownership	1	3	2	6
		Accessible knowledge	2	2	3	7
		Reputation	1	2	1	4
		Community building	2	3	1	6
		Relevance	2	3	2	7
	M2. Factors discouraging participation	Lack of digital literacy	2	2	1	5
		Lack of time	2	3	3	8
		Inadequate resources	2	2	2	6
		Language barriers	2	2	2	6
		Discomfort with using such a platform	3	2	2	7
		Frustration from technology	2	2	1	5
		Tone of discussion	1	2	1	4
		Top-down approach of urban governance	2	3	2	7
		Political considerations	1	2	1	4
		Distrust in the institutions	3	2	3	8
		Lack of interest	3	2	3	8
		Different priorities	2	2	2	6
		Lack of knowledge	1	2	1	4

7. Research outputs

This chapter presents the main outputs of this research, as developed based on the derived results. First, a trifold validation of the results, related to the past, present and future, is presented, in order to fulfil the rigor and design cycle of the design science research, establish a grounding in the knowledge base, and attain a continuous assessment and refinement (section 7.1).

Afterwards, the results, as analyzed and synthesized before (see chapters 5 and 6), were combined in order to produce the main outputs of this research and reach its objective, providing an overall answer to the main research question: *Which characteristics need to be included in designing a public participation platform so that it can enhance citizen engagement and facilitate more effective public participation in urban planning?*

To do so, two core research outputs occurred. As already mentioned, while the research is primarily focusing on identifying the characteristics needed in the design of a digital participation platform, the intention was also to explore public participation holistically, examining it also as a process. Therefore, each of the two developed outputs corresponds to the dual focus of this research.

More specifically, for the platform itself as a tool, a conceptual design was developed and proposed, based on the different views of the urban stakeholders (qualitative and quantitative analysis), along with the results of the validation (the second "type" of the executed validation related to the existing digital platforms of public participation), in light of scientific literature (theoretical background) (section 7.2.).

With regards to the process of public participation overall, a set of guidelines were developed, so as to provide general recommendations on how to enhance citizen engagement and the effectiveness of public participation, based on the different views of the urban stakeholders (qualitative and quantitative analysis), in light of scientific literature (theoretical background) (Section 7.3.).

7.1. Validating the results to meet the research objectives

The validation of the results consists of three parts, each of which took place at a different time. The first part was conducted throughout the data collection process. As mentioned in section 4.2 the different data collection methods were conducted at different times throughout the process of collecting data. This made it possible to partially validate some of the preliminary results.

For instance, the third conducted workshop had also a validating character, as the identified characteristics of the platform design at this time were discussed with the other participants in order to pinpoint their importance. In addition, during the last two interviews, after the completion of the interview with researchers, aggregated results from the previously conducted interviews were presented to the interviewees in order to receive their instant feedback. This part of the validation was considered as the preliminary validation.

The second part of the validation process was conducted after the completion of data collection and data analysis. This part of the results' validation included the comparison of the identified characteristics, requirements and technological features derived from data collection with existing platforms for public participation. In addition, scientific

literature related to the proposed components was examined in order to validate the results.

For this comparison, the examined (existing) digital platforms were chosen based on their relevance to the proposed platform. The base for identifying those platforms was Falco and Kleinhans' (2018) systematic review of 113 digital participatory platforms for co-production in urban development, which were analyzed and classified based on their relationship between citizens and the government. Along with those, platforms derived from other sources were also included. The overview of such platforms, as presented by the International Society for Participatory Mapping[1] was examined, together with platforms derived from desk research. Overall, 150 platforms were initially identified.

Based on the relevance of those platform to the proposed one, 19 platforms were finally selected for the validation. It is worth noticing that from the final selection of the platforms, platforms focusing on the previously cited conventional one-way of participation (information sharing) were chosen to be excluded, since the proposed platform aims at two-way communication.

The name, type of application and main features, description and link for each platform are presented in Table 13. In the same table, the comparison with the derived characteristics, technological features and technical requirements is presented. At this point, it is worth noticing that in many cases the access to the selected platforms was limited or the creation of an account was needed in order to identify specific characteristics of the platform. This constituted an important limitation for a better understanding of their environment. Nevertheless, the investigation of their websites, as well as related articles and literature ameliorated the comparison.

Table 13 below constitutes the present validation of the results. The symbol of x corresponds to the existence of the proposed characteristic while the empty cells mean the lack of the proposed characteristic or the absence of information.

Based on that, the characteristics, technical requirements, and technological features were evaluated based on their existence on similar public participation platforms. The examined components characterized as *not important/slightly important*, *important*, or *very important*. The very important and important components were considered fundamental and supplementary respectively, while the *not important/slightly important* components were excluded. Table 12 presents the relevance scale score.

[1] https://pmappingsociety.mn.co/

Table 12: Relevance scale score

Relevance score		
Not important/ slightly important	Important	Very important
0 - 0.33	0.33 – 0.67	0.67 - 1

In most cases, the correlation between existing platforms and proposed characteristics was high, which confirms the validity of their selection. The platforms that already accommodate most of the proposed components are: Civocracy, Maptionnaire, Neighborland, CityPlanner, Commonplace and Citizenlab.

It is worth noticing that "Build knowledge base among stakeholders" and "Involvement of stakeholders depends on the context" were the most identified characteristics, while "Merge qualitative and quantitative data" and "Moderator of the process" were the least important characteristics. Regarding the technological features, "Maps" and "Social Media" were existent on most of the platforms while "QR codes", "Audio recordings", "Lidar Scanners" and "Wearable technology" were non-existent. Lastly, regarding the technical requirements, "Easy to use", "Privacy", "Security" and "Intuitiveness" were the most notable ones, while "Open source" and "Trust among stakeholders" were the least identified requirements in the existing platforms.

The last part of the validation refers to future cycles of validation and is related to the Citizen Voice project. As already mentioned, the derived results of this thesis project can work as a basis for the team of Citizen Voice. The actual development of the platform, starting from a pilot platform and working on the final product can work as a continuous validation of the results, as the proposed characteristics, technical requirements and technological features will be tested in real life.

Table 13: Overview of the validation with existing digital platforms for public participation

