

# How Do Citizens Want to Participate in Smart City Programs? Some Answers from Greece



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## 1 Introduction

The development of Smart Cities (SC) is participatory when citizens are highly involved. The participation of citizens in the process of political decision-making is an important pillar of democracy. The change from “government” to “governance,” as it is interpreted in the literature, suggests greater participation of various stakeholders in the decision-making process and the implementation of public policy [1]. The broad fields of smart governance, economic models, mobility, environment, education, and security in SC together with active citizens and key stakeholders of the city, cooperating on smart solutions and working for a better quality of life, form a smart community as an interactive organism in a social and technological ecosystem [2]. The engagement of citizens is a fundamental but nontrivial aspect of the development of democratic smart cities. In fact, it is a multidimensional and multifaceted process that requires co-work between many different individuals and communities having different interests, visions, understanding, and expectations of various smart cities’ goals. The terms “citizen participation” and “engagement” imply complex interactions between citizens, government, governmental or local organizations, public or private institutions, and nongovernmental organizations as part of decision-making processes, developing policies, and participating in various projects’ development affecting public services [3]. To benefit from their ideas and

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ensure that the smart city meets the actual needs of people, citizens must be involved in the design process so that the participation strategy is tailored and reflects the context of the target city [4]. Importantly, the concerns and the aspirations of citizens need to be understood and taken into consideration before decisions being made, since asking for citizens' input after the decisions are made or making them participate in a coercive process that obliges them to agree does not qualify as engagement [5].

Over several decades, researchers have been working on the phenomenon of the "smart city," with extensive reference to cities that have adopted new methods, mainly technological, to solve everyday problems and improve living conditions [6–8]. Improving urban living standards is primarily based on smart development strategies and smart forms of governance adapted to the size and requirements of each community [9]. The 2030 UN Agenda for Sustainable Development promotes the objective of cities being inclusive, safe, resilient, and sustainable [10].

Sustainable development is "the development that meets the needs of the current generations without compromising the possibility of the future generations to do the same" [11]. Technically, sustainable development solutions must consider the systemic view of sustainability, which states that an economic system is a subsystem of a social system, which is itself a subsystem of a natural (biophysical) system [12, 13]. When talking about sustainability, abstractions are involved that are shaped by the observer's perspective. These different perspectives have an impact (a) on what is considered to be the main priorities and on (b) decisions regarding what policies should be put into place and what actions should be taken toward sustainability [12]. Additionally, modern ICT, energy savings, and mobility underpin sustainable urban development and the transition of conventional cities to an integrated smart digital environment [14].

Resilience in terms of cities generally refers to the ability to absorb, adapt, and respond to changes in an urban system [15]. Because new solutions that are planned to be implemented for resilient smart cities tend to face challenges in their acceptance, improvements in active citizen engagement play a key role in city development [16]. The current wisdom is that for cities to become smart cities, it is not only necessary to adopt new technologies but also to actively involve citizens [17]. Participatory development is the development in which citizens are actively involved at all stages of the decision-making process, from planning to the implementation stage of various projects and programs, and constitutes the realistic foundation for efforts addressing many social problems faced by humanity.

The scientific community has shown a great deal of interest and already produced a rich literature on the methods of participation, utilities used, and their results [4, 18, 19]. However, this is an area that still requires continuous exploration; hence, this study attempts to contribute with a particular research angle and importantly in the context of Greece, with the ultimate aim of providing some insights about both enhancing the participatory process and the active role of citizens in Greece and, in perspective, around the world. The study was conducted by using a questionnaire as central (key) tool for conducting the investigative process. The creation of the questionnaire was largely based on known theoretical grounds of the smart city

topic. During the bibliography study, no weighted questionnaire was found to satisfy the needs of the current study. Therefore, a novel questionnaire was designed from scratch based on similar questions and hypotheses of other studies [20, 21], and the respondents' answers were evaluated using a Likert scale. Thus, the ever-increasing need for citizen participation in the development of smart cities, as well as the rapid growth of ICT, provided the main research interests, namely, (1) what are the main motivations for citizens to participate in the digital transformation of their city; (2) what potential alternatives could exist in relation to different types of technology used in practice; and (3) what types of participation could be identified as preferred in concrete practice. The contribution of this study is not only aimed toward elucidating the relation between citizen involvement and smart city projects and policies but also toward obtaining insights that can help with the development of adequate research methodologies and tools.

The rest of this chapter is structured as follows: Section 2 presents an overview of the literature related to citizen participation. Section 3 presents the research questions and the research methodology. Section 4 describes and discusses the results, and Sect. 5 summarizes our conclusions.

## 2 Literature Review

### 2.1 *The Term Engagement*

Several researchers in their studies attempted to identify empirical studies and scientific articles on citizen involvement through systematic reviews of the literature [22–24], since the top-down decision-making approach often shows its ineffectiveness in many democracies. Although scientific research on citizen participation and public decision-making began in the late 1960s, during a period that was marked by urban struggles and movements, it managed to lay the foundations for participatory development.

Arnstein, in her article “A Ladder of Citizen Participation,” proposed a scale simulating different levels of participation (Table 1), ranging from citizen manipulation to citizen control, with each sublevel corresponding to the extent to which citizens could participate in the governance process. In addition to the eight “steps” of participation, the scale includes a continuous description of participatory power moving, from no participation (no power) to the degree of tokenism (fake power) and finally to the degree of citizen control (real power) [26, 27].

Citizen participation is considered a key challenge for the effective development of smart city projects [28] to improve citizens' quality of life. For a smart city to achieve its goals, it is important to engage its citizens and carry out actions and implement decisions in collaboration with them [29] by utilizing ICT technologies as the main driver for implementing smart city projects [30]. However, in [31], it is criticized the smart city approach based only on the use of ICTs and argued

**Table 1** Arnstein's ladder of citizen participation

Form and levels of participation	
Substantial participation (degrees of citizen power)	Citizen control, delegated power, and partnership
Symbolic participation (degree of tokenism)	Placation, consultation, and informing
Nonparticipation	Therapy and manipulation

Source: "A Ladder of Citizen Participation" [26]

that smart cities should aim in the motivation of the human capital of the city. Researchers in [32] point out that since participation is important for democracy, it is also equally important for the development of smart cities. Participation and collaboration between government, citizens, and organizations are considered essential for the development of smart communities [33], while citizens participate by playing the roles of the following:

- Democratic participant in the decision-making process to build sustainable local communities.
- Main source of expertise and skills to develop better solutions and designs.
- Data collectors in an active and integral part of the smart city.

