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HUMANIZING SMART CITIES – THE CASE OF LISBON

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Abstract

Smart cities are a growing phenomenon, largely driven by globalization and the digital revolution, which have enabled hyper connectivity, between people and between machines. Although there are more and more cities joining their efforts to become smart, the definition of a smart city is not consensual, there is a wide variety of definitions, which focusing on different aspects of it, cannot be considered wrong. However, it is known that a city, regardless of its intelligence, is made of people and for people, so its goal must be the constant improvement in the quality of life of its citizens. For this to happen, political power must be able to involve citizens in ongoing projects and initiatives designed to increase the city's intelligence.

With this work, through the application of a questionnaire, it is intended to understand to what extent citizens are aware of the ongoing initiatives to turn Lisbon into a smart city, what is their degree of involvement during this process and what potential measures could be taken to encourage the active participation of the inhabitants in this same construction. In the end, it is expected that with the results, the Lisbon City Council, upon understanding the citizens' opinion, their perception of smart cities and the measures they think are crucial for their participation to increase, the municipality will take the measures needed to leverage the city's intelligence.

Keywords: Smart cities, sustainability, technology, participatory governance.

1   INTRODUCTION

About seven million years ago, the human species began its great evolution, with the continuous development of characteristics that allowed an adequate adaption to the life on planet Earth as we know it. The population increase and the expansion of urbanization had a strong impact on infrastructure and available resources, decreasing the quality of life of citizens with the aggravation of problems such as poverty, changes climate and social inequality. 2020 was defined by the UN as a turning point in the battle for sustainable development, placing cities at the center of this scenario, since a large part of the population resides in urban centers [1]. To try minimizing these issues, thinking about cities in an intelligent way, using information and communication technologies, was the solution found. By collecting data generated from different sources, it is possible to better understand the functioning of the city and integrate this information in the various institutions, for a more conscious and synchronized decision-making, thus promoting the citizens' quality of life [2].

The main technologies used in creating a smart city are Internet of Things (IoT), Cloud Computing and Big Data [3]. With a more digital and connected world, millions of data circulate through the city, in sensor networks, systems of transit and citizen devices, which can be collected and analyzed to generate knowledge about the city and its real needs. However, technology alone does not guarantee the city's intelligence, it is not just a highly technological. The most important element in defining a smart city is its citizens [4]. It is necessary to combine the implemented technology with the participation of citizens, since that they are the ones who bring the city to life daily. In addition to being the target of initiatives, they must know how to use these same technologies and create intellectual capital, contributing to the intelligent economic and social development of their city [4]. What's the use of having a technologically evolved city, if its inhabitants are unaware of the initiatives in course, or they don't know how to take full advantage of these technological advances.

Cities have the mission of promoting channels of active participation, ensuring a participatory democracy, to understand what the real problems of the population are and to solve their priorities. Democratic participation allows citizens to express their views, helping to prioritize initiatives and avoid unnecessary investments, which will not be adhered to by the population because they do not solve the existing gaps. Active and digital citizenship would enable the discussion of important issues, such as the destination of founds, allowing the municipality to make more effective interventions and provide all those who want to settle in the city with suitable conditions [5]. Based on this premise, the

correct development of a smart city depends on two aspects: technological, with the use of digital innovations; and the human, with the knowledge of citizens and its social component [6]. Mayors must therefore ensure that the initiatives and platforms created, reach as many inhabitants as possible, overcoming barriers such as gender, age, and education, promoting equity, both in terms of quality of life and in terms of opportunities in an increasingly technological world.

When questioning the lack of smart cities after at least 14 years talking about the subject, Cooper argues that the main reason is the fact that the new paradigm does not yet have arrived, neither the heart nor the wallets of the citizens. This point gains relevance when we realize that citizens are the city, and if they don't feel smart, the city certainly it will not be smart [7].

The aims of this study is to understand, in the case of Lisbon, what is the degree of involvement of the population, in the construction of a smart city; what is their perception of this issue; and what measures can be taken so that citizens can actively participate in the development of the city improving its quality of life.

