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SMART CITIES' BENEFICIAL APPLICATIONS AND IMPACT: FROM CITIZENS' POINT OF VIEW – THE CASE STUDY OF GREEK AND CYPRIOT CITIZENS

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This Master's Thesis was prepared during the studies for the distance master's degree at Neapolis University and was approved on…..…… [date of approval] by the members of the Examination Committee.

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Περίληψη

Ο 21ος αιώνας θεωρείται «ο αιώνας των πόλεων». Μέχρι τα τέλη αυτού του αιώνα, πάνω από το 80% του παγκόσμιου πληθυσμού αναμένεται να ζει σε αστικές περιοχές. Ο υπερπληθυσμός έχει ήδη μετατραπεί από μια επικείμενη πρόκληση, σε ένα εμφανές πρόβλημα. Σταδιακά, αυτό οδηγεί σε πολλές άλλες προκλήσεις, μερικές από τις οποίες είναι: η υπερκατανάλωση ενέργειας, οι κλιματικές αλλαγές, οι περιορισμένοι πόροι και η ατμοσφαιρική ρύπανση. Η έννοια της αειφόρου ανάπτυξης προέκυψε μέσω της έννοιας της «Έξυπνης Πόλης» προκειμένου να αντιμετωπίστουν όλες οι προαναφερθείσες προκλήσεις και να καθοριστεί ο μελλοντικός αστικός σχεδιασμός. Επομένως, η έννοια της «Έξυπνης Πόλης» αποτελεί τον πρόδρομο της αειφόρου ανάπτυξης. Η ιδέα της «Έξυπνης Πόλης» αποσκοπεί κυρίως στη βελτίωση της ζωής στις πόλεις, με τη χρήση καινοτόμων, σύγχρονων τεχνολογιών.

Μια «Έξυπνη» πόλη αναπτύσσεται βασιζόμενη σε ένα σύνολο υπηρεσιών που απευθύνονται κατά κύριο λόγο στους πολίτες, καθώς αυτοί είναι οι κύριοι δικαιούχοι όλων των πλεονεκτημάτων που μπορεί να προσφέρει. Ο κυριότερος σκοπός της παρούσας διπλωματικής εργασίας είναι να παρουσιάσει την αντίληψη και την άποψη των πολιτών σε σχέση με την έννοια της «Έξυπνης» πόλης και να αποκαλύψει το επίπεδο γνώσης των Ελλήνων και Κύπριων πολιτών σχετικά με τις ενέργειες, τις εφαρμογές και τα στοιχεία μιας «Έξυπνης» πόλης. Ένας επιπλέον στόχος είναι να διευκρινιστεί κατά πόσο οι Έλληνες και Κύπριοι πολίτες έχουν συνειδητοποιήσει το θετικό αντίκτυπο και τα οφέλη που μπορεί να προσφέρει ένα «έξυπνο έργο» στην πόλη στην οποία ζουν. Για τη διεξαγωγή της ποσοτικής έρευνας της παρούσας διλωματικής εργασίας χρησιμοποιήθηκε ένα ερωτηματολόγιο ηλεκτρονικής μορφής, ως εργαλείο για τη συλλογή δεδομένων. Οι συμμετέχοντες ενημερώθηκαν για το σκοπό της έρευνας πριν το συμπληρώσουν. Το ερωτηματολόγιο απευθυνόταν σε Έλληνες (ελληνόφωνους) ανθρώπους που ζουν ανά την Ευρώπη. Εν τέλει, συμπληρώθηκε από συνολικά 545 ενήλικες ανθρώπους, εκ των οποίων οι 415 ήταν κάτοικοι της Ελλάδας και οι 108 κάτοικοι της Κύπρου. Επίσης, στην έρευνα πήρε μέρος ένας μικρός αριθμός Ελλήνων (22 συνολικά) που είναι κάτοικοι άλλων Ευρωπαϊκών χωρών.

Στην εργασία αυτή, αρχικά παρουσιάζονται μερικές γενικές πληροφορίες σχετικά με τις «Έξυπνες Πόλεις». Επιπλέον, δίνεται ιδιαίτερη έμφαση στον ενεργό ρόλο που επιβάλλεται να έχουν οι πολίτες, προκειμένου οι προσφορές μιας «Έξυπνης Πόλης» να μπορούν να επηρεάσουν θετικά τη ζωή τους. Στη συνέχεια, αναφέρονται ορισμένες έρευνες, οι οποίες παρουσιάζουν ένα είδος συσχέτισης με την έρευνα και το σκοπό της τρέχουσας εργασίας. Οι

έρευνες αυτές έχουν πραγματοποιηθεί σε πόλεις ανά τον κόσμο. Μέσω της αναφοράς τους, παρουσιάζονται τα εξής:

- Η σημασία της ενεργής συμμετοχής των πολιτών για την ανάπτυξη «έξυπνων» έργων στην πόλη που ζουν
- Η άποψη των πολιτών σχετικά με τον αντίκτυπο που έχουν οι δράσεις και οι εφαρμογές της «Έξυπνης Πόλης» στη ζωή τους
- Ορισμένα οφέλη που παρέχουν οι «Έξυπνες Πόλεις»

Κατόπιν, πραγματοποιείται μια περιεκτική αναφορά στους ορισμούς της «Αειφόρου Αστικής Ανάπτυξης» και της «Έξυπνης Πόλης». Επίσης, αναλύονται οι έξι βασικοί πυλώνες της «Έξυπνης Πόλης». Ακολουθεί η ανάλυση της ποσοτικής έρευνας της παρούσας διπλωματικής εργασίας, που σχετίζεται με το επίπεδο αντίληψης και γνώσης που έχουν οι πολίτες (κυρίως της Ελλάδας και της Κύπρου) σχετικά με την έννοια της «Έξυπνης Πόλης» και τον αντίκτυπο που έχουν οι δράσεις και οι εφαρμογές της στη ζωή τους. Παρουσιάζονται, επίσης, ορισμένα ερευνητικά ερωτήματα, που οδηγούν σε ενδιαφέροντα συμπεράσματα. Τέλος, παρουσιάζονται τα συμπεράσματα που προέκυψαν από τη στατιστική ανάλυση της έρευνας και οι απαντήσεις σε όλα τα ερευνητικά ερωτήματα.

Λέξεις-κλειδιά

Έξυπνη Πόλη, Αντίκτυπος, Πυλώνες, Συμμετοχή πολιτών, Τεχνολογίες Πληροφοριών και Επικοινωνίας, Έρευνα

Abstract

The 21st century is considered to be “the century of cities”. By the end of this century, over 80% of the global population is expected to be living in urban areas. Overpopulation has already transformed from an upcoming challenge to an obvious problem. Gradually, this leads to many other global challenges and concerns, such as energy overconsumption, climate changes, resource constraints, and air pollution. To cope with all these challenges, the concept of sustainable urban development emerged through the "Smart City" concept development to define urban planning significantly. The “Smart City” concept constitutes the precursor of sustainable development. Its main goal is to improve life in cities by using innovative and state-of-the-art technologies.

To become smart, a city should develop an approach of services that will focus mainly on citizens to be the primary beneficiaries of the things that the Smart City can offer. The current thesis's primary purpose is to present the citizens' perception of the smart city concept and reveal Greek and Cypriot citizens' level of knowledge regarding a Smart City's actions, applications, and elements. Additionally, we aim to clarify whether Greek and Cypriot citizens have realized the importance, the positive impact, and the benefits that a “smart project” can offer in the city they live in. For the conduction of our quantitative research, we have opted for a questionnaire as a tool for collecting data. The participants were introduced to the objectives and the purpose of the questionnaire before filling it in. The questionnaire was directed and shared to Greek people who live in cities all over Europe. It was eventually filled in by a total of 545 adults respondents. Most of them were Greek citizens of Greece (415 in total) and Cyprus (108 in total). Also, a small number of Greek people who live in some other European countries participated (22 in total).

In the beginning of this work, some general information about “Smart Cities” is presented. Furthermore, some emphasis is given to the active role that the citizens should have so that the offers of a smart city could positively impact their lives. Subsequently, several surveys and researches related to the current work are presented. These researches have taken place in cities from all over the world and present some relevant findings: a number of smart city benefits, the importance of citizen participation and ideas in a smart city project, feedback from citizens about the impact that the smart city actions have on their lives and, generally, the way that the people see a smart city. After this, a comprehensive reference to the definitions of “Sustainable

Urban Development" and "Smart City" is presented. Moreover, the smart city's six fundamental pillars are analyzed. The analysis of the current thesis' quantitative research follows, which is related to the level of perception and knowledge that Greek citizens (mainly living in Greece and Cyprus) have regarding the "Smart City" concept and to the impact that the "Smart City" actions and applications have on their lives. A number of research questions that lead to exciting conclusions are also presented. Finally, the conclusions that emerged from the survey's statistical analysis and the answers to all the research questions are presented.

Key Words

Smart City, impact, pillars, citizens participation, technology, ICT, research

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Introduction

At the beginning of the 21st century, the cities are presented as the primary source for some of the biggest concerns and challenges that the world has ever faced. Rapid urbanization (which leads to overpopulation), diminished resources, and continuous climate changes are some of these challenges. To successfully face the problems that emerge from these challenges, the authorities, governments, and citizens of big cities worldwide need to realize that sustainability achievement is the primary way [44].

The “smart city” concept is defined as a concept that can tackle environmental, economic, and social challenges that a modern city faces and will continue facing in the future [44]. From only focusing on using Information and Communication Technology systems, a smart city is now getting more closely related to people and communities [26]. There may not have been a clear and globally accepted definition for the smart city. Despite this fact, cities are embracing the notion of achieving smartness to achieve sustainable development and economic growth and, also, to improve their citizens’ quality of life [44]. Simply, we can define a “smart city” as a city that uses advanced technologies in order to achieve the goals it has set. These goals vary, depending on the city’s geographical location, the socio-economic conditions, the resources that the city can allocate and the perceptions of the respective local authorities. The goals may be financial development, education, eradication of poverty, social equality, enhanced citizens’ security, tourism, cultural education, intercultural physique, environment, and fast citizen service in public services [65]. Smart cities projects are related to many application areas, such as communication, culture, energy, environment/climate, health, tourism, and transport. “Smart cities” are closely related to “smart buildings” and “smart devices”, but neither cities, buildings, nor devices are smart by themselves. The whole concept relies on the city administration's smartness, politicians, and citizens to utilize technology in "smart" ways [9].

With new communication channels and interaction, citizens have acquired the opportunity to play a more active role in the city [44]. The significant increase in citizens' democratization and production capability has turned them into key factors for the innovation process and development of a city [66]. To succeed in the development of smart cities, citizens should be involved as an integral part because they are users, decision-makers, consumers, and sources of data and information [12]. Citizens’ participation, ideas, and perspectives are critical factors for smart city development [44]. The bigger the participation and the involvement in their

(smart) city's decision making, the better the understanding of the benefits and the positive impact that the smart city provides them.

This thesis' purpose is to present the citizens' perception about the smart city concept, to reveal the level of knowledge of Greek and Cypriot citizens regarding a Smart City's actions, application and elements, and to make clear to what extend the Greek and Cypriot citizens have realized the importance, the positive impact and the benefits that a "smart project" can offer in their lives.

A short reference about the thesis' subject, structure and purposes is made in the "Abstract" section. After the Abstract, the thesis is structured under seven (7) sections.

The 1st section is the "Introduction" (current chapter), where some general information about "Smart Cities" is presented. Furthermore, the importance of citizens' participation in developing a smart city project is emphasized, and a detailed presentation regarding the thesis' structure is presented.

The 2nd section refers to the "Related Work", which refers to the presentation of a number of surveys and researches that are somehow relevant to this specific work. These researches have been made in various cities from all over the world and present some relevant conclusions: a number of smart city benefits, the importance of citizen participation and ideas in a smart city project, feedback from citizens about the impact that the smart city actions have on their lives and, generally, the way that the people see a smart city.

In the 3rd section ("Smart City"), a comprehensive reference to the definitions of "Sustainable Urban Development" and "Smart City" is presented. Consequently, the smart city's six main pillars are analyzed.

The 4th section includes the methodology and the analysis of the current thesis' quantitative survey, which is related to the level of perception and knowledge that Greek citizens (mainly living in Greece and Cyprus) have regarding the "Smart City" concept and to the impact that the "Smart City" actions have on their lives. Several research questions that lead to exciting conclusions are also presented in this chapter. The last sub-chapter includes the survey's extended statistical analysis, according to the results gathered from the survey participants' responses. Internal consistency and independence tests have been performed on the data's variables. The data was gathered via an online questionnaire.

The 5th section summarizes the project and presents the conclusions that emerged from our survey's statistical analysis and the answers to all the research questions.

In the 6th section, the extended bibliography of the articles, papers, journals, and book chapters used for the writing of this thesis is presented.

Finally, in the 7th section, the questionnaire used for gathering the data of this survey is presented, with the exact questions that each of the participants answered.

Related Work

The following literature review is related to this thesis' work. Several already existing surveys and researches regarding the effects, the benefits and the impact of smart cities on the citizens' lives, as well as how citizens participate in forming a smart city, are presented.

The information and communication technology (ICT) applications form an essential factor for the development of sustainable smart cities, and their adoption has become a significant model for municipal cooperation between government and corporations. The author of [1] proceeds with a study where several Taiwanese citizens are surveyed. The purpose of this study is to emphasize that a smart city's services provide its citizens with an improved living environment and increased quality of life. Furthermore, the study aims to point out how important it is for the citizens' ideas and perspectives to be taken into account during the planning of the smart city's services. The results of this survey highlighted the citizens' willingness to accept the ICT-based smart city services, provided that their design is based on innovative processes that offer personal privacy and high quality of services.

The created questionnaire was distributed to several adult Taiwanese citizens under the condition that all of them had participated in the Intelligent Community Forum smart city campaigns at least one time. During this survey, a total number of 1091 valid questionnaires were obtained from the 1189 participants. The results revealed that Taiwanese people are willing to accept and use an ICT-based smart city service in case it is of high quality, secures privacy and is based on innovative concepts. The only factor that did not play a significant role in the citizens' acceptance and usage of smart city services was the city engagement. Furthermore, based on the results, the investigation showed that in order for smart city services to improve citizens; life positively, they need to be used frequently.

The city engagement factor did not seem to have played a major role in influencing the participants' usage of the smart city services in [1]. However, Belanche's et al. research in [2] presented that city attachment (engagement) affected both citizens' attitudes toward urban services and citizens' usage of them. The major difference between this investigation and the one in [1] is that the findings of this investigation were based on data that have been collected by the citizens of a European city: the city of Zaragoza in Spain. The research revealed how citizens' city attachment levels and other personal factors contribute to urban services usage.

As mentioned in [62], the more the citizens use the urban services, the better the service's performance, the life's quality, and the greater the satisfaction with urban management. It is confirmed that the use of public transportation (which is an urban service) leads to the production of substantial savings for the citizens [3] and, also, to benefits for the environment, by reducing air pollution, traffic injuries, and CO2 emissions [4]. The survey's framework resulted from a number of hypotheses relevant to the influence that the city attachment has, on attitudes toward urban services and the use of them and the city attachment's dependence on citizens' demographic features. The data was gathered from various groups of citizens in Zaragoza (different from each other) through a questionnaire that included questions about attitudes towards urban services, city attachment and the personal necessity to use the services. Although the results indicated that city engagement affected the attitudes toward urban services positively, the effect of city attachment on the use of these services was not of high significance. Moreover, city attachment was affected by the age factor in a positive way but negatively affected by educational level. In contrast, urban service usage was positively affected by highly educated people but not affected by age or gender.

Generally, the citizens' role in smart cities is significant. Their participation in the development of smart city initiatives seems crucial. In [5], the authors analyze the concept of co-production, which can be considered as a boosted type of participation of citizens, with their involvement in the creation and development of public services and policies. Co-production is based on a redistribution of power between citizens and government. "Smart" citizens constitute a fundamental dimension of smart cities. Thus, no smart city can be formed without smart citizens. Every smart city initiative impacts on the citizens' way of life and will be led to failure in case the citizens are not accepting to adapt their lifestyles accordingly or to collaborate by adopting "smart" behaviours. The collaboration between the service designers and creators and the service users (citizens) is a critical condition so that the desired results can be accomplished in smart city initiatives [6]. This collaboration is one of the critical attributes of the co-production of public services. From this aspect, when citizens act like co-producers, they get the chance to participate in smart city initiatives actively and to make the city they live in “smarter”. In the specific chapter ([5]), some points of view regarding citizens' participation in smart city initiatives have been discussed so that their "smartness" could become a contributory factor for the cities to become smarter. The discussion was based on Sherry Arnstein's principle. This principle states that in-depth participation cannot exist unless the power

relationship between those who hold power (government, professional public service providers) and the citizens are rebalanced. Moreover, the author describes the infamous, conceptual, eight-rugged Arnstein's ladder of citizens' participation. In the specific source, the levels of this ladder are not considered as increasing levels of participation. They are acknowledged as the definition of different 'participation configurations' that can be effective in specific contexts, concerning different issues and at different times. The author examined the role of citizens as sensors/information providers. They can provide information, which can be used both by the government and by the professional service providers for better management of the city's systems and the implementation of citizen/user-centered services. Thus, they can participate in procedures that can make cities smarter. Most of this information is acquired by their behaviours, and they can get to a point where they can control this information. The fact that the citizens can control the information that concerns their behaviour enables them to take part in the formation of smart city services as co-producers. However, some implications may occur from this asset. Given the opportunity to control this type of Bovaird, the citizens can decide whether and how to share it with the government, based on a cost-benefit calculation. They can decide to play a co-producer role for services that can benefit them the most, instead of the services that the city's government assumes are the most useful for them. Another implication is that citizens may decide to share the data that have to do with their behaviors with the government and other organizations or communities to create services that the citizens appraise.

Since in some cases the citizens do not get the chance to evaluate the improvements that take place in their city, the authors in [8] introduce a procedure/model to enhance the citizens' participation in their smart city's development plan. To become smart, a city should develop an approach of services that will focus mainly on citizens so that they could be the primary beneficiaries of the new urban project. In other words, according to the citizens' satisfaction, the city can proceed in development, which will be focused on its residents. In this research, the authors use Boyd Cohen's model (Smart Cities Wheel) as a metric model, which consists of six Key Performance Indicators (KPIs), based on Kano methodology, to determine the level of satisfaction that is generated in the citizens. Through the Kano model, the attributes that provide levels of satisfaction are determined and classified. Generally, the model classifies a service's characteristics (or product) based on the degree of interaction relations of customer satisfaction. Then, the Customer Satisfaction Index (CSI) is created. The CSI is formed by the

rate of customers that are satisfied with an attribute (SI: Satisfaction Index) and by the rate of those who are not satisfied because an attribute is absent or of not good quality. Based on all the previous, the authors' methodology was tested in a living lab for smart city solutions in the CUCEA campus (Business and Economics areas of specialty), one of the campuses of the University of Guadalajara. In the research, the KPIs of Boyd Cohen's model was structured in six variables, which were compounded by 38 items for the Kano methodology. This allowed the authors to extract thorough information on the required indicators. They were also able to relate the respective variables during the analysis process. The population that was used in the study were 377 students who were considered citizens.

According to the result of the analysis of the CSI, Smart Economy and Smart People should be highly attended; otherwise, the measured dissatisfaction would be highly significant. Also, any improvements in the area of Smart Environment will lead to citizens' great satisfaction. The most significant deviations are met in the categories of Smart Mobility and Smart Economy. In the other four categories (Smart People, Smart Sustainability, Smart Governance and Smart Living), no significant deviance is observed when it comes to the interaction between the SI and DI.

The research in [9] shows how smart cities are likely to be developed in India, considering the perspectives of both citizens and city officials (such as governments). It is also indicated how the size of a city can influence the priorities of both citizens and authorities. Since the urban population in India increases year by year, the development of smart cities becomes mandatory. The Indian perspective regarding smart cities was extracted by a citizen survey, which provided the way citizens see a smart city and smart city vision statements, which provide insight into how the city officials consider a smart city and the most important things for them. The citizen survey obtained information about the perspective of the citizens about priority areas for smart city development. Fifty-nine (59) cities took place in this survey. These cities hosted a poll to obtain information about citizens' perception, in the form of percentages. Also, they have been divided into clusters according to their population. Citizens' responses were categorized under five characteristics/elements, which constitute the most critical factors for the formation of a smart city (Smart Economy, Smart Environment, Smart Mobility, Smart Governance, Smart Living). The analysis of the citizens' data showed the citizens' priority areas. The size of the cities played a major role in the results. Overall, in terms of importance for the citizens, Smart Living was the most selected domain (51%), and Smart Mobility was second (30%). According

to the author, these results make sense, considering that India faces many deficits in these two domains. Also, it is worth mentioning that in cities with a population under 2.000.000 people, the priority is given to Smart Living, whereas in cities with a population under 2.000.000 people, the priority is shared between Living and Mobility. This shows how important it is for citizens in India's big-populated cities to have a proper mobility system. Finally, in terms of importance and value, the Smart Environment comes in third place for the citizens, while Smart Government and Economic get the last two places out of the five characteristics.
On the other hand, the results revealed that the city officials prioritize Smart Living, followed by Environment and Economy. The study results also reveal that the population plays a big part in the influences and the priorities of the citizens. In other words, the population may be a determinant factor for the concept of a smart city in India.

As the authors in [10] mention, the citizens can have their roles in smart cities through their participation and interaction in a smart city concept. Citizens' participation is a significant part of the smart city's development and can be either political or non-political. Thus, in this paper, the authors talk both regarding citizens' political participation, through which the citizens influence political decisions, and non-political (general) citizen participation, through which citizens help find solutions for the city's problems. The research concerns mostly Norwegian smart cities and municipalities. The concept of participation is presented as a democracy manifestation, emphasizing that it can cause the citizens to influence politically, share their knowledge, their expertise, and their time to improve smart city service. The authors present Berntzen's and Karamagioli's model to define the requirements needed for the citizens' electronic participation in a smart city.
Regarding political participation, the authors use another figure which represents OEDCs (Organization for Economic Co-operation and Development) model that focuses on the level of interaction between the government and their citizens. The model consists of three levels (Information only, consultation and participation), of which participation is the level that makes the citizens' role more active in the smart city. Moreover, the authors highlight the concept of transparency, which plays a significant role for the citizens to take an active part in political decision making. Many forms of transparency occur, such as document, process, meeting benchmarking and disclosure transparency. Finally, some standard tools of participation that are used by Norwegian municipalities are presented, such as webcasts, consultations, social network platforms, citizen petitions, discussion forums, online mail records etc.

Regarding non-political citizen participation, the authors present several examples that mostly focus on digital participation, have to do with applications, collaborative projects, and self-help networks, and show how citizens can help the city and their fellow citizen's non-political way.*FixMyStreet* application, *Sauberes Wiesbaden* project, *Green Watch* project and *Safety-net* network are some of them. All these projects emphasize the role of citizens as experts and volunteers too. The paper's key message is that even though most research on participation (and, especially, on e-participation, since ICT has truly blossomed) has focused on political and not on community involvement, the smart city development requires the citizens' role both as political participants and their help as experts and volunteers.

Another study worth mentioning is the one presented by the authors of [12]. It analyses the assessment and perception that a sample of university students have of the city they live in, regarding their current and ideal involvement in their municipality in the six principal pillars which define a smart city. These pillars are the smart economy, smart people, smart governance, smart mobility, smart environment and smart living. The authors describe these six smart city dimensions, each one separately. The description reveals the main and most significant goal of urban planning: the good quality of life. Although citizens constitute an essential factor regarding the "smartness" of a city and should be provided with essential roles and increased participation through the city management and the development of the public services (since they will be the primary users of them), they still do not seem to play a preeminent role in the design of smart cities. This right seems to be in the hands of the government and other officials, such as politicians or municipal technicians. As a result, citizens may still not have the proper knowledge and may not solely understand the concepts and consequences of their smart city in their daily life. Thus, this study's purpose is to analyze the citizen's knowledge and perception about their city, regarding the six "smart" pillars mentioned. Young citizens were chosen for this survey as they are more familiar with the use of ICT. Therefore, they have an increased ability to evaluate their presence in their city.
Two hundred seventy-two (272) university students, 18-26 years of age, took part in this study. The study took place at the University of León, a city in the northwest of Spain, and, as mentioned, the study sought to know both the citizens' perception regarding the smart city dimensions and their potential contribution to improved quality of life. For the data collection, a questionnaire was formed. The respondents were asked to fill in the questionnaire anonymously. They have presented a list of indicators that defined various practices of smart

cities, around the six aforementioned pillars. Each pillar was defined by a number of indicators, which were 25 in total. For each of them, the respondents were requested to express their point of view of current involvement in the city. Consequently, they had to assess the importance that each practice should have to improve citizen experience and quality of life.
According to the results of the study, the mean score was below the intermediate value of 3 in the five-point Likert scale for all six factors. More specifically, Smart living (2,76) and Smart mobility (2,66) had the highest mean scores, whereas Smart governance (2,43) had the lowest. This means that the respondents' assessment was inadequate and that they generally shared a negative perception of the city regarding all six dimensions and mostly in smart governance and in the smart economy. Moreover, respondents' opinion was requested on the ideal involvement of the city in smart urban practices, so that their experiences as citizens and the quality of their lives can be improved. In this case, all the mean results were around 4 in the five-point Liker scale for all six factors. The factors in which greater involvement is demanded by the citizens were smart living and smart economy (4.19), whereas the lowest score corresponded to smart governance (3.93). Consequently, a statistical comparison between current and ideal involvement took place. The differences between the mean scores of current and ideal involvement of citizens were statistically significant for all six pillars.

The discussion about citizens' participation in smart cities, which is followed by a relevant survey in [13] seems to be of high interest. Through this survey, which is directed to a number of smart city experts from different cities from all over the world, the authors' goal is to evaluate the citizens' participation in smart cities through the eyes of the smart city experts. In other words, the results of the survey show how citizens are affected by the smart city factors to prioritize where to participate the most, among the smart city's offered benefits. Another objective is the identification of new ways for the increase in civic participation.
After a reference to citizens' participation theory and a small analysis of the smart city concept, the authors emphasize on the citizens' participation in smart city projects, highlighting its importance for the quality of life of a smart city's inhabitants by using Hollands' statements [13]. Hollands criticizes smart city approaches that are based on ICT and claims that people should be the fundamental factor for progressive, smart cities. Consequently, the survey's methodology follows: the survey had the form of a questionnaire and, as mentioned, was administered in 37 smart city experts, which were very appropriate, considering that they had actively participated in the development of smart city projects in their country and that they

were serving important positions like Mayors, Ph. D. students, strategy advisors, consultants etc. Out of the 37, 20 responded. The key topics were the following:

- **Smart city priorities**: the respondents identified civic engagement and transportation as the most important objectives to be developed as smart city projects in their respective country. Health, education, human services, telecommunications and public safety followed.
- **Citizen participation priorities**: the results showed that "enhanced services for residents" and "open data/shared data" were the essential benefits for implementing or expanding citizen participation in a smart city project.
- **Budget allocation for citizen participation**: generally, the results showed that even if the decision-makers (e.g. government) deeply understand the high importance of citizen participation, they do not offer the appropriate budget for it.
- **Practices for the enhancement of citizen participation**: the results confirm that smart city experts worldwide highlight the critical role of citizens as co-creators and providers in developing public services in a smart city.

As for the **citizen participation barriers**, based on results, the budget limitations and the necessity for more long-term vision or plan are some of the most critical barriers for citizen participation in smart cities, along with smart city illiteracy. That is why the officials are willing to offer free courses in computer literacy for youth and adults to reduce the digital divide and prevent illiteracy.

