

Citizen Participation in the Transition of Greek Cities to Smart Cities: Does Size Matter?

Pagona-Xanthi Psathopoulou, Andreas Alexopoulos(✉), and Vasileios Panagou(✉)

Department of Accounting, University of West Attica, Athens, Greece
{ppsathopoulou,a.alexopoulos}@uniwa.gr, vas.panagou@gmail.com

Abstract. This paper focuses on the concept of the smart city and the factors that work for its formation. One of them is related to the size of the city. The concept of the "smart city" has been particularly widespread in recent years both within the academic community and more widely in the field of self-government and society itself. In this context, emerging 'smart city' strategies around the world, with an emphasis on 'smart citizens' and their role in shaping smart cities, are at the center of research, business and policy initiatives. Since the size of cities in Greece varies significantly, it is important to investigate whether this particular characteristic affects the process of transforming cities into smart cities.

For this reason, the paper focuses on the investigation of the concept of the smart city and its specific components, in relation to the importance of size, through the conduct of a qualitative research on representatives of different sized municipalities in Greece.

The results of the research highlight the fact that the idea of smart cities in Greek local society is more widespread in urban centers. In addition, in the smaller cities the daily communication and contact of the citizens with the representatives of the local authority is a primary way of citizen participation. Finally, the size of the municipalities under study seems to have a significant impact on issues related to staffing, resources, the operation of economies of scale, etc. and which determine the operational capacity of each municipality.

Keywords: Smart cities · city size · citizens participation

1 Introduction

In recent decades, the concept of smart cities is more widespread than ever, since it is associated with the provision of new, innovative solutions in areas of urban development such as mobility, environment, economy, governance, quality of life, education, etc. etc. Indeed, smart city is a conceptual umbrella that includes smart urbanism, smart economy, smart and sustainable environment, smart technology, smart energy, smart mobility, smart healthcare and a range of related topics (Jasrotia 2018).

Although the interest in smart cities was initially closely linked to new technologies to solve various urban issues (Perera et al. 2014), the interest soon shifted to citizens and how they can contribute to developing smart cities. (Simonofski et.al. 2021).

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In this context, citizen participation emerged as an alternative solution in order to give citizens an active role. And this is because citizens are often excluded from the decision-making process of the rulers, while they could act as experts and information providers for their cities (Secinaro et al. 2022).

The first scientific research on citizen participation in public decision-making began in the late 1960s, with Arnstein's famous article "The Ladder of Citizen Participation". In his article Arnstein presented a scale for levels of citizen participation. Thus, citizen participation is captured on a scale that includes various levels, from non-participation of the citizen, providing ideas but without impact on decision-making, and active participation where he co-decides and participates in the various processes.

Today the debate about the participation of citizens in decision-making both more broadly and specifically in relation to their participation in the transition of cities to smart ones is perhaps more relevant than ever. Elements such as the value of participation, the ways but also the means, by which this participation can be enhanced, are emerging.

The purpose of this paper is, after delineating the concept and importance of the smart city, to investigate the degree of citizen participation mainly in decision-making for the formation of a smart city and secondarily in the provided smart services that are available. A central parameter in this investigation is the variable of the size of the cities which, as a basic hypothesis, is considered decisive.

The work is structured in 5 sections. In Sect. 2 the process of citizen participation in smart cities is analyzed, in Sect. 3 research data is listed regarding the size of the cities under consideration and how this affects the transition of cities to smart cities, in Sect. 4 the research methodology is described and in Sect. 5 the analysis and discussion of the research results are presented.

2 Citizens Participation in Smart Cities

In the last few years, there are more and more studies regarding the participation of citizens in the smart cities under development. These studies focus each time on different applications, services and dimensions of under development smart cities, as well as on the ways through which citizen participation can be enhanced. Briefly, we list some of these studies around the world.

In particular, in a study by Yeh (2017), the importance of services to citizens in developing smart cities in Taiwan was studied. The research highlighted the fact that citizens were more receptive to smart services when their ideas were taken into account while designing the services. In addition, it was recorded that citizens are more accepting of services based on new technologies, especially when their design stands out for innovation, ensures personal data protection and high quality. On the contrary, in a research by Belanche et al. (2016), in Zaragoza, Spain, it was recorded that the participation of citizens in planning and decision-making regarding the smart city, ultimately contributes to the use of these services.

In addition, in the research of Castelnovo (2016), the participation of citizens in the creation and development of services and policies, emerges so important that no smart city can be formed without smart citizens. In the case where the citizens do not accept the cities becoming smart, the whole project towards the transformation of a city into a

smart city is said to have many chances of failure. The cooperation of citizens with the designers and creators of smart cities is a prerequisite.