In [34], participation is defined as the expectation that citizens' voices will be heard when needed to reflect the dissatisfaction with the way democracy works. Participation in politics is a mechanism developed by politicians and officials to extend these voices into the decision-making process. However, it is unclear what counts as participation and how to understand the various practices that exist. At this point, it must be noted that although the words citizen involvement and participation are sometimes used interchangeably, they are not synonyms. Although these notions seem to be similar, they have different perspectives on the role that citizens have in each one. The main distinction between citizen engagement and citizen participation is that citizen engagement necessitates an active, intentional discourse between citizens and public decision-makers, whereas citizen participation can only be initiated by citizens. Additionally, the term "engagement" has a different meaning to different people and various levels of engagement and participation [35].

Furthermore, participation can be ambiguous; it can either make it easier to resolve policy issues or through vetoing can, under certain circumstances, prevent the beneficial results of a project. In practice, many times citizen participation takes the form of consultation. Consultation, however, is based on the acceptance by policy-makers that they have the ability not only to comment but also to influence the final decision on a policy proposal. Consultation ensures that many voices are heard but takes no responsibility for the final decision. The most well-known approaches used for consultation are public meetings, discussion papers, etc. New technologies and standards (such as Internet of Things, cloud computing, integrated sensors, etc.) play an important role in transforming cities to smart cities. However, an important aspect is how technology is used for engaging citizens in smart cities.

Researchers in [36] argue that the term SC was adopted in 2005 by various technological companies that offered complex information systems for integration and operation in urban infrastructure. Citizen participation definition in the context of smart cities includes ICT concepts, citizens' involvement in the planning, and administrative processes. Other similar studies related to citizen participation in the context of smart cities, such as [37], propose a mixed approach with appropriate technology and social media for citizen participation. Furthermore, researchers in [38] state that the technologies used are mainly of general purpose and not designed to support online participation. They are suitable for use by older people, while information systems are usually suitable for youth participation. Also, the study in [25] presents more practices that enhance citizen participation such as accessing city services and reporting problems through smart mobile applications and suggests as the best method for developing citizen participation to be co-creators. Additionally, in [4], it was identified that methods which work well are face-to-face communication, open data workshops, and web-based collaborative platforms.

Another dimension that should be taken into consideration is the diversity of the citizens. Differences between citizens should be recognized and well understood before engagement procedures, practices, and policies are established. Some groups of citizens having special needs are children and young people, people with disabilities, and various minorities based on ethnicity, race, religion, etc. Especially for people with disabilities, citizen engagement and participation are interpreted as a redistribution of power that allows them to be involved in public planning, information dissemination, and resource allocation [25].

## 2.2 *Citizen Engagement Toolkits*

Recently, various citizen engagement toolkits were developed by several organizations covering different sectors. These toolkits aim to support individuals and organizations to understand the various levels of engagement and provide them with a set of methods and techniques that can help them to be engaged in a meaningful way that will positively affect their lives.

A number of different toolkits found in the literature are presented in Table 2.

According to Economic and Social Commission for Western Asia (ESCWA) toolkit [3], citizen engagement has three levels as follows:

- *Participation* involves government and nongovernment actors in a two-way collaboration but the government set the agenda.
- *Collaboration* involves government and nongovernment actors in a two-way collaboration where both sides can set the agenda, but actions are regulated by the government overall policy framework.

**Table 2** Citizen engagement toolkits

No	Toolkit title	Publisher
1.	Open Government Citizen Engagement Toolkit	ESCWA – United Nations, 2021 [3]
2.	Engaging Communities Toolkit. A Practical Guide to Community Engagement	West Lothian – Community Planning Partnership, 2015 [5]
3.	Public Engagement: A New Framework	NHS Lothian [35]
4.	Community Engagement Toolkit	Sparc bc, 2013 [39]
5.	Engagement Toolkit: Methods, Tips and Best Practices to Design Effective Participatory Processes	European Food Safety Authority (efsa), 2021 [40]
6.	Community Engagement Toolkit	Paul Schmitz, 2017 [41]
7.	The Manchester Community Engagement Toolkit	Patrick Hanfling, Susan Majeed and Ed Cox, 2005 [42]
8.	The Engagement Toolkit. Effective Engagement: Building Relationships with Community and other Stakeholders (V.4)	State of Victoria Department of Environment and Primary, 2014 [43]
9.	Community Engagement Toolkit for Planning	Department of Infrastructure, Local Government and Planning, State of Queensland, 2017 [44]
10.	Community Planning Toolkit. Community Engagement	Community Places, 2014 [45]
11.	Community Engagement Toolkit	Community Planning and Inclusion Glenorchy City Council, 2017 [46]
12.	Community Engagement Toolkit. Guidance and Resources for Engaging Community in Planning and Policy Development.	Futurewise, Interim CDA, OneAmerica, El Centro De La Raza, 2014 [47]
13.	Community Engagement Toolkit. Greenways for Pittsburgh	Department of City Planning, City of Pittsburgh, 2017 [48]
14.	Public Engagement Toolkit	SFU Morris J. Wosk Centre for Dialogue, 2019 [49]
15.	Equitable Community Engagement Toolkit 2020–2023	Boston Public Health Commission, 2020 [50]
16.	Community Engagement Toolkit. One Council Approach to Community Engagement	Slough Borough Council, 2018 [51]

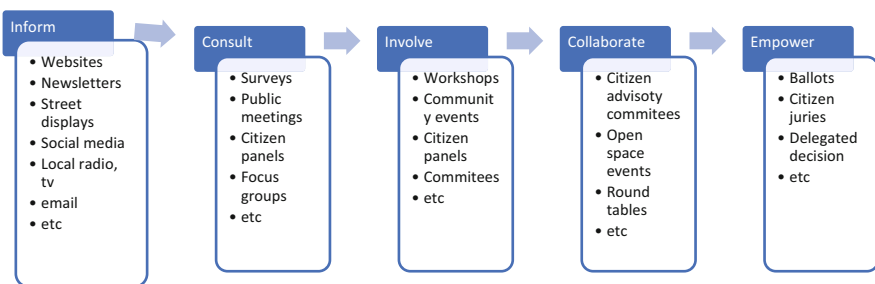
- *Full engagement* involves government and nongovernment actors in a two-way collaboration where both sides can set not only the agenda but the overall policy framework in form of “co-governing.”