The paper's goal in [15] is to explore citizens' experiences and feedback regarding products that aim to save energy and reduce emissions in Sweden. The use of DT (digital technologies) and ICT can lead to sustainability increase and transform a city into "smart", only in case citizens are actively engaged and involved in urban projects. The survey results that are presented in this paper indicate the importance of citizens' engagement and knowledge so that new products, services and technologies can be implemented. More significantly, this paper deals with smart meters that provide energy consumption information and with EVs (electric vehicles). The European Union provided much support in Member countries, contributing to the increase of energy efficiency and the decrease of emissions. Moreover, significant efforts have been made so that EVs' use could be increased, as they provide more sustainability than combustion engine vehicles and can help the European Union reach its CO2 emission goals.

For this research, a questionnaire and an online survey were used to gather information about the consumers' experience, knowledge and preferences regarding the use of smart electricity meters and the use of EVs. The online survey was distributed to customers of Mälarenergi, a city-owned power and district heating company, located in the city of Västerås, Sweden. Every EV owner in Sweden received a questionnaire.

In general, the results regarding the smart electricity meters show that, despite being available in all Swedish households since 2009, the citizens are not yet provided with frequent and detailed information about their energy consumption; thus, the authors suggest that energy suppliers should provide the customers with more information regarding their everyday energy consumption, as this would increase their consumption flexibility.

Since the EVs conduce to sustainability increase, the local authorities have to deliver the positive information and feedback of EV owners to the potential owners to lure them to use EVs too, thus increase their use. The survey participants indicated that, in order EV usage to be increased, "incentives" (31%) and "free charging" (17%) would be the best solutions. The participants made some other proposals too in the "free-text" option, such as "building charging infrastructure for people living in apartments". A 5% of the respondents also indicated that "more information is needed" to draw the attention of possibly new users, so this points out a lack of knowledge from the citizens' side regarding EVs.

Finally, the paper in [16] concerns an initiative that takes place in the city of St. Petersburg, in Russia, to enhance the understanding of citizens' perception and perspective on the concept of a smart city. Through this paper, the authors recognize the citizens as the essential stakeholder in smart city development. The paper's primary goal is to reveal and explain how a smart city appears to the citizens and what are their expectations from smart city projects at the very beginning. It succeeds by investigating smart city developments in St. Petersburg concerning the citizens' expectations and needs. The respondents, who took part in the survey through a questionnaire, were 421 in number. According to the survey findings, almost 95% of the respondents prefer to interact with the authorities via the internet or other electronic formats. Also, more than 60% of them consider themselves familiar with information technologies, whereas a little less than a third of them declare themselves "rather experienced users of IT". Another result revealed that the citizens' assessment of the effects of electronic interaction between them and the authorities is relatively restrained. For the question "*In your opinion, to what extent does the level of interaction between citizens and authorities through electronic*

channels at this stage achieve the following objectives?", the most popular answers where *"better understanding of the social situation"* (2.7 in the 5-point Likert scale) and "*better government image"* (2.5). The less popular answers from those offered were "*less corruption*" (2) and "*better administration processes*".

In the question "*In most cases, how do you respond to city problems?*", 32.1% of the participants responded by choosing the answer "*don't have time to do anything"*, and 22.3% of them chose "*Internet Portals"* as the best response to city problems. "*State telephone service*" answer was the least popular (7.6%).

Another impressive result is that 57% of the respondents believe that the most effective way to solve an urban problem is to communicate with the authorities through an online portal, whereas 17% prefer a personal visit and 11% prefer a paper application. As of the level of awareness of a smart city project, 19,6 of the respondents claim that they realize precisely how it should be built, 23,7% of them just realize what a smart project is, and 31,3% have just heard something about it. Also, respondents' opinion is that the most severe urban issues are related to public transport, roads, parking, traffic jams, infrastructure, construction, and improvement. Furthermore, the priority areas that citizens considered for the "Smart St. Petersburg" project are the following: the openness of government and citizens' involvement in city management (52.5%), solutions to environmental issues (44.2%), improvements in quality of life (33%), and human capital building (26%). As for their expectations from the "Smart St. Petersburg" project, the "*Effective city* management" and "*Better citizens' opinion counting*" were the most popular responses.

Finally, 77% of the inhabitants believe that interaction through electronic portals could influence political decisions, while 91% consider themselves ready to participate in city management.

Smart City

3.1 Sustainable Urban Development

According to [20], sustainability is a new development model that emerged from various concerns of the late twentieth and early twenty-first century. These concerns were mostly environmental, social and economic. Molnar et al. in [21] state that the concept of sustainable development is contested; thus, there is no clear and specific definition of sustainability that is globally accepted. The "sustainable development" notion was defined through the 1987 Brundtland Commission as "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" [63]. In the next years, sustainable development became an exciting object for study for scientific purposes and policymaking, along with international organizations' related programs, reports, and conferences [64].

The cities' role in sustainable development is reflected in the Sustainable Development Goals (SGDs) of the United Nations Department of Economic and Social Affairs (DESA U. N.) 2030 Agenda for Sustainable Development. This role is to "*make cities and human settlements inclusive, safe, resilient, and sustainable*" [22].

Most of the cities consume massive energy amounts globally. The main domains of this consumption are related to waste management, public lighting, heating and cooling of buildings, infrastructure in building and maintenance, public service precaution in transport and many more. It is a fact that modern cities cause the most massive environmental pollution and energy consumption. It becomes clear that, in case humanity stays inactive against this situation, the consequences will be harmful, especially in areas of water management, accessibility and urban air pollution [20]. Therefore, the concept of sustainable urban development emerged and significantly defined urban planning and development starting in the early 1990s [23]. According to [24], any city or ecosystem is supposed to be sustainable "*if its conditions of production do not destroy over time the conditions of its reproduction*". Castells in [24] also stated that, essentially, sustainable development is a type of solidarity between the older and the future generations. This solidarity is based on the fact that the older generations consume carefully and pollute the least they can get so that the future generations

could have the opportunity to live under the same or even better-living conditions. The desirable state is this where cities will consume the least possible resources, will become more livable, will offer a better quality of life to their citizens, and will minimize the impact that humans have on the environment [23].

The vast array of technical and environmental requirements that appear both on the building and the neighborhood scale shows how mostly sustainable urban development has penetrated in urban growth. Requirement systems such as LEED for Neighborhood Development, CASBEE for Urban Development, EarthCraft Communities and BREEAM Communities are some of the sustainable urban development assessment frameworks [20]. The same authors state that one of the essential characteristics of a sustainable community at the moment is the adequacy, quality, and resource efficiency of urban infrastructure.

Essentially, cities are places that offer the ground for new ideas and new solutions. Thus, many sustainable urban development frameworks reference the role of ICTs and human participation in progressing sustainability goals in cities. The great potential of the smart city approach is already thoroughly investigated by the United Nations through their study on "Big Data and the 2030 Agenda for Sustainable Development" [20].

3.2 Smart City: Concept and Definitions

According to [16], the 21st century is characterized as "the century of cities". This seems fair enough, as, by 2030, about 60% of the world's population will be living in urban areas and big cities; this percentage will exceed 80% at the end of the century [17]. Vanolo in [18] says that, nowadays, the concept of a smart city is viewed as a vision to determine the sustainable and ideal city form in the 21st century. In other words, **a smart city is a green, socially inclusive city characterized by efficiency and technological advances.**

The short-term goal of the cities globally is the continuous development in essential sectors such as the economy, health and education. The long-term goal of them is the satisfaction of the people living in them. The innovative solutions that are offered by already existing smart cities constitute a crucial factor for achieving these goals. However, many cities are not able to fully implement these innovations due to significant (mainly economic) difficulties. For this reason, the large urban centers are considered to be the most appropriate starting points for development so that the application spreading can be smoother and more efficient at a later stage [19].

Despite the global trend around the term "smart city" and the fact that the smart city concept is in the spotlight for scholars and experts, the definition of what smart cities are is still not settled. A one and only, universally accepted definition seems challenging to be found and shared [5]. "Smart City" has been conceived as a term to describe urban development through the improvement of citizens' life, the development of better services and sustainability accomplishment [9]. Since the world we live in becomes urban, the cities globally need to become smarter. A city that is considered smart uses ICT for the improvement of both its livability and its sustainability. Moreover, aiming to protect the environment and being able to manage natural and human resources, equipment and infrastructures, are characteristics of a smart city [25].

Throughout the literature, the word "smart" from "smart cities" is many times replaced by other adjectives, such as "intelligent", "digital", or "creative", attributing a lack of consistency to the way it is used [26]. According to many scholars such as Hollands, "Smart" and "Intelligent" are used interchangeably throughout the literature [13]. Although in the beginning there seem to have been some small distinctions between "smart city" and "intelligent city" terms, it seems that these distinctions are now prone to disappear. Therefore, most smart city researchers consider "intelligent city" and "smart city" as similar terms [27].

Neirotti et al. in [29] state that one of the smart city's reasons for not having a clear and globally accepted definition is because it has been applied to different domains – both "hard" and "soft" domains. In "hard" domains belong, energy, natural resources, waste management, buildings, etc. The use and the role of ICT in these domains are significant and decisive. On the other hand, "soft" domain consists of government, participation, collaboration, social inclusion, education, culture, etc. In this domain, the ICTs' role is unclear.

The smart city definitions that were given by various scholars and researchers vary significantly in terms of many significant factors, such as the type of intelligence they infer or the urban systems they refer to. The main idea is the use of state-of-the-art technology for the accomplishment of urban development. However, some definitions emphasize innovation in sustainability or human capital [27]. Since the main trait of a smart city is the use of ICT, it is expected that most definitions emphasize on edge technology, which (according to the definitions) can make a city itself act "smart". Such definitions are the following:

- "*A smart city can be understood as the use of smart technologies to build and integrate critical infrastructures and services of a city, and it denotes the important cities' efforts to catch the diverse benefits from technology use, such as increases in efficiency,*

effectiveness, transparency, convenience, and sustainability. Smart city initiatives envision smart living, smart environment, smart mobility/transportation, smart energy saving, and smart health care in large urban concentrations" [30].

- "*A Smart City is a city well performing built on the 'smart' combination of endowments and activities of self-decisive, independent and aware citizens*" [31].
- "*A city to be smart when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance"* [40].
- "*The concept of the smart city has gained traction in recent years and although it has been coined for a variety of purposes, it broadly refers to a city that is using new ICTs innovatively and strategically to achieve its aims. Smart city investment might include, for example, implementing a network of sensors*" [41].

The following definition was not only based on the state-of-the-art technology but on the power that this technology could give to the city constituents the ability to innovate, to collaborate and take part in society's affairs and to encounter problems for the common good [27]: "*Intelligent cities are territories with high capacity for learning and innovation, which is built in the creativity of their population, their institutions of knowledge creation and their digital infrastructure for communication and knowledge management. The distinctive characteristic of intelligent cities is their increased performance in the field of innovation, because innovation and solving of new problems are distinctive features of intelligence. In this sense, intelligent cities and regions constitute advanced territorial systems of innovation, in which the institutional mechanisms for knowledge creation and application are facilitated by digital spaces and online tools for communication and knowledge management*" [42]. Another specific strand of definitions focuses on environmental sustainability McNerney's and Zhang's definition in [43]: "*Smart cities use recent advances in ICT to make buildings, transport systems, healthcare providers and businesses operate in safer, more efficient and more sustainable ways. Making our cities smarter will ultimately allow individuals, regardless of technical ability, to go about their daily activities while minimizing their carbon footprints*".

Tadili & Fasly in [12] mentioned Nam & Pardo's way of organizing smart city definitions. They organized them according to the following dimensions:

- Technology Dimension: The use of urban information and ICT infrastructure is the most significant factor for a better quality of life in a city and for the rise of a smart city generally.
- Human dimension: human capital is a significant factor in this dimension. The smart city relies on citizens, knowledge and education.
- Institutional Dimension: the cooperation between institutional governments and smart city stakeholders plays a significant role in the development of a smart city project.

According to [42], another observation for the "smart city" term is that it is used to describe areas (cities, regions) where the local innovation system is supported and upgraded via digital networks and applications. With the use of information and communication technologies, innovation systems obtain greater depth and scope. Their functions become more transparent and efficient. The city is led to prosperity through innovation. Two critical components of smart cities are [42]:

- The local/regional innovation system, which positively contributes to the development of knowledge and technologies in the region organizations (businesses, universities, technology parks, incubators, etc.)
- Digital information and knowledge management applications, which facilitate information, communication, decision making, collaboration for innovation, technology transfer and application etc.

In general, smart cities constitute a promising idea for an ideal future of global urbanization and the confrontation of its drawbacks. Smart cities constitute the ideal model that can lead to urban development. A smart city corresponds to an integrated, forward-looking vision, useful for defining a method for city development, as seen through the prism of digital technologies and knowledge ecosystems. Also, the adaption of this vision to the local needs, priorities and constraints of a city is of high importance. Even today, no city can consider itself totally "smart". On the contrary, since societies and technologies change frequently, the smart city has to reassess itself and try new ways of thinking about technology and its engagement for the common good.

3.3 The Smart City Dimensions

In [31], Giffinger et al. identified four primary smart city components: education, participation, industry and technical infrastructure. After some extensive analysis of these components and a

specific project that conducted by the Centre of Regional Science at the Vienna University of Technology, six main smart city dimensions/pillars have been identified: smart economy, smart people, smart governance, smart living, smart environment and smart mobility (Figure 1) [47].

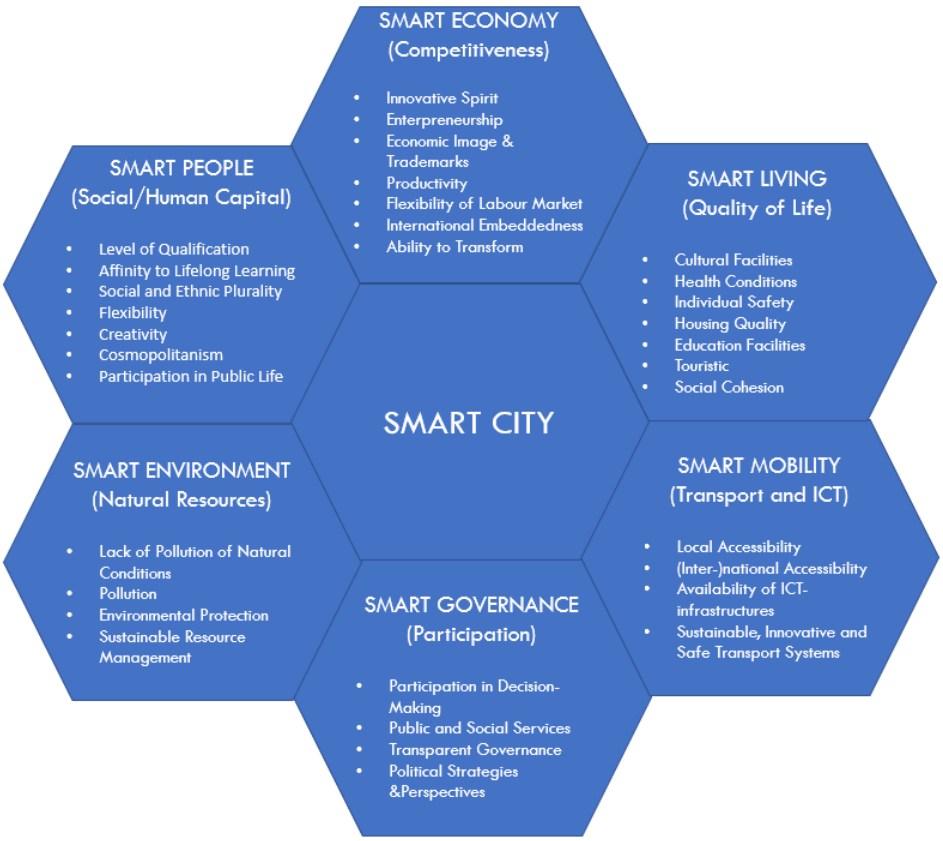

Figure 1 The six dimensions of a smart city (source: author's elaboration)

The inclusion of "quality of life" as another dimension of a smart city would be particularly interesting. However, a significant number of scholars and researchers argue that "quality of life" should not be included in the dimension list as a separate smart city pillar, as all the actions that are taken in the other six areas should have the common goal of improving the quality of life anyway [45].

Each of the six dimensions is linked to several individual factors. The dimensions constitute a smart city model, which was developed as a ranking tool, to evaluate mid-sized European smart cities in the corresponding fields (governance, mobility, people, economy, living and environment) [48]. Colldahl et al. in [48] also state that this model allows the examination of a city's current state and can identify the areas that need further development to reach the appropriate level of being a smart city.

The main focus of this six-dimensional model is to solve the various problems that appear in actual cities and to prevent any possible issues that may appear, such as population-related,

mobility, environmental or energy-saving problems. Each smart application should contribute to at least one of the six dimensions, without negatively affecting any of the other ones. For example, an application that contributes to economic prosperity but causes a massive environmental problem can never be considered a smart application [46].
The six components of the smart city also synchronize with the "hard" and "soft" domains. Thus, they cover all forms of application of the smart city concept [44].

3.3.1 Smart Economy (Competitiveness)

The notion of the smart economy is based on entrepreneurship and innovation spirit, research and development expenditures, the flexibility of labour market, high productivity, ability to transform and openness to international and interregional embeddedness. In other words, in the smart economy approach, an economic model that is based on the use of natural resources is substituted by a knowledge-based model, which emphasizes innovation and on the use of ICT to develop. Two of the essential attributes of this economic model is the global competition and the constant organizational and technological improvement [49].
For the existence of a robust economy, characterized by sustainability and social evolution, the main operation is innovation by opening up new business sectors. By this process, new technologies will be added to the manufacturing chains. As a result, productivity will increase, whereas the costs and environmental impacts will decrease. These innovations can usually be applied only with significant investments, which can be supported only by powerful economies [46].
All the other smart city characteristics depend on the smart economy [46]. It would be almost impossible to develop most of the applications in the European standard classifications without a prosperous economic state. All the applications that are to be developed in a smart city project should contribute to the economy of the area. This means that each application should be planned, aiming to lead to economic growth and to open windows for new development opportunities [46].
Kogan and Lee in [50] underline how important is the creation of a beneficial environment for a smart city, to get positive economic results as business and job creation, workforce development and productive improvement. As a result, many scholars underline the significance of endorsing entrepreneurial initiatives, competitiveness and innovative spirit as indispensable values for economic growth and productivity improvement. Moreover, the

economic pillar emphasizes investment in ICT services to develop new products and the incorporation of international markets [29].

Schaffers et al. in [51] stated that smart economy is characterized through the use of citizens' knowledge, skills and creativity, transforming plans and ideas into successful processes, products and services. Furthermore, it focuses on the "green economy" by developing "green companies". This type of companies promotes the usage of renewable energy sources. This leads to an increase in energy efficiency and the decrease in costs.

Kumar and Dahiya in [52] present several goals and characteristics of a smart economy. Specifically, the smart economy aims to transform the smart city in every aspect of its economic activities by efficiently using ICTs. As a result, through the smart economy, the smart city has a clear economic future that will last for a long time and is supported by the citizens, the public and private sectors and other stakeholders. Moreover, the smart economy is built on an economic model that is based on knowledge, through the continuous sharing of knowledge for the economic benefit of the people. Further, the smart economy is able to create economic imaging, branding and trademark and able to highly produce land, labour and capital.

Innovation and entrepreneurship constitute essential factors for the flourish of a smart economy [49][52]. Innovation is developed through collaboration, competition and grouping of economic units and activities, while entrepreneurship is produced through individual effort and is raised through positive business climate, institutional strengthening and acceptance to unexpected opportunities. Also, a good quality of life for all the citizens of a smart city is another factor that plays a significant role in this smart dimension's development. This requires the provision and proper management of urban infrastructures, as well as proper management of the urban environment, urban liveability and efficient use of natural resources. Finally, smart economy facilitates the evolution of local culture, art, and heritage and connects all these to the development and promotion of sustainable tourism [52].

In short, the smart economy describes in detail all the necessary actions that aim in strengthening and in transforming the economy of a region. Any kind of administration or power, such as the local government of a city, constitutes an important source of help and support, during the effort for the strengthening of the economy. The cooperation of all the competent actors significantly improves the chances of success of the initial goal, as the proper conditions for the development and prosperity of a smart economy will be created. The emerging conclusion is that to achieve economic evolution to a degree where it can be

characterized as smart, the economy should align with technology, as these two sectors interact to a significant extend [19].

3.3.2 Smart People (Social and Human Capital)

The dimension of smart people contributes to the development of human and social capital of high quality, by continuously improving the qualifications of a city's inhabitants in their life and career. This can be accomplished by improving the quality of human resources and achieving a flexible and adaptive labour market. This dimension aims to create a more qualitative educational system to provide lifelong learning and support to all the citizens, both the young and the elderly. It also improves the social capital by fostering socio-economic dialogue, human participation and communication, citizen inclusion and impact in public life, utilization of cultural and creative potential and the development of touristic and sports infrastructures [49]. In other words, the key factors that constitute the smart city dimension are the social and ethnic plurality, cosmopolitanism, flexibility, participation and collaboration in public sectors and other several aspects, creativity, cooperation, openness to lifelong learning innovations and development of the high level of qualifications [46].

Creative, multicultural background for more in-depth knowledge of public life is essential for the encouragement of the citizens to act, behave and think smarter. Also, to become "smarter", the people need to be provided with the ability to cooperate and collaborate on daily issues that happen in the city [46].

Seeing the city through the citizens' eyes can provide the best kind of information that any government can obtain. Real-time reports can inform the authorities about the defects of each neighbourhood and the real needs of the citizens. The data should be carefully stored and analyzed so that the priorities can be identified. This is the best way for the main city issues to be encountered faster and better. Moreover, the authorities can have a general, deep and clear view on the key factors that need to be improved [46].

Kogan and Lee in [50] have a similar aspect regarding smart people. According to them, civic active participation and engagement constitute the critical factors of a city's development. Therefore, a smart city aims to create more educated, informed and cooperative citizens, by the use of ICT applications and services. Thus, the development of citizens' e-skills, as well as the promotion of digital education to facilitate the improvement of learning and to provide more

opportunities for the people, are essential components within the dimension of smart people [29].

The "smart people" dimension includes a variety of projects and activities directly related to employment, quality of life and social inclusion. These projects and activities mainly concern the construction and development of infrastructures that will significantly upgrade people's daily lives. The reconstruction of educational infrastructure, the update of public space and life and the assurance of a balanced level for the people's employment constitute some of the most important examples [19].

In conclusion, people who are open to new ideas and who can adapt to new conditions and situations could be characterized as creative and smart people. With the development of the "smart people" dimension, the conception of smart solutions to problems that need special attention is significantly increased [19]. After all, according to Ghosh and Mahesh in [53], a "smart" person is defined as an active and deeply informed person, and without this type of person, a smart city cannot exist.

3.3.3 Smart Living (Quality of Life)

The dimension of smart living attempts to develop an effective system of high quality urban public space. This space should be friendly and attractive to people, containing various threads, values and styles that, even if they differ, they constitute a coherent whole. This dimension is correlated with the attempt to build public spaces which will be used for the performance of various types of functions, such as health, sport, social, cultural and recreational projects. Moreover, it aims to create a safe space both for pedestrians and for cyclists, with pure air and water, green areas and buildings of high quality, both for housing and for other activities. All these contribute to a more sustainable and efficient city. Generally, the dimension of smart living has a close relationship with the idea of "smart buildings" which are environmentally and human-friendly, thanks to the new technologies that are incorporated in them [49].

The primary goals of this dimension, gathered in [46] are the following: social coherence, educational and cultural facilities, health and housing quality, individual safety and touristic attractiveness. One of the most important objectives that a smart city can offer to its citizens is the best possible quality of life, which depends on comfortable living and an efficient information system for citizens. Therefore, either new enhanced services with edge technology

are created, or new technologies are added to the already existing services to improve them, so that comfortable, safe and sustainable living can be attained [46].

In [11], it is claimed that, when it comes to culture, the literature helps to spread the information related to cultural activities easier, and, also, motivating the people to participate in these activities. Some initiative examples are applications that inform the people about the waiting time to visit a specific monument, city or museum, guidance applications available in smart technology (e.g. smartphones) etc. [29]. State-of-the-art ICTs can also be used in healthcare systems, supporting illness preventions and helping in the finding of a diagnosis or a treatment. In that way, citizens are assured that they are provided with efficient health facilities and services. An example of healthcare innovation is the development of telemonitoring [29][54]. Another typical example is the use of new electronic services most notably regarding the e-health and the electronic environment with necessary learning aids for People with Disabilities so that their quality of life can also gradually improve [19].

The protection of the citizens' integrity and the optimization of emergency services that depend on the big data collection also constitute significant aspects of this dimension [29][54]. As a result, some of the essential elements of smart living are [11]:

- Security
- Usability
- Better access to technology
- Adaptation to sustainable building technologies for the accomplishment of energy efficiency

All in all, smart living attempts to improve the quality of living in a city. This is mainly achieved by upgrading the existing infrastructure that interacts with key factors of people's daily lives. Typical examples are sectors such as health, education, culture, security, etc. By upgrading these sectors, new development prospects are expected in various fields, such as culture, education and tourism. Even if the role of "smart living" dimension may be easily understood, it is essential to emphasize that this dimension is related to the other five dimensions, directly or indirectly [19].

3.3.4 Smart Mobility (Transport and ICT)

According to [49], "*smart mobility is the improved flow of people providing better access to information, facilitating collaboration and the introduction of electric vehicles*". This

dimension requires the implementation of solutions that offer better-combined transport network management and a reduction in the amount of disruption in public transportation. Travel by all modes of transport should be facilitated, reducing traffic congestion, increasing the acceptability of city transport and lowering emissions of harmful gases for the sake of the environment.

The critical factors for the smart mobility dimension are the local and international accessibility, the availability of ICT infrastructures and the safe, sustainable and innovative transport systems [31].

Since it is already known that the population in the cities grows bigger and bigger and will keep growing, one of the main problems to solve both actually and in the future will be mobility and transportations [55]. Moreover, mobility is a factor that is responsible for a high percentage of pollution and gas emissions in the cities. The usual retention and congestion issues cause both high economic costs and high levels of pollution [56]. The critical actions for smart mobility in a smart city both at resent and in the future will be the use of vehicles that provide sustainability (such as electric vehicles) and the frequent and qualitative use of public transportation from a significant amount of people [57].

Since smart mobility is a comprehensive vision, there is no standard definition that is broadly accepted. However, some scholars have proposed some definitions. Specifically, in [26], Albino et al. refer to this dimension as the use of ICT in modern transport technologies to improve urban traffic. According to [51], smart mobility is a concept of understandable and smart future traffic service which is combined with smart technology, while in [18], it is described as a concept that provides local and international accessibility, availability of ICTs and sustainability that comes from modern and safe transport systems. Although these definitions differ, the standard view is that for smart mobility to be achieved, ICTs should be used. Smart Mobility systems traditionally include the fields of Intelligent Transportation Systems, Automotive Technology, Information and Communications Technology and Embedded Systems. Smart Mobility systems can gather data from different sources, such as traffic data from traffic management systems, transport timetables from transport systems, crowd data from citizens, and sensor data from vehicles, traffic lights, parking lots, roads, etc. [58].

The leading smart mobility's areas of interest are the following [58]:

- Driving safety: this area provides technology for secure mobility. It allows vehicles' interaction with each other and with the infrastructure around them.