In the research of Tadili and Fasly (2019), on smart city experts around the world, the need for citizen participation in smart cities is emphasized, both at the initial stage of planning public services (as co-creators), and afterwards by voicing the experiences and their knowledge on a variety of issues. Awareness of the importance of citizen participation in smart cities was prioritized.

Also, in a research by Berntzen and Johannessen (2016), it emerged that the development of smart cities in India requires emphasizing the opinions of both citizens and governments.

Moreover, in the research of Berntzen and Karamagioli (2010), in Norwegian cities, citizens seem to take on different roles in order to contribute to the development of smart city services. On the one hand there are citizens who can influence political decisions, while on the other hand there are those who do not have access to decision-making or general participation. However, all citizens have the opportunity to share their knowledge, experiences and time.

In the research of Simonofski et.al. (2021), in the cities of Namur (Belgium) & Linköping (Sweden), the active participation of citizens in the design of the smart city and the presentation of their ideas are taken into account in order for the smart city to meet their real needs. In addition, each city has its own unique characteristics that should be taken into account when designing a strategy that favors citizen participation.

Also, in Hollands (2008) research, smart city experts attempted to identify ways and means to increase citizen participation in smart cities. The research documented a variety of factors that affect citizens in a smart city, such as the transfer of power, addressing inequalities, redefining the concept of "smart city", using new technologies to benefit peoples' needs.

In research by Myeong et al. (2018), the determinants influencing the development of smart cities were investigated. The results of the study highlighted the participation of citizens as the most important factor, followed by leadership, infrastructure, the reorganization of the legal system, the willingness of governments to cooperate, etc.

Finally, in a research by Georgiadis et al. (2021), the active participation of citizens is emphasized as a vital part for the development of any smart city. In particular, in the same research, the perceptions of Greek and Cypriot citizens regarding the concept of the smart city, their opinions and their beliefs regarding the level of "smartness" of their city were studied. Municipal authorities should adopt methods that inspire and encourage the participation of citizens, provide them with incentives, identify the reasons for which they are reluctant to participate (e.g. lack of trust, dissatisfaction), work closely to solve local problems and implement innovative ideas.

From what was discussed in this section, the question arises "since the participation of citizens is recognized as important, why is this not a priority during the development of smart cities?". Perhaps this can be justified to the fact that the two sides start from different points, focusing on different dimensions of the cities each time. As an example, we mention the results of Gupta and Hall's (2017) research, where citizens focus on issues such as mobility, environment, governance and economy, while city officials

prioritize environment, economy, mobility and governance. It is likely that citizen participation varies from country to country, from city to city and is related to a number of factors such as the culture of participation, the existence of strong centralized and paternalistic models in public administration, the degree of integration of technology, the institutional framework, etc. Therefore, citizens' participation in smart cities needs further investigation.

3 The Size of Cities and Smart Cities

In this section we present research data regarding the size of the cities under consideration and how this affects the transition of cities to smart cities.

In particular, according to Kumar and Dahiya (2016), there is strong evidence that the city's population size matters, especially in EU member states, when it comes to developing a smart city.

In research by Gupta and Hall (2017), the size of cities is a critical factor for the development of smart cities. Size seems to influence the priorities of citizens and officials (governors and people in positions of power) of developing smart cities in India. Thus, the concept of a smart city varies, related to the population and infrastructure of each city.

In Berntzen and Johannessen's (2016) research in India, city size can influence the formation of smart cities by determining the priority areas for project development.

Furthermore, Borsekova's et al. research on 158 European smart cities explored the ways in which the size of each city shapes individual smart city characteristics and indicators. The survey found that the size of cities is significantly related to the profile of smart city participants, as well as the ways in which these cities manage their resources. In particular, regarding the profile of the participants, citizens in medium-sized cities are described as more open-minded compared to larger cities, which seems to affect their decisions as well. This is due to the fact that in larger cities there are citizens of different ethnicities, with different interests and pursuits, as well as the fact that life in larger cities is much more impersonal, with a more fragmented sense of community. In addition, citizens in medium-sized cities are shown to be more innovative than citizens in larger cities. This is probably justified, according to the results of the research, by the fact that in medium-sized cities, citizens do not have the same intense rhythms in their daily lives and are not as busy as those in large cities. In the same research on resource management, the research highlighted that large investments in new technologies may not always be the best or most efficient solution for smaller and medium-sized smart cities. Small and especially medium-sized cities are constantly forced to look for new growth opportunities and make more efficient use of internal resources. On the contrary, larger cities (metropolitan cities) have more money to invest in new technologies, are more interesting from a business point of view, in terms of investment sizes and their returns, as well as the market scope which is of considerable interest. Finally, the research concluded that the dimension of city size still remains undervalued when studying smart cities.