Name	Type of Application - main features	Description	Link
Maptionnaire	Participatory mapping surveys. Maps, comments, submit ideas, exporting	User-friendly questionnaire creation; interpretation and insight of results. A map-based questionnaire promoting discussion by publishing the results. Analyze and report.	https://maptionnaire.com/
Ushahidi	Custom surveys and crowdsourcing tools. Open source, Data collection analytics	Set of tools designed to crowdsource, analyze, visualize and respond to timely data about events or crises. Developed to map reports of violence in Kenya after the post-election violence in 2008.	https://www.ushahidi.com/
Map Your World	Participatory mapping surveys	Online mapping tool targeting youth to explore issues and ideas to make change in their communities	http://mapyourworld.org/
GIS Cloud	Custom surveys and crowdsourcing tools	Crowdsourcing solution for organizations, cities, public and anonymous users. Anonymous users can submit reports, including photos and comments, of any kind using Mobile or Web App. Citizens can review existing reports, comment or vote on reports and observations submitted by others; connected to GIS Cloud platform and environment	https://www.giscloud.com/
BUURbook	Discussion forum, maps,uploads	Forum that encourages community discussion and action at neighbourhood level	https://buurbook.nl/
Airesis	Open Source, Discussion,voting tools.	A platform to organize groups, engage people and hear their opinion. Tool to share documents, discuss ideas, vote and summarize shared solutions. A mass deliberative system. A tool to enhance collective intelligence.	https://www.airesis.eu
Bang the Table –Engagement HQ	Platform for public engagementneeds. Digital mapping,ideation, stories, blogs,discussion forums.	Opinion maps,surveys, submitIdeas, Forums,Exporting,Analytics	http://www.bangthetable.com/
Block by Block	Simulation software and urban design	It is based on Minecraft to engage poor communities in urban design and fund the implementation of public space projects all over the world.	https://www.blockbyblock.org/
Carticipe	Voting, submit ideas, comments, map-based, Analytics	Carticipe is participatory platform designed to foster citizens debate and consultation on city-related matters. The tool combines social networks and interactive maps.	https://carticipe.net/
CityPlanner	Submit ideas, maps, comments, 3-d models	Map-based platforms and 3-D models that allows citizens to submit their ideas and projects.	https://eu.opencitiesplanner.bentley.com/site/
Commonplace	Map-based, Analytics, ideas, comments	A simple and clear map-based tool for capturing people's views.	https://www.commonplace.is/
coUrbanize	Comment, voting tool, ideas, maps, Analytics	List project information for development proposals and gather online feedback.	https://www.courbanize.com/
Crowdgauge	Open source Budget allocation, maps, rating, comments	Allows users to set priorities, rate and support different options and contribute with ideas about actions and policies.	http://crowdgauge.org/
MetroQuest	Submit ideas, Voting, maps	It incorporates scenario planning and visualizations for informing the public and collecting feedback. Allows citizens to submit and vote ideas.	https://metroquest.com/
Neighborland	Submit ideas, comments, maps, discussion forums.	It empowers civic leaders to collaborate with residents in an accessible, participatory, and enjoyable way providing real-world design tools and a powerfully simple platform to engage people on the web.	https://neighborland.com/
Civocracy	Discussion board, voting tool	Enables effective, constructive discussion and shared decision- making between stakeholders (citizens, businesses, organizations, governments) and encourages active citizen engagement.	https://www.civocracy.com/
Colab	Mobile app, Geo-located reporting, Voting tool,	Mobile app for reporting issues, making suggestions and ideas to local government.	https://www.colab.re/
Citizen Space	Online consultations, and surveys, Statistics and analytics.	A system for creating online consultations, building surveys, complete with contextual information. Designed in collaboration with government specifically for public sector use.	https://www.delib.net/
Citizenlab	Participatory mapping surveys. Open-source, Maps, comments, submit ideas, exporting	Uncover community insights to make inclusive and data-driven decisions in your city. CitizenLab's centralized community engagement platform makes it easy for governments to engage their residents, manage input, and make informed decisions.	https://www.citizenlab.co/

Characteristics													
Name	C1. Build knowledge base between stakeholders	C2. Effective communication	C3. Dialogue between stakeholders	C4. Frequency of data updates	C5. Inclusive way to participate	C6. Inform well the relevant stakeholders	C7. Involvement of stakeholders depends on the context	C8. Merge qualitative and quantitative data	C9. Moderator of the process	C10. The tone of the discussion	C11. Toolbox of participation	C12. Transparency of the process	C13. Understand the audience and the context
Maptionnaire	X	X	X	X			X	X		X	X	X	X
Ushahidi	X	X		X			X			X			X
Map Your World	X	X					X			X			
GIS Cloud	X		X	X			X				X		X
BUURbook	X			X	X	X	X			X		X	X
Airesis	X				X	X	X	X		X	X		X
Bang the Table –Engagement HQ	X	X	X			X	X			X	X	X	X
Block by Block	X		X			X				X			X
Carticipe	X	X				X	X						X
CityPlanner	X		X		X	X	X			X	X		
Commonplace	X	X	X		X	X	X			X	X	X	
coUrbanize	X		X	X			X			X		X	X
Crowdgauge	X	X	X				X					X	
MetroQuest	X		X		X			X		X			
Neighborland	X	X	X	X		X	X				X	X	X
Civocracy	X	X	X		X	X	X	X		X		X	X
Colab			X			X	X			X	X	X	
Citizen Space	X	X	X		X	X				X		X	X
Citizenlab	X	X	X	X		X	X			X	X		X
Overall score	0,95	0,58	0,74	0,37	0,37	0,63	0,84	0,21	0,00	0,79	0,47	0,53	0,68

Technological features												
Name	F1. 3D model	F2. Audio recordings	F3. Gamification	F4. Language	F5. Lidar scanners	F6. Maps	F7. Modularity of the features depends on the context	F8. QR codes	F9. Rewards	F10. Social media	F11. Storytelling	F12. Wearable technology
Maptionnaire	X		X	X		X	X		X	X		
Ushahidi			X	X		X				X		
Map Your World				X		X				X	X	
GIS Cloud	X			X		X	X					
BUURbook				X		X	X			X	X	
Airesis				X			X		X	X		
Bang the Table –Engagement HQ				X		X	X			X	X	
Block by Block	X		X	X		X						
Carticipe						X	X			X	X	
CityPlanner	X			X	X	X	X			X		X
Commonplace				X		X	X			X		
coUrbanize		X		X		X	X			X	X	
Crowdgauge			X	X		X			X	X	X	
MetroQuest			X	X		X	X			X		
Neighborland	X			X		X	X			X	X	
Civocracy			X	X		X	X			X	X	
Colab			X	X		X	X			X		
Citizen Space				X		X	X			X		
Citizenlab				X		X	X			X		
Overall score	0,26	0,05	0,37	0,95	0,05	0,95	0,79	0,00	0,16	0,89	0,42	0,05

Requirements											
Name	R1. Attractive-visual and content interesting	R2. Easy to use - User friendly	R3. Fun to use	R4. Intuitiveness	R5. Verification	R6. Modular design	R7. Open Data for participants	R8. Open-source	R9. Privacy	R10. Security	R11. Trust among stakeholders
Maptionnaire	X	X	X	X		X	X		X	X	
Ushahidi	X	X		X			X	X	X	X	
Map Your World	X	X	X	X	X				X	X	X
GIS Cloud	X	X		X					X		
BUURbook		X		X	X		X		X	X	
Airesis		X		X	X	X	X	X	X	X	
Bang the Table –Engagement HQ	X	X		X	X	X	X		X	X	X
Block by Block	X		X				X		X	X	
Carticipe		X		X			X			X	
CityPlanner	X	X	X	X	X		X		X	X	
Commonplace	X	X		X	X	X	X		X	X	X
coUrbanize		X		X	X	X	X		X	X	X
Crowdgauge	X	X	X	X	X		X	X	X	X	
MetroQuest	X	X	X	X	X	X	X		X	X	
Neighborland	X	X		X	X	X	X		X	X	X
Civocracy	X	X	X	X	X	X	X		X	X	X
Colab	X	X	X	X	X	X	X		X	X	
Citizen Space		X		X	X	X	X		X	X	
Citizenlab	X	X		X	X	X	X	X	X	X	
Overall score	0,74	0,95	0,42	0,95	0,74	0,58	0,89	0,21	0,95	0,95	0,32

7.2. Conceptual design

The proposed conceptual design consists of the identified technical requirements, technological features, and characteristics, as synthesized and validated. It is worth noticing that many of the identified characteristics, while they were focused on the platform as a tool, they can also act as guidelines for improving the process of public participation. In other words, the characteristics refer to the tool itself but, in many cases, can be also applied to the process of public participation in general.

For instance, the characteristic of building a knowledge base among stakeholders can refer to the tool as can work as a knowledge base for urban stakeholders itself but at the same time, this constitutes a guideline for a more effective public participation in urban planning which can be applied outside of the context of this platform with various ways.

7.2.1. Characteristics

The characteristics that occurred in the existing platforms for public participation and are simultaneously considered compulsory components for urban stakeholders are:

- Build knowledge base between stakeholders
- Effective communication
- Dialogue between stakeholders
- Frequency of data updates
- Inclusive way to participate
- Inform well the relevant stakeholders
- The involvement of stakeholders depends on the context
- Toolbox of participation
- Transparency of the process
- Understand the audience and the context

These characteristics were all considered essential for the conceptual design of the proposed platform; therefore, they were chosen to be part of the proposed conceptual design. Pfeffer et al (2013) confirm building a common knowledge base, derived from information sharing and exchanging among the different involved stakeholders it is essential for a participatory platform, leading to more effective engagement and socially acceptable planning decisions.