- Smart Lighting Systems: this area uses light-emitting diodes (LEDs) with connected controls for better lightning, for the reduction of energy consumption and traffic congestion and the improvement of traffic flow.
- Sharing and Urban Mobility: shared transport systems include car and bicycle sharing, carpools and vanpools. Apart from this, multimodal systems can use different and optimally combined transport ways within the trip chain in a seamless way to achieve greater sustainability in urban transportation.
- Electric Mobility: it provides a sustainable way of mobility that is environmentally-friendly and provides resource savings.
- Green Mobility: it reduces the environmental impact caused by the transportation sector without impacting the growth momentum.
- Smart Payment Systems: these systems are designed to prevent the constraints of the classic payment methods by refurbishing the payment method via parking meter and other technologies

Generally, Smart Mobility is a crucial concept for the transformation of transportation in an urban city. It changes the way a whole city moves. Several initiatives have been and will be developed around the world to provide more mobility for citizens [58]. Apart from intelligent transport systems, the key to the application of this dimension is the number of techniques that originate from the use of ICTs in the field of infrastructure. Thus, to achieve a high qualitative mobility service, a holistic approach should be taken, related both with citizens, tourists and businesses [19].

3.3.5 Smart Governance (Citizen Participation)

In [49], Augustin presents smart governance as smart public management, where the most emphasis is given to public participation in planning and decision-making, to the transparency of actions so that citizens' participation could be useful, and to high quality and availability of public services. It also insinuates a constant search for a new order, as well as a compromise between environmental demands, social pleasure for the improvement of the quality of life and available technological solutions for any local issue that may occur.

According to [46], the critical factors of the sector of smart government are citizens' participation in decision making, governance transparency, development of public and social services, transparent perceptions and political strategies.

This smart city's dimension refers to the way that the government chooses to act and to the level of transparency and usefulness in the management of public services. When a city is characterized by smart governance, many online referendum-like projects take place; through online platforms, the citizens have the opportunity to share their opinions regarding the existed public services or to report to the local government issues that may happen in their neighborhood or in places that they usually visit within the city. This can happen through the submission of applications. In this way, they are encouraged to actively participate in public life. Moreover, the government can play a more active role in the citizens' participation through online portals where they can directly ask the citizens' opinion about city issues, ideas, or projects [46].

As mentioned, the smart governance sector includes management with open data, transparency, planning and decision making, with the participation of the citizens and the help of ICTs. [29][50]. Vázquez et al. in [11] describe smart governance as an administration which provides the following things:

- Incorporation of communication, information and functional technologies.
- Optimization of planning, management and other courses of action in various domains and areas.
- Sustainable public value.

Some other factors of this dimension refer to efficient public services for citizens and institutions as well as to the integration of private, public civil and European organizations [11].

In the smart governance dimension, the efficiency of public services in the daily lives of the people with the lowest possible administrative costs is essential. A key factor for achieving the combination, as mentioned above, is e-governance, which is used by many European countries. In [60], Fitsilis et al. describe e-governance as a continuous process of using ICTs to serve citizens and improve their interaction with the state. It is a tool created to emphasize the electronic way of distribution and production of services. The essential service provided to citizens through e-governance is the application of e-commerce means and techniques for government operation. In other words, there is an increase in efficiency while reducing costs and expenses through better administration, open data and electronic document management [19].

To sum up, smart governance is the key to communication between people, businesses, or organizations with the authorities within a municipality. There is a significant number of

advantages and positive elements that come from this communication. The most important assets are the transparency and the availability of the local government in the whole population of a city, the faster and more efficient citizens' reporting and the solutions that can be planned for issues in public places [19].

3.3.6 Smart Environment (Natural Resources)

The dimension of a smart environment attempts to maintain balance within the ecosystem. This requires efficient management of environmental resources, proper usage of natural resources and the development of skills to prevent and diminish the negative environmental impact of economic activity. The smart environment also provides ecological security of social infrastructure, and citizens are regularly improving the quality of the environment, protecting natural resources and landscape values and recovering degrades ecosystems. Moreover, smart environment adapts to abrupt climate changes by the following activities [49]:

- Investment increase in technological research and on actions for improving energy efficiency.
- Improvement of the security of natural fuels and energy.
- Reduce the environmental impact of the energy sector.
- Development of renewable energy sources.

According to [46], the critical factors for the smart environment dimension are pollution reduction and prevention, protection of the environment, the attractiveness of natural conditions, and resource sustainability. Globally, one of the most significant current interests is the environment. Generally, the most prominent sources that harm and pollute the environment come from industrial cities and from industrial areas which are mostly located in the city suburbs. Population growth leads to pollution growth globally. The reduction of pollution and energy consumption leads to a more environmentally-friendly living. For the reductions mentioned above to happen, the proper management of natural resources is an imperative factor. Significantly, the most significant focus is made on public utilities, such as electricity, gas and water management. The development of green spaces as well as the reduction of the CO2 emissions are of high importance, too [46].

Kogan and Lee state that a smart environment highly depends on green technologies. Moreover, it is based on the principle that supports the "*doing more with less*" motto. It has been made clear through literature that the smart city concept uses state-of-the-art technology

to contribute to the protection of the environment and to manage natural resources efficiently so that that sustainability can be achieved [29][40]. The protection of natural resources and the related infrastructure, such as waterways and sewers and green spaces (parks), is also of high interest [50]. Furthermore, some authors point out the usage of ICT for the measurement and information exchange about energy consumption and for providing incentives for an increase of resources' reuse and recycling [31][40][61].

A typical example that constitutes an important action of the smart environment is the process of introducing smart lightning in public places (Smart Street Lightning). This method uses a large amount of solar energy. It also contributes to financial resource savings, as the rural lighting is activated when mobility is detected by special sensors that are used. At the same time, the city's aesthetics is improved. This provides a solution to the problem of managing large lighting networks, which is an issue that exists mainly in large urban centers. The companies that design, support, and build such studies guarantee an autonomous and continuous operation of public lighting [19].

Another example worth mentioning is the existence of innovative bins (smart bins), which can improve the quality of waste management in public areas. This innovation includes particular waste bins of high technology. Special sensors are placed inside the bins for their proper operation. Their purpose of the sensors is to send a signal to the waste collection center when the bins are full so that the garbage trucks can empty them. The use of these bins derives many vital benefits in social, business and economic level. Thus, smart bins are an important means of enhancing the smart environment dimension of an urban area. They also play a significant role in transforming a city from a simple urban area to a smart city, as its quality is significantly upgraded [19].

Generally, the smart environment contributes to urban planning, with the primary purpose of improving the effectiveness of its actions. At the same time, many efforts are made so that the environmental impact can be minimized to create a fully sustainable environment that will upgrade the image of a city [19].

Survey Methodology and Analysis

The main purpose of this survey was to examine the perception that the Greek and Cypriot citizens have, regarding the Smart City concept, as well as to present their opinions and beliefs about the current level of "smartness" that appears in the city they live. This level of "smartness" is based on how developed each of the six principal pillars appears in a city. Most of the Greek cities have not delved into the smart city concept and applications that correspond in all six main pillars. Especially in Greek cities, the development of most of the six Smart City pillars still appears in an early stage. In other words, Greece, as a country, is still not totally oriented and adapted towards the implementation of smart-city methods and elements in its cities. For this reason, we, as authors, have decided to examine the standpoints of the Greek and Cypriot citizens regarding the implementation of smart city elements into Greek and Cypriot cities through this quantitative research. In this way, some conclusions could be drawn regarding the impact that a smart city has on the citizens at present or will have in the future. Conclusions also emerge about the intentions of the citizens who are not at all familiar with the smart city concept, as of their interest and willingness to understand the term and the impact in their lives.

4.1 Research Questions

Based on the purpose of the survey, a number of research questions have been exported. These questions lead to conclusions that reveal the Greek and Cypriot citizens' point of view about the smart city objectives, elements, and applications. The same applies to a small sample of Greek citizens who live in other foreign countries of Europe and have also participated in this survey. The conclusions eventuate through multiple comparisons and statistical analyses.

The survey's questionnaire was created based on these research questions so that an amount of data could be gathered and analyzed in order to provide answers to these questions.

The research questions correspond to two categories: the first category includes the participants that have either a small or broad knowledge of the smart city concept and its contributions; the second includes the participants that are not familiar with the term at all.

The research questions of the first category are listed below:

1) How many of the citizens that have participated in the survey stated that they have heard about the "smart city" term? How is the result above formed when age, gender and city factors are taken into account?
2) How many of the citizens that have participated in the survey state that they have a decent (or probably better) knowledge of what a smart city is? How is the result above formed when age, gender and city factors are taken into account?
3) How many of the participants believe that actions have been made in their city so that it can be transformed into a smart city in a holistic way? How is this result formed when the city factor is taken into account?
4) Which are considered as the most important challenges for the development of a smart city, according to the participants? How do these results form when the city factor is taken into account?

The research questions of the second category of participants (the "non-familiar with the smart city term" ones) are listed below:

1) Does the "Education level" factor determines the way that the number of non-familiar participants is formed?
2) Which do the non-familiar participants consider as the most significant action in a modern city (for example, in the city that they live)? How are the preferences affected by the age and the city that the participants live?
3) Are the non-familiar participants interested in acquiring further information for the smart city concept in the future? How is their opinion affected by their age and city?
4) How many of the non-familiar participants believe that the local authorities have taken initiatives for the citizens' information about the "smart city" concept? How are the preferences affected by the city that the participants live?

4.2 Questionnaire Composure

For the conduction of this quantitative research, we have opted for a questionnaire as a tool for collecting data. The data was collected from the 3rd until the 17th of December, in 2020. We developed the questionnaire via a template of the Microsoft Google Forms. As a result, it was provided in an internet-only version. The questionnaire was provided to the participants mainly via the platforms of social media (Facebook, Instagram). The type of limitation that exists in this research has to do with the fact that only citizens with internet access could have

participated. However, this was the most accurate and valid way for the data to be imported into the SPSS (Statistical Package for the Social Sciences) tool so that the statistical data analysis could be done.

The participants were introduced to the objectives and the purpose of the questionnaire before filling it in. The Greek language was used in the questionnaire because it was referred to Greek people who live in Greece and Cyprus and also in a small number of Greek people who live in some other European countries. Specifically, the questionnaire was filled in by a total of 545 adult respondents. The respondents that live in Greece were 415, whereas those who live in Cyprus were 108 in total. As of Greece, 74 respondents are citizens of Athens, 181 of them live in Thessaloniki and 160 of them live in other Greek cities. As of Cyprus, 79 of the respondents live in Paphos, whereas a number of 29 live in other Cypriot cities. Lastly, 22 of the participants are Greek people who live in other European countries.

The first five (5) questions constitute the questionnaire's first section: "*Demographic Features*". They are common for each participant and are related to the demographic features that we consider important for the survey (gender, age, education, occupation, and city). However, subsequently, the questions are not the same for each participant. The number of questions that each participant answers are determined by the answers that each participant provides individually in question 6, which is an independent question and does not belong to any section. Specifically, question 6 asks the participant if they are familiar with the "smart city" term. It is a dichotomous-scale question and provides "Yes" and "No" as possible answers. Through the "branch" option that the Microsoft Forms' template provides, 2 sub-questionnaires are created, based on the answer that the participant provides in question 6:

- If the answer to question 6 is "Yes", the questionnaire continues to the second section: "Smart Cities". This section includes a number of ten (10) questions related to the concept, the activity, the importance, the challenges, the difficulty factors, the results and the six fundamental pillars of a smart city. The questions have been created according to the 5-point Likert scale, to the multiple-choice scale and to the simple choice scale. Subsequently, the third section ("Smart City Applications") follows. This section includes a number of nine (9) questions, created according to the 6-Likert scale. These questions refer to some applications and actions that contribute to the creation of a smart city. These applications are grouped into categories that belong to the six dimensions/pillars of a smart city.

- If the answer to question 6 is “No”, the participant is transferred to the fourth (alternative) section (the system skips the 2nd and the 3rd sections). This alternative section includes a short and simple definition of the smart city term (in order for the participant to get a bit familiar with the term), which is followed by six (6) questions that refer to the non-familiar-with-the-term participant. The purpose of these questions is to reveal the intention and interest of the participant to learn more about smart cities in the future, as well as to examine which of the six fundamental pillars the participant considers more important, based on their perceptions.

All in all, the participants that are familiar with the smart city term fill in the first three questionnaire sections, whereas the participants that are not familiar at all with the smart city term fill in the first and the fourth sections of the questionnaire.

4.2.1 Questionnaire’s Reliability Degree and Validity Tests

Internal consistency refers to the general agreement between multiple Likert-scale items that make-up a composite score of a survey measurement of a given construct. This agreement is generally measured by the correlation between items.

In order to assess the internal consistency of the questionnaire, the coefficient alpha (Cronbach’s alpha) was calculated for the number of questions that were formed under the Likert scale. The software program that was used for this calculation was the Statistical Package for the Social Sciences (SPSS). The reliability statistics that eventuated from this calculation are shown in the following table:

Table 1: Reliability Statistics for Likert questions

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,935	,939	79

A generally accepted rule is that a coefficient alpha of 0,6-0,7 indicates an acceptable level of reliability and 0,8 or greater a very good level [67]. For the specific research attempt, the value

of Cronbach's alpha was calculated as 0,935. This fact indicates that, when it comes to the amount of Likert variables, our questionnaire has a very high internal consistency. As a result, the credibility of the present research attempt is certified. The number of "Items" (79 in total) indicates the number of ordinal variables that are included in the questionnaire.

The Cronbach's alpha has also been calculated for the ordinal variables (items) of each of the Likert questions that appear in the research, separately. Each calculation's result appears in the following subchapter, "Survey Analysis", under the statistical analysis of each of the questions that belong to this type.

The Kaiser-Meyer-Olkin (KMO) test and the Bartlett's test of Sphericity have also been excecuted for the number of questions that were formed under the Likert scale. The KMO test is used in research in order to determine the sampling adequacy of data that are to be used for Factor Analysis [68]. The Bartlett's test of Sphericity checks if there is a redundancy between variables that can be summarized with some factors [69]. The Factor Analysis results that emerged are shown below:

Table 2: Factor Analysis-Validity Check

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,854
Bartlett's Test of Sphericity	Approx. Chi-Square	12541,577
	df	3081
	Sig.	,000

According to the results, the KMO value (0,854) is considered as meritorious [70], while the Bartlett's Test value (Sig.=0,000) is lower than 0,05. Therefore, the sampling is adequate and the data are suitable for Factor Analysis. All variables are suitable for Factor Analysis, considering the fact that their "Extraction" values are > 0,5. More specifically, the Extraction values fluctuate from 0,5 to 0,846, as SPSS's results indicate.

4.3 Survey Analysis

4.3.1 Analysis of the First Section

As mentioned, this questionnaire was completed by a total of 545 respondents. The demographic feature questions formed the questionnaire's first section. When it comes to the

first question (“Gender”), a relative balance seems to appear between the number of men and the number of women that participated in the survey. More specifically, 49% (267 in total) of the participants were women, whereas 51% (278 in total) were men:

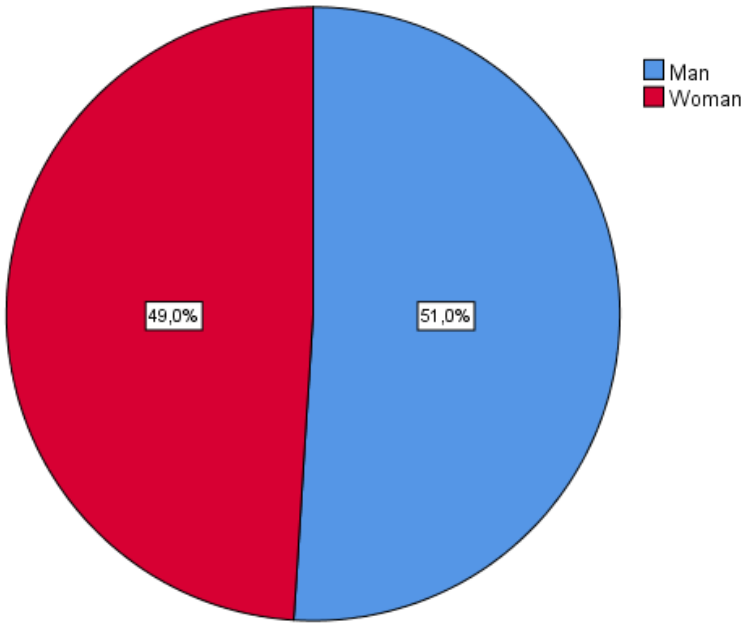

Figure 2: Gender

The second question had to do with the participants’ age. Only adults have participated in this survey. Out of the total respondents, 37,2% (203 in total) are from 18 to 30 years old of age; 50,3% (274 in total) are from 31 to 40 years of age; 9,4% (51 in total) are from 41 to 50 years of age; 2,4% (13 in total) are from 51 to 60 years of age and, lastly, a small percentage of 0,7% (4 in total) were the respondents who are older than 60 years. As a result, a total of 87,5% of the citizens that have taken part in the survey were from 18 to 40 years old. Figure 3 shows the results.

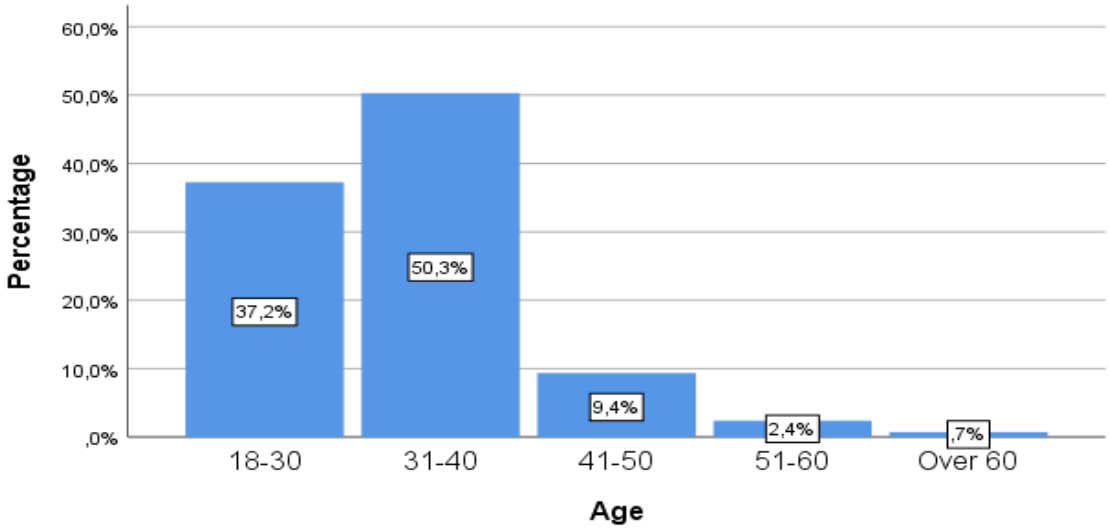

Figure 3: Age

The third question referred to the educational level of the participants. A variety of choices was offered to them to choose. The following bar chart shows the total results:

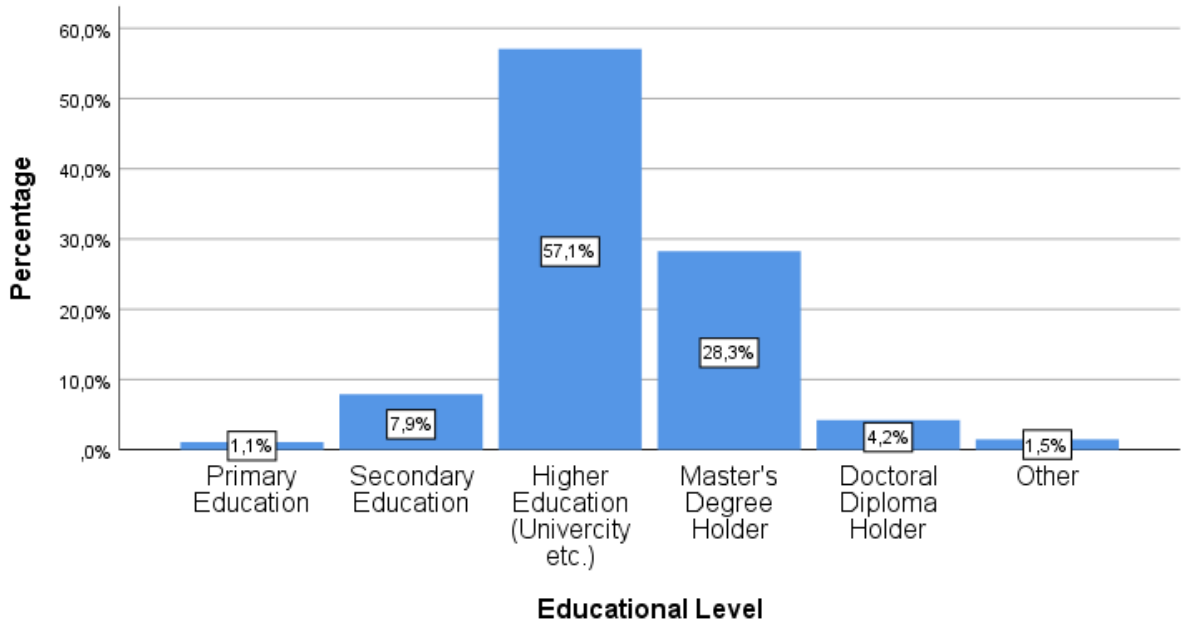

Figure 4: Educational Level

Most of the participants (57,1%, which corresponds to 311 citizens in total) belong to the "Higher Education" category, whereas a quite high percentage of 28,3% of the total participants (154 in total) hold a Master's degree. 9% of all the participants have a lower educational level (primary and secondary education) than the others. 4,2% of them are holders of doctoral diploma, while 1,5% of them have declared "Other" as an answer. In general, based on the

results, 91% of the participants appear to be highly educated, whereas a total of 9% appear to have a lower educational level.

As of the occupation, most of the participants (47,7%) work as private employees, while 19,6% of them are freelancers and 15% of them are civil employees. The college students constitute 8,4% of the participants, and the rest 9,2%, are unemployed or retired citizens, as well as citizens that have chosen the "other" answer:

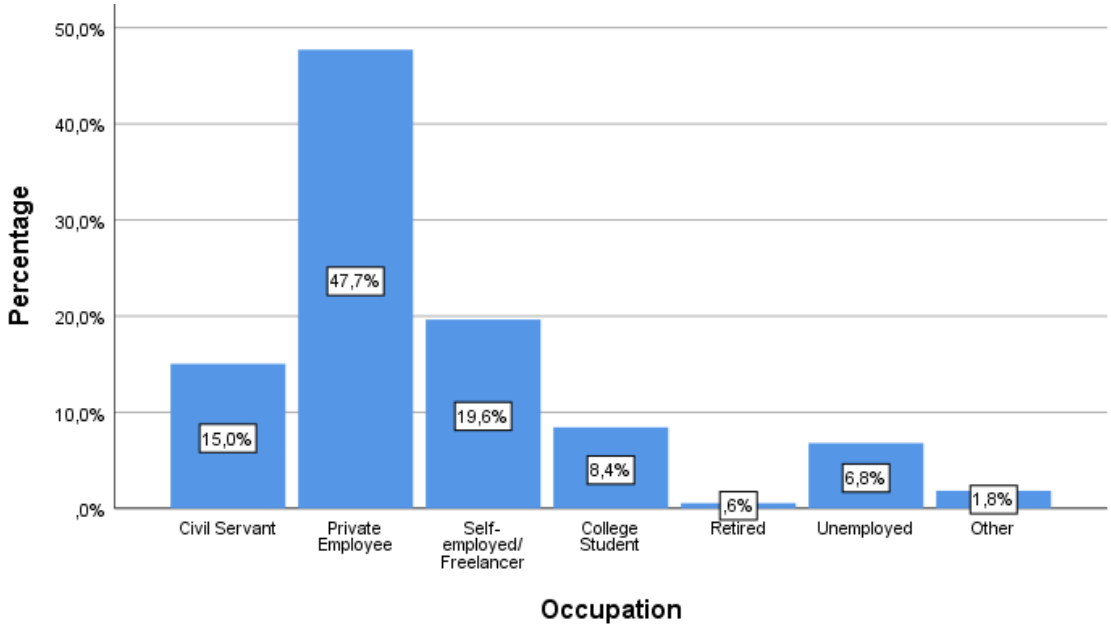

Figure 5: Occupation

The participants that have taken part in this survey are citizens of a total of 61 cities all over Greece, Cyprus and other European countries. In order to analyze the data in a more composed way, we decided to classify the cities into six big categories:

- Citizens of **Thessaloniki.**
- Citizens of **Athens.**
- Citizens who live in other cities within Greece (**Rest of Greece**).
- Citizens of **Paphos.**
- Citizens who live in other cities within Cyprus (**Rest of Cyprus**), such as Larnaca, Limassol, Nicosia.
- Greek citizens who live in **other European cities,** such as London, Liverpool, Manchester Stuttgart, Frankfurt, Copenhagen, Madrid, Bucuresti, Groningen etc.

Specifically, 33,2% of the participants live in Thessaloniki (181 in total number) and 13,4% of them live in Athens (73 in total), while there is a total number of 160 Greek citizens (29,5% in

percentage number) who live in other 41 Greek cities than Athens and Thessaloniki. As of Cyprus, 14,5% of the participants live in Paphos, while 5,3% live in other Cypriot cities. 4% of the participants are Greeks who live in other European cities. The results are shown below:

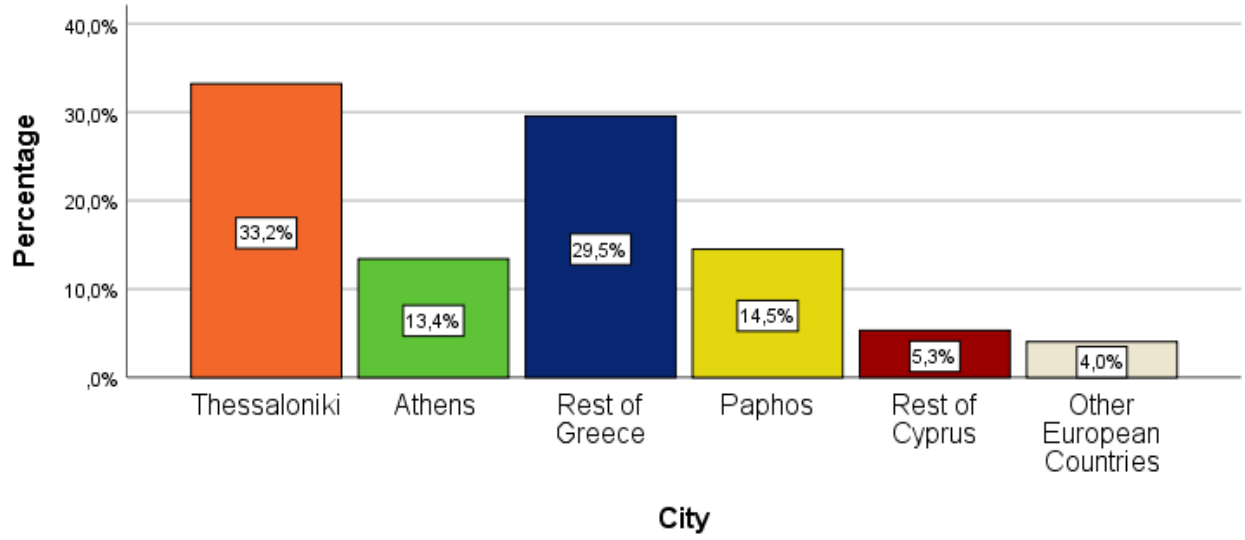

Figure 6: City Categories

The previous five questions constituted the questionnaire's first section and were all common questions for the participants. The sixth question determined the next questions, which formed the sub-questionnaire that each participant filled in eventually. The question is: "Have you ever heard the term "Smart City" before?". Its purpose was to separate those who were familiar with the term from those who were not. Thus, the answer to this question determined the next questions that each citizen answered. The results showed that 58,5% of the participants answered "Yes". This means that 319 of the participants stated that they had at least heard the smart city term or had a decent knowledge about it. The rest 226, answered "No", and were "transferred" to the questionnaire's alternative section through the "branch" option of Microsoft Forms.