In contrast, for Duygan et al. (2022), who studied 22 Swiss cities to determine the factors that make some cities more advanced than others in smart city development, city

population size was less important. In particular, population (or city size), which is widely recognized as a favorable factor for the promotion of smart projects and innovation, turned out to be not a critical factor (in Switzerland) in the case of Swiss cities. These data are attributed to the political and institutional conditions, since in Switzerland, even the smallest municipalities have considerable power in institutionalizing and planning the use of infrastructure. The legal and fiscal autonomy of cities can enable local governments to initiate and implement smart city projects. However, the results showed that high participation of the service sector, the presence of research institutions and high urban density are sufficient for the development of smart cities, while population size, new residential development and participation in international networks seem less significant. The case of Switzerland therefore reveals that progress towards the smart city transition is not limited to large, metropolitan areas, but as it turns out, even small suburbs with a population of around 20,000 (e.g. Pully) can also be centers for the implementation of smart city projects, due to their denser population, the large share of the service sector, the proximity to major cities and the universities of the region.

From what was mentioned above in the cities under consideration, we notice that size seems to influence the development of smart cities. However, is population size enough to rank cities as small or large? According to Oliveira et al. (2018), population size alone is not sufficient to classify a city as small, medium or large. It is necessary to take into account other factors, such as the relations established with the nearby cities, the influence of the periphery, the movements and the activities developed in the cities under review.

In the same direction contributes the research of Simonofski et al. (2021), in which it is pointed out that each city has particularities that must be taken into account in order to design a meaningful citizen participation strategy, which must be adapted to factors such as the city's context, values, organization, size, the peculiarities of a country, etc.

Ultimately, nowadays it is difficult to follow a single smart city recipe, due to the geographical heterogeneity and urban diversity of cities. After all, smart thinking presupposes an understanding of the complexity of the city and its interrelated components. It is important to understand what kind of city is to be analyzed and in which sector. Thus, small and medium-sized cities cannot aim for the same "performance" but often have the same means and resources to achieve smart projects, just like large regional metropolises (Caruso et al. 2022).

Therefore, research is required in cities of different sizes, in order to establish the degree to which of the above considerations apply, but also to capture how the size of towns ultimately affects or not the participation of citizens in them. In this context, a qualitative research was carried out in selected Greek cities of different sizes, described in the next section.

4 Research Methodology

As mentioned above in the theoretical part of our work, the existing literature receives more extensive research, is intensified, regarding the role of citizens and how it is outlined during the development of smart cities of different sizes. Thus, in the present work, the investigation of the ways and means utilized by different size Municipalities is attempted,

in order to transform the cities into smart ones and operate by providing better quality services, being at the same time more competitive in the context of the global economy. In addition, the research focuses on the participation of citizens in the formation of smart cities and in the relevant decision-making.

In particular, the research focuses on the following research fields:

- The ways in which the inhabitants of the cities under examination participate in the transformation of the cities into smart cities,
- In the correlations between citizens' participation in the planning and development/implementation of innovative actions and their demographic characteristics,
- In the inhibiting factors of the development of smart cities,
- In the role of local authorities in encouraging the participation of citizens in the "intelligence" - digitization of each city,
- Usability-friendliness of new technologies to encourage citizen participation in existing or developing smart cities,
- The impact of the pandemic period on enhancing citizen participation in smart cities (at the level of decision-making and service provision).

The paper aims to investigate the transformation of cities into smart cities, while addressing the following research questions: (1) How do Municipalities of different sizes manage their transformation into smart cities? (2) What are the main conversion axes (how they transform cities into smart cities)? (3) What are the main obstacles faced by Municipalities of different sizes in their transformation into smart cities? (4) What is the role of the citizens in the process of co-creating products or services in cities of different sizes? (5) How did the pandemic affect citizen participation in cities of different sizes?

By focusing on the above research questions, we can derive information that depends on how the situation regarding citizen participation is shaped in smart cities of different sizes or under development. This information can then contribute to the study of all cases of Greek smart cities.

This research aims to explore the process and critical factors of transforming cities into smart cities and at the same time to examine the role of citizens in this process. The qualitative method and in-depth interviews were chosen to conduct the research since, as mentioned above, our aim is to study in depth the phenomenon of citizen participation in the development of smart cities of different sizes. Through qualitative research, the formation of a global perception is sought on the basis of contexts and detailed elements, as they appear in their natural social context (Mason 2003).