Next to that, effective communication is crucial to be taken into consideration when designing a participatory platform, since miscommunication or misleading communication among the facilitators can lead to limited engagement in the platform; bidirectional communication between the institutions and the citizens/groups should be ensured (Pietilä et al., 2019; Sheedy et al., 2008). Effective communication can also be translated into transparency; "how and what is reported to whom", since for Sheedy et al (2008) having an overall transparent process is vital for citizen engagement (p. 34).

Furthermore, participation should be facilitated through such a platform in an inclusive way. Inclusivity is also related to the context within which the platform is used; it is, thus, important to make clear already from the design of the platform, the context and the

reasons why citizens or specific citizens groups are engaged, as confirmed by (Lee et al., 2020).

On the contrary, some characteristics were not considered crucial for urban stakeholders nor identified in the existing platforms for public participation. More specifically, the characteristic referred to the need for a moderator of the process was not considered essential for the urban stakeholders and was not identified in the existing platforms as in most cases the moderator of the process was the platform itself and not an independent entity that can secure everyone's interests. For this reason, this component was excluded from the final design.

Furthermore, the tone of the discussion was not considered necessary by urban stakeholders, while it was identified in many existing platforms that try to engage people in creative ways. However, this characteristic was excluded from the final design, as already high-scored characteristics, such as effective communication, an inclusive way to participate and dialogue among stakeholders can fulfil the debated characteristic.

Lastly, the characteristic of merging qualitative and quantitative data was considered critical by urban stakeholders, while it was not identified in many existing platforms for public participation. Referring to open-source tools, Yap et al (2022), underline that qualitative and quantitative data are equally important. Taking this into consideration, along with the importance that was attached to the characteristic of merging those two types of data (mainly by policy makers), this characteristic was chosen to be included in the final conceptual design proposed.

7.2.2. Technical Requirements

The technical requirements occurred from the existing platforms for public participation and are simultaneously considered compulsory components for urban stakeholders are:

- Attractive-visual and content interesting
- Easy to use - User friendly
- Fun to use
- Intuitive
- Modular design
- Open Data for participants
- Privacy
- Security
- Trust among stakeholders (validation)

The technical requirements listed above were all considered essential for the conceptual design of the proposed platform. The importance of various of those requirements are also confirmed by scientific literature, considering digital participations platforms. For Gün et al (2019) designing a easy to use platform can help overcome challenges related to citizen engagement, and eventually increase the engagement in the participatory process at hand.

Fun to use is another important technical requirement to be taken into account when designing such a platform. Panopoulou et al (2014) consider this requirement of fun environment a success factor, in digital participation, while it is worth noticing that this

requirement is rendered also, according to Hutter et al (2011), as a factor that can motivate people to participate in a digital participation platform.

However, some of the technical requirements were not considered crucial for urban stakeholders nor identified in the existing platforms for public participation. More specifically, the requirement of open source was not considered essential by urban stakeholders and was not identified in many existing platforms. However, due to literature findings as presented in the theoretical background, this requirement was decided to be included in the proposed conceptual design. More specifically, for Yap et all (2022) creating digital platforms as open-source tools is crucial, considering the evolution of the technology and the numerous possibilities that are offered and can be utilized in planning, but also other disciplines.

Focusing on designing an open-source tools constitutes a reflection to the increasingly trending shifts of facilitating urban planning processes in a "platform-oriented way…that reflect how societies, economies and cities are digitally embedded" (Yap et al., 2022, pp. 3-4). According, though, to Lock et al (2020), providing open data and designing open-source tools does not ensure the optimal support for open urban governance, raising a point of criticism when it comes to open data. Therefore, while considering this requirement vital for the proposed conceptual design, it is very important at the same time to recognize challenging points that may need particular attention when applying in the future this conceptual design.

With regard to the verification requirement, this was not considered necessary by the urban stakeholders while it was identified in many existing platforms. Nonetheless, the requirement of verification was chosen to be included in the final design, as it was considered as highly related to certain requirements for the platform, such as security and trust among stakeholders in terms of validation.

7.2.3. Technological features

The technological features that are evaluated as fundamental or important in the identified existing platforms but also by the urban stakeholders are the following:

- 3D models
- Gamification
- Language
- Maps
- Modularity of the feature depends on the context
- Social media

These technological features were all considered essential for the conceptual design of the proposed platform. Integrating gamification elements in such a platform was also highlighted in the scientific literature. As for 3D models, Hanzi (2007) calls them the "most effective form" of visualizing and presenting planning-related decisions, verifying the importance of such a feature in the design of the digital participatory platform.

For Poplin (2014), the importance of gamification is twofold; on the one hand, it can provide a more enjoyable context for co-creation, rendering it more attractive to citizens/groups, while on the other hand gamification can, to a certain extent, deals with complexity, helping citizens to manage it. Ritterfeld et al (2009) add on that that gamification can help people focus on more specific issues, exploring the complexity of the urban space.

Furthermore, scientific literature confirms that the use of maps in a digital participatory platform can be particularly beneficial when intending to ensure and enhance citizen engagement for it. Gordon et al (2011) and Sieber (2006), referring to the use of maps using GIS in digital participation platforms provide endless flexibility. This flexibility is translated into the infinite ways the available data can be combined and visualized, increasing at the end the overall transparency of the participatory process and expanding the idea of cocreation among the involved stakeholders.

Linders (2012) verifies the importance of using social media in urban planning-related processes, focusing on the advantages of coproduction and mass collaboration among the involved stakeholders. Similarly, though, to the technical requirement of open-source, social media, as a technological feature, comes also with challenges that need to be considered and handled when including this feature in the platform design.

Mergel's (2013) empirical study showed that social media are mostly used by governments as "push techniques" that focus on simply providing the available information to the public, without encouraging active engagement and collaboration. It is, therefore, crucial, to ensure that the platform's aim of establishing two-way communication can be realized, integrating, and utilizing the feature of social media in an appropriate manner.

On the other hand, several technological features were not considered crucial by the urban stakeholders nor identified in the existing platforms for public participation. More specifically, technological features such as audio recordings, lidar scanners, QR codes, wearable technology, and rewards were decided to be excluded from the final design. With regards to the latter, it is important to mention that rewards were excluded for adding them as a technological feature to the conceptual design, but due to their high importance, as reported by the urban stakeholders and scientific literature, it was included in the guidelines provided for facilitating an effective process of public participation (see next section).

Lastly, the feature of storytelling was not considered necessary by the urban stakeholders while it was identified in many existing platforms that try to engage people in a comprehensible way. As confirmed by scientific literature, using storytelling practices can effectively lead to the creation of stronger urban communities (Slingerland, Kooijman, Lukosch, Comes, & Brazier, 2021). Therefore, it was considered also for the design of a digital participation platform that focuses on enhancing cocreation, and building in the long run stronger communities, and as such it was chosen to be included in the proposed conceptual design.