However, in a more granular approach, most toolkits identify five levels of citizen engagement which in turn lead to an increased level of public impact. These are the following:

- *Inform*: Just provide the public with the necessary information to understand an issue.
- *Consult*: Collect information from the public about their opinions and attitudes and provide feedback about how these inputs affected the decision.
- *Involve*: Involve the public to all stages of work to make sure that their concerns and aspirations are well understood and considered.
- *Collaborate*: Treat the public as partners in every aspect of the decision and implementation process.
- *Empower*: The making of final decisions is placed on the hands of the public.

The study of citizen engagement toolkits identifies that the citizen engagement process is very close to stakeholder’s management process in a project. Many of the methods and techniques that are described in toolkits are the same with methods and techniques used in stakeholders’ management. Specifically, the development of a citizen engagement policy and strategy, the planning of engagement, the identification and prioritization of participants, the communication, and the monitoring and evaluation are identified as common processes, along with a set of common techniques and tools. On the other hand, the massive character of citizen engagement and the diversity of them require the adoption of specific tools that could enable and enhance collaboration and active participation. The main types of such tools are citizen participation platforms, crowdsourcing and co-design tools, mobile apps, communication tools, multi-application software, data collection tools, and data sharing tools. Such tools can be chat platforms, blogs, emails, repositories, social networks, shared bookmarks, wiki, electronic voting, etc.

A set of tools that can be used in each stage are shown in Fig. 1.



**Fig. 1** Stages of citizen engagement and tools that can be used

Factors such as the type of tool, the technical skills required for its installation and usage, the usage of data, and the cost have an important role and influential role in the final selection and therefore to citizen participation. Researchers have investigated perceptions, opportunities, efforts, and toolkits aimed at assisting individuals and organizations to understand the various levels of engagement and provide them with a set of methods and techniques for effectively involved people in meaningful ways that affect their lives; however, it is unclear which methods and incentives will succeed in largely enabling citizens to participate through the use of ICTs.

### 3 Research Methodology

The main goal of this study is to examine citizens' intention toward participatory development and how they could be motivated by using ICT. Firstly, a literature review necessary for understanding the multifaceted concept of citizen participation for the development of a smart city was conducted. In parallel, a research aiming to ascertain possible ways of enabling citizens to participate in public life and regarding the different citizen engagement toolkits that exist was also conducted. Based on the findings of the literature review, the following research questions were arisen:

RQ1: How do demographic characteristics affect citizen participation?

RQ2: To what extent do they want to participate?

RQ3: By using what technology would they like to get involved?

RQ4: Which method for citizen participation is most representative?

RQ5: What are the motivations for citizens to participate?

Next, based on the literature, a questionnaire consisting of 15 questions divided in 5 sections was created. The first section's questions aimed to explore citizens' intention to participate in terms of participation levels based on Arnstein's conceptual participation scale. Respondents could express their intention by using the five-point Likert scale with the options "not at all, a little, moderate, very, and very much." In the second section, respondents were asked to answer questions related to which technology they intend to use in order to participate. They had to select between general purpose systems and specific information systems. The third section contained questions related to the choice of participation method between participation as democratic participants, as co-creators, and as ICT users. The fourth section concerned factors that affect motivation for participation, aiming to identify the strongest motivating factor, and finally, the fifth section contained questions related to the profile of the respondents of this study. They were asked about their gender, age, level of education, employment status, and place of residence.

The questionnaire was created using Google Forms and distributed to email addresses provided by various city communities. Also, social networks such as Facebook, Instagram, LinkedIn, and Viber were used to distribute the questionnaire.



Although it is difficult to record the exact number of people who received the questionnaire, it is calculated that at least 1500 people received the invitation to answer it. After 2 weeks, 384 responses were collected, providing a response rate of 25.6% that gives a representative number of answers. At that time, the Kaiser-Meyer-Olkin (KMO) test was used to examine the sampling adequacy. KMO value varies between 0 and 1, and recommendations suggest that the accepted values should be greater than 0.5. Specifically, values between 0.5 and 0.69 are mediocre, values between 0.7 and 0.79 are good, values between 0.8 and 0.89 are great, and values between 0.9 and 1 are superb [52]. KMO test gave a result value of 0.932 which was considered extremely satisfactory for further analysis, and at this point, it was decided to close the survey. Furthermore, Cronbach's alpha test was used to verify the reliability of the five-point Likert scale that was used in the questionnaire as it demonstrates how closely a set of items are, as a group. The index takes values in the range [0, 1], with 0 being interpreted as a lack of reliability, while 1 is interpreted as a strong reliable scale. According to [53], it is generally accepted that Cronbach's alpha values that are higher than 0.8 are acceptable. In the present study, Cronbach's alpha index proved to be extremely high (Cronbach's alpha = 0.933), which means that the questionnaire scale has internal consistency. Both Cronbach's alpha and KMO tests were implemented using SPSS v.26 statistical package.<sup>1</sup>

## 4 Research Findings

### 4.1 Descriptive Statistics

The descriptive analysis included the frequency distribution of the qualitative variables and estimation of the position and dispersion parameters of the quantitative variables (mean value, standard deviation, minimum and maximum value). Possible correlations were investigated using inductive analysis, which included Spearman correlation coefficient, Mann-Whitney U test for independent samples, and Kruskal-Wallis H test for control of qualitative independent variables with more than two groups and quantitative dependent variables.