The present qualitative research was conducted with individual interviews with representatives of municipalities of different sizes in Greece and involved both political figures and executives involved in decision-making regarding the digital strategy of each city.

All the data were collected by 6 representatives of municipalities selected from the total of 332 municipalities in the country. More specifically, each representative came from a different category of municipality as defined in the "Existing model of

city typologies n. 3852/2010 “New Architecture of Self-Government and Decentralized Administration - Kallikratis Program"” More specifically, these are the following categories:

(a) Municipalities of Metropolitan Centers,
(b) Large Mainland Municipalities and Capital Prefecture Municipalities,
(c) Mid-Continental Municipalities,
(d) Small Continental and Small Mountain Municipalities,
(e) Large and Medium Island Municipalities,
(f) Small Island Municipalities.

More specifically, respondents from the municipalities of Peristeri, Trikkaia, Domoko, Deskatis, Syros, Astypalaia participated in the survey. The interviews were conducted online and had the form of a semi-structured interview, in the Greek language. The survey was conducted from June 2022 to October 2022.

The interview as a means of collecting research material is considered to offer higher quality information with a lower degree of statistical bias than other methods (Howard and Sharp 2001). In particular, this method was preferred, as the purpose of the research was to study elements, such as perceptions of the phenomenon of citizen participation in cities of different sizes, the beliefs regarding the strengthening of participation, the context in which the factors that act as inhibitors are formed in the development of smart Greek cities. The sample of respondents can be considered suitable, because it has the elements we want to investigate, the knowledge, the characteristics and the will to give more complete and in-depth answers to the question about the degree of citizen participation in the formation of different sized smart cities.

5 Analysis and Discussion of Research Results

The analysis and discussion of the research results is presented based on the above axes.

Regarding the current situation, in terms of the degree of development of smart cities in the Greek area, the respondents consider that the idea of smart cities is not widespread in Greek society. Some of them (a finding from respondents in smaller cities) express the belief that the idea of smart cities is more widespread in larger municipalities, compared to smaller ones. More generally, there is a confusion on the issue of “what is considered a smart city”, since also through the data of our research, the incorrect interpretation that is often attributed to the concept of a smart city is captured. Bibliographic data from a survey of municipalities in Greece confirm our findings by documenting that most participants have a vague understanding of the conceptual framework of a smart sustainable urban area (Siokas et al. 2021).

However, some of the interviewees point out that gradually this picture seems to be changing for the better, as citizens are gradually adopting smart city practices, making use of the infrastructure offered to them, without the majority of them, however, currently being able to understand “the big idea” of smart cities. Bibliographic data validates the fact that citizens recognize the concept of smart cities, as well as the benefits they can bring to their quality of life (Kontothanasi 2021).

Summing up, from all the answers given, it can be seen that in Greek local communities the idea of smart cities is not particularly developed. In particular, what seems to

emerge is that the practice of smart cities in Greece is more widespread in urban centers compared to smaller, more remote municipalities. The following can be considered as the main reasons: a) the fact that citizens are limited to enjoying the benefits of smart applications and services, without participating in their design and development and essentially without understanding the "idea" of smart cities, b) in the wrong handling of local government agencies regarding the promotion of new technologies and, in particular, in the fact that no emphasis had been placed on the use of new technologies, which could facilitate the daily life of citizens, c) in a lack of knowledge or lack of awareness from the part of citizens about what is considered as a smart city (what is a smart city, what services are provided by a smart city, etc.) and what is the role of decision-makers in them (limited perceptions - mentality), d) the geographical heterogeneity of cities and the possibilities (practices) given for the development of projects in them.

The role of local government is multi-dimensional, decisive and critical for the development of smart cities according to all respondents in the survey. In particular, they consider that it provides infrastructure, information, education, inspires and motivates the citizen to use new technologies to their advantage, while absorbing resources through the European and other programs it secures. However, there is a strong perception that smaller municipalities cannot compete with larger municipalities (for reasons discussed below) and that larger municipalities will serve as role models for the smaller cities surveyed by us.

The value of citizen participation and the need to implement projects and provide services based on the real needs of citizens, is evident from the results of the survey. The internal organization is set as a necessary condition by the research participants, in order for any projects to be successful and last over time. Therefore, the question arises "in what ways/instruments can we strengthen the participation of citizens in smart cities?", which will be attempted to be answered below.

In addition, citizen participation in smart cities is seen as crucial by survey participants. This finding is also confirmed in other research, where the importance of citizens' participation in the design of the smart city is highlighted in order to benefit from their ideas, so that the smart city meets their real needs (Simonofski et.al. 2021).