4.3.2 Analysis of Second and Third Section

The 319 participants who answered "Yes" in the sixth question of the questionnaire were "transferred" to answer the questions of the second and third sections.

The second section included questions 7-16, while the third section included questions 18-26. The 7th question's purpose ("Do you know what a smart city is?") is to reveal how many of the 319 participants have not simply heard about the smart city term but also they have a decent

(or even broader) knowledge about it. The results showed that 82,1% of the 319 participants answered "Yes" in the 7th question. Therefore, these participants somehow state that have a decent (or even broader) level of knowledge about the smart city concept. The other 17,9% that answered "No" in the 7th question somehow state that they just have heard /have a slight knowledge about the smart city term. The conclusion that emerged from questions 6 and 7 is that from the 319 participants that have heard the smart city term, 262 of them have a decent or even broader knowledge about it, whereas the rest of them (57) have not, and have just heard the term.

The 8th question was: "To what extent do you believe that the following options correlate with the smart city concept?". Since it was created by the 5-point Likert scale, each of its items constituted an ordinal variable in SPSS software. As a result, the Cronbach's alpha value was calculated for the amount of the ordinal variables of this question so that the internal consistency of these items could be checked. The results follow below:

Table 3: Reliability Statistics for the items of question 8

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,606	,618	6

We notice that the value of Cronbach's alpha is 0,606, which indicates an acceptable level of reliability. The "Item-Total Statistics" table that is exported along with the table above shows that no item needs to be excluded in order for the Cronbach's alpha value to grow:

Table 4:Item-Total Statistics for question 8

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Modern management	17,35	4,460	,410	,323	,530
ICT	17,02	5,273	,302	,218	,577
Sustainable development	17,03	4,829	,416	,246	,533
Efficient use of energy	16,86	5,541	,271	,200	,588
Citizens' involvement in public decision making	17,58	4,231	,333	,313	,579
Urban mobility	17,05	4,975	,343	,176	,561

As mentioned, for question 8, a number of options/items were presented to the participants. They were offered to choose among the following responses for each option: "**Not important at all**", "**Less important**", "**Moderately important**", "**Quite important**" and "**Very important**". Generally, the participants acknowledged the fact that all options given are of high importance for the development of a smart city project; thus, "Not important" and "Less important" options gathered an insignificant percentage amount. The results also showed that the two options that gathered the highest percentages of "Very important" responses were the "Efficient use of energy" option (74,9% of the participants opted for "Very important") and the "Sustainable development" (63,3% of the participants opted for "Very important"):

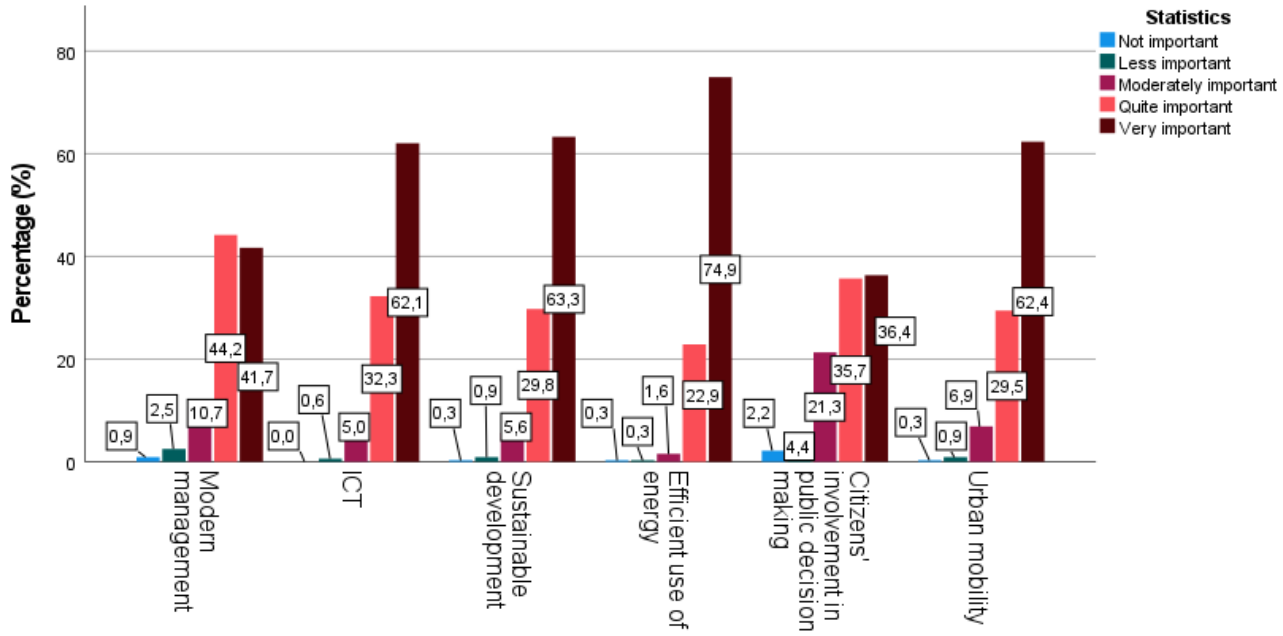

Figure 7: Results of question 8

Questions 9, 10 and 11 are related to each other in the following way: question 9 (“Do you think that efforts have been made in order your city to be transformed into a “Smart City”?”) offers 3 possible answers: “Yes”, “No” and “I do not know”. If the participant’s answer is “Yes”, then they continue to the 10th question. In any other case, the 10th question is skipped, and the participant is “transferred” to the 11th question. The results of the 9th question are shown in the following figure:

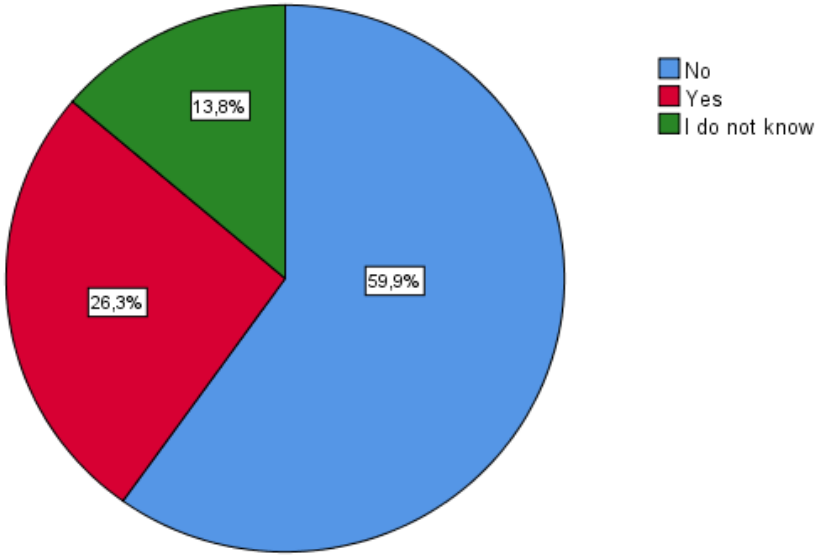

Figure 8: Question 9: Do you believe that any efforts have been made so that your city could become "smart"?

Therefore, out of the 319 participants, 84 of them (26,3%) answered “Yes”, 191 (59,9%) answered “No” and 44 (13,8%) answered “I do not know”. In other words, 84 participants continued by answering the 10th question: “In which of the following sectors have you noticed any kind of activity? (you can select more than one choice)”. The options were related to the six fundamental pillars of a smart city and the participants were offered the capability to choose more than one of these given options. Generally, all options were chosen, in a quite sufficient percentage; the most popular choices were the “Environment” (chosen by 50 out of the 84 participants, a number which corresponds to 59,5%) and the “Mobility” (chosen by 47 out of the 84 participants, a number which corresponds to 56%). The less popular options were the “Living” option (33,3%) and the “Human Capital” option (33,3%):

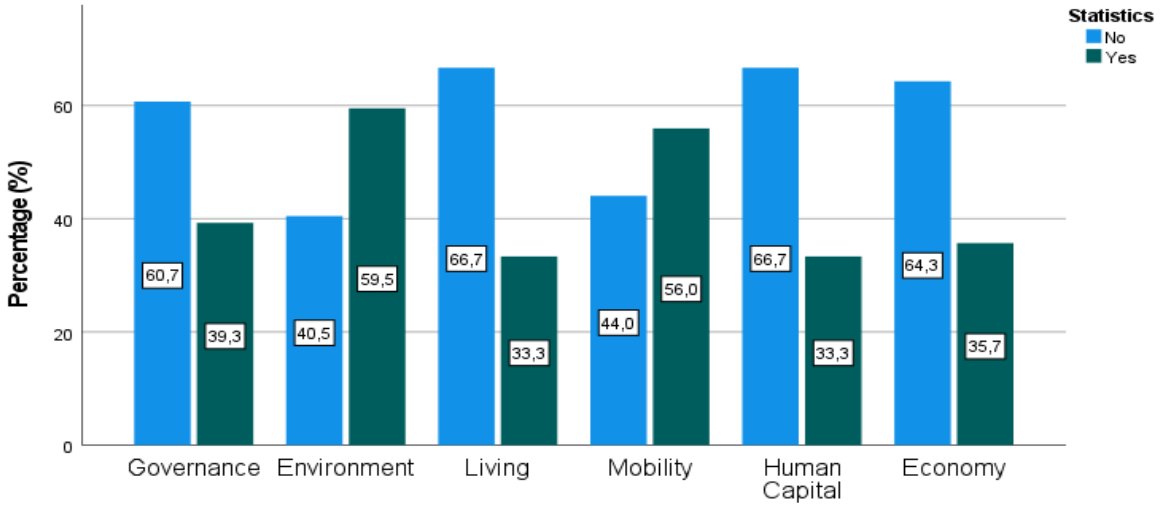

Figure 9: Results of question 10

Question 11 ("In which of the following areas do you think improvements need to be made in the city where you live?") was also a multiple-choice question, which again offered the six smart city fundamental pillars as choices. The results revealed that, in general, each option has been chosen by the participants in a relatively high percentage; in fact, each option's choice exceeded the 55 percentage board. This reveals that each of the options provided was highly chosen by the participants. The specific results are shown in the below table:

Table 5: Results of question 11

	Governance	Environment	Living	Mobility	Human Capital	Economy
No	37.0%	20.4%	25.7%	27.0%	42.0%	31.3%
Yes	63.0%	79.6%	74.3%	73.0%	58.0%	68.7%

Typically, the most popular options that were chosen by the participants were the "Environment" (chosen by 254 out of 319 participants) and "Living" (chosen by 237 out of 319 participants). The table is followed by the figure that shows the above results:

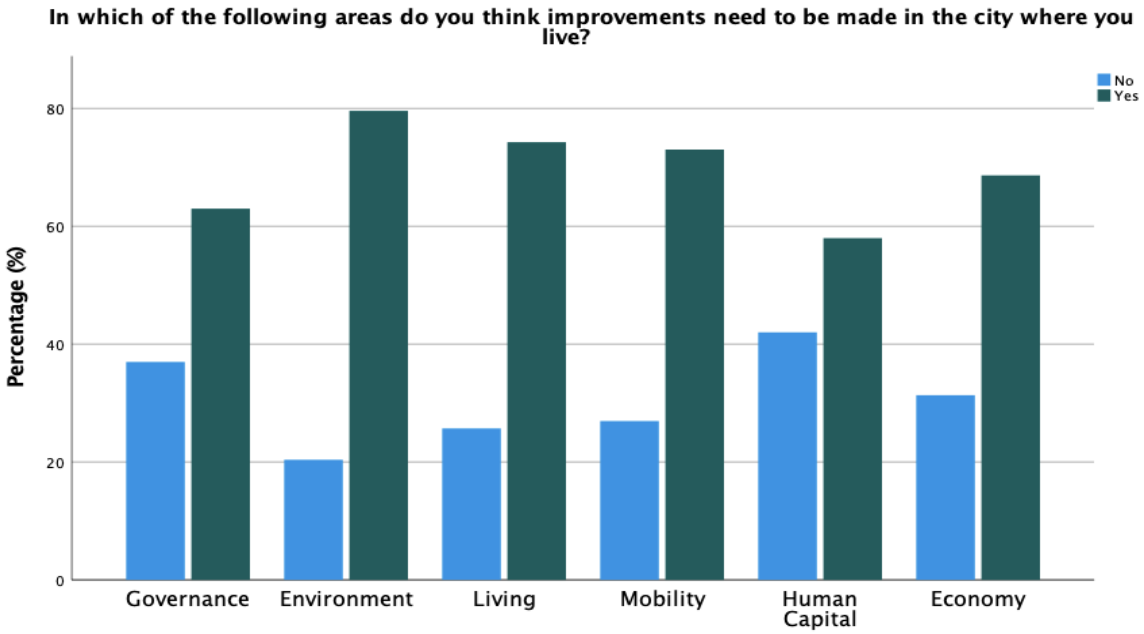

Figure 10: Results of question 11

Following question 11, question 12 asked the participants to evaluate the six smart city pillars based on their importance. Since this question was created by the 5-point Likert scale, each of its items constituted an ordinal variable in SPSS software. As a result, the Cronbach's alpha value was calculated for the number of the ordinal variables of this question so that the internal consistency of these items could be checked. The results follow below:

Table 6: Reliability Statistics for the items of question 12

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,649	,677	6

The value of Cronbach's alpha appears to be 0,649, which indicates an acceptable level of reliability. However, the "Item-Total Statistics" table shows the following:

Table 7: Item-Total Statistics for question 12: first calculation

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Smart Governance	17,92	4,403	,187	,058	,701
Smart Environment	17,29	4,690	,382	,179	,610
Smart Living	17,24	4,490	,488	,277	,580
Smart Mobility	17,35	4,555	,337	,186	,620
Smart People	17,57	3,881	,450	,290	,577
Smart Economy	17,55	3,852	,553	,363	,537

The table shows that Cronbach's alpha can get a bigger value in case the "Smart Governance" item is excluded from the reliability analysis. Specifically, the new value will be 0,701. If the above item is excluded and another reliability test is performed, the results will be the following:

Table 8: Reliability Statistics of the items of question 12 (final test)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,701	,705	5

The value now is 0,701, which is higher and more acceptable than the previous one. The new "Item-Total Statistics" table that is exported along with the table above, shows that no item needs to be excluded in order the Cronbach's alpha value to grow more:

Table 9: Item-Total Statistics of question 12: final results

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Smart Environment	14,23	3,460	,357	,163	,689
Smart Living	14,18	3,210	,512	,275	,637
Smart Mobility	14,29	3,174	,396	,181	,676
Smart People	14,51	2,659	,472	,288	,652
Smart Economy	14,49	2,641	,584	,359	,592

In question 12, the participants were offered to choose among the following responses for each option: "**Not important at all**", "**Less important**", "**Moderately important**", "**Quite important**" and "**Very important**". The results revealed once again that the participants are generally aware of each of the pillars' high importance. This is shown by the fact that the "Quite important" and "Very important" choices (combined) exceeded the 75% percentage board for each of the six pillars provided, whereas "Not important" and "Less important" choices could not even exceed the 5% percentage board for each of them:

Table 10: Results of question 12

	Smart Governance	Smart Environment	Smart Living	Smart Mobility	Smart People	Smart Economy
Not important	0.3%	0.0%	0.0%	0.0%	0.3%	0.0%
Less important	4.1%	0.3%	0.3%	0.9%	2.2%	0.9%
Moderately important	19.4%	1.6%	2.5%	4.1%	8.2%	8.2%
Quite important	41.7%	26.3%	19.4%	25.4%	34.8%	37.3%
Very important	34.5%	71.8%	77.7%	69.6%	54.5%	53.6%

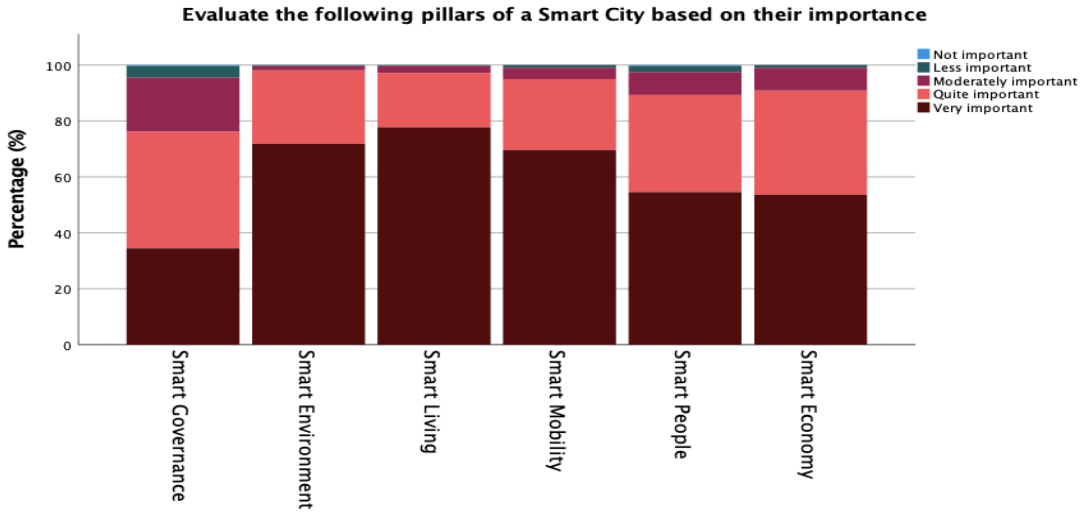

Figure 11: Results of question 12

Another question created by the 5-point Likert scale was question 13, which asked for the participants to state to what extend the six smart city pillars appear in the city where each of them lives. Each of the question's items constituted an ordinal variable in SPSS software. As a result, the Cronbach's alpha value was calculated for the amount of the ordinal variables of this question so that the internal consistency of these items could be checked. The results follow below:

Table 11:Reliability Statistics for the items of question 13

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,932	,932	6

The value of Cronbach's alpha appears to be 0,932, which indicates an excellent level of reliability. The "Item-Total Statistics" table shows that the coefficient alpha can rise more if the item "Smart People" is excluded from the reliability test:

Table 12: Item-Total Statistics for question 13: first calculation

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Smart Governance	7,43	26,573	,756	,589	,925
Smart Environment	7,31	25,367	,854	,748	,913
Smart Living	7,30	25,086	,872	,777	,910
Smart Mobility	7,31	25,415	,811	,689	,918
Smart People	7,06	27,421	,687	,496	,934
Smart Economy	7,19	25,520	,826	,690	,916

If "Smart People" is excluded and another reliability test is performed, the results will be the following:

Table 13: Reliability Statistics of the items of question 13 (final test)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,934	,934	5

The value now is 0,934, which is higher than the previous one. The new "Item-Total Statistics" table that is exported along with the table above, shows that no item needs to be excluded in order for the Cronbach's alpha value to grow more:

Table 14: Item-Total Statistics of question 13: final results

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Smart Governance	5,77	18,650	,756	,584	,931
Smart Environment	5,65	17,611	,860	,747	,911
Smart Living	5,64	17,419	,873	,773	,909
Smart Mobility	5,65	17,594	,822	,689	,919
Smart Economy	5,53	17,929	,807	,660	,921

In question 13, the participants were offered to choose among the following responses for each option: "**Not at all**", "**A bit**", "**Moderately**", "**Quite**" and "**A lot**". The general opinion shows that, significant appearance of the smart city pillars has not been noticed. In other words, the majority of the participants (based on their experience and knowledge about the smart city concept) have stated that each of the six pillars "does not appear" at all or "appears" a bit in the cities that they live. The fact that the percentages of the "Not at all" and the "A bit" options of each pillar exceed the 40% percentage border confirms the aforementioned statement. Four of the pillars is stated that they "do not appear" or "appear a bit" by over 55% of the participants. On the other hand, the options "Quite" and "A lot" combined do not even exceed the 20% percentage border for each pillar:

Table 15: Results of Question 13

	Smart Governance	Smart Environment	Smart Living	Smart Mobility	Smart People	Smart Economy
Not at all	31.3%	24.5%	25.7%	28.8%	17.6%	21.0%
A bit	27.6%	35.7%	32.0%	27.0%	26.3%	32.9%
Moderately	25.7%	20.7%	23.8%	24.5%	35.4%	26.6%
Quite	11.3%	12.9%	11.9%	13.5%	13.8%	11.0%
A lot	4.1%	6.3%	6.6%	6.3%	6.9%	8.5%

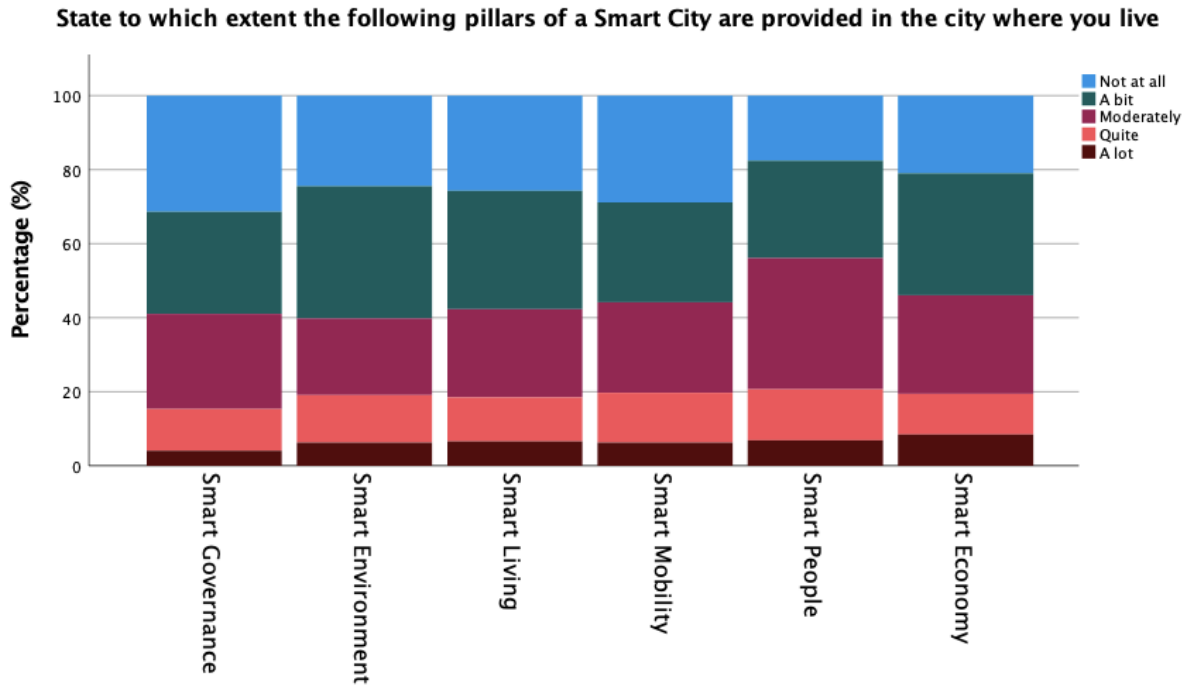

Figure 12: Results of question 13

Question 14 (“In your opinion, how important are the following results that a smart city offers?”) was also created by the 5-point Likert scale. Each of the question’s items constituted an ordinal variable in SPSS software. As a result, the Cronbach’s alpha value was calculated for the amount of the ordinal variables of this question, so that the internal consistency of these items could be checked. The results follow below:

Table 16:Reliability Statistics for the items of question 14

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,843	,852	14

The value of Cronbach’s alpha appears to be 0,843, which indicates a high level of reliability. The “Item-Total Statistics” table shows that the coefficient alpha can rise more:

Table 17: Item-Total Statistics for question 14: first calculation

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Better city governance	45,70	25,859	,511	,354	,831
Better health conditions	45,34	26,944	,528	,405	,832
Improved citizens' education	45,49	26,175	,519	,337	,831
Better trasport conditions by private vehicle	45,86	26,511	,311	,227	,848
Improved public transport	45,46	26,143	,471	,383	,834
Entrepreneurship development	45,56	26,078	,540	,367	,830
Greater citizens' participation in decision-making	45,94	25,469	,440	,349	,838
Improving ciy's cleanliness	45,43	26,158	,569	,389	,828
Increased security of citizens	45,55	25,481	,559	,374	,828
Transparency	45,62	26,449	,423	,258	,837
Local business development	45,62	26,035	,526	,400	,830
Increase of job vacancies	45,44	26,083	,491	,372	,832
Greater environmental protection	45,36	26,784	,545	,456	,831
More efficient energy consuption	45,40	26,877	,473	,354	,834

If the “Better transport conditions by private vehicle” item is excluded and another reliability test is performed, the results will be the following:

Table 18: Reliability Statistics of the items of question 14 (final test)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,848	,853	13

The value now is 0,848, which is higher than the previous one. The new “Item-Total Statistics” table that is exported along with the table above, shows that no item needs to be excluded in order the Cronbach’s alpha value to grow more:

Table 19: Item-Total Statistics of question 14: final results

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Better city governance	42,50	22,534	,517	,353	,836
Better health conditions	42,14	23,583	,530	,402	,836
Improved citizens' education	42,29	22,934	,508	,323	,837
Improved public transport	42,26	23,119	,426	,312	,842
Entrepreneurship development	42,36	22,790	,538	,366	,835
Greater citizens' participation in decision-making	42,74	21,965	,470	,340	,841
Improving ciy's cleanliness	42,23	22,837	,572	,389	,833
Increased security of citizens	42,35	22,215	,559	,372	,833
Transparency	42,42	23,062	,432	,257	,842
Local business development	42,42	22,735	,526	,395	,835
Increase of job vacancies	42,24	22,652	,512	,370	,836
Greater environmental protection	42,16	23,434	,547	,456	,835
More efficient energy consuption	42,20	23,534	,472	,354	,839

For question 14, a number of smart city results (benefits) were presented to the participants as options/items. For each of these options, they were offered to choose among the following responses: "**Not important at all**", "**Less important**", "**Moderately important**", "**Quite important**" and "**Very important**". Each of these options/smart city results belongs to each of the six of the fundamental smart city pillars but were presented randomly, under no specific classification. In general, the participants acknowledged the high importance of each of these smart city results. This is revealed by the fact that the combination of "Quite important" and "Very important" responses for each of them exceeded the 75% percentage board:

Table 20: Results of question 14

	Better city governance	Better health conditions	Improved citizens' education	Better trasport conditions by private vehicle	Improved public transport	Entrepreneur ship development	Greater citizens' participation in decision-making	Improving civ's cleanliness	Increased security of citizens	Transparenc y	Local business development	Increase of job vacancies	Greater environment al protection	More efficient energy consuption
Not important	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%
Less important	1.6%	0.0%	0.9%	4.7%	2.8%	0.6%	3.8%	0.3%	1.6%	0.6%	0.3%	1.6%	0.3%	0.0%
Moderately important	8.8%	3.1%	6.0%	15.4%	4.4%	6.3%	18.8%	5.6%	8.5%	11.0%	8.8%	5.6%	2.5%	5.3%
Quite important	41.7%	22.3%	27.9%	35.1%	23.2%	35.4%	38.2%	24.8%	27.3%	32.6%	37.6%	20.4%	23.8%	23.8%
Very important	48.0%	74.6%	65.2%	44.8%	69.6%	57.7%	38.9%	69.3%	62.7%	55.8%	53.3%	72.1%	73.4%	70.8%