According to descriptive statistical analysis concerning the responders' demographic characteristics, approximately 60% of them were female and 40% were male. In terms of educational level, 2.46% of the respondents hold a university degree, 21% of them hold a postgraduate degree, 30.5% are high school graduates, and finally nearly a 2% of responders hold a Ph.D. degree (Fig. 2).

Regarding their employability (Fig. 3), 35.7% are civil servants, 33.6% work in the private sector, and 10.4% are unemployed.

The majority of respondents (Fig. 4) (67.4%) live in urban areas of more than 10,001 inhabitants, 14.8% live in semi-urban areas of up to 10,000 inhabitants, and

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<sup>1</sup> <https://www.ibm.com/products/spss-statistics>

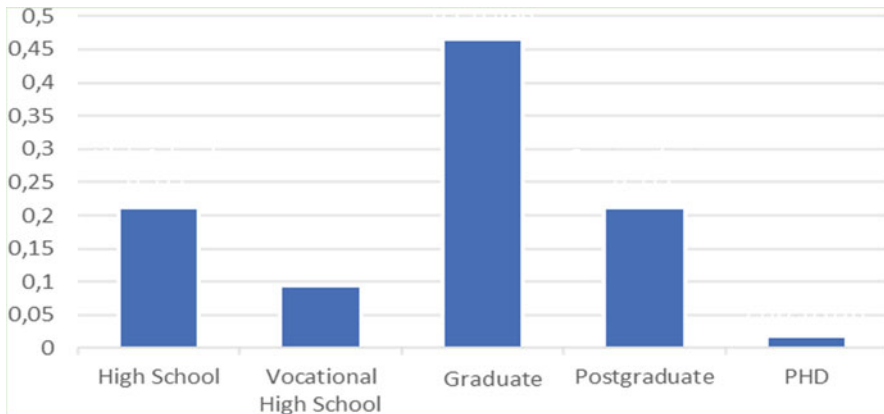


Fig. 2 Educational level

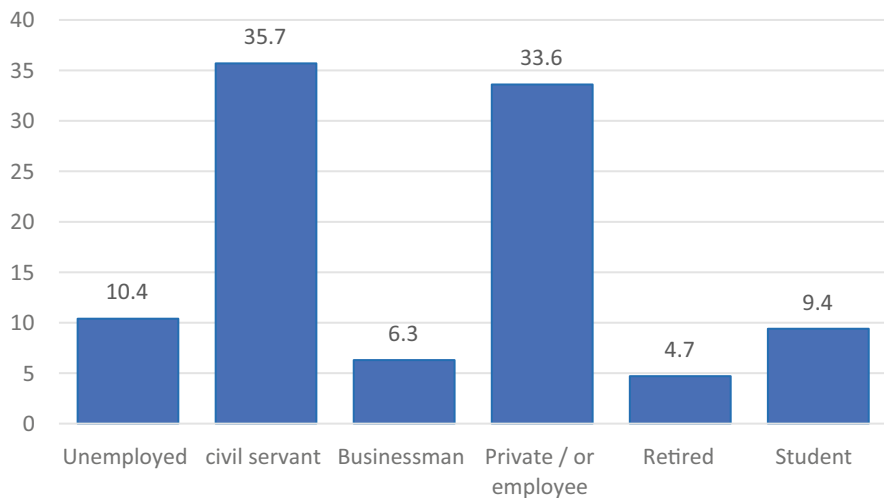
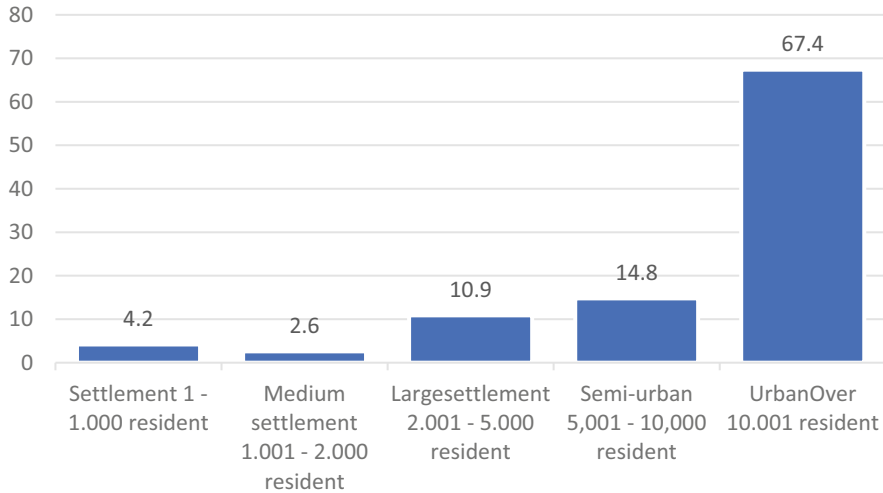


Fig. 3 Working condition

10.9% live in large settlements, while the remaining 6.8% live in settlements with less than 2000 inhabitants.

Regarding the levels of citizen participation concerning RQ2, they were classified from bottom to top based on the Arnstein scale as (a) the level of nonparticipation that includes treating and manipulating citizens; (b) the level of symbolic participation as informing, consulting, and appeasing citizens; and (c) the level of meaningful participation as cooperation, delegation of power, and full control by citizens. Results, as they presented in Table 3, show that about power-level “substantial participation,” most of the citizens want to have some kind of control in relation to task planning, decision, and policy-making with no intermediates. Regarding the