However, this participation of citizens is often presented as "virtual", in the sense that the elected bodies pick the priorities and choose each time what will happen in practice. In particular, for the smaller cities, according to the answers given "in practice it has been proven that the citizen hardly participates at all". The participation of citizens is limited to the use of any applications or services and concerns use by younger citizens. However, to lead to a real smart city, the active participation of the citizen should be ensured (Zubizarreta et al. 2016). Therefore, the question of real citizen participation should be put at the center of research.

The next axis concerns practices and initiatives to encourage citizen participation in smart cities.

Thus, according to the research data, citizen participation in the cities under study is expressed through a) participation/use of citizen applications and electronic services, b) online councils and consultations, c) communication/contact with the citizen, d) social media, e) conducting surveys and polls at local level (Table 1).

Table 1. Practices and initiatives to encourage citizen participation in smart cities. Source: Editing of Own Research Data.

Municipalities category (as described in the section "*4. Research methodology*")/Inhibiting factors	Face to face communication	Online councils - Consultation	Use of application/Electronic services	Sureys/Polls	Social Media
(a)	-	X	X	X	X
(b)	-	X	X	X	X
(c)	X	-	-	-	-
(d)	X	-	-	-	-
(e)	-	-	X	X	X
(f)	X	-	-	-	-

Conducting surveys and polls is considered important by the people interviewed in the survey, although up to the time of conducting our survey, there has rarely been any relevant research with an emphasis on the needs of the citizens. In particular, for the smaller cities, the understaffed municipal staff, the staff's technological training, but also the staff's willingness to "run" surveys, is recorded and acts as an inhibiting factor. In addition, for these cities, any investigation that has been carried out, it is recording "…zero participation of citizens in surveys with questionnaires".

The emphasis on personal contact and real-life communication with the citizen is considered decisive for all the participants in the research, in order for the citizens to get involved in the "smartening" processes of the city. In particular, in the smaller cities, the daily communication and contact of the citizens with the representatives of the local authority is a primary way of citizen participation. Personal contact appears to be a more popular tactic for smaller municipalities, while leveraging new technologies is a more popular tactic for larger municipalities.

At this point, the following questions rightly arise ¨How can one measure the impact that each service and/or application has on citizen satisfaction during the development of smart cities? How can it be established whether the existing, implemented and planned services and applications are useful in the development of smart cities, since there is no sufficient and accurate data resulting from the essential participation of citizens? How can we involve the citizens of smaller cities more technologically/electronically?¨.

In particular, initiatives that have been developed concern the user identification and authentication platform (gov.hub), consultations that take place online per municipality, as well as the utilization of municipalities' social media to record and collect data on citizens' needs. But also the gathering and quantification of the data of each city in practice, through measurements and surveys (e.g. "…we put bicycles and suddenly we saw a terrible reduction in the streets and squares…") are valuable elements for the further planning and development of smart cities.

In the above context, one of the respondents also mentioned the need to create a consultation platform, where collective bodies will be able to put forward citizens' proposals, discuss and make decisions. Also, the size of the city seems to influence the

aforementioned consultations. Thus, the participation of citizens in the smaller cities often registers low levels ("participation was too small, the percentage was too small, not even 5%") and mainly by the youngest citizens.

Here the question arises "Couldn't the existing websites that the municipalities already have, technically support this need?" In any case, the need to create a platform, adapted to the needs of each municipality of different size, where all opinions from and in every direction will be taken into account, is deemed necessary. After all, this has been emphasized in other research where the collaborations created by cities become more beneficial when they involve not only municipalities and private companies but also NGOs, research institutions as well as different political organizations (Jablonska 2018).

However, the following question was raised here: "Who will make the final decisions?" Who will choose what will be given importance?' The majority of respondents believe that the final decision should be made by those in power, because citizens think and act individually and not according to the "common good". In particular, on the one hand, the opinion is expressed that participation, the expression of ideas and opinions is required, and on the other hand, the very concept of participation is often negated, from opinions expressed by the respondents who argue that the municipality should give direction to the citizens, because either they themselves do not know what they should do, or in order to speed up any formal procedures. Ultimately, citizens do not seem to be recognized as 'smart citizens' and remain largely outside or peripheral to power structures and decision-making processes, limiting the boundaries of the smart city and its ability to claim and restructure. The citizen still remains marginal to the existing smart city (Shelton and Lodato 2019).

The participation of the citizens is limited to the use of any application/infrastructure, but also to the sending of corrections, etc., and does not concern their substantial participation in the decision-making for the development of smart cities.