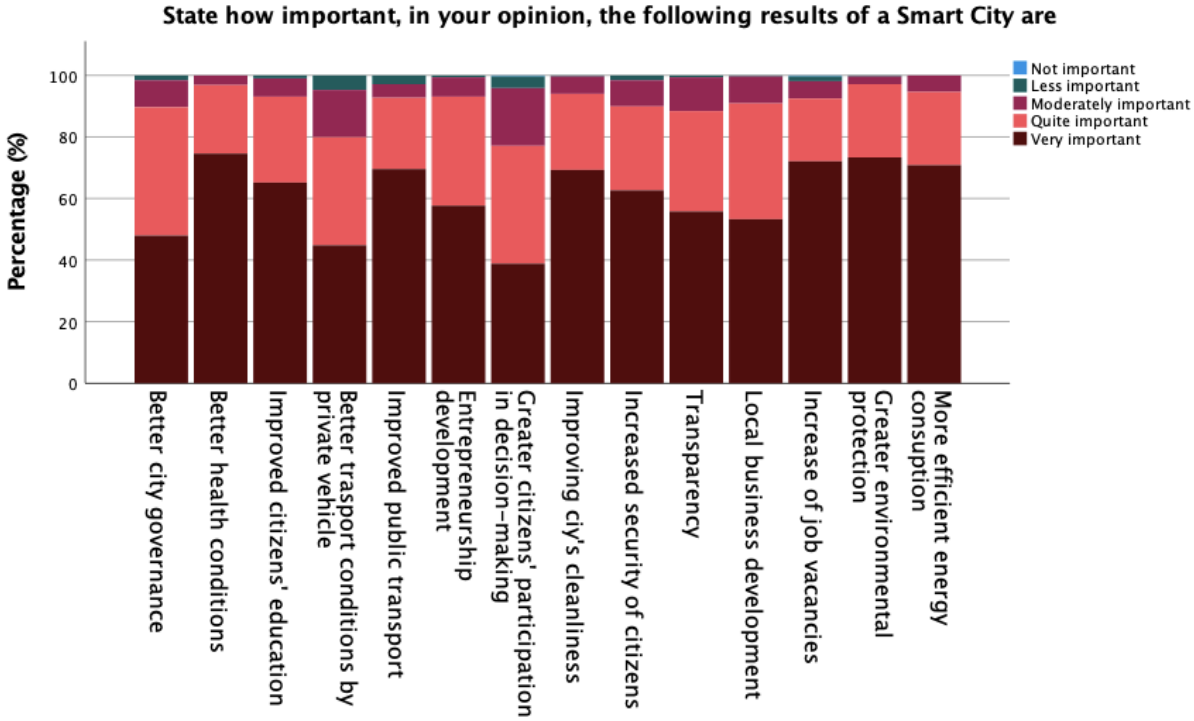

Figure 13: Results of question 14

Question 15 is: "Which is the biggest challenge for the development of a "Smart City?"". The respondents were offered to choose among five options ("Other" option was included). The results showed that 31,7% of the participants (101 out of 319) think that the cooperation

between public and private sector is the biggest of the offered challenges. The Citizens' participation, the transparency in the decisions of municipal authorities and the development of complete business movements, each gathered also a significant percentage:

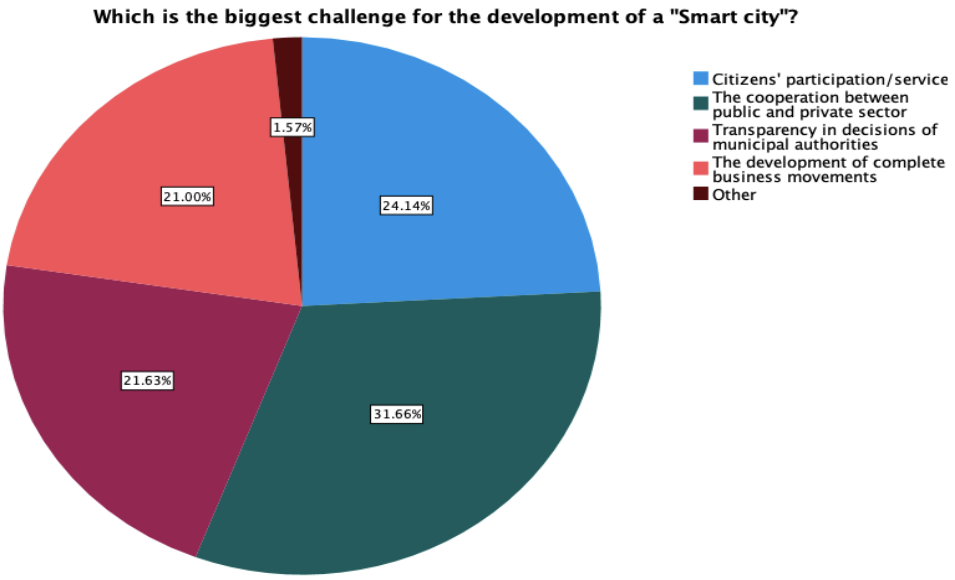

Figure 14: Results of question 15

The last question of the questionnaire's second section was question 16, which was formed by the 5-point Likert scale: "To what extend do you think the following factors make it difficult for a city to become "Smart"?". Each of the question's items constituted an ordinal variable in SPSS software. As a result, the Cronbach's alpha value was calculated for the amount of the ordinal variables of this question, so that the internal consistency of these items could be checked. The results follow below:

Table 21:Reliability Statistics for the items of question 16

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,684	,686	8

We notice that the value of Cronbach's alpha is 0,684, which indicates an acceptable level of reliability. The "Item-Total Statistics" table that is exported along with the table above, shows

that no item needs to be excluded from the reliability test, as there is no more room for the coefficient alpha to increase:

Table 22: Item-Total Statistics for question 16

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Technical constraints/Lack of infastructure	20,11	13,880	,303	,180	,669
Difficulties in moving from pilot projects to larger projects	20,43	13,246	,433	,276	,643
Financial constraints	20,01	13,239	,357	,239	,658
Legislative difficulties	20,33	12,976	,315	,146	,670
Lack of interest from citizens	20,49	12,326	,405	,282	,647
Lack of information	20,12	12,338	,471	,360	,630
Environmental limitations	20,50	12,590	,411	,211	,645
Lack of vision from local government officials	19,80	13,562	,310	,159	,668

For each of the provided options/items, the participants were offered to choose among the following responses: "**Zero**", "**Low**", "**Moderate**", "**Quite high**" and "**Very high**". According to the results, all of the provided difficulty factors collect a significant percentage of "Quite high" and "Very high" responses. "Financial constraints" was considered as the most popular difficulty factor by the participants, collecting 43,6% of "Quite high" and 36,7% of "Very high" responses (an amount of 256 out of the 319 participants opted for these responses). The "Zero" and "Low" responses were of insignificant percentage, with the "Lack of interest from citizens" as the option with the highest combined percentage (13,8%):

Table 23: Results of question 16

	Technical constraints/Lack of infastructure	Difficulties in moving from pilot projects to larger projects	Financial constraints	Legislative difficulties	Lack of interest from citizens	Lack of information	Environmental limitations	Lack of vision from local government officials
Zero	0.3%	0.6%	0.9%	0.9%	2.5%	0.6%	1.6%	0.9%
Low	3.4%	5.6%	4.4%	10.3%	11.3%	6.6%	11.6%	3.4%
Moderate	18.5%	29.8%	14.4%	27.0%	29.2%	19.7%	27.6%	10.3%
Quite High	51.4%	52.7%	43.6%	32.9%	35.7%	38.9%	42.3%	34.2%
Very High	26.3%	11.3%	36.7%	28.8%	21.3%	34.2%	16.9%	51.1%

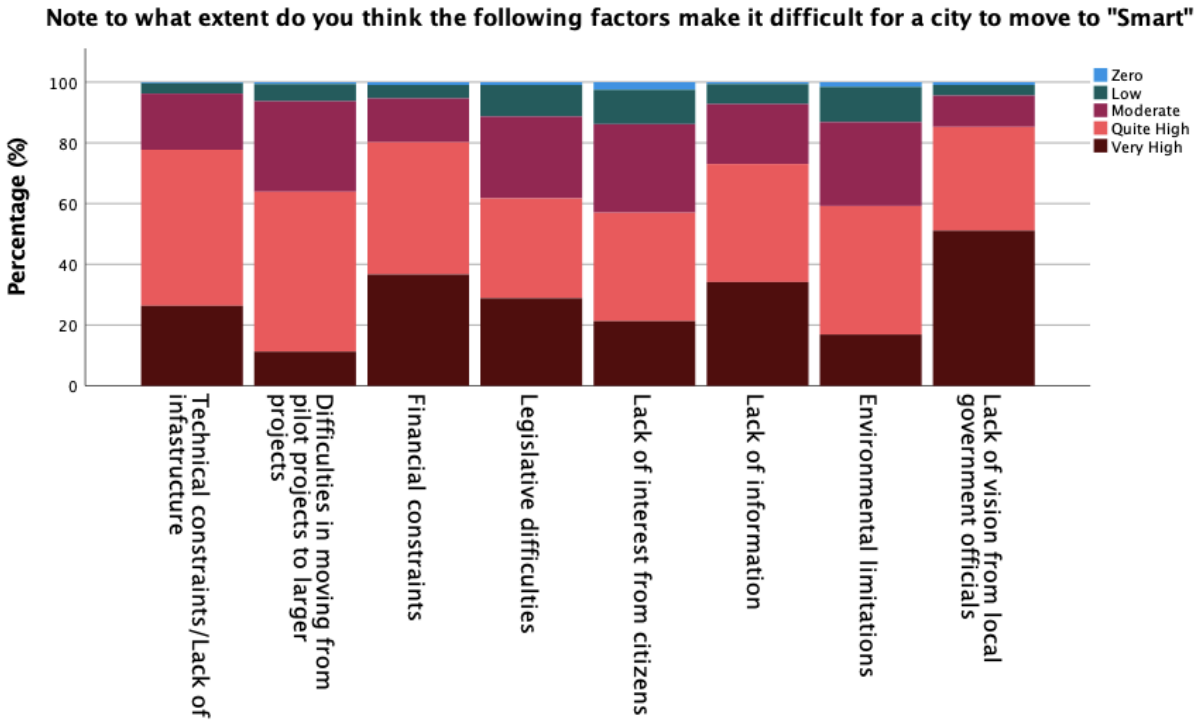

Figure 15: Results of question 16

After answering the questions above, the 319 participants continued by filling in the questions of the third section. The concept of the third section is the following: a number of applications/actions that contribute to the development of a smart city is presented. These applications are classified into nine (9) **categories,** which belong to the six fundamental dimensions/pillars of the smart city. The participants were asked to state how **important is the impact of each of the following applications for turning the city that they live into a "smart city"**. The nine categorized questions are created by the 6-point Likert scale. For each of the provided applications/options, the participants were offered to choose among the following responses: "**I do not know**", "**Not important**", "**Less important**", "**Quite important**", "**Very important**" and "**Extremely important**".

Since each of the categories/questions is formed by Likert-scale, a reliability test was performed for each of them. The results were gathered and are shown in the following table:

Table 24: Cronbach's Alpha for Questions 18-26

Likert questions (18-26)	Cronbach's Alpha	N of Items
Q18: Category of Information and Communication Technology (ICT)	0,720	5
Q19: Category of Environment	0,793	5
Q20: Category of Mobility and Transportation	0,789	5
Q21: Category of Health/Healthcare	0,736	3
Q22: Category of Sustainable Development	0,802	5
Q23: Category of Culture and Tourism	0,811	4
Q24: Category of Economy	0,798	3
Q25: Category of Security	0,796	4
Q26: Category of E-Government	0,804	5

Question 18: Cronbach's alpha: 0,72 (acceptable). The "Item-Total Statistics" table follows:

Table 25: Item-Total Statistics for Question 18

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Wireless network development	15,58	8,225	,504	,295	,662
Fiber optic network development	15,38	8,469	,479	,294	,673
Hardware and software development	15,30	8,669	,557	,314	,647
Installation of electronic boards	15,90	8,069	,496	,267	,667
Citizen service line	15,49	9,219	,372	,169	,713

Question 19: Cronbach's alpha: 0,793 (acceptable). The "Item-Total Statistics" table follows:

Table 26: Item-Total Statistics for Question 19

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Sensor installation for environmental phenomena	16,30	8,274	,590	,388	,749
Sensor installation for light level measurements	16,12	8,168	,644	,452	,730
Sensor installation in waste bins	16,42	7,779	,586	,361	,753
Alternative fuels in public transportation	15,77	9,108	,583	,414	,753
Water measurement and leak monitoring systems	15,78	9,576	,483	,325	,781

Question 20: Cronbach's alpha: 0,789 (acceptable). The "Item-Total Statistics" table follows:

Table 27: Item-Total Statistics for Question 20

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Real-time traffic management applications	16,08	8,700	,514	,289	,767
Use of pedestrian crossing systems	15,98	8,544	,617	,389	,735
Sensor installation in public transportation	16,22	7,950	,648	,438	,722
Car parking sensor installation	16,23	8,200	,547	,333	,758
Creation and promotion of alternative fuel vehicles	15,89	9,029	,520	,276	,764

Question 21: Cronbach's alpha: 0,736 (acceptable). The "Item-Total Statistics" table follows:

Table 28: Item-Total Statistics for Question 21

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Development of remote monitoring systems for vulnerable social groups	8,34	3,138	,573	,380	,644
Development of systems for monitoring patients remotely	7,97	4,012	,650	,430	,588
Development of telemedicine systems	8,13	3,590	,500	,265	,727

Question 22: Cronbach's alpha: 0,802 (acceptable). The "Item-Total Statistics" table follows:

Table 29: Item-Total Statistics for Question 22

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Instalation of photovoltaic elements in public facilities	15,39	9,943	,552	,310	,780
Energy saving from municipal lighting	15,23	11,138	,575	,333	,768
Awareness actions for the citizens for saving energy	15,28	11,554	,532	,294	,780
Fuel consumption measurement	15,50	10,351	,670	,490	,738
Telemetry systems for remote controls	15,70	9,902	,623	,444	,752

Question 23: Cronbach's alpha: 0,811 (acceptable). The "Item-Total Statistics" table follows:

Table 30: Item-Total Statistics for Question 23

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Development of local electronic tourist guide	11,77	5,606	,656	,516	,749
Creation of travel content applications for smart devices	11,56	5,982	,712	,571	,729
Content digitalization of historical and archeological sites	11,64	5,565	,667	,457	,743
Development of cultural spaces in abandoned areas	11,44	6,354	,498	,267	,823

After deleting "Development of cultural spaces in abandoned areas" item, the coefficient alpha becomes 0,823:

Table 31: Reliability Statistics for the items of question 23 (final test)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,823	,828	3

Table 32: Item-Total Statistics for Question 23 (final test)

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Development of local electronic tourist guide	7,74	2,923	,682	,510	,753
Creation of travel content applications for smart devices	7,54	3,212	,749	,569	,698
Content digitalization of historical and archeological sites	7,61	3,088	,618	,396	,819

Question 24: Cronbach's alpha: 0,798 (acceptable). The "Item-Total Statistics" table follows:

Table 33: Item-Total Statistics for Question 24

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Actions for promotion of local products	7,87	3,278	,624	,421	,749
Interactive consulting services for new enterpreneurs	7,68	3,333	,721	,520	,643
Job finding actions through the municipality's website	7,44	3,719	,590	,373	,777

Question 25: Cronbach's alpha: 0,796 (acceptable). The "Item-Total Statistics" table follows:

Table 34: Item-Total Statistics for Question 25

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Warning emergency systems	11,87	6,003	,554	,327	,770
Care taking of public facilities	12,43	5,126	,627	,416	,736
Photocell and security system installation on specific roads	12,42	5,093	,644	,442	,726
Civil protection and area evacuation plans	12,01	5,654	,610	,388	,744

Question 26: Cronbach's alpha: 0,804 (acceptable). The "Item-Total Statistics" table follows:

Table 35: Item-Total Statistics for Question 26

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Electronic services for easier access	15,64	10,552	,541	,345	,780
Application development for reporting problems and submitting requests by the citizens	15,72	10,238	,652	,488	,752
Development of tools for active citizen participation	15,96	9,608	,623	,444	,755
Social inclusion tools for better social cohesion	16,22	9,082	,606	,382	,762
Free access to open data (transparency)	15,96	9,470	,550	,312	,781

Question 18 pertains to the category of information and communication technologies (**ICT**). The results revealed that the participants consider all the provided smart city applications as "Very important" and "Extremely important" in a significant percentage. The upgrade of the software and of the computer components (hardware) of the municipality, for better online service providing to the citizens, was of the highest importance in general. It was characterized as "Very important" from 33,2% of the participants and as "Extremely important" from 41,4% of them. "Fiber optic network development" followed with 34,8% and 39,5% respectively. The "installation of electronic information boards" in real time (for local news, weather information etc.) was considered as the least important among the actions given, although, of course, the "Very important" and "Extremely important" responses that corresponded to it revealed that,

generally, it is anything but unimportant (51,4% in total). The declared ignorance's percentage was insignificant for all the actions.

Table 36: Results of question 18

	Wireless network development	Fiber optic network development	Hardware and software development	Installation of electronic boards	Citizen service line
I do not know	1.3%	1.9%	0.3%	0.3%	0.0%
Not important	0.9%	0.3%	0.6%	1.9%	1.9%
Less important	8.8%	4.1%	2.2%	18.8%	6.9%
Quite important	22.3%	19.4%	22.3%	27.6%	21.6%
Very important	36.1%	34.8%	33.2%	28.2%	36.4%
Extremely important	30.7%	39.5%	41.4%	23.2%	33.2%

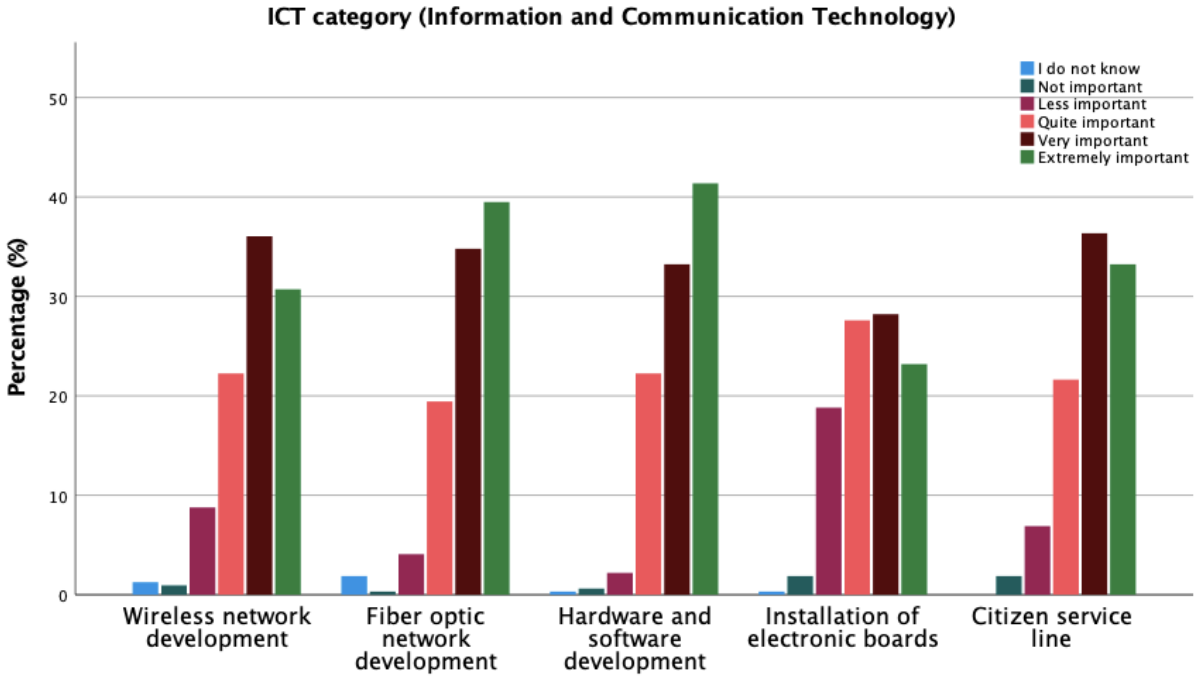

Figure 16: Results of question 18

Question 19 pertains to the category of **Environment**. The results also revealed that the participants consider all the provided smart city applications as "Very important" and "Extremely important" in a significant percentage. The usage of alternative fuels in public transportation was declared as the most important action of this category, based on the "Extremely important" percentage results (53,3%). "Water quality measurement and leak monitoring systems" followed, with 51,7% of "Extremely important" responses. The total combined percentage of the respondents that have chosen "Very important" and "Extremely

important" as answers were over 80% for both of the aforementioned actions. The declared ignorance's percentage was insignificant for all the actions.

Table 37: Results of question 19

	Sensor installation for environmental phenomena	Sensor installation for light level measurements	Sensor installation in waste bins	Alternative fuels in public transportation	Water measurement and leak monitoring systems
I do not know	1.9%	0.9%	0.6%	0.0%	0.0%
Not important	0.0%	0.3%	2.8%	0.0%	0.6%
Less important	4.7%	5.3%	12.5%	3.1%	1.9%
Quite important	30.7%	21.9%	24.1%	14.4%	14.1%
Very important	35.4%	36.4%	32.0%	29.2%	31.7%
Extremely important	27.3%	35.1%	27.9%	53.3%	51.7%

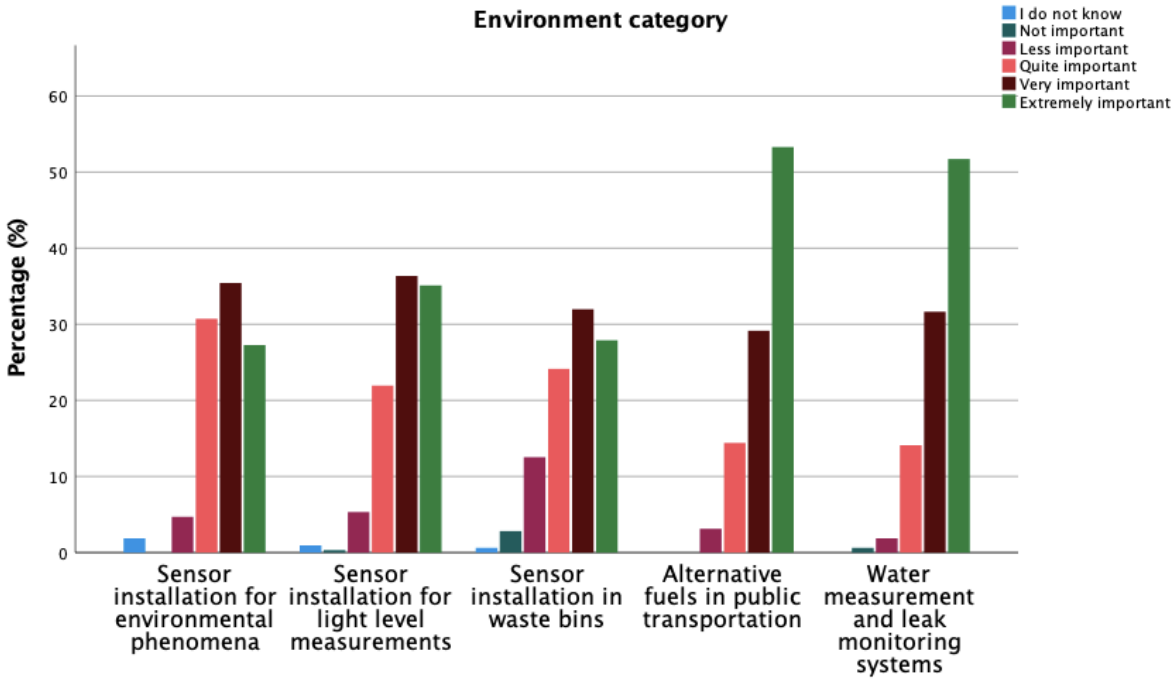

Figure 17: Results of question 19

Question 20 pertains to the category of **Mobility and Transportation**. Once again, the results revealed that the participants consider all the provided smart city applications/actions as "Very important" and "Extremely important" in a significant percentage. The "Creation and promotion of alternative fuel vehicles" was declared as the most important action of this category, based on the "Extremely important" percentage results (45,1%). The "Use of pedestrian crossing systems" for the easiest movement of the citizens followed, with 41,1% of "Extremely important" responses. The total combined percentage of the respondents that have

chosen “Very important” and “Extremely important” as answers were over 75% for both of the aforementioned actions. The declared ignorance’s percentage was insignificant for all the actions.

Table 38: Results of question 20

	Real-time traffic management applications	Use of pedestrian crossing systems	Sensor installation in public transportation	Car parking sensor installation	Creation and promotion of alternative fuel vehicles
I do not know	0.9%	0.0%	0.3%	0.0%	0.3%
Not important	0.6%	0.3%	0.9%	0.9%	0.6%
Less important	3.8%	4.7%	6.9%	11.6%	3.1%
Quite important	21.9%	19.1%	26.6%	21.6%	14.7%
Very important	36.1%	34.8%	32.3%	30.7%	36.1%
Extremely important	36.7%	41.1%	32.9%	35.1%	45.1%

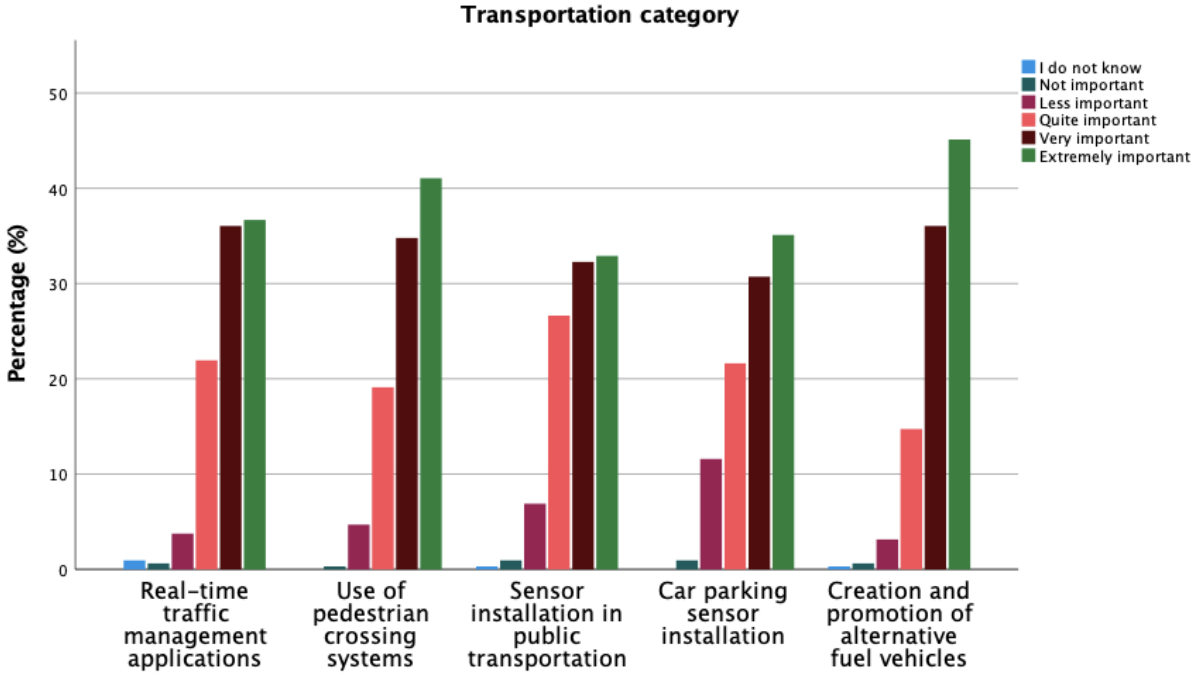

Figure 18: Results of question 20

Question 21 pertains to the **Health/Healthcare** category. Once again, the results revealed that the participants consider all the provided smart city applications as “Very important” and “Extremely important” in a significant percentage. All three actions of this category were considered as “Very important” in a percentage over 25% and “Extremely important” in a percentage over 40% each. The “Development of telemedicine systems” was considered the most important of all three, based on the results. The declared ignorance’s percentage was insignificant for all the actions.