**Fig. 4** Place of residence

level of “delegated power,” 69% of the respondents support this option in the sense that they want to be assigned with the power to control, manage, and decide about programs rather than just be participating and managed by powerholders. This also enhances accountability. However, there is a noticeable 31% that are not in favor of this approach. Causes of this could be the lack of time, no willingness to take responsibility, different worldviews, fatalism, etc. However, as the causes of this approach are not easy or trivial to be interpreted from the collected data, more research is needed, for deriving safe conclusions. “Partnership” is the preferable choice for more respondents regarding the level “substantial participation” as almost 90% of them want to have the power to negotiate better deals, be able to set veto to decisions, share funding, and set requests that are partially or fully fulfilled. Regarding the level of “placation,” more than half of respondents (51.6%) do not want to be granted with limited degree of influence, and their participation is largely or entirely tokenistic, meaning that they do not want their participation to be demonstrated as an alibi for powerholders’ decisions. However, there is 29.2% that occasionally can accept this behavior, and almost 20% have no problem to be tokenized. Regarding the level of “consultation,” most of the respondents (75.8%) want to be involved in a consultation process. The same holds for level “informing.” Regarding “therapy” level, 49.2% of respondents do not want to participate in a way that allows powerholders to hide their responsibilities and accuse citizens in case of failures, while a remarkable 50.8% does not have a problem with this. Finally, concerning “manipulation” level, 69.2% of the participants declared that they do not want to be manipulated. However, there is a significant 21.4% that can accept some degree of manipulation and 9.4% have no problem to be manipulated. It is worth mentioning that in most cases there is almost 20% of the respondents do not

**Table 3** Participation levels

		NAA	AL	MOD	VR	VM	Total
Substantial participation	Citizen Control	3.1	17.4	<b>34.1</b>	32.0	13.3	100
	Delegated power	<b>8.1</b>	<b>22.9</b>	<b>33.1</b>	26.8	9.1	100
	Partnership	1.3	9.4	19.8	<b>37.2</b>	32.3	100
Symbolic participation	Placation	22.4	<b>29.2</b>	<b>29.2</b>	14.3	4.9	100
	Consultation	7.8	16.4	<b>31.3</b>	29.9	14.6	100
	Informing	8.1	16.1	24.2	<b>26.0</b>	25.5	100
Non-participation	Therapy	22.9	<b>26.3</b>	<b>25.5</b>	18.0	7.3	100
	Manipulation	<b>48.4</b>	20.8	<b>21.4</b>	7.6	1.8	100
NAA: Not at all, AL: A little, MOD: Moderately, VR: Very, VM: Very much							

NAA not at all, AL a little, MOD moderately, VR very, VM very much

**Table 4** Participation technologies

		NAA	AL	MOD	VR	VM	Total
General purpose systems	Email	5.5	16.7	<b>25.5</b>	<b>31.5</b>	20.8	100
	Electronic voting	3.4	15.9	22.1	<b>35.7</b>	22.9	100
	Interactive websites	3.1	16.1	27.9	<b>32.0</b>	20.8	100
	Video conference	16.4	18.2	<b>31.0</b>	19.0	15.4	100
Information systems	Open consultation app	8.1	22.1	26.6	<b>28.6</b>	14.6	100
	Web platforms	1.3	17.2	25.8	<b>36.5</b>	19.3	100
	Social media	7.0	21.1	18.2	<b>28.4</b>	25.3	100
	Troubleshooting app	5.5	20.6	24.5	<b>32.0</b>	17.4	100
	Smart mobile app	2.9	16.1	18.8	29.2	<b>33.1</b>	100

have any willingness to participate. This is also something that needs to be further analyzed in a future research as it is beyond the scope of this work.

As for RQ3 which concerns the use of participation technologies (Table 4) citizens intend to use, they have identified two types of technology, that is, (a) general purpose systems that include the categories: email, e-voting, interactive websites, and video conferencing and (b) information systems that include the categories: open consultation applications, web platforms, social media, problem reporting applications, and smart mobile applications. Analysis of the responses indicates that citizens are in favor of using ICT to participate and they can easily use applications that are familiar with such as mobile devices and social networks.

Regarding the participation methods (Table 5) which are examined in RQ5, and more specifically “citizens as democratic participants,” all three questions of this group gathered most responses in the “very” category. Specifically, “citizens as democratic participants” want in their majority (>80%) to have a moderate or higher degree of participation in decision-making processes, problem-solving, and public administration issues. The same applies for “citizens as co-creators,” a category where citizens express their willingness to participate in exchanging ideas with city’s management, participate in focus groups with experts, or take part at living

**Table 5** Methods of participation

		NAA	AL	MOD	VR	VM	Total
Citizens as democratic participants	In the decision-making process	4.9	14.6	24.2	<b>39.3</b>	15.9	100
	Specialization in public administration issues	3.9	15.1	31.0	<b>38.3</b>	11.7	100
	Problem solving	1.6	18.2	22.7	<b>37.5</b>	20.1	100
Citizens as co-creators	Immediate exchange of ideas with management	2.1	15.4	29.2	<b>33.1</b>	20.3	100
	Focus groups with experts	2.3	15.6	29.4	<b>36.5</b>	16.1	100
	In living laboratories	9.6	18.2	<b>30.2</b>	26.8	15.1	100
Citizens as ICT users	Use of smart infrastructure of the city	1.3	14.6	22.1	<b>36.2</b>	25.8	100
	Access to open data	1.6	13.0	27.3	<b>36.7</b>	20.8	100
	Feedback	2.1	18.5	24.7	<b>33.9</b>	20.8	100

laboratories. Category “citizens as ICT users” also follows the previous status with respondents indicating that they want to use the smart infrastructure of their city, access open data of their city, and be aware of any feedback provided by authorities.

In terms of RQ5 concerning “what are the motivation for citizens to participate,” two dimensions were examined, the “personal interest” and “social influence.” According to respondents, “personal interest” stems from the fact that they want to contribute, in various degrees of commitment, to smart initiatives (78.4%) because they think that it is important to some extent for their city (91.4%). The factor of “interpersonal communication” has also an important contribution to their motivation to participate (76.6%). Regarding motivation from “social influence,” the influence from friends or relatives is a significant factor (71.6%). However, there is a 28.4% declaring that they are not influenced by this factor. Even higher (84.4%) is the motivation sourcing from suggestions coming from other sources without blindly follow, unquestioningly, what others do (59.1%). This demonstrates the importance to inform citizens about their city development and on their personal benefits from their participation according to respondents (Table 6).