Regarding the type of participation recorded during the development of smart cities, it seems to be mostly pretentious. In particular, the views of the citizens recorded in the consultations are often of a "pretend" nature. We would say that once again, although the efforts start with pure intentions, ultimately in the majority of cases any citizen participation in Greek smart cities seems to be treated by the municipal authorities virtually and superficially.

It appears that, despite efforts to reframe the smart city as 'citizen-centred', smart urbanism remains rooted in pragmatic, instrumental and paternalistic discourses and practices rather than those of social rights, political citizenship and the common good (Cardullo and Kitchin 2019). Indeed, to become smart, a city should develop a service approach that will focus mainly on citizens who are also the main beneficiaries of the services offered by a Smart City (Georgiadis et al. 2021).

But what is finally happening in the Greek reality? From what was presented above, it seems that in Greek cities the transformation towards the achievement of intelligence meets several obstacles.

Regarding the factors that affect the motivation of citizens' participation, various factors are recorded that work, either positively and reinforcing, or inhibiting.

Thus, on the one hand, the provision of incentives, the satisfaction of the real needs of citizens, the use of new technologies to simplify and reduce the time of the services offered, act as positive factors, while the established culture in the municipalities is recorded among the inhibiting factors (at all levels, citizens, employees, municipal authorities), along with the insufficient resources, the inability to distribute responsibilities, the multiplicity of legislation, the size of the municipalities, etc.

More specifically, citizens' participation in the formation and operation of smart cities could be enhanced through incentives, that are related to realistic goals that actually concern the improvement of citizens' quality of life.

With regard to the strategies to strengthen citizens' participation in the formation and operation of smart cities, three basic elements are necessary according to the respondents, as follows: time, mood and will.

The following table (Table 2) summarizes the main inhibiting factors in the development of smart Greek cities.

The most important problem that remains, according to the research data, concerns polynomiality and legislation. The need for rewording, correction, completion, etc. of the lawsis emphasized, in order for them to facilitate the procedures and not be obstacles in the development of smart cities. In addition, the difficulty arising from the fact that most cities have a history, a culture, a character that must be preserved, as well as resources that must be protected, redistributed, supported when developing a smart city or region is highlighted. Therefore, any change should be governed by creativity that supports the development of the city or region based on its particular characteristics.

Strengthening the level of citizen participation can be achieved through "internal reorganization". In particular, in the smaller municipalities, the opinion is recorded that several projects are still at the level of contracts and tenders, because the specific municipalities are able to support a limited number of projects based on the staff they own.

In regards to the creation of the aforementioned consultation platform, it is proposed in order to increase participation. The contribution of new technologies is considered crucial for the completion of such a plan. Finally, once again research data is confirmed according to which, the main challenges faced by policy makers when developing applications and services are organizational and not technological (Mondschein et al. 2021). Furthermore, despite the fact that the majority of cities have incorporated various forms of smart projects, a rather partial implementation of related initiatives in their daily operations is observed (Siokas et al. 2021).

The size of municipalities seems to have a decisive effect on citizen participation. More specifically, the staffing of small municipalities, their strategic planning, the low level of education (e.g. the absence of universities or other institutions through which citizens could be educated), the inability to attract investment and the lack of business activity, the lack of connection with Academic institutions and research centers, the lack of civil society organizations, define the culture of a city's citizens and contribute to their participation or non-participation in the transition of cities to smart cities.

In addition, the size of cities plays a decisive role in the quantity and quality of projects and the citizens' use of them.

Table 2. Inhibiting factors in the development of smart Greek cities. Source: Editing of Own Research Data.

Municipalities category (as described in the section "*4. Research methodology*")/Inhibiting factors	Size of cities	Resources - Manage resources	Legislation/Polynomy	Culture	Unknown fear	Technological involvement	Age	Municipality capabilities	Lack of research	Internal organization
(a)	-	-	X	-	-	X	X	X	-	-
(b)	-	-	-	X	-	X	-	-	-	-
(c)	X	X	-	X	X	X	-	X	-	X
(d)	X	X	-	X	-	-	-	X	-	X
(e)	-	X	-	X	X	X	X	X	-	X
(f)	X	X	X	X	-	X	X	X	-	-

In addition to size, the geographic location of each municipality determines citizen participation in smart cities. People living in island regions are more innovative, on the contrary, people living in small villages (e.g. farmers), often do not have access to knowledge or sometimes are not interested (different priorities and cultures) and therefore, a part of them remains technologically and typically illiterate.

Furthermore, the geographical location or topography of smaller municipalities often renders any planned projects incomplete, as practical (geographical) difficulties are inhibiting factors.