Table 39: Results of question 21

	Development of remote monitoring systems for vulnerable social groups	Development of systems for monitoring patients remotely	Development of telemedicine systems
I do not know	2.5%	0.3%	2.5%
Not important	2.2%	0.0%	0.6%
Less important	7.5%	4.4%	5.6%
Quite important	20.4%	13.8%	16.6%
Very important	27.3%	32.9%	25.4%
Extremely important	40.1%	48.6%	49.2%

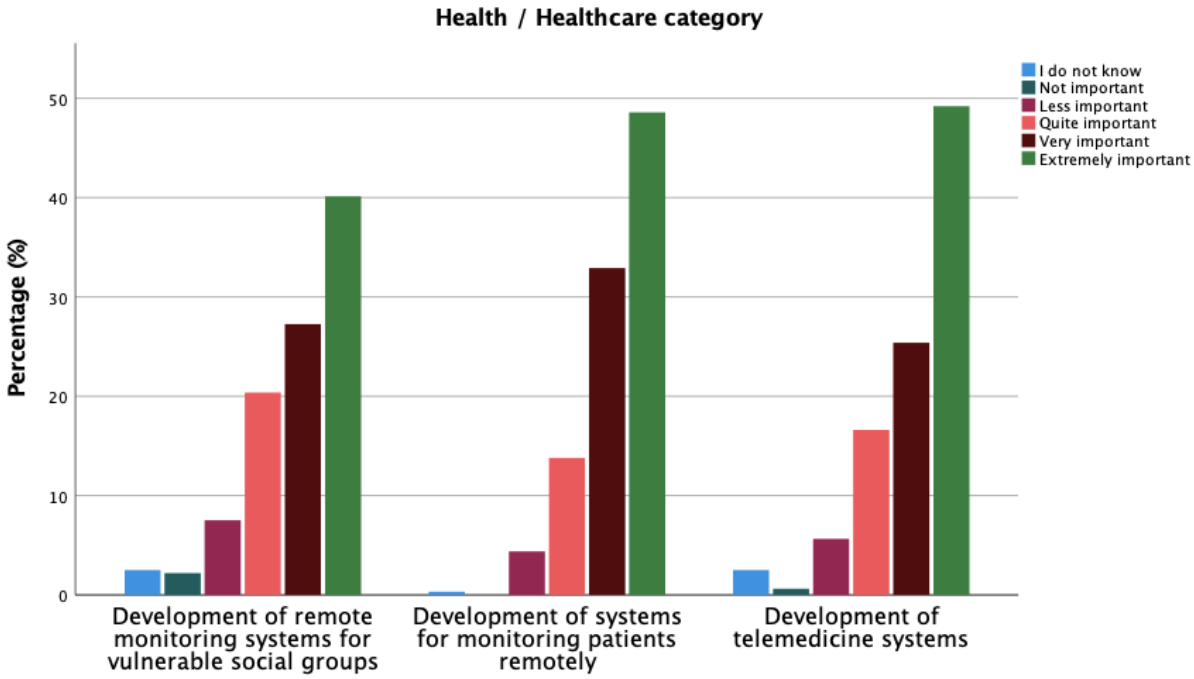

Figure 19: Results of question 21

Question 22 pertains to the category of **Sustainable Development**. Once again, the results revealed that the participants consider all the provided smart city applications as "Very important" and "Extremely important" in a significant percentage. The "Energy saving from municipal lighting" was declared as the most important action of this category, based on the "Extremely important" percentage results (38,2%). The "Installation of photovoltaic elements in public facilities" followed, with 37,9% of "Extremely important" responses. The total combined percentage of the respondents that have chosen "Very important" and "Extremely important" as answers were over 65% for both of the aforementioned actions. Apart from a

4,4% of the respondents who declared ignorance regarding the “Installation of photovoltaic elements in public facilities” action, the declared ignorance’s percentage was insignificant for the rest of the actions.

Table 40: Results of question 22

	Instalation of photovoltaic elements in public facilities	Energy saving from municipal lighting	Awareness actions for the citizens for saving energy	Fuel consumption measuremen t	Telemetry systems for remote controls
I do not know	4.4%	0.3%	0.3%	0.9%	2.8%
Not important	0.6%	0.6%	0.6%	0.9%	1.6%
Less important	4.4%	6.6%	4.1%	7.8%	10.0%
Quite important	21.3%	16.9%	23.5%	26.6%	28.8%
Very important	31.3%	37.3%	37.0%	37.6%	34.5%
Extremely important	37.9%	38.2%	34.5%	26.0%	22.3%

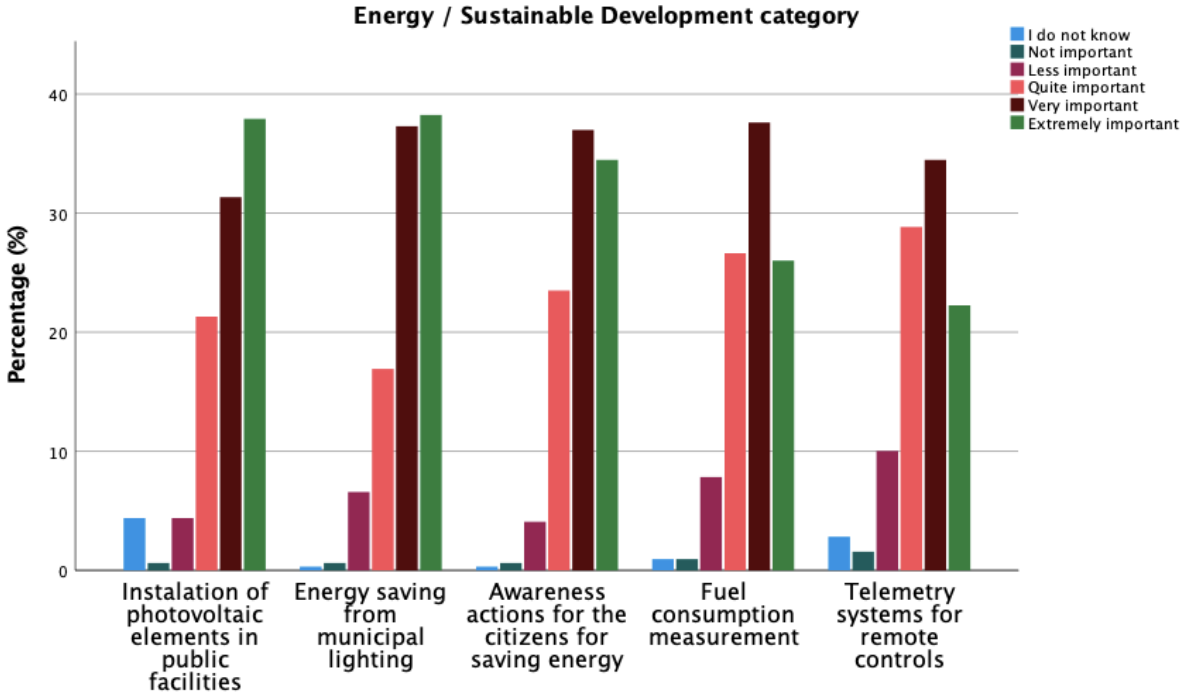

Figure 20: Results of question 22

Question 23 pertains to the **Culture and Tourism** category. In the importance scale, all four actions that were presented under this category were considered as “Quite important” or above in percentages that exceeded 85% each. The “Development of cultural spaces in abandoned areas” action was declared as the most important action under this category, based on the results (39,8% of the participants considered it as “Extremely important”, while a total of 92,8% declared it as “Quite important” or above). The declared ignorance’s percentage was insignificant for all the actions.

Table 41: Results of question 23

	Development of local electronic tourist guide	Creation of travel content applications for smart devices	Content digitalization of historical and archeological sites	Development of cultural spaces in abandoned areas
I do not know	0.6%	0.0%	0.3%	0.3%
Not important	1.6%	0.3%	0.9%	0.9%
Less important	8.5%	4.7%	9.7%	6.0%
Quite important	30.4%	27.9%	23.8%	21.0%
Very important	34.2%	38.2%	34.5%	32.0%
Extremely important	24.8%	28.8%	30.7%	39.8%

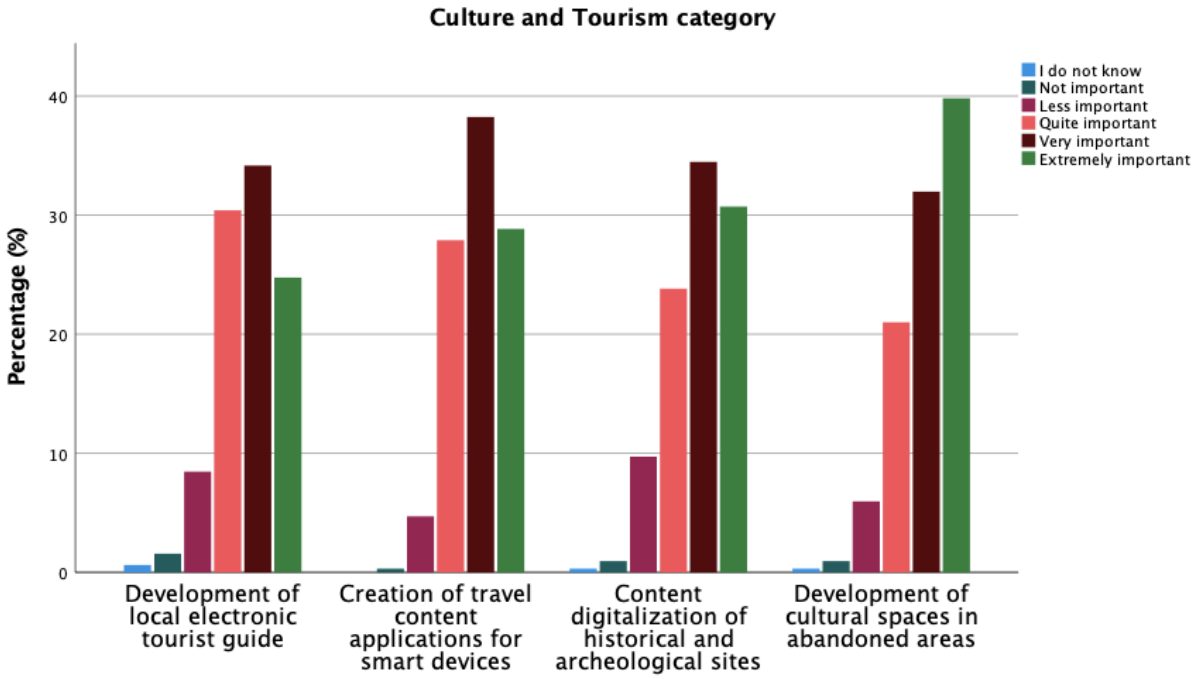

Figure 21: Results of question 23

Question 24 pertains to the **Economy/Economic Development** category. Although all three provided actions were declared as of significant importance in general, the "Job finding actions through the municipality's website" action was declared as the most important, gathering a 40,8% of "Extremely important" responses out of all respondents. This percentage was bigger than the corresponding one of the "Interactive consulting services for new entrepreneurs" action (which followed as second most important action) by almost 13 percentage units. The declared ignorance's percentage was insignificant for all the actions.

Table 42: Results of question 24

	Actions for promotion of local products	Interactive consulting services for new enterpreneurs	Job finding actions through the municipality's website
I do not know	1.6%	1.3%	0.6%
Not important	1.3%	0.6%	0.9%
Less important	11.6%	6.6%	6.3%
Quite important	29.8%	26.3%	17.6%
Very important	30.4%	37.3%	33.9%
Extremely important	25.4%	27.9%	40.8%

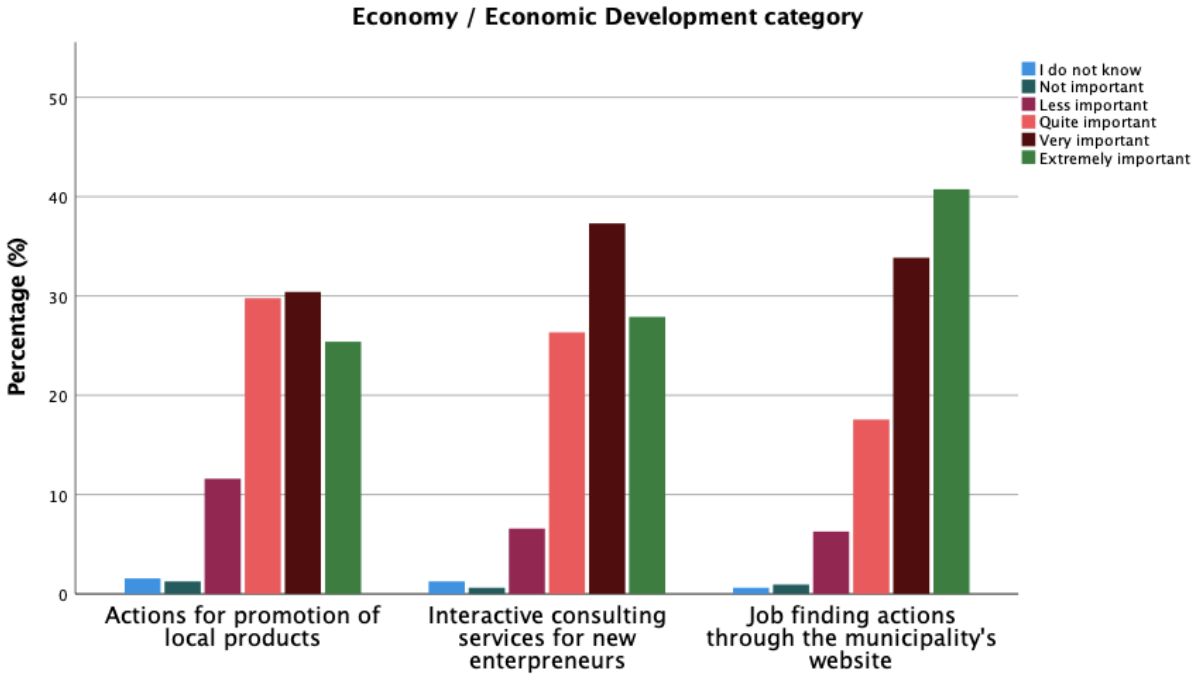

Figure 22: Results of question 24

Question 25 pertains to the **Security** category. The "Warning emergency systems" for the encounter of emergency incidents (such as earthquakes, floods etc.) was declared by far the most important action (56,7% of the respondents chose the "Extremely important" option). "Civil protection and area evacuation plans" followed, with 48,9% "Extremely important" answers. The declared ignorance's percentage was, once again, insignificant for all the actions.

Table 43: Results of question 25

	Warning emergency systems	Care taking of public facilities	Photocell and security system installation on specific roads	Civil protection and area evacuation plans
I do not know	0.6%	0.6%	0.6%	0.0%
Not important	0.0%	1.6%	0.9%	0.3%
Less important	2.2%	6.9%	8.5%	5.3%
Quite important	12.9%	27.3%	24.8%	14.1%
Very important	27.6%	33.9%	35.4%	31.3%
Extremely important	56.7%	29.8%	29.8%	48.9%

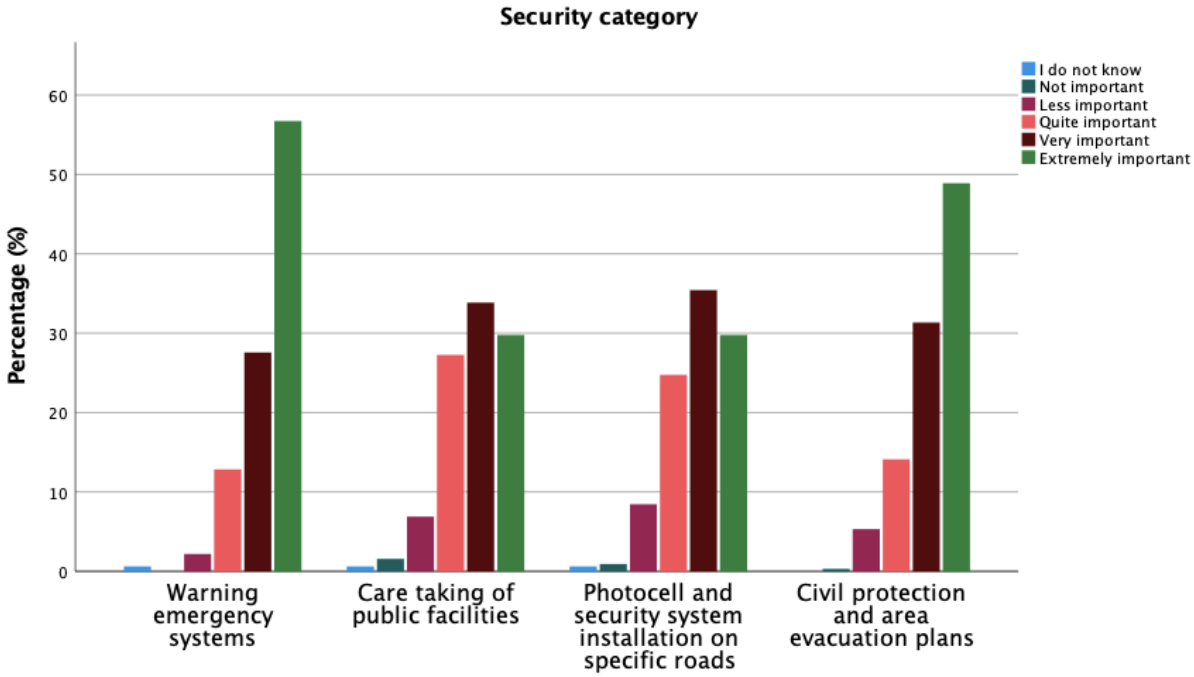

Figure 23: Results of question 25

Question 26 pertains to the **E-government** category. Once again, the results revealed that the participants consider all the provided smart city applications as "Very important" and "Extremely important" in a significant percentage. The providing of "Electronic services for easier access" by all citizens was declared the most important action (48% of the respondents chose the "Extremely important" option). "Application development for reporting problems and submitting requests by the citizens" followed, with 39,2% "Extremely important" answers. The declared ignorance's percentage was, once again, insignificant for all the actions.

Table 44: Results of question 26

	Electronic services for easier access	Application development for reporting problems and submitting requests by the citizens	Development of tools for active citizen participation	Social inclusion tools for better social cohesion	Free access to open data (transparency)
I do not know	0.6%	0.6%	0.9%	1.6%	1.9%
Not important	0.3%	0.3%	0.3%	3.4%	2.2%
Less important	3.1%	1.9%	6.6%	8.8%	5.0%
Quite important	14.7%	16.9%	25.1%	25.7%	21.6%
Very important	33.2%	41.1%	32.3%	34.8%	32.3%
Extremely important	48.0%	39.2%	34.8%	25.7%	37.0%

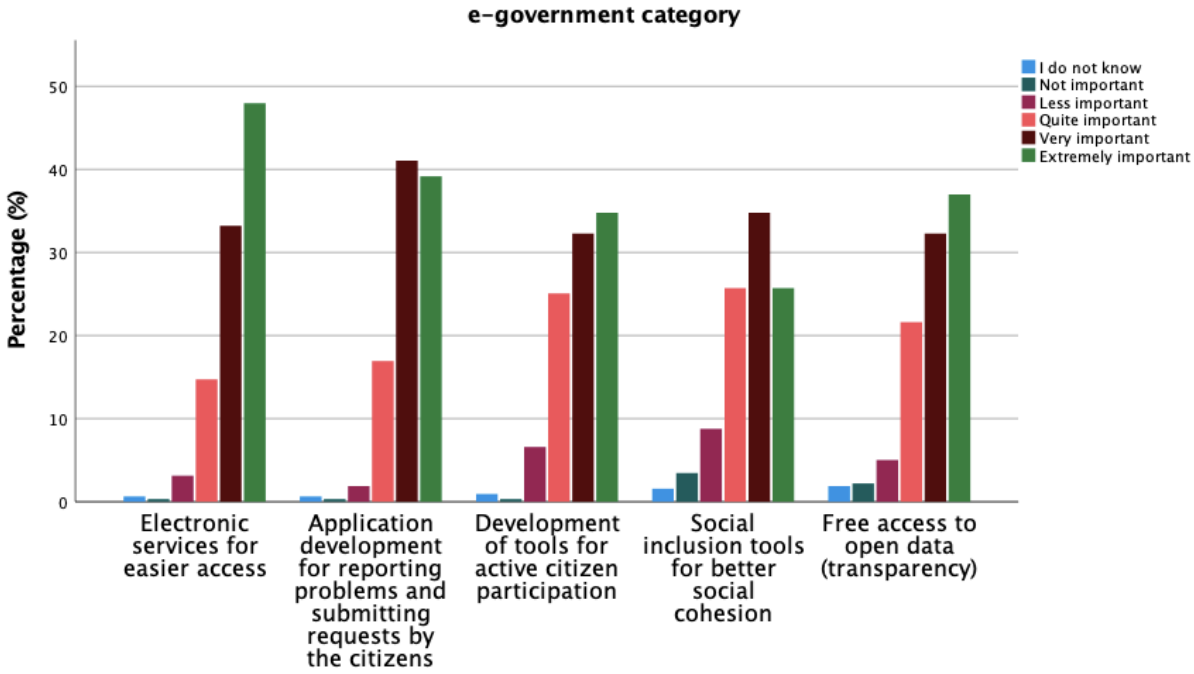

Figure 24: Results of question 26

4.3.3 Analysis of Fourth (Alternative) Section

This section's questions were answered by the respondents that declared themselves as non-familiar with the smart city term by choosing the "No" option in Question 6 of the questionnaire. The 2nd and 3rd sections were skipped for this portion of respondents. An amount of 226 (from the initial number of 519) participants were transferred to this section after

answering Question 6. As a result, 41,5% of the total participants were declared as non-familiar with the smart city term.

This alternative section begins with a short and simple definition of the smart city term (in order for the participant to get a bit familiar with the term), which is followed by six (6) questions that refer to the non-familiar-with-the-term participant.

In question 27, the 226 "non-familiar" participants were asked if they are willing to learn more things about the smart city concept in the future so that they can understand the term better. A vast amount of them (89,8%) answered "Yes" as the following pie graph shows:

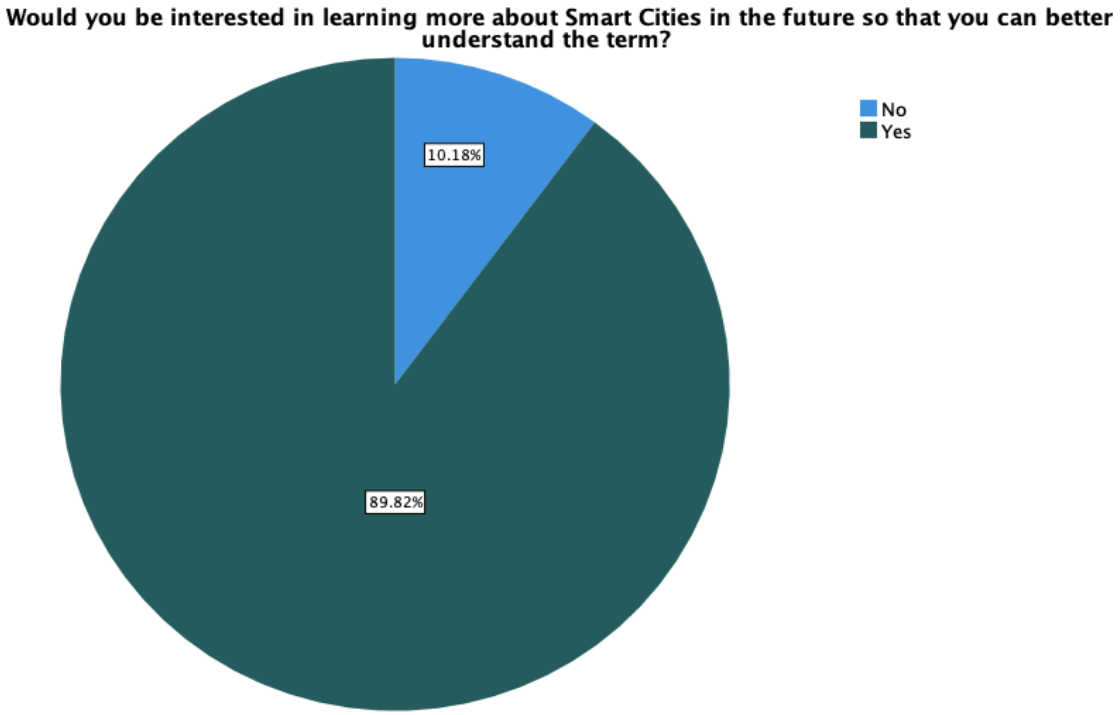

Figure 25: Results of question 27

Question 28 asks the "non-familiar" participants' opinions about whether the local authorities in their city have taken initiatives to inform them about the Smart City concept or not. The results have shown that over half of the respondents claimed that they don't think that this kind of initiative has been taken in their city, by answering "No" (50,4%). 43,4% of the participants showed unawareness on the subject while only 6,2% (which corresponds to only 14 out of 226 respondents) answered "Yes":

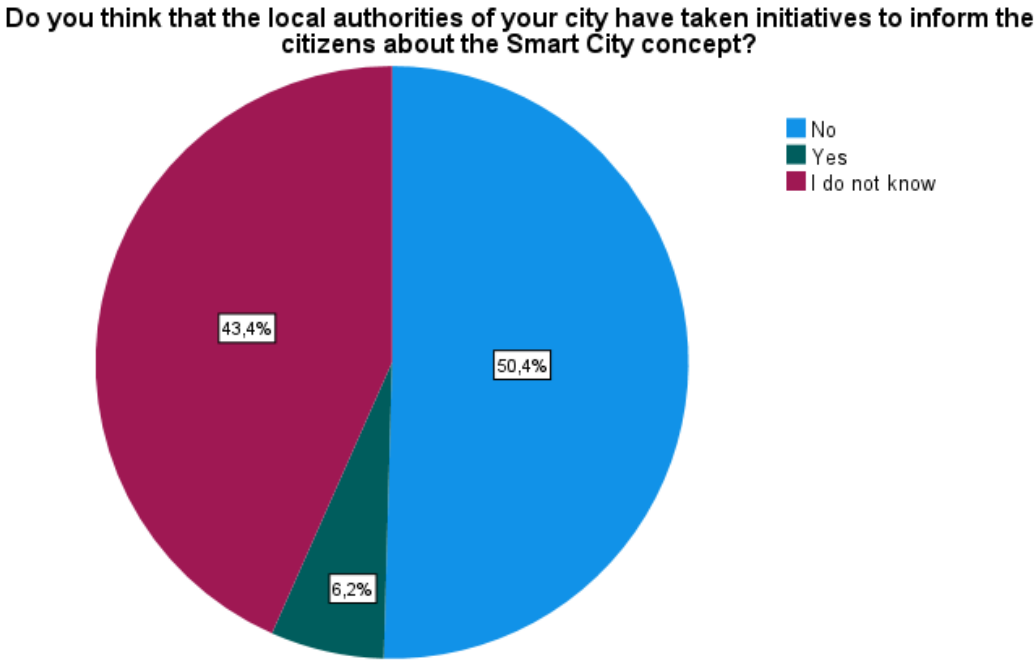

Figure 26: Results of question 28

Question 29 asks the "non-familiar" participants' opinions about whether the local authorities in their city have taken initiatives to promote the development of "smart" projects in the city they live, or not. Similar to the 28th question's results, the results show that a large amount of the respondents (39,4%) answered negatively. The percentage of the participants who showed unawareness on the subject was significantly high once again, even higher than that of those who answered negatively (46,5%). The percentage of those who answered "Yes" was once again low (14,2%) although a bit higher than the corresponding percentage in question 28:

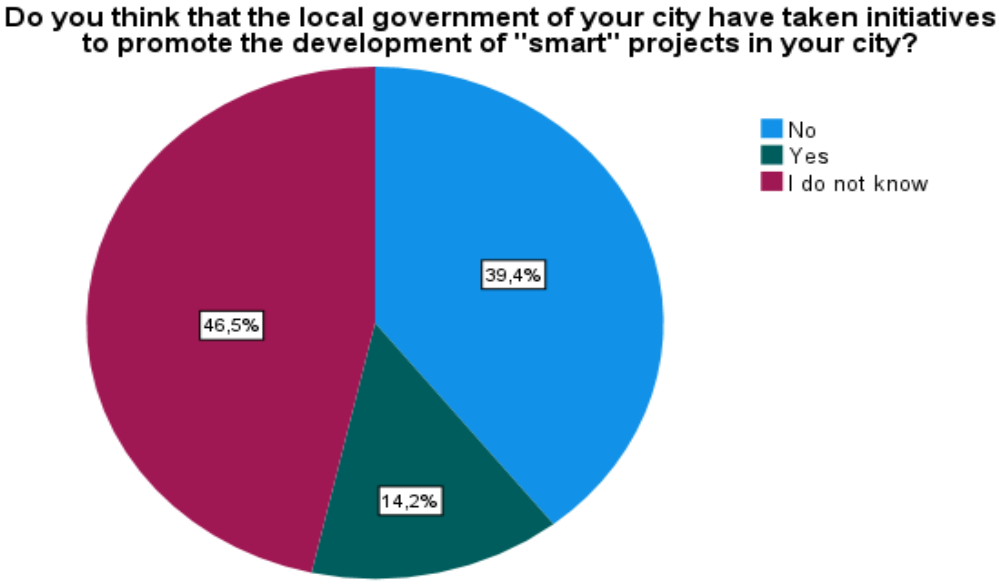

Figure 27: Results of question 29

Question 30 asks the “non-familiar” participants whether they would be willing to participate in the decision making for the development of their city via a digital platform or not. The vast majority of them (71,2%) answered “Yes”, while 27,4% did not appear to be sure. Only 1,4% showed no interest in taking part in decisions for projects related to their city:

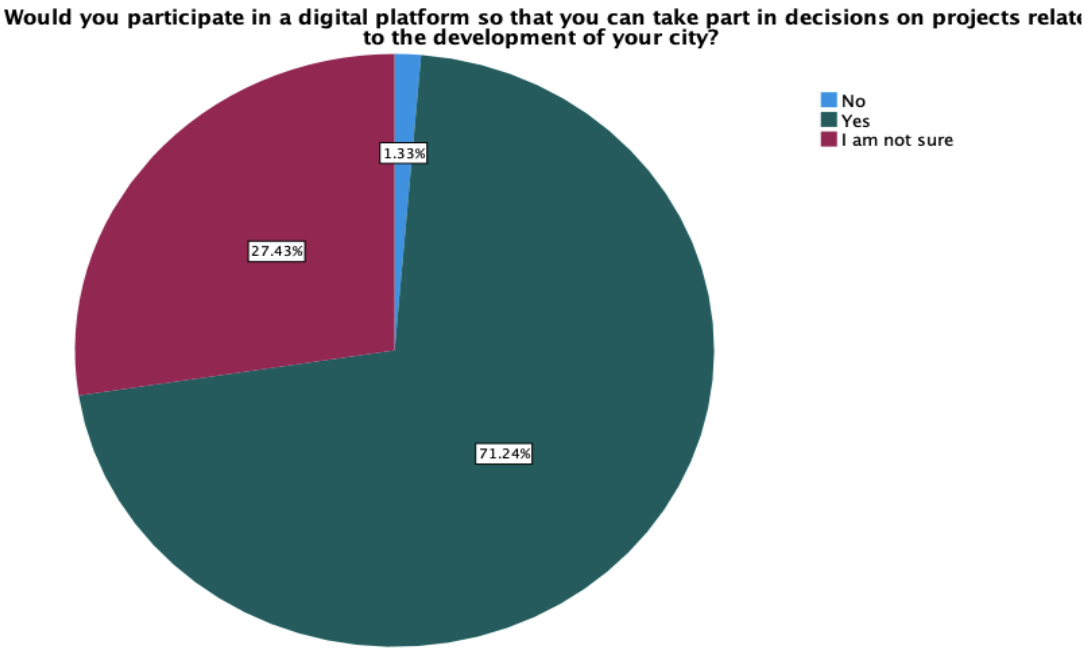

Figure 28: Results of question 30

The last question of the section was a multiple-choice question. Among a number of provided options, the participants were asked to choose those that they considered the most important to exist in a modern city (in their city). Each of the provided options (six in total) represented a fundamental smart city pillar. The concept of this question was to somehow get the opinion of the “non-familiar” respondents about which of the six pillars they consider more important, unawares, based on their general perception. The respondents were offered the capability of choosing from one (1) to three (3) options for the ones provided.

All of the six options were chosen by a quite significant number of respondents. However, the most popular choices were the “Respect of the environment and proper resource management” (chosen by 71,7% of the respondents - 163 in total) and the “Improved quality of life of citizens” (chosen by 63,3% of the respondents - 143 in total), options that correspond to “Smart Environment” and “Smart Living”. The least popular choice among the respondents was the “Easy transportation within the city” option, which collected the preference of 31,4% (71 out of 226) of them. As a result, the “non-familiar with the smart city concept” respondents opted

unawares for “Smart Environment” and “Smart Living” as the most important smart city pillars. The final results of the last question are presented in the figure below:

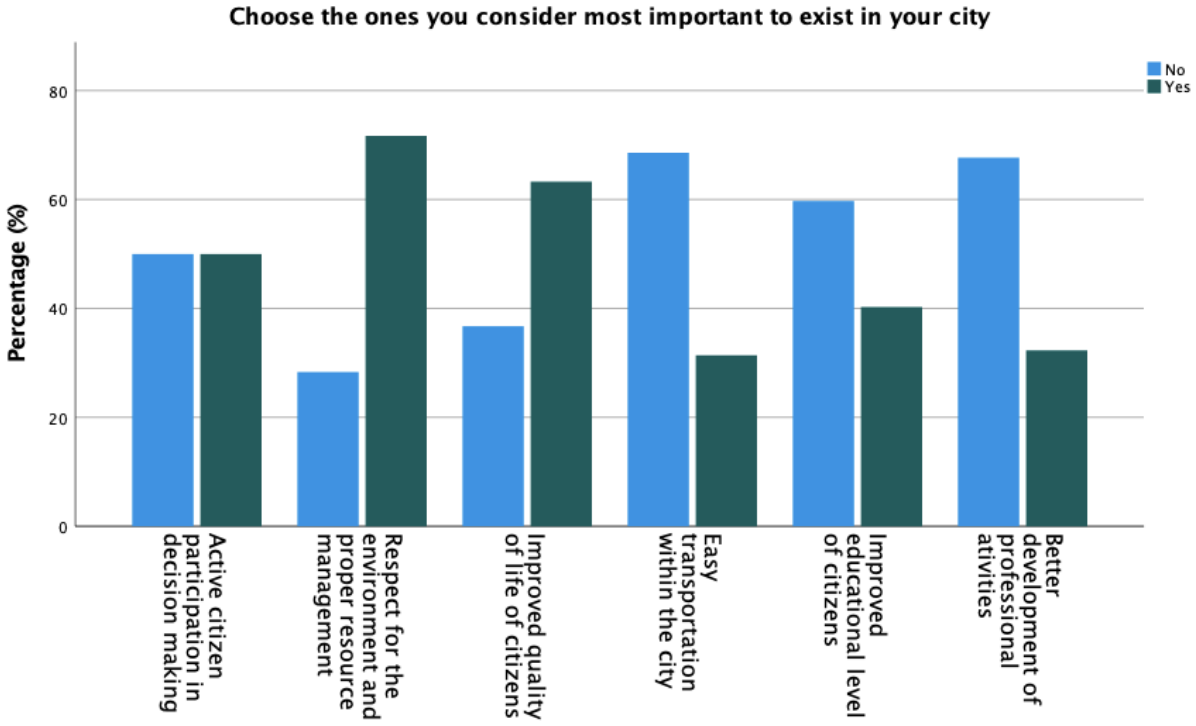

Figure 29: Results of question 31

4.3.4 Analysis of Research Questions

In this subchapter, the analysis of the research questions that are mentioned in subchapter 4.1 is presented, through relevant figures for each of them. Also, tests are applied in order to check if there is any kind of dependency between the categorical variables that are related to each research question.

1) ***How many of the citizens that have participated in the survey stated that they have heard about the “smart city” term? How is the result above formed when age, gender and city factors are taken into account?***

As the results of question 6 revealed, 319 out of 545 participants have stated that they have heard about the “smart city” term.

Is gender related to the fact that a participant has heard the term?

The Chi-Square statistic test was used to test if there is any relationship or dependence between the above variables. The test was performed in SPSS software. The results are shown in the below table:

Table 45: Chi Square test for research question 1 with "gender" as independent variable

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	16,396[a]	1	<,001		
Continuity Correction[b]	15,699	1	<,001		
Likelihood Ratio	16,475	1	<,001		
Fisher's Exact Test				<,001	<,001
Linear-by-Linear Association	16,366	1	<,001		
N of Valid Cases	545				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 110,72.

b. Computed only for a 2x2 table

This assumption has not been violated because 0 cells have expected count less than 5. The p-value ("Asymptotic Significance" column, first row-<0,001) is less than 0,05. This means that the result is statistically significant, and that the independence hypothesis is rejected. In other words, there is a dependency between the variables and this means that gender is indeed related with the fact that the participant has heard the term:

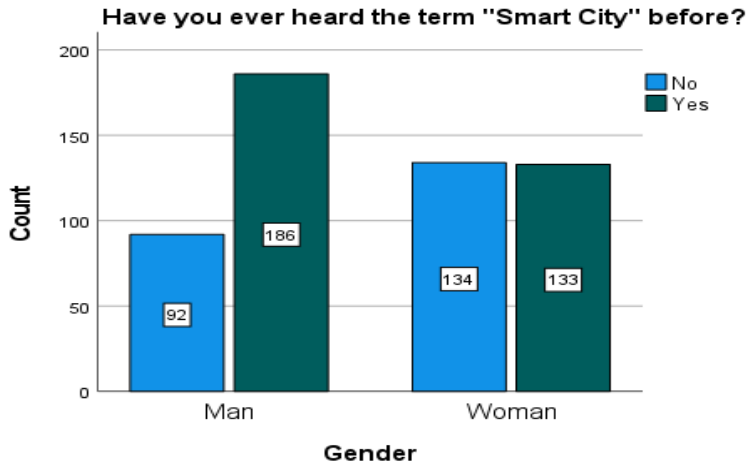

Figure 30: Results of the crosstabulation of the "gender" factor and of the responses in question 6

The above results show that 66,9% of men (186 out of 278 in total) claimed that they had heard the term, whereas 49,8% of women claimed the same (133 out of 267 in total). This shows that, based on the research, men are more familiar with the term "Smart City" than women.

Is age related with to fact that a participant has heard the term?

The Chi-square's test results in order to check if age plays any role in the fact that a person has heard the "smart city" term, are shown below:

Table 46: Chi Square test for research question 1 with "age" as independent variable

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8,807[a]	4	,066
Likelihood Ratio	8,806	4	,066
Linear-by-Linear Association	4,533	1	,033
N of Valid Cases	545		

a. 2 cells (20,0%) have expected count less than 5. The minimum expected count is 1,66.

This assumption has not been violated because no more than 20% of the cells have expected count less than 5. The p-value is 0,066> 0,05. This means that the independence hypothesis cannot be rejected. In other words, the variables are not likely to be associated, thus age is not a significant factor for a person that has heard the term before:

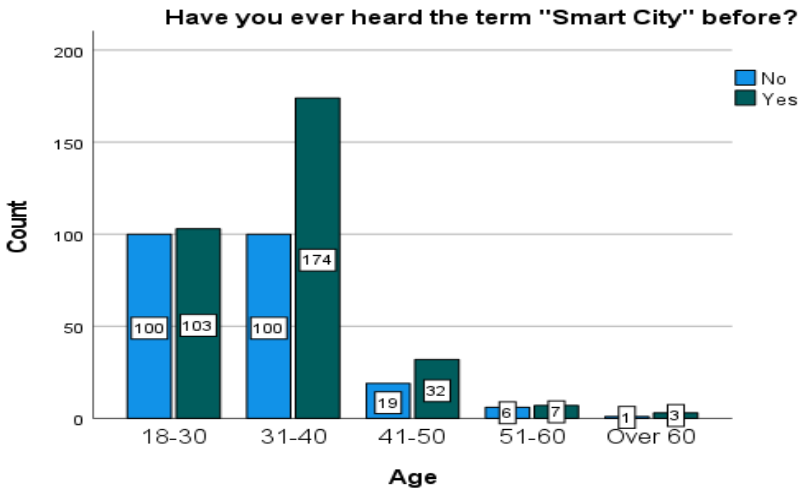

Figure 31: Results of the crosstabulation of "age" factor and of the responses in question 6

Is city a determinant factor for the fact that a participant has heard the term?

The analysis will be presented for the four big city categories of our research: “Thessaloniki”, “Athens” “Rest of Greece” and “Paphos”. The Chi-square’s test results in order to check if the city plays any role in the fact that a person has heard the “smart city” term, are shown below:

Table 47: Chi Square test for research question 1 with “city” as independent variable

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	10,885[a]	3	,012
Likelihood Ratio	11,002	3	,012
Linear-by-Linear Association	7,167	1	,007
N of Valid Cases	494		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 30,71.

This assumption has not been violated because 0 cells have expected count less than 5. The p-value is 0,012 < 0,05. This means that the result is statistically significant, and that the independence hypothesis is rejected. In other words, there is a dependency between the variables and this means that city is indeed related with the fact that the participant has heard the term:

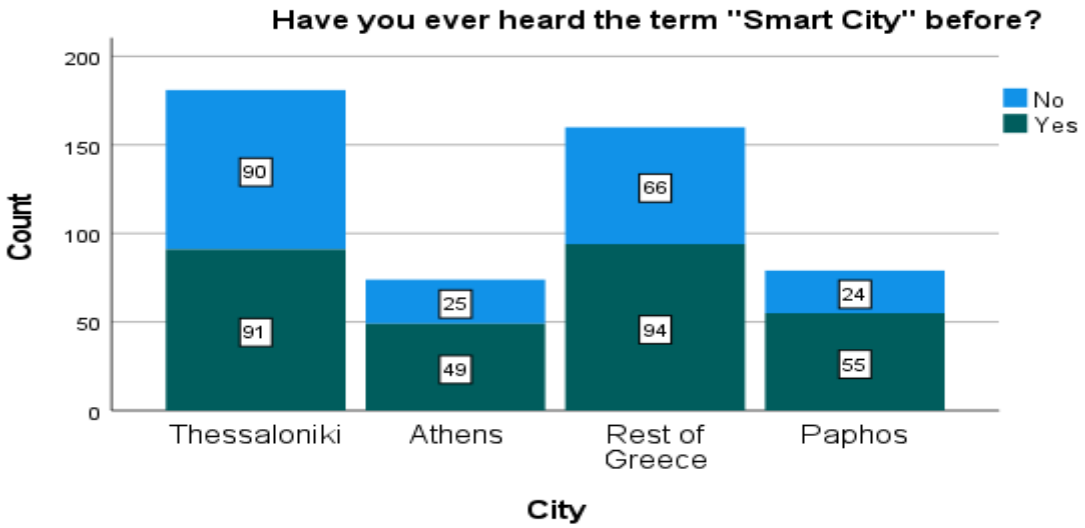

Figure 32: Results of the crosstabulation of “city” factor and of the responses in question 6

The above results show that, proportionally, the citizens of Paphos that have participated in the research have heard the term “smart city” before in a 69,6% percentage. The citizens of Athens

follow with 66,2% while those of "Rest of Greece" and "Thessaloniki" categories are in 58,8% and 50,3% correspondingly. These results show that, generally, the Cypriot citizens in Paphos are more familiar with the term, than the Greeks are. Out of the citizens in Greece, the Athenians seem to be more familiar with the term than the others living in Thessaloniki and in other Greek cities.

2) ***How many of the citizens that have participated in the survey state that they have a decent (or probably better) knowledge of what a smart city is? How is the result above formed when age gender and city factors are taken into account?***

The conclusion that emerged from the question 7 is that from the 319 participants that have heard the smart city term, 262 of them have a decent or even broader knowledge about it, whereas the rest of them (57) have not, and have just heard the term.

Is gender related to the fact that a participant has a decent (or broader) knowledge of the term?

The Chi-Square statistic test was used to test if there is any relationship or dependence between the above variables. The test was performed in SPSS software. The results are shown in the below table:

Table 48: Chi Square test for research question 2 with "gender" as independent variable

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2,408[a]	1	,121		
Continuity Correction[b]	1,970	1	,160		
Likelihood Ratio	2,381	1	,123		
Fisher's Exact Test				,139	,081
Linear-by-Linear Association	2,401	1	,121		
N of Valid Cases	319				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 23,76.

b. Computed only for a 2x2 table

This assumption has not been violated because 0 cells have expected count less than 5. The p-value is 0,121. This means that it is bigger than 0,05. Thus, the independence hypothesis cannot be rejected. In other words, the variables are not likely to be associated, thus gender is not a significant factor for a person that has a decent or broader knowledge of the term.

Table 49: Result of the above crosstabulation

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * Do you know what a smart city is?	319	58,5%	226	41,5%	545	100,0%

Gender * Do you know what a smart city is? Crosstabulation

			Do you know what a smart city is?		
			No	Yes	Total
Gender	Man	Count	28	158	186
		Expected Count	33,2	152,8	186,0
	Woman	Count	29	104	133
		Expected Count	23,8	109,2	133,0
Total		Count	57	262	319
		Expected Count	57,0	262,0	319,0

Is age related to the fact that a participant has a decent (or broader) knowledge of the term?

The Chi-Square statistic test's results are shown in the below table:

Table 50: Chi Square test for research question 2 with "age" as independent variable (Exact Method)

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	4,248[a]	4	,374	,358		
Likelihood Ratio	5,988	4	,200	,226		
Fisher-Freeman-Halton Exact Test	3,003			,511		
Linear-by-Linear Association	4,038[b]	1	,044	,053	,024	,010
N of Valid Cases	319					

a. 3 cells (30,0%) have expected count less than 5. The minimum expected count is ,54.

b. The standardized statistic is 2,009.

We notice that 30% of the cells have expected count less than 5. In this case, we cannot proceed by taking into consideration the p-value (Pearson Chi-Square – Asymptotic Significance) that is shown in the above table (0,374), because in this case, this assumption will be considered as

violated. Therefore, we check the "Fisher-Freeman-Halton Exact Test" value. This value is taken into consideration instead of p-value when over 20% of the cells have expected count less than 5, in order to test if there is any relationship or dependence between the variables [72]. If this value is >0,05, then there is no kind of dependance between the variables that are examined. Otherwise, the variables are associated with each other. In this case, the Fisher-Freeman-Halton value is 0,511 > 0,05. Thus, the independence hypothesis cannot be rejected. In other words, the variables are not likely to be associated, thus age is not a significant factor for a person that has a decent or broader knowledge of the term.

Table 51: Result of the above crosstabulation

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Age * Do you know what a smart city is?	319	58,5%	226	41,5%	545	100,0%

Age * Do you know what a smart city is? Crosstabulation

			Do you know what a smart city is?		
			No	Yes	Total
Age	18-30	Count	23	80	103
		Expected Count	18,4	84,6	103,0
	31-40	Count	30	144	174
		Expected Count	31,1	142,9	174,0
	41-50	Count	4	28	32
		Expected Count	5,7	26,3	32,0
	51-60	Count	0	7	7
		Expected Count	1,3	5,7	7,0
	Over 60	Count	0	3	3
		Expected Count	,5	2,5	3,0
Total		Count	57	262	319
		Expected Count	57,0	262,0	319,0

Is city a determinant factor for the fact that a participant has a decent (or broader) knowledge of the term?

The analysis will be presented for the four big city categories of our research: “Thessaloniki”, “Athens” “Rest of Greece” and “Paphos”. The Chi-square’s test results in order to check if the city plays any role in the fact that a person knows what the “smart city” term is, are shown below:

Table 52: Chi Square test for research question 2 with “city” as independent variable

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7,534[a]	3	,057
Likelihood Ratio	7,481	3	,058
Linear-by-Linear Association	4,559	1	,033
N of Valid Cases	289		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 8,99.

This assumption has not been violated, according to the results. The p-value is 0,057> 0,05. This means that the independence hypothesis cannot be rejected. In other words, the variables are not likely to be associated, thus city is not a significant factor for a person that knows what “smart city” means.

Table 53:Results of the above crosstabulation

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
City * Do you know what a smart city is?	289	58,5%	205	41,5%	494	100,0%

City * Do you know what a smart city is? Crosstabulation

			Do you know what a smart city is?		
			No	Yes	Total
City	Thessaloniki	Count	20	71	91
		Expected Count	16,7	74,3	91,0
	Athens	Count	14	35	49
		Expected Count	9,0	40,0	49,0
	Rest of Greece	Count	13	81	94
		Expected Count	17,2	76,8	94,0
	Paphos	Count	6	49	55
		Expected Count	10,1	44,9	55,0
Total		Count	53	236	289
		Expected Count	53,0	236,0	289,0

3) ***How many of the participants believe that actions have been made in their city, so that it can be transformed into a smart city in a holistic way? How is this result formed when the city factor is taken into account?***

The hypothesis' question here is the following: ***Is the city factor related to the fact that a participant's belief is that actions have been made to their city, so that it can be transformed into a smart city***?

For this crosstabulation, the analysis was performed for all city categories. The Chi-square test results are shown in the table below (by using the "Exact" method):

Table 54: Chi square test for the research question No 3 with city as independent value (Exact Method)

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	51,448[a]	10	<,001	.[b]		
Likelihood Ratio	51,179	10	<,001	.[b]		
Fisher-Freeman-Halton Exact Test	.[b]			.[b]		
Linear-by-Linear Association	18,443[c]	1	<,001	<,001	<,001	,000
N of Valid Cases	319					

a. 4 cells (22,2%) have expected count less than 5. The minimum expected count is 1,79.

b. Cannot be computed because there is insufficient memory.

c. The standardized statistic is 4,295.

We notice that 22,2% of the cells have expected count less than 5. In this case, we should check the "Fisher-Freeman-Halton" value. However, when using the "Exact Method", the results for "Fisher-freeman-Halton" test cannot be obtained ("*Cannot be computed because there is insufficient memory*"). Therefore, the Chi-Square Tests have been calculated again, by using the "Monte Carlo" method. This method is used when we cannot obtain the results we want by "Exact Method" [71]. The test results that accrued by using the Monte Carlo method are shown below:

Table 55: Chi square test for the research question No 3 with city as independent value (Monte Carlo Method)

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Monte Carlo Sig. (2-sided)			Monte Carlo Sig. (1-sided)		
				Significance	99% Confidence Interval Lower Bound	Upper Bound	Significance	99% Confidence Interval Lower Bound	Upper Bound
Pearson Chi-Square	51,448[a]	10	<,001	,000[b]	,000	<,001			
Likelihood Ratio	51,179	10	<,001	,000[b]	,000	<,001			
Fisher-Freeman-Halton Exact Test	48,185			,000[b]	,000	<,001			
Linear-by-Linear Association	18,443[c]	1	<,001	<,001[b]	,000	<,001	<,001[b]	,000	<,001
N of Valid Cases	319								

a. 4 cells (22,2%) have expected count less than 5. The minimum expected count is 1,79.

b. Based on 10000 sampled tables with starting seed 957002199.

c. The standardized statistic is 4,295.

The Monte Carlo estimation of 0,000 for the "Fisher-Freeman-Halton" p-value is based on 10.000 random samples from the reference set, using a specific starting seed [71]. According to the Monte Carlo way, there is an estimation of 99% that the p-value is within the confidence interval (Lower Bound, Upper Bound). "Fisher-Freeman-Halton" p-value is 0,000 < 0,05 as the "Significance" column indicates. This means that the result is statistically significant, and that the independence hypothesis is rejected. In other words, there is a dependency between the variables and this means that city is indeed related with the belief of a participant that actions have been made to their city, so that it can be transformed into a "smart" one.

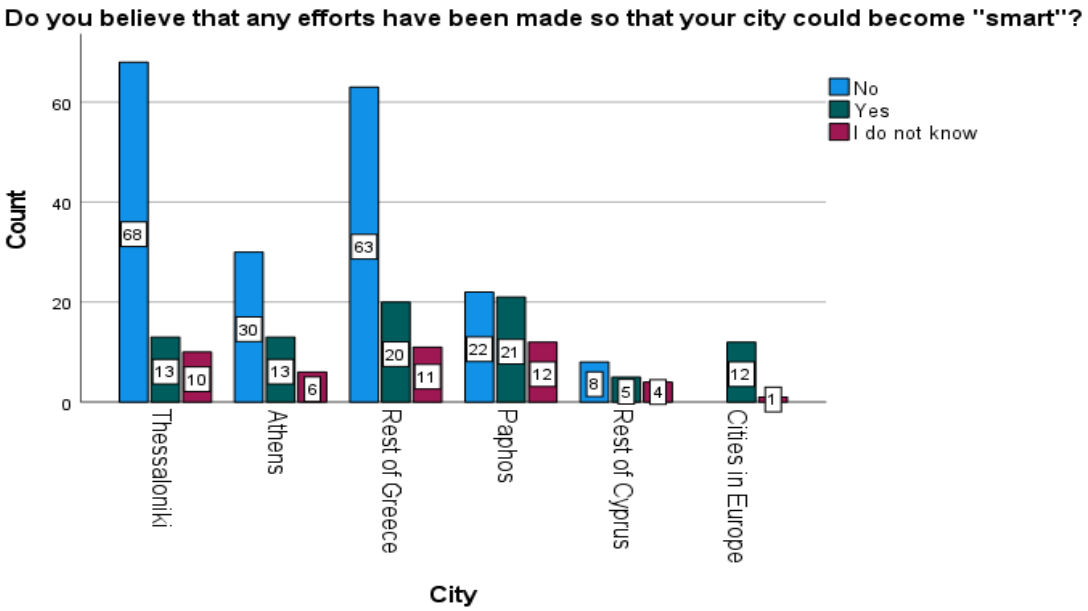

Figure 33: Count results of the crosstabulation among the variables of the 3rd research question

It is clear that the "Yes" answers that were given from the citizens of Greece are relatively low in percentages (14,3% from Thessaloniki's citizens, 26,5% from Athenians and 21,3% from

citizens that live in other cities of Greece). However, the correspondent answer has been chosen from a bigger proportion of the citizens of Paphos (38,2% answered "Yes") and from even bigger proportion of citizens of other European countries (92,3%). This shows that citizens in Paphos generally appear to believe that efforts have been made in their city in order to become smart in a proportionally higher percentage than citizens living in Greece. Also, a great percentage of citizens that live in other countries who have heard the term, seem that the local authorities of the city have made efforts for their city to develop into a smart one.