**Table 6** Motivation to participate

		NAA	AL	MOD	VR	VM
Personal interest	I contribute to smart initiatives	1.8	19.8	<b>28.6</b>	<b>25.3</b>	<b>24.5</b>
	It is important for my city	–	8.6	22.9	<b>29.7</b>	<b>38.8</b>
	Interpersonal communication	5.2	18.2	28.1	<b>25.8</b>	<b>22.7</b>
Social influence	Influence from my friends/relatives	6.0	22.4	<b>35.2</b>	24.2	12.2
	I hear suggestions from others	1.0	14.6	26.6	<b>39.8</b>	<b>18.0</b>
	I follow what others do	29.2	29.9	26.8	<b>9.9</b>	<b>4.2</b>

**Table 7** Correlation Mann-Whitney U test and Kruskal-Wallis H test

Correlation Mann-Whitney U test		Substantial Sig.	Symbolic Sig. membership	Nonparticipation Sig.
Sex	Male and woman	0.452	0.730	0.990
Correlation Kruskal-Wallis H test				
Age		0.050	0.339	0.147
Education		<b>0.001</b>	<b>0.016</b>	0.866
Occupation		0.059	0.084	0.962
Residence		0.739	0.753	0.308

## 4.2 Correlation for Citizen Participation and Influencing Factors

In this section, the correlation between participation and influencing factors like gender, education, occupation, etc. regarding RQ1 is presented. A confidence interval of 95% was used for the statistical analysis, and the significance level was set to  $\alpha = 0.05$ . Next, the correlation of participation levels with gender was performed using the Mann-Whitney U test coefficient. For the correlation with other demographic characteristics, the Kruskal-Wallis H test was used. Statistically significant results were obtained only in terms of education level. The level of education positively influenced the intention to participate both at the level of meaningful and symbolic participation since the p-values of p- 0.001 and p- 0.016 < 0.05, respectively (Table 7).

Specifically, as it is depicted in Fig. 5, in terms of substantial participation, the highest degree is presented to those participants who hold a Ph.D. degree. However, since the number of Ph.Ds was rather small in the sample, the results need to be further analyzed in future research.

The correlation between participation levels and the other variables was then tested using Spearman's Rho coefficient.

As it is depicted in Table 8, the results of the correlation for the participation indicate that (a) the control by the citizens, (b) the delegation of power, (c) the cooperation, (d) the placation, (e) the consultation, and (f) the information are positively related to the intention of effective participation. Regarding the intention of symbolic participation, results indicate that (a) control by citizens, (b)

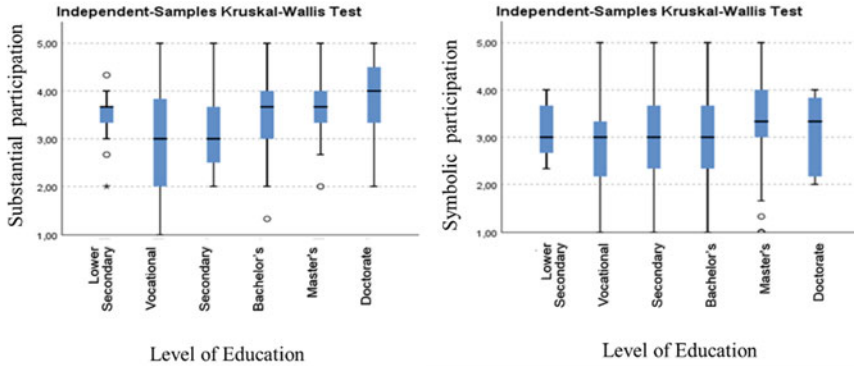


Fig. 5 Level of education in substantial and symbolic participation

cooperation, (c) placation, (d) consultation, (e) information, and (f) treatment and manipulation present a statistically significant correlation.

## 5 Conclusions

Citizen engagement is a vital factor of success in any project or effort that were undertaken for the development of smart cities. That is because these processes require knowledge, skills, and resources that are not held by any governmental or other organizations alone [3]. The importance of citizen engagement is augmented through the development of various forms of citizen engagement toolkits aiming to enhance citizen participation through the development of personal skills such as communication, collaboration, and teamworking, build confidence, and improve the sense of belonging and ownership in local community. Furthermore, by using such tools, local authorities and government can be more confident that resources are targeted to those that most need them, and cities' infrastructures meet citizens' needs appropriately through the implementation of atomic and composite smart services [54].

According to the results of this research, citizens are interested and want to have meaningful participation, care about the well-being of their city, want to advice, and are willing to participate using smart technologies that they are familiar with. Citizens also recognize that participation has an impact on decisions made about their lives and enhances trust in their city life, and they are willing to support the whole process. Also, based on the results, it seems that the higher the level of education, the higher the level of citizens' willingness to participate, which is a factor that should be taken seriously by the administrations. Based on this, they need to create appropriate conditions from a technological point of view, so other populations could reach and be engaged both at the city and country levels.

**Table 8** Correlation coefficient Spearman's Rho

Correlation of levels of participation with rate Spearman's Rho	Substantial participation		Symbolic participation		Nonparticipation		N
	Correlation coefficient	Sig. (two-tailed)	Correlation coefficient	Sig. (two-tailed)	Correlation coefficient	Sig. (two-tailed)	
<i>Subs participation</i>							
Citizen control	.772**	.000	.325**	.000	.023	.647	384
Delegated power	.743**	.056	.098	.056	-.088	.086	384
Partnership	.820**	.000	.353**	.000	-.004	.938	384
<i>Symbolic participation</i>							
Placation	.180**	.000	.732**	.000	.366**	.000	384
Consultation	.308**	.000	.773**	.000	.270**	.000	384
Informing	.221**	.000	.782**	.000	.354**	.000	384
<i>Nonparticipation</i>							
Therapy	.016	.000	.433**	.000	.875**	.000	384
Manipulation	-.061	.000	.238**	.000	.787**	.000	384
<i>General purpose systems</i>							
Email	.388	.000	.322	.000	.109	.032	384
Electronic voting	.405	.000	.285	.000	-.022	.664	384
For active websites	.399	.000	.254	.000	-.036	.482	384
Teleconferencing	.425	.000	.305	.000	.030	.564	384
<i>Information systems</i>							
Open consultation applications	.489	.000	.271	.000	.012	.816	384
Online platforms	.402	.000	.238	.000	.038	.452	384
Social media	.194	.000	.240	.000	.097	.058	384
Troubleshooting applications	.304	.000	.244	.000	.070	.169	384
Smart mobile applications	.285	.000	.241	.000	.104	.042	384