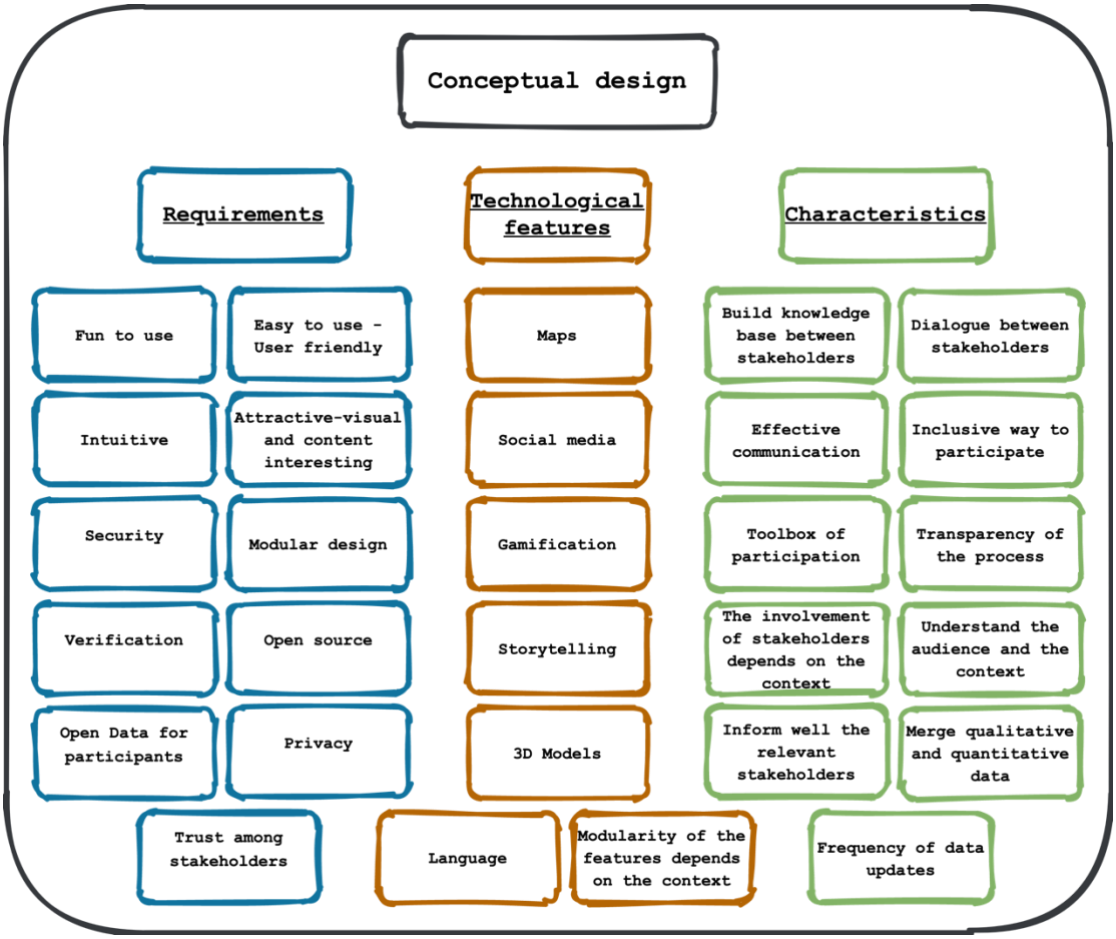

Figure 15: Overview of the proposed conceptual design of the platform

7.3. Guidelines

For the proposed set of guidelines for enhancing citizen engagement and facilitating (more) effective public participation, the identified general findings, along with the de(motivational) factors for public participation and the characteristics, were combined. With regards to the latter, as already mentioned, the theme of characteristics, as derived from the data analysis and synthesis, refer both to the tool itself, but also to the process of public participation in general. Thus, besides the proposed conceptual design, they were also included (as synthesized and validated) in the proposed set of guidelines. These characteristics along with the general findings and factors for engagement were evaluated with the same technique as the components of the conceptual design and the approved elements were translated into guidelines. The final set of the proposed guidelines is presented at the end of this section.

7.3.1. (De)motivational factors for public participation

With regards to the factors that can incentivize citizen engagement regarding public participation platforms, the following were identified as the most important, based on the views of the urban stakeholders:

- Non-monetary rewards
- Simple and easy-to-use interface

- Social media
- Gamification
- Feeling of ownership
- Accessible knowledge
- Community feeling
- Relevance

These motivational factors were considered essential in order to enhance citizen engagement. Hutter et al (2011), shedding light on people's intrinsic motivations to engage in a cocreation process, highlight that those are perceived as non-monetary rewards from the users, and, thus, can motivate them to engage. Among those, the authors refer to political interest and knowledge sharing, while they underline that providing an enjoyable environment for the users can motivate them to participate, balancing the joy they can get from their participation as more important compared to the effort they put into the process.

The use of a simple format (easy to use), social media and gamification elements in the design of the platform, are features and requirements that can increase people's motivations to engage. As verified earlier from scientific literature, all the aforementioned factors can render a digital participatory more attractive to potential users, increase their responsiveness, and keep them engaged throughout the whole planning or decision-making process at hand (Gün et al., 2019; Linders, 2012; Poplin, 2014; Ritterfeld et al., 2009).

Providing information and knowledge that is easily accessible was another motivating factor that enhance citizen engagement. Galegher, Sproull and Kiesler (1998) confirm that looking for such information and knowledge is a crucial factor that influences citizen engagement, while along with it, they also highlight the importance of providing information that is relevance-dependent, as people tend to seek information and knowledge that is related to them in terms of context, problems, or environment.

Lastly, community feeling is confirmed by the scientific literature as an important motivation for citizen engagement. Wijnhoven, Ehrenhard and Kun (2015) refer to it as "kinship", defining it as the need of people to feel that their participation can contribute to the community they feel they belong to (see also von Krogh, Haefliger, Spaeth, & Wallin, 2012).

On the contrary, for the urban stakeholders, several incentives were not considered essential, therefore, those were chosen not to be added to the proposed set of guidelines. More specifically, those incentives include personal development, selfish motivations, reputation and monetary rewards. With regards to the latter, it is worth mentioning that for von Hippel (2007) monetary rewards are considered by the users equally important to non-monetary rewards, since they believe that such a reward, in any form, is equal to the time and effort they put into the process.

However, for most urban stakeholders, monetary rewards can attract people for the wrong reasons and increase bias. Therefore, even though the scientific literature does not support this exclusion, greater importance was decided to be attached to the stakeholders' views, and therefore keep monetary rewards out of the final set of the proposed guidelines.

Concerning the most important discouraging factors for citizen engagement, based on the views of the urban stakeholders, these are:

- Lack of digital literacy
- Lack of time
- Inadequate resources
- Language barriers
- Discomfort with using such a platform
- Frustration from technology
- The top-down approach to urban planning
- Distrust in the institutions
- Lack of interest
- Different priorities

These demotivational factors were considered essential, and therefore need to be taken into consideration when developing the set of the proposed guidelines. The lack of digital literacy, besides being identified as a discouraging factor by the urban stakeholders, Falco and Kleinhans (2018) highlight that the lack of digital literacy is a strong criticism against the use of digital participation platforms overall.

Frustration with using such a platform can also be related to Falco and Kleinhans' (2018) argument, since the authors also highlight that there may be a need for training when introducing new technology with such a platform. Next to that, people's willingness to engage in such a platform can be significantly influenced by people's lack of interest and time, as confirmed also by scientific literature (Brown, 2012; Falco & Kleinhans, 2018; Pietilä et al., 2019). Lastly, the lack of trust was also confirmed by the scientific literature as a crucial discouraging factor for citizen engagement; Putman underlines that engagement and trust are "mutually reinforcing" (Putnam, 2000, p. 137), while for Iorio and Kumagai (2020) also confirm that the lack of trust can significantly influence citizens' willingness to engage in a participatory process, limiting at the same time the performance and accountability of this process.

On the contrary, based on the stakeholders' views, several disincentives were not considered essential. More specifically, disincentives such as tone of the discussion, political considerations, and lack of knowledge were decided not to be taken into consideration for the final set of guidelines.

7.3.2. General findings

Based on the urban stakeholders' views, some general findings related to the process of public participation were highlighted as important, when intending to facilitate more effective public participation in urban planning. These are:

- Challenges in public participation
    - The top-down approach in urban planning
    - Management of the (many) involved stakeholders
    - Different perspectives of people raise complexity for the platform
- Combination of digital tools and in-person participation
- Community feeling
- Different people-ideas-priorities-needs-desires
- Quality and quantity of input

As occurred from the results, there are various challenges in relation to public participation that need to be considered for enhancing the effectiveness of public

participation. Concerning the top-down approach in urban planning, Reynante, Dow and Mahyar (2021) underline that when using conventional ways of participation, with top-down driven approaches, people with little or no power or control over the processes are left out of the process, jeopardizing the levels of inclusiveness that can be achieved.