The issue of the unevenness of the municipalities is recorded as another factor affecting the operational capacity of each municipality, in the sense of the impossibility of horizontalizing certain initiatives that could be implemented at the national level, which concern either directly or indirectly the citizen. This finding is confirmed bibliographically, since each city has its own unique characteristics that must be taken into account in order to design a citizen participation strategy, truly adapted to the context at hand (Simonofski et al. 2021).

Moreover, the culture of a city's citizens can play a decisive role in their participation in the development of smart cities. In addition, the prevailing culture and specifically the lack of culture of political leadership on participatory issues, combined with the aforementioned lack of coordination and legislation, is another important inhibiting factor noted.

In addition, the culture of a municipality's employees, their receptivity to structural operational changes and participatory practices, can influence citizen participation in smart cities to a very large extent. In particular, the opinion is recorded that it would be useful to emphasize the training of employees, in order to remove the aforementioned obstacles. The need to invest in training and familiarizing employees with modern digital tools, has also been highlighted in other research (Siokas et al. 2021).

In addition, the culture of the society as a whole and the role played by the companies cooperating with the local government in the overall organization, is an issue for further investigation. Through the answers given, the need for redefining strategies emerges in combination with the culture that exists as a whole in society (a factor mentioned above), elements that act as an inhibitor during the development of smart cities.

Another inhibiting factor recorded concerns the responsibilities, the resources and the ways in which they are distributed. Moreover, another problem that emerged from smaller municipalities was the lack of software and the uneven distribution of resources. The issue of lack of resources is often one of the most important barriers recorded that can be improved by combining resources through an inter-municipal collaboration (Mavroyianni 2019; Karahasan and Hagane 2018). The lack of synergy and convergence between the various interventions, leads to the impossibility of exploiting the added value offered by the coordination of resources and the joint efforts of organizations (Phararaj et al. 2018).

Therefore, the provision of incentives, the formation of a relevant culture (of the municipality, the citizens, the employees), the correct strategic planning, the decentralization of responsibilities and the correct distribution of resources, the redefinition of laws, the size of the cities and their geographical location are listed as decisive factors for the development of smart cities. Indeed, some of the inhibiting factors recorded in the

present research are also found in the research of Tadili and Fasly (2019). In particular, obstacles to the active participation of citizens are related to factors, such as bridging the digital divide, the lack of a long-term vision and the lack of a specific allocation of the budget in the developing smart cities.

With reference to the demographic characteristics and the degree to which they affect the participation of citizens in smart cities, the sample under examination varies its answers, focusing on the factors of age, education, technological-digital training, human geography and professional status.

Regarding the education of citizens, more than half of the respondents state that it is a very important factor, while the rest consider that "educational level does not play any role".

Furthermore, while for some of the respondents, age is not considered one of the factors that determine the degree of participation, for some others it is a determining factor. In particular, the opinions are recorded that age plays a role, but not a decisive one. The age of the citizens is a decisive factor for the representatives of smaller cities, regarding the use of technology. Also, emphasis was placed on the training required for these people, in order to facilitate the use of the new technologies.

However, according to literature, the age factor and factors related to the city (city-factors), seem not to be decisive for the development of smart cities in the research of Georgiadis et al. (2021).

With reference to the professional qualification, this seems to determine the mentality and the opportunities to deal with new technologies and, to a further extent, the technological training of the citizens, in the smaller cities. However, as noted, technological means strengthen the interface, but there should be a desire and willingness on both sides for any technological venture to work well.

In particular, on technology training, the respondents seem to be divided into two parts. More specifically, for smaller cities, technological training/competence is considered a decisive factor. Thus, in these cities "younger citizens participate to some extent using online services and applications, while older citizens lack the motivation for such engagement and often exhibit a technophobia." These findings seem to agree with research where, indeed, there is a portion of citizens with low levels of digital access and digital literacy who even tend to be excluded, receiving limited benefits from digital urban services and infrastructure in smart cities (Shin et al., 2021). In particular, as reported by Zdjelar and Keleman (2019), the number of e-service users aged 54+ is extremely low, however bridging the digital gap will be achieved by looking for the best way related to abilities, skills and needs of each person.

In addition, respondents as a whole, place a strong emphasis on providing incentives as a strategy to enhance participation.

Moreover, the activation of civil society in a logic where everyone can contribute and solve problems of the local society, develop their ideas, testify their experiences, co-create, is suggested by an interviewee, as a way of substantial active participation. In the same logic, actions – updates of new applications and services, as well as seminars, workshops, conferences for the citizens are proposed.