<i>Participation as co-creators</i>									
Exchange of ideas with the management	.482	.000	.262	.000	.023	.649	384		
Focus groups with experts	.396	.000	.267	.000	.080	.119	384		
Living laboratories	.403	.000	.254	.000	.135	.008	384		
<i>Social influence</i>									
Influence from my friends/relatives	.000	.000	.295	.000	.199	.006	384		
I hear suggestions from others	.000	.000	.406	.000	.329	.011	384		
I follow what others do	.002	.000	.157	.000	.141	.006	384		

\*\*The double asterisks (\*\*) in the correlation coefficient column in Table 8, indicate that the correlation coefficient is statistically significant (at the 0.05 level), meaning that there is a very low probability of observing such a strong correlation by chance alone

Moreover, this work also gives us preliminary results about (a) the intention of citizens to participate is greater in urban centers, (b) citizens are interested and want to have meaningful participation, and (c) citizens follow social lines for participation, since they believe that this is beneficial for their city. Using these preliminary results, we plan for a new research to create more technical questions about the type of technology could be used to promote civility and well-being in the interaction of citizens among specific communities and their cities. Given that this research theme is quite open and there are a lot of searches and explorations to identify the best ways to develop the appropriate methods for citizen participation in specific domains, this work will be continued to consolidate the preliminary results and conclusions to develop new research questions that will also include self-assessment of citizens' ability to collaborate and make propositions to their cities through various methods and citizens' training needs to improve their skills [55] for participation in smart cities' development.

Further research to expand the findings could focus on those factors that could enable participation for citizens who do not have the basic ICT knowledge since our research sketches a portrayal of at least a moderate ICT user. Moreover, we plan to thoroughly research and compare the need for implementing citizen engagement toolkits in various smart cities and their foci regarding the different stages of their involvement.

## References

1. D. Jurlina Alibegović, S. Slijepčević, Attitudes towards citizen participation in the local decision-making process: A comparative analysis. *Društvena istraživanja: časopis za opća društvena pitanja* **27**(1) (2018). <https://doi.org/10.5559/di.27.1.08>
2. V. Roblek, M. Meško, Smart city knowledge management: Holistic review and the analysis of the urban knowledge management, in *The 21st Annual International Conference on Digital Government Research*, (2020, June), pp. 52–60
3. ESCWA, *Open Government Citizen Engagement Toolkit* (United Nations, Beirut, 2021)
4. A. Simonofski, T. Vallé, E. Serral, Y. Wautelet, Investigating context factors in citizen participation strategies: A comparative analysis of Swedish and Belgian smart cities. *Int. J. Inf. Manag.* **56**, 102011 (2021)
5. West Lothian Community Planning, *Engaging Communities Toolkit. A Practical Guide to Community Engagement* (West Lothian Community Planning, 2015)
6. V. Albino, U. Berardi, R.M. Dangelico, Smart cities: Definitions, dimensions, performance, and initiatives. *J. Urban Technol.* **22**(1), 3–21 (2015)
7. A. Stratigea, C.A. Papadopoulou, M. Panagiotopoulou, Tools and technologies for planning the development of smart cities. *J. Urban Technol.* **22**(2), 43–62 (2015)
8. P. Fitsilis, P. Tsoutsas, L. Anthopoulos, O. Ragos, Teamwork behavior in smart and sustainable cities ecosystems, in *The Eighth International Conference on Advanced Collaborative Networks, Systems and Applications*, (Venice, Italy, 2018)
9. M. Boykova, I. Ilina, M. Salazkin, The smart city approach as a response to emerging challenges for urban development. *Форсайт* **10** (2016)
10. R.P. del Hoyo, A. Visvizi, H. Mora, Inclusiveness, safety, resilience, and sustainability in the smart city context, in *Smart Cities and the UN SDGs*, (Elsevier, 2021), pp. 15–28