With regards to the need to manage the many stakeholders involved in a planning participatory process and the consequent complexity that emerges due to their different perspectives, these are also important challenges that need to be efficiently managed through the design of a digital participation platform. Stratigea et al (2015) highlight that planning decisions may be relevant to a range of different stakeholders that are directly or indirectly affected by it. Therefore, there is a need to come up with ways of engaging citizens, that can minimize the complexity, and the potential conflicts that may arise.

With regards to the combination of digital and in-person participation, Reynante, Dow and Mahyar (2021) point out and confirm that both types of participation are equally important. Physical participation is possible to ensure higher levels of involvement and commitment to the participatory process, while with online participation many constraints that come along with physical participation, including costs or time, may be overcome. Next to that, the authors highlight that by utilizing the advantages of both types of participation and providing hybrid ways of engagement, participation can be scaled up "by offering additional point of entry with flexible and accessible participation options" (Reynante et al., 2021, p. 17).

Community feeling, as already presented earlier, it is an important point to take into account when aiming to facilitate effective public participation, as it can be considered an important factor that can act as an incentive for people to engage in the participatory process (see Wijnhoven et al., 2015).

Lastly, it is worth noticing the problem of misconnection was chosen not to be taken into consideration for the development of the proposed set of guidelines. Several policymakers and researchers who participated in the research referred to it, without, though, emphasizing to it. Next to that, there was no scientific literature included in the literature that supported or objected this finding. Therefore, it was chosen to be excluded.

Based on the above, the final set of the proposed guidelines was developed. Overall, seven guidelines were formulating, providing general recommendations on how to enhance citizen engagement and facilitative more effective participatory processes. The final set of guidelines includes the following:

1. Create tools that enable active engagement and collaboration among the relevant urban stakeholders
2. Establish procedures that renders knowledge accessible to the relevant urban stakeholders and creates common ground
3. Establish communication channels and transparency control mechanisms throughout all the stages of public participation
4. Create interactive participatory processes and tools that are attractive to the urban stakeholders
5. Provide tailor-made participatory tools and procedures, depending on the context and the targeted urban stakeholder groups

6. Provide guidance to citizens in using new technology
7. Support online, in-person and hybrid participation in order to meet the needs and capacities of the targeted urban stakeholder groups

Table 14 below presents an overview of this set, also indicating the elements that of the previously presented characteristics, (de)motivational factors and general findings that fall under each guideline. It is worth noticing that some of those elements were considered relevant for more than one guideline. Therefore, they are indicated under all the guidelines that were considered as capable of covering/fulfilling them.

Table 14: Guidelines for the enhancement of citizen engagement and the facilitation of (more) effective public participation

Guidelines for the enhancement of citizen engagement and the facilitation of (more) effective public participation	
Create tools that enable active engagement and collaboration among the relevant urban stakeholders	• Feeling of ownership • Community feeling • Relevance • Lack of interest • Different priorities • Different people-ideas-priorities-needs-desires
Establish procedures that renders knowledge accessible to the relevant urban stakeholders and creates common ground	• Accessible knowledge • Build knowledge base between stakeholders • Dialogue between stakeholders
Establish communication channels and transparency control mechanisms throughout all the stages of public participation	• Inform well the relevant stakeholders • Effective communication • Transparency of the process • Distrust in the institutions
Create interactive participatory processes and tools that are attractive to the urban stakeholders	• Non-monetary rewards • Simple and easy-to-use interface • Social media • Gamification • Lack of interest
Provide tailor-made participatory tools and procedures, depending on the context and the targeted urban stakeholder groups	• Inclusive way to participate • The involvement of stakeholders depends on the context • Toolbox of participation • Understand the audience and the context • Lack of time • Language barriers • Lack of interest • Different priorities • Different people-ideas-priorities-needs-desires • Management of the (many) involved stakeholders • Different perspectives of people raise complexity for the platform

	• Quality and quantity of input
Provide guidance to citizens in using new technology	• Discomfort with using such a platform • Frustration from technology • Lack of digital literacy • Inadequate resources
Support online, in-person and hybrid participation in order to meet the needs and capacities of the targeted urban stakeholder groups	• Top-down approach to urban governance • Inclusive way to participate • The involvement of stakeholders depends on the context • Toolbox of participation • Understand the audience and the context • Combination of digital tools and in-person participation

8. Conclusion

8.1. Concluding remarks

In this thesis project, a speck of the public participation process in urban planning was presented, under the lights of new possibilities that the technological advancement offers. The changes and pressures that cities are undergoing have given rise to new digital tools in urban planning, with the aim of tackling them effectively. The use of new technologies and the creation of new digital tools help to change and enrich the conventional methods of public participation, changing the way people perceive and inhabit the city. The importance of utilizing participatory approaches in the design process, as an attempt to bridge the gap between decision-makers, citizens and the scientific community has been emphasized by many scholars (Booher David, 2002; Hanzl, 2007; Macintosh, 2004).

Utilizing technological advancement through digital tools for public participation can enhance the effectiveness of the design process, and, thus, facilitate participation and attract a wide range of participants. In this context, the new digital tools can act as means to expand the cognitive base of the design, but also to record the range of different views and perspectives of social groups, in order to integrate them into the final product of the urban design. As such, they can contribute to the upgrading of both the design process itself, through the widening of the participatory dimension, and the final product produced by it (Stratigea, 2015).

A significant range of tools and technologies are already mature and available to serve the objectives of participatory design. Despite this fact, and while a number of theoretical contributions are recorded, there is no similar activity in the context of applications. The aforementioned disproportion implies that a digital tool cannot be considered a discrete entity. The encapsulation of these tools in the design process requires the management of several issues related to technical, political, institutional, and societal dimensions.

Technological advancement has significantly expanded the range of tools and technologies to be utilized in the context of participatory approaches so as to solve design problems. The traditional methods of participation, but also those implemented through the support of new digital tools, expand the toolbox of participation, offering appropriate methods, that depend on the socio-economic context in which participation takes place, the culture of participation within this context, the model of communication and interaction of citizens, the needs and objectives of the design, the technological infrastructure and the available tools (Stratigea, 2015).

This study attempted to determine the conceptual design of a public participation platform that can enhance citizens' engagement and facilitate a more effective public participation in urban planning, aiming at a design by all and for all. The proposed conceptual design promotes the principles of participatory planning and strengthens the roles of the different stakeholder groups by making appropriate use of ICT.

Along with the conceptual design, a set of guidelines was also formulated, so as to provide recommendations on how to enhance citizen engagement and facilitate

more effective public participation schemes. Those two research outputs combined, are capable of strengthening the role of citizens, making them co-producers of data used by design, but also achieves the dissemination of information to urban stakeholder groups to inform and raise their awareness. Moreover, they can integrate participatory decision-making processes, adding value to them, through their enrichment by local knowledge.

At the same time, the outputs of this research can potentially allay the limitations of conventional methods of participation, such as the physical presence in a specific space and the involvement in a specific time. It also creates a platform for communication and interaction between decision-makers, citizens and researchers. By doing so, urban sustainability can be promoted by creating new urban landscapes that satisfy citizens-users, who are "committed" to taking care of and managing them responsibly for future generations, while at the same time can improve transparency, build trust and open dialogue. Finally, they can encourage productive forms of compromise by all stakeholders, so that solutions are produced that will result from the synthesis of different views, thus satisfying all those involved.