Furthermore, open consultations are recorded as an important mean to enhance citizen participation, in the sense that, through them, citizens can determine the development and progress of their city.

Finally, social media are proposed as means of enhancing participation that gives the possibility of immediacy, attracting younger citizens, while at the same time it is an economic tool for municipalities (as long as it does not require any significant financial investment) and which is already used by the whole of the municipalities under study. These data seem to be confirmed in a study by Triantafillidou et al. (2022), where "smart cities in Greece use Facebook mainly to publish information of interest to various audiences in the form of announcements and press releases about activities and services of municipalities". However, it should be noted (as mentioned above) that, for smaller municipalities, information through direct contact is a priority, since citizens are not yet used to being informed through the municipality's website (or modern technological means).

In summary, regarding the strategies to enhance citizen participation in smart cities, this is presented on two levels. On the one hand, the participation in decision-making and in the formation of smart applications and services and on the other hand in their operation.

Finally, regarding the role played by the pandemic in the participation of citizens in the formation of smart cities, it seems to be more strengthened after the period of the pandemic. In particular, it seems to have acted as an accelerator of citizens' technological involvement, since according to all respondents in the survey, the pandemic played a decisive role in introducing citizens to the concept of digital transformation and the use of new technologies - applications. In addition, on a practical level, it helped people who either lived in remote areas, or who feared for their health due to the pandemic and were facilitated by electronic exchange. However, according to some of the interviewees in the research, it seems that at the level of infrastructure development, it often acted as a hindrance since it was not possible due to practical difficulties (prohibition of movement) for the municipality's projects to develop smoothly.

At the level of everyday life, a relative disturbance was created for the citizen after it forced them to take actions unknown (to them) until then.

From what was discussed above, it appears that the compulsion caused by the pandemic, the effort to satisfy needs through smart services and applications, pushed the active participation of citizens to use smart applications and services. However, concerns are raised as to whether and to what extent this participation is active or passive. In particular, the manner of citizen participation is under investigation, since citizens participated in the use of data and services produced by local self-government organizations or the government, without being given the opportunity to choose or co-create it. Possibly conducting studies regarding the way the pandemic affected the active or passive participation of citizens, as well as strategies to strengthen their role could be the subject of future research.

6 Conclusions

The concept of the smart city and the participation of citizens in it is a modern, dynamic and evolving research field, which cannot be studied statically and in isolation.

In our research, an attempt is made through the primary research that was carried out to capture the general picture of the situation regarding the participation of citizens in making decisions for the formation of smart cities, particularly examining the size parameter. However, further investigation, at the level of municipalities - local self-government, is deemed imperative and necessary in order to examine other factors that may be related to the geographical area, the organizational culture of each body and its citizens.

In the Greek area, the development of smart cities cannot be considered to be at the same level as that found in many developed countries. Also, the range of factors associated with the participation process work differently in cities of different sizes, sometimes enhancing and sometimes inhibiting. Among the most important problems for the development of smart cities remains the culture (citizens, employees-executives, political leadership), finding resources, the inability to distribute responsibilities, polynomy - legislation, organization, etc. In particular, in smaller municipalities, the understaffing and training (mainly technological) of the staff, as well as the culture of the citizens, is recorded as acting as a hindrance to the development of the cities.

The role of the citizen in the transformation of cities into smart ones remains limited and passive, while time, will, methodicality, cultural change, etc. are required, in order for the citizen to be at the center, at least according to what emerges from all the cities under study, with any limited generalizations that could be made here, since this is a qualitative research. Citizens in large cities gradually seem to be adopting the practices of the smart city, while at the same time making use of the relevant infrastructure and tools offered to them. In particular, they send requests to citizen service platforms, participate in online councils and consultations, actively participate in social media, express their opinions and positions through surveys and polls at the local level. Of course, even in this case there is still great room for improvement and several steps to be taken. On the other hand, the majority of citizens, mainly in small provincial towns, seem to stick to a daily communication and traditional practices without giving much importance to the advantages that the development of digital services and projects brings to them. In the great majority, in these cases, citizens do not seem to be able to understand "the big idea" of smart cities and thus their participation is often recorded as limited, low and problematic. This does not mean that at the city level there are not some exceptions.

In addition, it appears that larger cities have had more ICT-related projects, which is attributed to their ability to absorb larger funds/resources, the economies of scale that they can develop, as well as geographic factors.

Undoubtedly, the research data cannot be generalized. However, they provide a first insight into the progress of Greek cities towards the process of "smartness".

We believe that an in-depth study of local government officials (elected officials and technocrats), on a larger scale, in municipalities of different sizes, could more adequately reflect the current situation.

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