11. I. Borowy, The social dimension of sustainable development at the UN: From Brundtland to the SDGs, in *The Struggle for Social Sustainability*, (Policy Press, 2021), pp. 89–108
12. B. Giddings, B. Hopwood, G. O'Brien, Environment, economy and society: Fitting them together into sustainable development. *Sustain. Dev.* **10**(4), 187–196 (2002)
13. J. Gowdy, J.D. Erickson, The approach of ecological economics. *Camb. J. Econ.* **29**(2), 207–222 (2005)
14. D.L.A. Lozano, S.E.D. Márquez, M.E.M. Puentes, Sustainable and smart mobility evaluation since citizen participation in responsive cities. *Transp. Res. Procedia* **58**, 519–526 (2021)
15. R. Leichenko, Climate change and urban resilience. *Curr. Opin. Environ. Sustain.* **3**(3), 164–168 (2011)
16. M. Martikka, S. Salo, K. Siilin, T. Ruohomäki, P. Tuomaala, E. Nykänen, Smart city resilience with active citizen engagement in Helsinki, in *2018 International Conference on Intelligent Systems (IS)*, (IEEE, 2018, September), pp. 162–167
17. P. van Waart, I. Mulder, C. de Bont, A participatory approach for envisioning a smart city. *Soc. Sci. Comput. Rev.* **34**(6), 708–723 (2016)
18. P. Cardullo, R. Kitchin, Being a 'citizen' in the smart city: Up and down the scaffold of smart citizen participation in Dublin, Ireland. *GeoJournal* **84**(1), 1–13 (2019)
19. M.E. Cortés-Cediel, I. Cantador, M.P.R. Bolívar, Analyzing citizen participation and engagement in European smart cities. *Soc. Sci. Comput. Rev.* **39**(4), 592–626 (2021)
20. B. Radu, Citizen participation in the decision making process at local and county levels in the Romanian public institutions. *Transylv. Rev. Adm. Sci.*. Retrieved in October 20 2011 **6**, 76–92 (2009)
21. B.K. Mak, L.T. Cheung, D.L. Hui, Community participation in the decision-making process for sustainable tourism development in rural areas of Hong Kong, China. *Sustainability* **9**(10), 1695 (2017)
22. M. Ianniello, S. Iacuzzi, P. Fedele, L. Brusati, Obstacles and solutions on the ladder of citizen participation: A systematic review. *Public Manag. Rev.* **21**(1), 21–46 (2019)
23. I. Bouzguenda, C. Alalouch, N. Fava, Towards smart sustainable cities: A review of the role digital citizen participation could play in advancing social sustainability. *Sustain. Cities Soc.* **50**, 101627 (2019)
24. R. Falanga, The national participatory budget in Portugal: Opportunities and challenges for scaling up citizen participation in policymaking, in *Hope for Democracy: 30 Years of Participatory Budgeting Worldwide*, (2018), pp. 447–466
25. J. Tadili, H. Fasly, Citizen participation in smart cities: A survey, in *Proceedings of the 4th International Conference on Smart City Applications*, (2019, October), pp. 1–6
26. S. Arnstein, A ladder of citizen participation. *J. Am. Inst. Plann.* **35**(4), 216–224 (1969)
27. J. Gaber, Building "a ladder of citizen participation". *J. Am. Plan. Assoc.* **85**(3), 188–201 (2019). <https://doi.org/10.1080/01944363.2019.1612267>
28. P. Tsoutsas, O. Iatrellis, O. Ragos, P. Fitsilis, A framework for developing teamwork enabled services in smart city domains, in *2021 the 4th International Conference on Computers in Management and Business*, (2021, January), pp. 26–32
29. P. Tsoutsas, P. Fitsilis, L. Anthopoulos, O. Ragos, Nexus services in smart city ecosystems. *J. Knowl. Econ.* **12**(2), 431–451 (2021)
30. J.M. López-Quiles, M.P.R. Bolívar, Smart technologies for smart governments: A review of technological tools in smart cities, in *Smart Technologies for Smart Governments*, (2018), pp. 1–18
31. R.G. Hollands, Will the real smart city please stand up? Intelligent, progressive or entrepreneurial? *City* **12**(3), 303–320 (2008)
32. L. Berntzen, M.R. Johannessen, The role of citizen participation in municipal smart city projects: Lessons learned from Norway, in *Smarter as the New Urban Agenda*, (Springer, Cham, 2016), pp. 299–314
33. A. Coe, G. Paquet, J. Roy, E-governance and smart communities: A social learning challenge. *Soc. Sci. Comput. Rev.* **19**(1), 80–93 (2001)

34. P. Bishop, G. Davis, Mapping public participation in policy choices. *Aust. J. Public Adm.* **61**(1), 14–29 (2002)
35. NHS Lothian, *Public Engagement. A New Framework* (2021)
36. A. Simonofski, E.S. Asensio, J. De Smedt, M. Snoeck, Citizen participation in smart cities: Evaluation framework proposal, in *2017 IEEE 19th Conference on Business Informatics (CBI)*, vol. 1, (IEEE, 2017, July), pp. 227–236
37. L. Berntzen, M.R. Johannessen, The role of citizens in “smart cities”, in *Management International Conference*, (2016, June)
38. E. Panopoulou, E. Tambouris, K. Tarabanis, eParticipation initiatives in Europe: Learning from practitioners, in *International Conference on Electronic Participation*, (Springer, Berlin/Heidelberg, 2010, August), pp. 54–65
39. SPARC BC, *Community Engagement Toolkit* (Social Planning and Research Council of British Columbia, Burnaby, 2013)
40. EFSA, *Engagement Toolkit. Methods, Tips and Best Practices to Design Effective Participatory Processes* (European Food Safety Authority, Parma, 2021)
41. P. Schmitz, *Community Engagement Toolkit v2.2* (Collective Impact Forum, 2017)
42. P. Hanfling, S. Majeed, E. Cox, *The Manchester Community Engagement Toolkit* (Manchester City Council, Manchester, 2005)
43. Department of Environment‘ Land‘ Water and Planning, *Effective Engagement: Building Relationships with Community and Other Stakeholders. Book 3: The Engagement Toolkit*, 4th edn. (State Government of Victoria, Melbourne, 2015)
44. Department of Infrastructure Local Government and Planning, *Community Engagement Toolkit for Planning* (Queensland Government, Brisbane, 2017)
45. Community Places, *Community Planning Toolkit* (Community Engagement, 2014)
46. Community Planning and Inclusion Glenorchy City Council, *Community Engagement Toolkit* (2017)
47. Futurewise, Interim CDA, One America, El Centro de la Raza, *Community Engagement Toolkit* (Guidance and Resources for Engaging Community in Planning and Policy Development, 2014)
48. Department of City Planning Pittsburgh City, *Community Engagement Toolkit* (2017)
49. SFU Morris J. Wosk Centre for Dialogue, *Public Engagement Toolkit* (SFU, 2019)
50. Boston Public Health Commission, *Equitable Community Engagement Toolkit 2020–2023* (2020)
51. Slough Borough Council, *Community Engagement Toolkit* (2018)
52. G. Hutcheson, N. Sofroniou, *The multivariate social scientist* (Sage, London, 1999)
53. A. Field, *Discovering Statistics Using SPSS: Introducing Statistical Method*, 3rd edn. (Sage, Thousand Oaks, 2009)
54. P. Tsoutsas, O. Ragos, Towards an ontology for teamwork enabled services, in *Proceedings of the 2020 4th International Conference on Algorithms, Computing and Systems*, (2020, January), pp. 69–75
55. P. Tsoutsas, I.C. Lampropoulos, Preparing for smart cities’ future competences: Trends arising through keyword and review analysis, in *Building on Smart Cities Skills and Competences*, (Springer, Cham, 2022), pp. 37–51