Based on the above, the number and the power of the benefits that can result from the use of such a tool seem to be considerable, however, it is necessary to refer to the possible risks that such a tool conceals. An important issue in the use of digital tools, in general, is the lack of digital literacy that creates the so-called digital divide between the educational levels of society. In addition, the use of platforms similar to the proposed for data mining that supports urban planning requires special management, as the data may not be representative of a city and its inhabitants, but rather of very specific groups of them.

Citizen Voice is a pilot digital tool for which accurate conclusions cannot be drawn without its implementation in real conditions. The benefits of the participatory design process can be several, as are most new digital tools, but this does not recommend replacing traditional design methods and tools, as each of them must be chosen according to the context at stake. To conclude, the proposed conceptual design and specifically the platform of Citizen Voice is not a panacea for public participation processes in urban planning.

The proposed characteristics for a public participation platform could be an alternative approach to incentivize citizens to participate in the decision-making process and to improve the effectiveness of urban planning in terms of inclusiveness. As with all great challenges, there is no one way to solve them once and for all. However, this does not mean that we should stop trying to find new solutions. Technology is a key factor that can improve the existing situation of public participation but needs to be harmonized with the understanding of the whole process of public participation.

8.2. Limitations of the research

This research was based on a combination of data collection methods, in order to identify the characteristics that are required in the design of a public participation platform, aiming at citizen engagement and effective urban governance. It is important, however, to notice that this research comes with certain limitations, mostly related to the research approach and methodology that was followed.

To begin with, the combination of multiple (and different) data collection methods was intentionally chosen, in order to gain input from multiple actors with different perspectives and achieve the triangulation of the sources. However, each of the selected methods has some limitations, regardless of the steps that were followed to ensure the overall quality and trustworthiness of the research.

To begin with, workshops were used in order to obtain experts' input in relation to the platform. The highly collaborative environment of such a setting, for both sides, can potentially make people participating more passive. Therefore, there is the possibility of perspectives being ignored or not even expressed during the workshops. Next to that, the fact that personal notes were taken by the researcher during these workshops, there is the possibility of researcher bias and mistaken assumptions by the researcher.

With regards to the interviews, access constitutes a primary limitation within the context of this research – as a master thesis project- and its predefined (limited) time. The sample used for the interviews is relatively low (6 in total). In case of more available times, more potential interviewees could be invited to participate in the research. Furthermore, besides the numerical enlargement of the sample, more perspectives could also be included, approaching confirming the participation of other relevant sectors for the platform, such as government or private sector representatives.

Next to that, the quality of the derived data from the conducted interviews might be affected by the interviewer's quality and his interaction with the interviewees. The experience, interviewing skills and the overall approach of the interviewer may have an effect on the inputs' quality. The researcher had limited prior experience in conducting interviews and thus the selected approach of structuring and conducting the interviews constitute a limitation. Consequently, the researcher's interaction with the interviewees might affect the quality of the obtained information. Next to that, considering that each of the scheduled interviews is unique, along with the connection of the researcher with each of the respondents, the results from the interviews may vary significantly, and therefore, mislead the data analysis that followed.

Concerning the questionnaires, it is important to notice that the fact that the questionnaire was mainly distributed digitally may influence the reported results and respondents' preferences regarding online public participation. Therefore, there is the possibility of having biased respondents. In addition, language barriers and linguistic issues also constitute limitations for this selected data collection method. Considering that Dutch and Greek people covered the majority of the respondents, and the questionnaire was conducted in English, there is the possibility of having misleading or not accurate results, due to the level of understanding of the posed questions.

Next to that, limited application and low response rate constitute limitations, within the context of this research. The distribution of a questionnaire, in general, but also particularly online, is possible that left excluded specific groups of people, including people that are not able to read and/or write very old people, or people with no access to electronic devices. Therefore, the respondent population might be partially inclusive. Moreover, the respondents' interest in the topic of the research, their perception of its relevance to their own interest and their availability may affect the response rate. Taking also into consideration the given time of the research, the response rate could be significantly different. Therefore, the limited time of the research in combination with the low response rate within this time constitutes a limitation for this

research, considering that the derived results might not be representative of the whole respondent population.

Next, it is important to mention that the combination of multiple data collection methods brings upon one more limitation for this research which is related to the data analysis. More specifically, the synthesis of the derived results from all the used methods might be inexpedient in some cases. Considering the context and the target group of each of the data collection methods, differentiated -in terms of content- and different -in terms of the use of language- questions were formulated and posed, even though the core remained the same (keeping the core themes in relation to the research questions). This may affect the way the results were clustered, analyzed and synthesized since in some cases there was no direct or clear point of comparison among the results.

Additional limitations of this research could be considered the emphasis on digital public participation. While the intention was to focus on digital tools, as well as on the process of public participation in urban planning, emphasis was given to online participation. Another important limitation for the validation of the derived results constitutes the way that the selected existing platforms were compared to the proposed components. In many cases, access to the selected platforms was limited or the creation of an account was needed in order to identify specific characteristics of the platforms. This affected the understanding of their environment, as well as the comparison with the proposed characteristics.

8.3. Recommendations for future research

Based on the aforementioned limitations, as well as the results of this research, future research suggestions were formulated. The proposed conceptual design can work as a base for the development of public participation platforms that can enhance citizen engagement. However, both proposed conceptual design itself, as well as the proposed guidelines, can be combined in different ways in order to work as a "toolbox of participation". The outcomes of this study constitute a single way to translate all this different input into a design. Taking into consideration the context and the audience that public participation needs to apply to, various use cases can be developed, being tailor-made for the case at hand.

Taking into consideration all the different perspectives and the different needs that each urban stakeholder group has, six different use cases are proposed for further research. All these different use cases can be adapted to each user's needs, in order to maximize efficiency. The requirements, characteristics and features of each use case can be tailor-made. These use cases can work as a base for the Citizen Voice platform, where various features and characteristics could be tested in real-life scenarios, in order to understand and validate the findings of this study.

Table 15: Overview of the proposed use cases for further research

Name	User	Description
City Dashboard	Policymakers	Top-level monitoring and strategies of the city
Project platform	Policymakers	Specific interventions with frequent monitoring
Neighborhood identity	Citizens	Share information about personal stories, history of the neighbourhood, initiatives
Research platform	Researchers	Data collection for scientific purposes
Community action	Citizens	Organization of local activities
Neighbourhood forum	Citizens	Facilitate communication channels among citizens

Additional suggestions for further research are:

- A comparison between digital and offline public participation components needs to be investigated so as to identify the similarities and dissimilarities and provide a holistic approach to public participation in urban planning.
- An extensive and more in-depth investigation of the existing platforms for public participation is needed in order to detect the vital components that a platform for public participation needs to have.
- Further research is needed for the validation of the results. The proposed conceptual design and the guidelines for effective public participation in urban planning need to be validated by the urban stakeholder groups in order to evaluate the final design.
- This research was carried out in the Netherlands and the core input was taken from people that live in this country. The input from citizens was retrieved also from other countries, such as Greece, however policymakers and researchers live in the Netherlands. Additional research needs to be done in order to prove the context dependency of the derived results. For instance, an interesting topic for further research could be the identification of characteristics of a public participation platform by people from different countries.
- The proposed guidelines for effective public participation in urban planning can be further developed in order to provide policymakers, urban planners and governments with a framework that can be used in order to evaluate their practices and improve citizen engagement.

8.4. Research relevance

8.4.1. Scientific relevance

This thesis project can contribute to scientific knowledge in several ways. To start with, it can provide input for academic studies related to digital public participation tools. It can contribute scientific knowledge regarding the characteristics that should be included in a public participation platform in order to enhance citizen engagement and facilitate more effective public participation in urban planning. Next to that, the conceptual design of the proposed platform, as well as the guidelines that were developed can contribute to the scientific community in the field of citizen engagement. In relation to that, the proposed components of the platform design, as well as the guidelines, can work as a steppingstone for other researchers for further development (see section for future research).