2 METHODOLOGY

To understand the citizens perceptions about smart cities and whether the initiatives created in Lisbon have the proper dissemination and participation, a series of goals were established. Based on a literature review and a focus group, a questionnaire was constructed, with different questions, most with indicators associated with a Likert-type scale (5 points), from 1 (Very Disagree/Never Used/I don't know) to 5 (I really agree / I use it a lot / I know it very well).

The objectives were to determine the perception and importance attributed to the creation of smart cities; what technologies and dimensions are associated with; the degree of knowledge of the projects and applications created within the scope of the smart city and the level of satisfaction with their dissemination; the measures that could be taken for greater involvement of the population in the city's development process; and finally, from the point of view of those who live and visit the city, what is Lisbon's degree of intelligent development.

The collected data were analysed using Excel and SPSS tools. In the first phase, the exploratory phase, a focus group was set up to understand key indicators and concepts for the construction of the questionnaire. In a second phase, the inferential phase, with the results obtained in the exploratory phase, was intended to respond to the established objectives.

The sample of this study was randomly constituted by 206 participants of both genders, aged over 10 years, without any restriction on the place of residence, since the municipalities are not only interested in improving the quality of life. of those who live in the city, as well as in attracting more citizens to live, invest and visit.

The gender sample consisted of 106 male members (51.5%) and 100 female members (48.5%). Regarding age, 4 people in the sample are between 10 and 17 years old (1.9%), 114 are between 18 and 25 years old (55.3%), 52 are between 26 and 35 years old (25 .2%) and 36 are older than 35 years (17.5%). The choice of these age ranges is to focus on the younger population, up to 35, since they will be participants in the cities of the future. About the place of residence, and just to determine differences or similarities in the perception of those who live in Lisbon and those who visit it, 159 of the 206 do not reside in Lisbon (77.2%) and the remaining 47 do (22 .8%). Of the 159 who do not live in Lisbon, 65 usually visit 3Lisbon once a year (38.7%), 35 visits twice a year (20.8%), 13 visit 3 times a year (7.7%) and 55 visit more than 3 times (32.7%).

3 RESULTS

3.1 The universe of Smart Cities

After analysing the responses to the questionnaire and intending to verify the perceptions that citizens have about smart cities, it was verified that, although the statements presented generate agreement among the subjects, the definition of city which meets the stimuli of entrepreneurship and the digital and city that is concerned with sustainability, generated more agreement (Table 1).

Table 1. Definitions of Smart Cities.

For you, a smart city is:	Average (0 to 5)	Standard Deviation
A city that cares about sustainability facing global challenges.	4.21	1.059
A city that educates and encourages its inhabitants in an entrepreneurial and digital environment.	4.08	0.987
A city that connects its inhabitants and infrastructure with the use of Information and Communication Technologies.	4.03	1.019
A defined geographic area, which uses state-of-the-art technologies to increase the quality of life of inhabitants in the most varied areas of the city.	4.03	1.136
A city governed by a set of well-defined issues, to establish the rules for municipal management and its development.	3.85	1.055
A city with independent, conscientious, and self-determining citizens.	3.65	1.098

Regarding what is most associated with smart cities, the most prominent concepts were Sustainability and Efficiency and Innovation, obtaining the same percentage (73.8%). The third most voted concept was Technology (73.3%), after Safety (61.7%) and Good Mobility (60.2%). Next, the most voted concepts were Connectivity (55.8%), Communication (55.8%), and focus on the citizen (42.3%). The least voted were Surveillance (26,2%), Privacy (22.3%) and People control (6.8%).

Then, it was intended to determine the importance that citizens attributed to the creation of smart cities, obtaining the results presented in table 2, which shows that more than half of the sample considers the construction of smart cities a pressing issue.

Table 2. Importance of Smart Cities.

In your opinion, the creation of Smart Cities:	Percentage
It's very important, and cities should start their planning as soon as possible.	50.5%
It's important, but it's not justified to all cities.	32.0%
It's important, but in a longer time frame	14.6%
I don't consider it too little or too much important.	2.4%
It's not important.	0.5%

As for the advantages associated with smart cities, the most outstanding were Improve the quality/access of public services and Improve citizens' quality of life. The least associated was the decrease in traffic and Increase transparency in municipal management (Table 3).