4) ***Which are considered as the most important challenges for the development of a smart city, according to the participants? How do these results form, when the city factor is taken into account?***

The hypothesis' question here is the following: ***Is city a determinant factor for a participant's belief about the biggest challenge for the development of a smart city?***
For this crosstabulation, the analysis was performed for the four biggest categories of our research. The Chi-square test results are shown in the table below:

Table 56: Chi-square test for the 5th research question

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	14,537[a]	12	,268
Likelihood Ratio	17,183	12	,143
Linear-by-Linear Association	6,198	1	,013
N of Valid Cases	289		

a. 4 cells (20,0%) have expected count less than 5. The minimum expected count is ,85.

This assumption has not been violated because no more than 20% of the cells have expected count less than 5. The p-value is 0,268 > 0,05. This means that the independence hypothesis cannot be rejected. In other words, the variables are not likely to be associated, thus city is not a determinant factor for a participant's belief about the biggest challenge for the development of a smart city.

Table 57: Count results for the 5th research question

City * Which is the biggest chalenge for the development of a "smart city"? Crosstabulation

Count

		Citizens' participation/service	The cooperation between public and private sector	Transparency in decisions of municipal authorities	The development of complete business movements	Other	Total
City	Thessaloniki	21	24	19	24	3	91
	Athens	11	14	11	11	2	49
	Rest of Greece	19	31	23	21	0	94
	Paphos	18	20	12	5	0	55
Total		69	89	65	61	5	289

5) ***Does the "Education level" factor determines the way that the number of non-familiar participants is formed?***

The Chi-square test results of this hypothesis' question are shown in the table below:

Table 58: Chi square test for the research question No 5 with "education" as independent value (Exact Method)

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	23,561[a]	5	<,001	<,001		
Likelihood Ratio	24,892	5	<,001	<,001		
Fisher-Freeman-Halton Exact Test	23,958			<,001		
Linear-by-Linear Association	21,895[b]	1	<,001	<,001	<,001	,000
N of Valid Cases	545					

a. 4 cells (33,3%) have expected count less than 5. The minimum expected count is 2,49.

b. The standardized statistic is 4,679.

We notice that 33,3% of the cells have expected count less than 5. In this case, we check the "Fisher-Freeman-Halton" p-value. Since it is lower that 0,05, the result is statistically significant, and the independence hypothesis is rejected. In other words, there is a dependency between the variables and this means that education is indeed related with the fact that a participant is or is not familiar with the term:

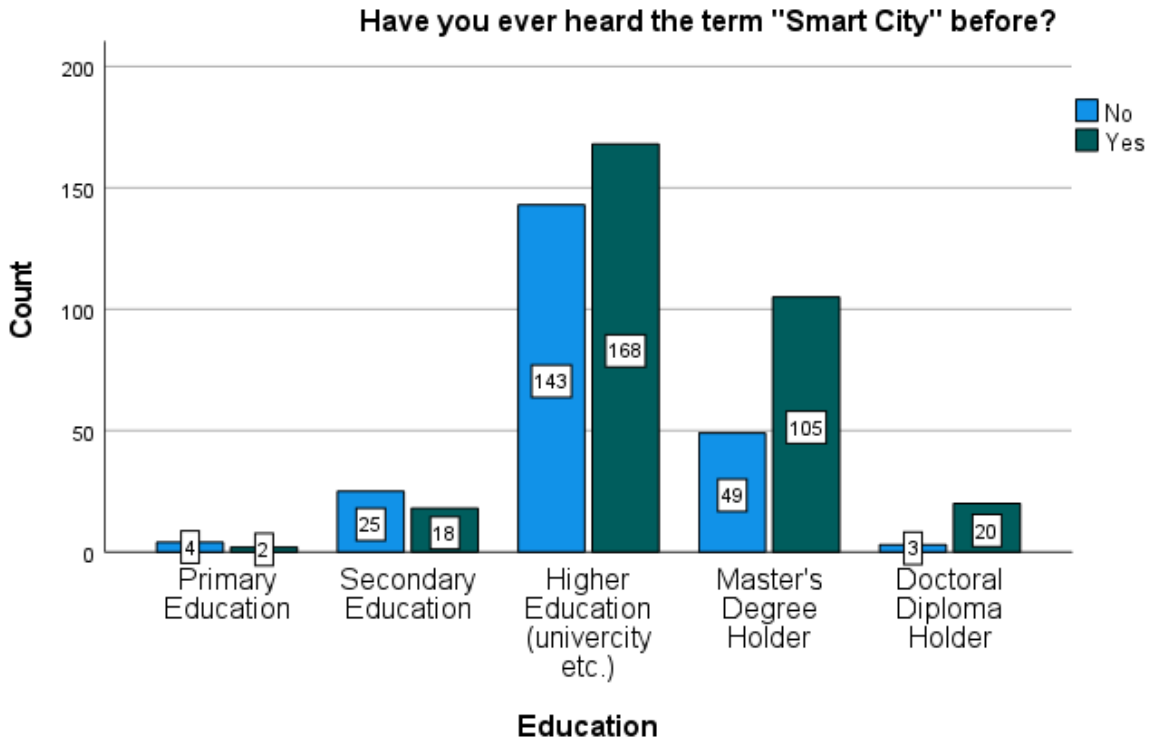

Figure 34: Count results of the crosstabulation among the variables of the 6th research question

It is clearly concluded that most of those who have a lower educational level (secondary education and below) tend to be non-familiar with the smart city term, whereas most of those who have a high educational level ("Higher education" and above) tend to be more familiar with it, by even just having heard of it.

6) ***Are the non-familiar participants interested in acquiring further information for the smart city concept in the future? How is their opinion affected by their age and city?***

The first hypothesis' question here is this: ***Is age a determinant factor regarding the participants' interest for further learning about "Smart Cities" in the future?***

The chi-square test results are presented below:

Table 59: Chi square test for the research question No 6 with "age" as independent value (Exact Method)

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	3,412[a]	4	,491	,435		
Likelihood Ratio	4,106	4	,392	,391		
Fisher-Freeman-Halton Exact Test	3,064			,562		
Linear-by-Linear Association	3,239[b]	1	,072	,084	,041	,022
N of Valid Cases	226					

a. 4 cells (40,0%) have expected count less than 5. The minimum expected count is ,10.

b. The standardized statistic is 1,800.

We notice that 40% of the cells have expected count less than 5. In this case, we check the "Fisher-Freeman-Halton" -value. Since 0,562 > 0,05, the independence hypothesis cannot be rejected. In other words, the variables are not likely to be associated, thus age is not a determinant factor regarding the participants' interest for further learning about "Smart Cities" in the future.

The second hypothesis' question for this research question is: ***Is city a determinant factor regarding the participants' interest for further learning about "Smart Cities" in the future?***

The chi-square test results are presented below:

Table 60: Chi square test for the research question No 6 with "city" as independent value (Exact Method)

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	3,131[a]	5	,680	,690		
Likelihood Ratio	4,565	5	,471	,570		
Fisher-Freeman-Halton Exact Test	2,419			,779		
Linear-by-Linear Association	1,078[b]	1	,299	,321	,169	,037
N of Valid Cases	226					

a. 4 cells (33,3%) have expected count less than 5. The minimum expected count is ,92.

b. The standardized statistic is 1,038.

We notice that 33,3% of the cells have expected count less than 5. In this case, we check the "Fisher-Freeman-Halton" p-value. Since 0,779 > 0,05, the independence hypothesis cannot be rejected. In other words, the variables are not likely to be associated, thus city is not a

determinant factor regarding the participants' interest for further learning about "Smart Cities" in the future.

To sum up, the results have shown that most of the participants are interested in learning new things about the smart city concept in the future, regardless of their age and the city they live.

7) ***How many of the non-familiar participants believe that the local authorities have taken initiatives for the citizens' information about the "smart city" concept? How are the preferences affected by the city that the participants live?***

The hypothesis' question for this research question is: ***Does city affect the belief that the local authorities have taken initiatives for the citizens' information about the "smart city" concept*****?**

The Chi square test that was calculated, revealed the following results:

Table 61: Chi square test for the research question No 7 with "city" as independent value (Exact Method)

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	32,217[a]	10	<,001	.[b]		
Likelihood Ratio	30,195	10	<,001	.[b]		
Fisher-Freeman-Halton Exact Test	.[b]			.[b]		
Linear-by-Linear Association	,730[c]	1	,393	,402	,204	,013
N of Valid Cases	226					

a. 7 cells (38,9%) have expected count less than 5. The minimum expected count is ,56.

b. Cannot be computed because there is insufficient memory.

c. The standardized statistic is ,854.

We notice that 38,9% of the cells have expected count less than 5. In this case, we should check the "Fisher-Freeman-Halton" p-value. However, when using the "Exact Method", the results for "Fisher-freeman-Halton" test cannot be obtained ("*Cannot be computed because there is insufficient memory*"). Therefore, the Chi-Square Tests have been calculated again, by using the "Monte Carlo" method. The test results that accrued by using the Monte Carlo method are shown below:

Table 62: Chi square test for the research question No 7 with "city" as independent value (Monte Carlo Method)

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Monte Carlo Sig. (2-sided)			Monte Carlo Sig. (1-sided)		
				Significance	99% Confidence Interval Lower Bound	Upper Bound	Significance	99% Confidence Interval Lower Bound	Upper Bound
Pearson Chi-Square	32,217[a]	10	<,001	,001[b]	<,001	,002			
Likelihood Ratio	30,195	10	<,001	<,001[b]	<,001	,002			
Fisher-Freeman-Halton Exact Test	27,587			<,001[b]	<,001	,001			
Linear-by-Linear Association	,730[c]	1	,393	,407[b]	,394	,419	,204[b]	,193	,214
N of Valid Cases	226								

a. 7 cells (38,9%) have expected count less than 5. The minimum expected count is ,56.

b. Based on 10000 sampled tables with starting seed 475497203.

c. The standardized statistic is ,854.

"Fisher-Freeman-Halton" p-value is <0,05. This means that the result is statistically significant, and that the independence hypothesis is rejected. In other words, there is a dependency between the variables and this means that city affects the belief that the local authorities have taken initiatives for the citizens' information about the "smart city" concept:

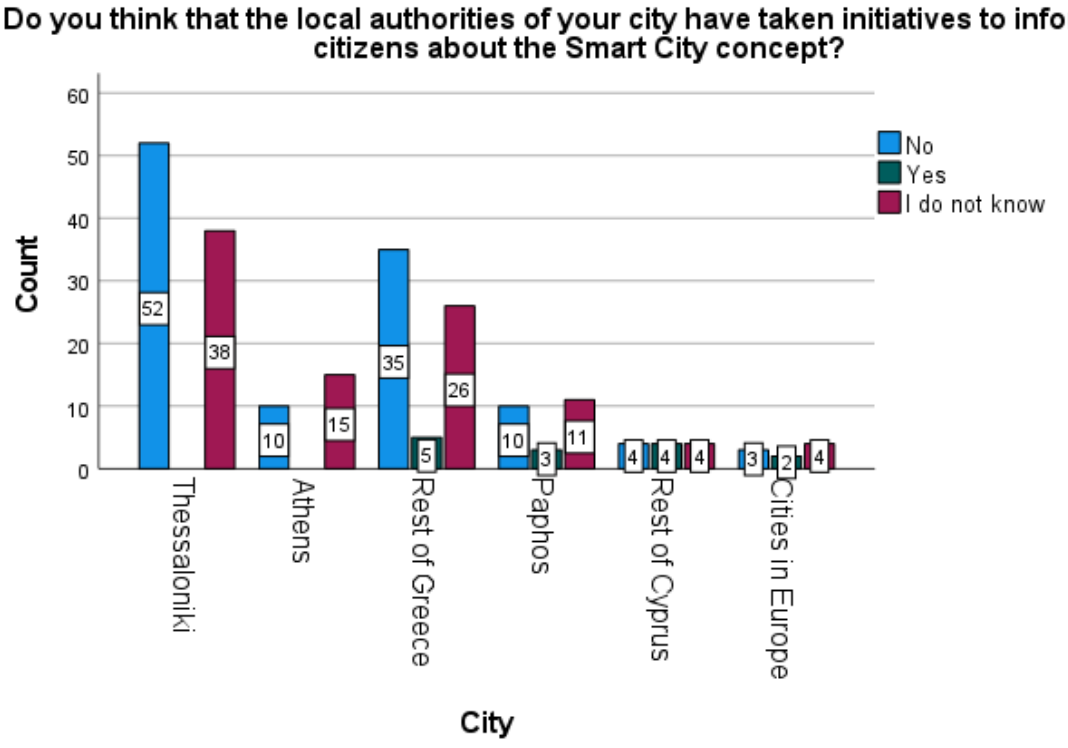

Figure 35: Count results of 9th research question

None of the "non-familiar with the smart city term" citizens of Thessaloniki or Athens thinks that initiatives have been taken for their information about the "smart city" concept. In the rest

cities on Greece as well as in Paphos, a very small number of them believes the opposite. In general, negativity and ignorance prevail for all the city categories.

Conclusions

The smart city concept is becoming a megatrend and appears to emerge globally. The development of smart cities seems to have become mandatory, as it allows cities all over the world to cope with the challenges that are derived from increasing urbanization and population growth. The smart city concept already holds the potential to address aspects of the sustainability challenge by promoting citizen participation, developing innovative and smart solutions for sustainability, and adopting a transparent governance system.

Through this work, we firstly presented a number of already existing surveys regarding the effects, the benefits, and the impact of smart cities on citizens' lives. Most of these surveys emphasized a common denominator: the citizens' participation in the decision making for the development of a Smart City. When actively participating, the citizens' opinion and perception regarding a Smart City advantages become more holistic and appreciable. The results of the presented surveys revealed how important is the citizens' role for a Smart City project to be developed.

Consequently, we analyzed the term "Sustainable Development", which plays a central role in encountering various concerns, mostly environmental, social, and economical. Moreover, we analyzed the Smart City term by presenting a number of definitions that conclude the tasks, benefits, and offers of a Smart City. We also presented and analyzed the six fundamental dimensions of a Smart City and underlined the importance of each of them for a better overall quality of life for the citizens.

In order to make this work more specific, we proceeded by doing a survey. The purpose of this survey was mainly to examine the perception that the Greek and Cypriot citizens have, regarding the Smart City concept, as well as to reveal their beliefs about the current level of "smartness" that appears in the city they live in. Since Greek cities have not delved into the smart city concept and applications at an advanced and holistic level, we decided to examine the standpoints of Greek and Cypriot citizens regarding the implementation of smart city elements into Greek and Cypriot cities through quantitative research. Since the questionnaire that was used for this research as a tool for collecting data was provided in an e-version, we are aware of the limitation that accrues: only citizens with internet access were able to participate. Another limitation comes from the fact that the choice of the participants was totally random; since we addressed to an audience that has generally a small experience regarding the Smart City concept, we did not focus on experts to fill in the questionnaire. We

proceeded by this way in order to get the opinion and perception of random Greek and Cypriot adult citizens about the subject. It is worth mentioning here that 87,5% of the participants who opted for filling the questionnaire were from 18 to 40 years old. This result reveals that younger people are probably more interested in indulging in the Smart City concept.

Most of the respondents had a high educational level, meaning that most of them are University graduates. Also, although the Greek respondents appeared to live in places all over Europe, most of them that filled in the questionnaire live in Greece and Cyprus (90,7% in total, combined). Only a total of 22 Greek citizens were inhabitants of other European countries. Thus, for a major part of the review, we considered the number of Greek citizens that live in foreign countries insignificant. Generally, we focused on four city categories: Thessaloniki, Athens, the Rest of Greece, and Paphos.

Regarding the "Smart City" term, 319 out of 545 participants (58,5%) stated that they have already heard it. 48,1% (262 out of the total 545) of the Greek participants stated that not only have they heard the "Smart City" term before, but they also have a decent (or broader) knowledge of what "Smart City" stands for. This is quite encouraging, especially for the citizens of Greece, where there is not a "pure" Smart City till today. The conclusions that accrued from the above results show that most of the people who have heard the term are men; thus, gender is a contributory factor for those who have heard the term. Also, overall, the Cypriot citizens in Paphos seem to know better what a "Smart City" is than the citizens of Thessaloniki, the Athenians, and those who live in other cities in Greece. When isolating the participants that live in Greece, the Athenians seem to have a broader knowledge of the term than citizens of Thessaloniki and those who live in other cities of Greece, proportionately. This happened because Athens is the capital of Greece and its citizens probably have better information from the local authorities about the Smart City concept. It is also worth mentioning that, according to the survey analysis and results, most of those who have a lower educational level (secondary education and below) tend to be non-familiar with the smart city term, whereas most of those who have a high educational level ("Higher education" and above) tend to be more familiar with it, by even just having heard of it.

Consequently, the survey's results revealed that most of the participants consider "Efficient use of energy" and "Sustainable development" as the factors that correlate the most with the smart city concept.

Generally, a large number of participants indicated that they do not believe that any actions have been made in their city in order to become smart. Of those who indeed believe that there

has been some action, most of them stated that they had noticed actions in environment and mobility categories. Another conclusion that emerged from the survey analysis is that citizens in Paphos generally appear to believe that efforts have been made in their city in order to become smart in a proportionally higher percentage than citizens living in Greece.

About the most important challenges for the development of a smart city, the survey revealed that the cooperation of the private and public sector is the biggest of them, according to the participants. The city factor does not appear to be determinant for this result.

For the participants that do not appear to be familiar with the smart city term, a number of conclusions also accrue. The fact that almost 90% of the non-familiar participants claimed that they are interested in acquiring further information about Smart Cities in the future is very promising. The age and city factors do not appear to be determinant for this result.

Another interesting conclusion is that none of the "non-familiar with the smart city term" citizens of both Thessaloniki and Athens thinks that initiatives have been taken for their information about the "smart city" concept. A very small number of the citizens that live in other cities in Greece, as well as in Paphos, believes the opposite. In general, negativity and ignorance prevail for all the city categories regarding the initiatives that the local authorities have taken for informing the citizens about smart cities.

Finally, the "caretaking of the environment and the proper resource management" is the option that the non-familiar participant chose as the most important to exist in their city.

Hopefully, this thesis can contribute to the exciting research within smart cities and may help in maximizing the potential for the smart city concept to stand as a solution for sustainability in our increasingly urbanized world.

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Questionnaire's Appendix

Smart City Questionnaire

Section 1: Demographic Features

1. **Gender**

   □ Male
   □ Female

2. **Age**

   □ 18-30
   □ 31-40
   □ 41-50
   □ 51-60
   □ Over 60

3. **Education**

   □ Primary Education
   □ Secondary Education
   □ Higher Education (Univercity etc.)
   □ Master's Degree Holder
   □ Doctoral Diploma Holder
   □ Other

4. **Occupation**

- □ Civil Employee
- □ Private Employee
- □ Self-Employed/Freelancer
- □ College Student
- □ Retired
- □ Unemployed
- □ Other

5. **City**

- □ Thessaloniki
- □ Athens
- □ Paphos
- □ Rest of Greece
- □ Rest of Cyprus
- □ Other European Countries

6. **Have you ever heard the term "Smart City" before?**

- □ Yes
- □ No

Section 2: Smart Cities

7. **Do you know what a Smart City is?**

- □ Yes
- □ No

8. **To what extend do you believe that the following options correlate with the "Smart City" concept?**

	Not Important at all	Less Important	Moderately Important	Quite Important	Very Important
Modern management (modern public administration, where emphasis is placed on citizens' participation in the planning and decision-making of their city)					
ICT (information and communication technologies)					
Sustainable development (development, mainly economic, implemented by taking into account the protection of the environment and the production of abundant / inexhaustible natural resources)					
Efficient use of energy					
Citizens' involvement in public decision making- Interaction between citizens and government					
Urban Mobility (smooth and easy way of transporting the citizen within the city, with the least possible environmental burden)					

9. Do you think that efforts have been made in order your city to be transformed into a "Smart City"?

□ Yes
□ No
□ I do not know

10. If yes, in which of the following sectors have you noticed any kind of activity? (you can select more than one choice)

□ Governance (e.g. citizen interaction with authorities, citizen participation in decision making, e-government, e-elections, etc.)
□ Environment (e.g. energy meters, waste and water management, building management, environmental factor measurements, etc.)
□ Living (e.g. health and safety of citizens, prevention and detection of problems in the city, social cohesion, etc.)
□ Mobility (e.g. road infrastructure, public transport, traffic management, etc.)
□ Human capital (e.g. education, promotion of lifelong learning, etc.)

□ Economy (e.g. promotion of local businesses, promotion of innovation, support of business initiatives, etc.)

11. In which of the following areas do you think improvements need to be made in the city where you live? (you can select more than one choice)

□ Governance (e.g. citizen interaction with authorities, citizen participation in decision making, e-government, e-elections, etc.)
□ Environment (e.g. energy meters, waste and water management, building management, environmental factor measurements, etc.)
□ Living (e.g. health and safety of citizens, prevention and detection of problems in the city, social cohesion, etc.)
□ Mobility (e.g. road infrastructure, public transport, traffic management, etc.)
□ Human capital (e.g. education, promotion of lifelong learning, etc.)
□ Economy (e.g. promotion of local businesses, promotion of innovation, support of business initiatives, etc.)

12. Evaluate the six smart city pillars, based on their importance

	Not Important at all	Less Important	Moderately Important	Quite Important	Very Important
Citizens' participation in the decisions of their municipality (Smart Governance)					
Respect for the environment and proper resource management (Smart Environment)					
Better quality of life of citizens (Smart Living)					
Easy transportation within the city (Smart Mobility)					
Level of education of citizens (Smart People)					
Better business activities (Smart Economy)					

13. To what extend do you think that the following fundamental pillars of a Smart City appear in your city?

	Not at all	A bit	Moderately	Quite	A lot

Smart Governance					
Smart Environment					
Smart Living					
Smart Mobility					
Smart People					
Smart Economy					

14. In your opinion, how important are the following results that a Smart City offers?

	Not important at all	Less Important	Moderately Important	Quite Important	Very Important
Better city governance					
Better health conditions					
Improved citizens' education					
Better transport conditions by private vehicle					
Improving public transport					
Entrepreneurship development					
Greater citizen participation in decision-making					
Improving city's cleanliness					
Increasing the security of citizens					
Greater access to data (transparency)					
Local business development					
Increase of job vacancies					
Greater environmental protection					
More efficient energy consumption					

15. Which is the biggest challenge for a development of a "Smart City"?

- □ Citizens' participation/service
- □ Cooperation between public and private sector
- □ Transparency in decisions of municipal authorities
- □ Development of complete business movements
- □ Other

16. To what extend do you think the following factors make it difficult for a city to become "Smart"?

	Zero	Low	Moderate	Quite High	Very High
Technical constraints/Lack of infrastructure					
Difficulties in moving from pilot projects to larger projects					
Financial constraints					
Legislative difficulties					
Lack of interest from citizens					
Lack of information					
Environmental limitations					
Lack of vision from local governemt officials					

17. (Empty question for "branch" option purposes)

Section 3: Smart City Applications

A number of applications-actions that contribute to the development of a "Smart City" is presented below. These applications are grouped below into categories, which belong to the six basic dimensions of a Smart City (Smart Governance, Smart Environment, Smart Living, Smart Economy, Smart Citizens, Smart Mobility). Based on your personal opinion, please

declare how important each of the following applications is for turning your city into a "Smart City".

18.ICT (Information and Communication Technology) category

	I do not know	Not Important	Less Important	Quite Important	Very Important	Extremely Important
Wireless network development for free internet access in public areas						
Fiber optic network development						
Hardware and software development of the municipality's computers for better online service of the citizens						
Instalation of electroinic boards for real-time information (for local news, weather conditions etc.)						
Citizen service line development for complaint declaration						

19.Environment category

	I do not know	Not Important	Less Important	Quite Important	Very Important	Extremely Important
Sensor installation for measurements of environmental phenomena (electromagnetic radiation, noise, air pollution, temperature, rainfall level, etc.)						
Sensor installation for light level measurements for saving energy						
Sensor installation in waste bins for completeness information						
Use of alternative fuels in public transportation						
Water measurement and leak monitoring systems						

20.Transportation/Mobility category

	I do not know	Not Important	Less Important	Quite Important	Very Important	Extremely Important
Real-time traffic management applications						

Use of pedestrian crossing systems for easier movement						
Sensor installation in public transportation for traffic load monitoring						
Car-parking sensor installation for information and guidance of drivers in free spaces						
Creation and promotion of alternative fuel vehicles						

21.Healthcare category

	I do not know	Not Important	Less Important	Quite Important	Very Important	Extremely Important
Development of remote monitoring systems for vulnerable social groups						
Development of applications for monitoring the progress of the patients						
Development of telemedicine systems						

22.Sustainable Development category

	I do not know	Not Important	Less Important	Quite Important	Very Important	Extremely Important
Installation of photovoltaic elements in public facilities						
Energy saving from municipal lighting						
Awareness actions for the citizens for saving energy						
Fuel consumption measurement of public vehicles						
Telemetry systems for remote controls (e.g. sensors for monitoring oil consumption, gas, electricity etc.)						

23.Culture and Tourism category

	I do not know	Not Important	Less Important	Quite Important	Very Important	Extremely Important
Development of local electronic tourist guide						

Creation of travel content applications for smart devices						
Content digitalization of historical and archeological sites						
Development of cultural spaces in abandoned areas						

24.Economy/Economic Development category

	I do not know	Not Important	Less Important	Quite Important	Very Important	Extremely Important
Actions for promoting local products through the municipality's website						
Interactive consulting services for new entrepreneurs via public online platforms						
Job finding actions through the municipality's website						

25.Security category

	I do not know	Not Important	Less Important	Quite Important	Very Important	Extremely Important
Warning emergency systems (for earthquakes, floods etc.)						
Care taking of public facilities						
Photocell and security system installation on specific roads						
Civil protection and area evacuation plans						

26.E-government category

	I do not know	Not Important	Less Important	Quite Important	Very Important	Extremely Important
Electronic services for easier access by all citizens						
Application development for reporting problems and submitting requests by the citizens						
Development of tools for active citizen participation						

Social inclusion tools (eg foreigners) for better social cohesion						
Free access to open data for use by other public institutions (transparency)						

Section 4: Smart Cities (Alternative Section)

Although there is no commonly accepted definition for the term "Smart City", a simple definition can be the following: ""Smart" are considered the cities that use advanced technologies to improve the quality of services provided to citizens and to increase transparency and efficiency. By these actions, the cities become more resilient, functional and sustainable. In this way they will be able to meet modern challenges and improve the quality of life of their citizens."

27. Are you willing to learn more about Smart Cities, so that you can better understand the term in the future?

□ Yes

□ No

28. Do you think that the local authorities of your city have taken initiatives to inform the citizens about the "Smart City" concept?

□ Yes

□ No

□ I do not know

29. Do you think that the local authorities of your city have taken initiatives to promote the development of "smart" projects in your city?

- □ Yes
- □ No
- □ I do not know

30. Would you participate in a digital platform so that you can take part in decisions on projects related to the development of your city?

- □ Yes
- □ No
- □ I am not sure

31. From the following options, chose the ones you consider the most important to exist in your city. You can select up to three (3) choices.

- □ Active citizen participation in decision making
- □ Respect for the environment and proper resource management
- □ Improved quality of life of citizens
- □ Easy transportation within the city
- □ Improved educational level of citizens
- □ Better development of professional activities