In addition, this study can provide insightful input for the different perspectives of urban stakeholders. Furthermore, this study can contribute to the identification of factors that incentivize or discourage citizen engagement. The approach used for this research, simultaneously focusing on the digital tool itself and the process of public participation can be adopted and further developed by researchers in order to achieve a more comprehensive approach. Last but not least, this thesis project contributes to design science research ascertaining that this approach can be used in order to design a conceptual design and provide a set of guidelines that can make public participation in urban planning more effective.

8.4.2. Societal relevance

With regard to societal relevance, this study can contribute to the endeavors of developing public participation platforms that can enhance citizen engagement. The proposed conceptual design can work as a base for the development of digital platforms for public participation. The identified components of the conceptual design can be used by developers in different combinations (modularity), so as to achieve tailor-made solutions. In addition, the formulated guidelines can be used by policymakers and urban planners in order to enrich the process of public participation and improve its effectiveness.

Governments can also benefit from the proposed guidelines, as well as the proposed conceptual design, as they can make use of them to improve the tools and the process of public participation in urban planning. Furthermore, policymakers and practitioners can make use of the identified factors that incentivize and discourage citizen engagement in order to align their techniques and involve more people in urban planning. Lastly, the identification of different perspectives from urban stakeholder groups that were provided and analyzed can be used in order to improve the understanding of the existing conflicts among relevant actors.

8.4.3. Relevance with CoSEM

Complex System Engineering and Management (CoSEM) focuses on designing interventions in complex socio-technical systems. The emphasis is not only on the management of the technology per se, but also on the process, as well as the social aspects of the issues at stake. CoSEM combines the different perspectives of the involved actors, considering social, technical, economic, and institutional aspects. In addition, CoSEM provides systematic ways to understand and analyze the complexity of the challenge, in order to propose ways to cope with it.

In this study, all the aforementioned aspects were encapsulated, as the focus of this study was not limited to the tool itself but was also emphasized in the process of public participation in general. Considering cities as complex socio-technical systems, and the technical, economic, institutional, and societal knowledge that is required, this research aimed to provide an innovative yet practical solution. The objective was to increase citizens' involvement, developing the conceptual design of a pilot tool -a digital platform- that will be able to provide policymakers with a way to achieve more effective public participation in urban planning and decision-making procedures.

Working on the development of such a platform, in the light of urban complexity, required the use of methods, techniques, and tools in a creative and systematic way. The research subject covered values originating from both public and private domains. In addition, the management of a plethora of stakeholders with widely diverging

interests, as well as the consideration of ethical aspects was taken into account within the context of the research. All the above, indicate the relevance to the CoSEM requirements for this research, as a thesis project.

8.5. Reflection in the process of thesis project

This thesis project constitutes a mandatory part of the graduation of students from Complex System Engineering and Management programme. The overall working load of this study requires one semester, which is considered by the author as suitable. In general, it was a challenging period with peaks and valleys. While finishing this study several considerations came across.

From a practical point of view, the time management of the tasks needs to be precise in order to achieve the final objectives. The documentation needs to happen simultaneously with the research steps, in order to secure the consistency of the report. The issues that arise throughout the process need to be solved one by one, in order to accomplish the final goals of the study. There is a need to be specific on the terms that are used and clarify and define what is trying to be achieved with this research.

Great challenges cannot be solved at once. The limitations that are in place or emerge throughout the process need to be considered. The complexity that exists in these complex problems needs to be broken down into smaller and more manageable pieces. Solving these smaller problems while also focusing on the relations among these pieces can help coping with complexity.

While CoSEM provides a comprehensive way to manage complex systems, many times unpredictable limitations and obstacles can influence the final product of the study. As a person that enjoys overthinking the issues at hand and trying to go deeper and deeper, I could say that this many times considers beneficial but may affect the time management of the study. My suggestion to upcoming students is: Do overthink but not too much. Great challenges, such as public participation cannot be solved only using technology or some written pages. There is no doubt that technology and research can help in this direction. However, the crucial thing is for what reasons the research and technology are used and who are benefit from these. People that want to change their living environment need to strive for that.

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A

A.1. Letter of approval

Date 13-Jun-2022
Contact person Dr. Cath Cotton, Policy Advisor Academic Integrity
E-mail c.m.cotton@tudelft.nl

TU Delft Delft University of Technology

Human Research Ethics Committee
TU Delft
(http://hrec.tudelft.nl/)

Visiting address
Jaffalaan 5 (building 31)
2628 BX Delft

Postal address
P.O. Box 5015 2600 GA Delft
The Netherlands

Ethics Approval Application: Let citizen voice heard
Applicant: Ioannou, John

Dear John Ioannou,

It is a pleasure to inform you that your application mentioned above has been approved.

Please note that this approval is subject to your ensuring that the following condition is fulfilled: the interview transcripts are not published, or if it's necessary to do so care must be taken to make sure that transcripts are not only "anonymous", but also not identifiable.

Where it is feld that transcripts or transcript summaries must be published, we advise that where possible the transcript/summary itself should be approved by participants or it is confirmed by

Good luck with your research!

Sincerely,

Dr. Ir. U. Pesch
Chair HREC
Faculty of Technology, Policy and Management

A.2. Informed Consent Form

Delft University of Technology
HUMAN RESEARCH ETHICS
(Version: January 2022)

Thank you for agreeing to participate in this interview. My name is Ioannis Ioannou. I am conducting this interview as part of my master thesis project at TuDelft. The project aims at developing a map-based, open-source public participation tool, by identifying the characteristics required when designing such a tool. It is called Citizen Voice and it is a digital survey tool based on geographical information systems (GIS). The focus of Citizen Voice is on digital participatory mapping, enabling the collection of spatial data directly from citizens.

The purpose of this interview is to gain input from urban stakeholders in order outline the characteristics required for this conceptual design. The interview is divided into three parts. The first part is introductory, for outlining the profile of the interviewee. The core part of the interview includes questions related to effective urban governance, public participation, and digital public participation platforms. For the last part of the interview, additional input and suggestions can be provided by the interviewee. The duration of the interview is estimated to be approximately one hour and will be conducted in a semi-structured manner. Your participation in this study is entirely voluntary and you can withdraw at any time. You are free to omit any questions. The interview will be recorded under the permission of the interviewee.

As with any online activity the risk of a breach is always possible. Risks that may arise with your participation considered: Failure to protect personal data against loss or misuse, exposing participants to threats and intimidation, damaging reputation (including professional reputation), failure either to obtain appropriate consent, or to act according to the consent terms agreed, may give rise to adverse reputational effects. To the best of my ability your answers in this study will remain confidential. I will minimize any risks by applying data minimization techniques (collect as little PII/PIRD as possible), use tools and platforms that are considered secure from an IT perspective, anonymization of the participants and deletion of all personal data after the completion of the research.

Informed Consent Form

PLEASE TICK THE APPROPRIATE BOXES	Yes	No
A: GENERAL AGREEMENT – RESEARCH GOALS, PARTICPANT TASKS AND VOLUNTARY PARTICIPATION		
I have read and understood the study information sheet, or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.	☐	☐
I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.	☐	☐
I understand that taking part in the study involves audio recordings, which will later be (partially) transcribed in text, and possibly textual and visual information co-produced by the expert and the workshop conductor.	☐	☐
B: POTENTIAL RISKS OF PARTICIPATING (INCLUDING DATA PROTECTION)		
I understand that taking part in the study involves the following risks [personal data loss or misuse, exposing to threats and intimidation, damaging reputation, failure either to obtain appropriate consent, or to act according to the consent terms agreed].	☐	☐
I understand that the following steps will be taken to minimise the threat of a data breach and protect my identity in the event of such a breach [data minimization, use tools and platforms that	☐	☐

are considered secure from an IT perspective, anonymization of the participants and deletion of all personal data after the completion of the research].		
I understand that personal information collected about me that can identify me, such as email, name, job title and audio recordings, will not be shared beyond the study team.	☐	☐
I agree that my information can be quoted in research outputs without mentioning my name, but my broad job description. Any personal information that can identify me will be anonymized.	☐	☐
C: RESEARCH PUBLICATION, DISSEMINATION AND APPLICATION		
I understand that information I provide will be used within a Master Thesis project. Subsequently, given academic interest, aggregated results might be published in an academic paper and will be made publicly available.	☐	☐
D: (LONGTERM) DATA STORAGE, ACCESS, AND REUSE		
I give permission for the textual or visual inputs that I provide, as well as audio transcripts to be achieved in a repository so it can be used for future research and learning. The data deposited will in any case be anonymized so that no backtracking can happen.	☐	☐

Signatures

_____	_____	_____
Name of participant [printed]	Signature	Date

I have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

_____	_____	_____
Researcher name [printed]	Signature	Date

Study contact details for further information: *E-mail: l.loannou@student.tudelft.nl*

A.3. Interview guide

Interview guide

Urban Voices

Citizen Voice: An innovative Open-source Map-based tool for effective public participation

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PART 1: INTRODUCTION

Information related to the project

Thank you for agreeing to participate in this interview. My name is Ioannis Ioannou. I am conducting this interview as part of my master thesis project at TuDelft. As already informed, you, I am doing this thesis project in collaboration with Centre for Urban Science & Policy, being involved in the Citizen Voice research project. I am currently at the stage of data collection for my thesis. Previously to that, I have developed my theoretical framework via literature review which revealed that there is an evident imbalance between technological advancement and digital public participation's effectiveness, in terms of inclusiveness. This thesis project's goals are (1) to develop the conceptual design of a (digital) public participation platform, aiming to enhance citizen engagement and (2) to provide guidelines to support the effective use of participatory data in urban planning, and decision-making procedures. The main research question addressed in this research is:

Which characteristics need to be included in designing a public participation platform so that it can enhance citizen engagement and facilitate a more effective urban governance?

The purpose of this interview is to gain input from urban stakeholders in order outline the characteristics required for this conceptual design. The interview is divided into three parts. The first part is introductory, for outlining the profile of the interviewee. The core part of the interview includes questions related to effective urban governance, public participation, and digital public participation platforms. For the last part of the interview, additional input and suggestions can be provided by the interviewee. The duration of the interview is estimated to be approximately one hour and will be conducted in a semi-structured manner. The interview will be recorded under the permission of the interviewee.

Information related to the interviewee

1. What is your position/role within your organization?
2. What is your expertise?
3. What is your experience related to public participation?

PART 2: MAIN QUESTIONS

I. Importance of public participation in urban governance

1. What are the advantages of including public participation in urban governance?
2. What are the challenges/disadvantages of using public participation in urban governance?
    a. How do you think that we can overcome these barriers?
3. What type of public participation has a greater effect on urban governance in your opinion?

II. Definition of effective public participation

1. How would you define effective public participation?
2. What do you think that is more important in public participation, the quantity of participants or the quality of the input?
3. What factors can incentivize citizen involvement in a public participation platform?
4. What factors can discourage citizen involvement in a public participation platform?

III. Digital platforms for public participation.

1) Have you ever used digital platforms for public participation?
    a) If you use or would use a public participation platform, in which way would you like to communicate and collaborate with citizens?
2) What is your general opinion on public participation platforms?
    a) Could help urban governance to be more effective?
    b) Do you have in mind any public participation platform that helped to increase effectiveness in urban governance?
3) What technical requirements should a public participation platform have?
    a) Could you prioritize the requirements that you mentioned?
4) What functionalities should a public participation platform have?
    a) How could mapping features of a public participation platform help decision makers and citizens?
    b) What else do you think can add map-based technology to public participation?

PART 3: CLOSING QUESTIONS

-Is there anything you think it is important to add?

-Open discussion, feedback, comments, share contact information

Thank you for your time

A.4. Questionnaire

Citizen Voice

Let citizen voice heard

Citizen Voice: An innovative Open-source Map-based tool for effective public participation

Thank you for agreeing to participate in this survey. My name is Ioannis Ioannou and I am conducting this survey as part of my master thesis project at TuDelft. I am doing this thesis project in collaboration with the Centre for Urban Science & Policy, being involved in the Citizen Voice research project. This project aims at developing a digital, open-source, and map-based survey tool, that is called Citizen Voice. This tool can be used for getting input from citizens; Where to locate a new park? Where additional public lights are needed? Or where the pavement needs maintenance?
The purpose of this survey is to gain input from citizens in order to outline the characteristics required for this tool; What are the features that would make this tool useful and easy for you to use?
The survey should take you approximately 5 minutes of your time. Your participation in this research is voluntary. You have the right to withdraw at any point during the study. Your responses will be kept completely confidential.

The researcher of this survey can be contacted at E-mail:
I.Ioannou@student.tudelft.nl

By clicking the button below, you acknowledge that:

- Your participation in the survey is voluntary.

- You are 18 years of age.
- You are aware that you may choose to terminate your participation at any time for any reason.

I agree with the terms and conditions of the survey

What is your gender?

(You can select one answer)

Man
Woman
Non-binary / third gender
Prefer not to say

What is your age?

(You can select one answer)

18 - 24
25 - 34
35 - 44
45 - 54
55 - 64
65 - 74
75 - 84
85 or older

What is your education level?

(You can select one answer)

Less than high school
High school graduate
Bachelor degree (Bsc)
Masters degree (Msc)
Doctor of Philosophy (PhD)
Other (please indicate)

What is your annual income?

(You can select one answer)

Less than €20,000
€20,000 - €39,999
€40,000 - €59,999
€60,000 - €79,999
€80,000 - €99,999
More than €100,000

In which city do you live?

(Please type your answer)

In the city that you live, in what way do you prefer to participate in city planning?

(You can select one answer)

Digitally (online)
Physically (in-person)
Hybrid (combination of the above)
I do not want to participate

Which of the following characteristics do you believe would make public participation for your city more effective?

(Please select at least 3 choices. You may add your suggestions)

Transparency
Responsiveness
Consensus orientation
Equity
Inclusiveness
Accountability
Efficiency
Trust
Please indicate you suggestion

Please indicate you suggestion

Please indicate you suggestion

Have you ever used digital platforms (e.g.,websites, applications) for public participation?

(You can select one answer)

No
Yes

If an application for public participation would have been developed for your city, which of the following characteristics would motivate you to use it?

(Please select at least 3 choices. You may add your suggestions)

Easy to use
Monetary rewards
Find information
Relevance
The feeling of ownership
Social media features
Gain authority and power in the decision-making process
Gamification of the platform
Please indicate you suggestion

Please indicate you suggestion

Please indicate you suggestion

If an application for public participation would have been developed for your city, what would discourage you from using it?

(Please select at least 3 choices. You may add your suggestions)

Time availability

Lack of interest
Lack of access to technological tools (smartphone, personal computer, etc)
Digital literacy
Preference on in-person participation
Language barriers
Distrust (opinions will not be taken into consideration)
Please indicate you suggestion
Please indicate you suggestion
Please indicate you suggestion
Please indicate you suggestion

If an application for public participation would have been developed for your city, how would you like to participate and interact within this application?

(Please select at least 3 choices. You may add your suggestions)

by replying to open questions
by voting
by ranking
by interacting in a map
by interacting in a 3D environment
by story telling
by uploading pictures
by uploading audio recordings
by uploading videos

Please indicate you suggestion
Please indicate you suggestion
Please indicate you suggestion

If an application for public participation would have been developed for your city, which of the following characteristics do you believe would be essential to be included?

(Please select at least 3 choices. You may add your suggestions)

Privacy
Security
Availability
Accessibility
User-friendliness
Transparency
Open-source
Modularity
Please indicate you suggestion
Please indicate you suggestion
Please indicate you suggestion