Table 3. Advantages of Smart Cities.

In your opinion, a smart city allows:	Average	Standard Deviation
Improve the quality/access of public services.	4.27	0.979
Improve citizens' quality of life.	4.25	0.960
Ensure energy efficiency.	4.15	0.979
Access to cutting-edge technologies.	4.09	0.984
Improve communication.	4.06	1.001
Improve solid waste management.	4.00	0.980
Increase security in the city.	3.99	1.019
Promote participatory citizenship.	3.93	1.036
Promotion/Increase of public transport.	3.87	1.023
Improve parking management.	3.84	1.034
Increase transparency in municipal management.	3.76	1.040
Decrease in traffic.	3.67	1.049

To determine which aspects the development of a Smart City is related to, a series of concepts was presented, among which the most chosen were: Artificial Intelligence (62.1%), Internet of Things (IoT) (47.1%), 5G (38.8%), Robotics (29.6%), Big Data (28.2%) and finally Cloud Computing (27.2%).

3.2 Projects and Platforms

Regarding the programs to be implemented in Lisbon, the degree of knowledge of a list of projects collected in the literature review was questioned. The most known projects are the Smart Street Lighting and the Digital Literacy Programs (Table 4). However, there was a general lack of knowledge of the projects presented.

In the case of Smart Open Lisboa, which seeks to promote open data in Lisbon, only 14 participants know the project very well, 49 know it little and 92 do not.

As for the Digital Literacy program, which consists of practical and free courses for the development of digital skills and overcoming fears related to the use of the internet, 33 participants know it well, 95 know little and 78 never heard about the project.

The Hour of Code project, consisting of several workshops where participants play small games and acquire basic computer programming concepts, is well known by 24 participants, little known by 79 and unknown by 103.

The LX Data Lab project, a Lisbon urban data laboratory, aims to extract value from the information available in the municipality, through advanced analytics, artificial intelligence, and supercomputing, to improve planning, security, mobility, and operational and emergency management in the city of Lisbon. 12 participants know the project well, 76 know it little and 118 don't.

The Intelligent Management Platform of Lisbon allows the integration of data from various sources and, through analytical tools, allows the processing and availability of information to almost 60,000 simultaneous users, including the Integrated Operational Centre, the Data Laboratory, the Data Portal Open, the Municipal Services, the Parish Councils, and the citizens. 28 participants know this platform well, 83 know little about it and 95 are unaware of its existence.

The program of sensors in waste deposits allows for more efficient waste management, through the management of installation and location points, and the creation of dynamic circuits when the sensors alert that they are full. Of the 206 participants, 28 know the project well, 83 know it little and 95 don't. Finally, the best-known project, Intelligent Public Lighting, makes the city's lampposts a support for monitoring devices and data capture relevant to energy, mobility, and environmental management in the city, it is well known by 78 participants, little known by 91 and unknown by 37.

Table 4. Smart Projects in Lisbon

What is your level of knowledge about the projects presented here?	Average	Standard Deviation
Smart Street Lighting	2.96	1.300
Digital Literacy Programs	2.18	1.179
Sensors in Waste Deposits	2.05	1.161
Code time (workshops)	1.94	1.118
Smart Open Lisbon (promotion of open data in Lisbon)	1.90	1.031
Lisbon Intelligent Management Platform	1.89	1.018
LX Data Lab.	1.72	0.961

As for the platforms created for the intelligent development of the city of Lisbon, My SNS and the Lisbon City Council website was the most known and used, and on My Street LX, the least (Table 5).

As for the use of the platforms, there was also a lack of knowledge and use by the participants. The Open Lisbon Portal, an open data portal about the city, is aimed at developers and students who wish to develop solutions, apps, websites, or platforms, according to the licenses under which they are published. 17 participants stated that they have used/use the portal, and 189 never used it.

The Lisbon City Council website is also little used by most participants, 43 have used/use it and 163 have never used it.

The Smar Lisbon Website, where several smart projects underway in the city are advertised, was/is used by only 13 participants, and 193 have never used it.

My SNS, created with the aim of improving access to information and simplifying the provision of services to users of the national health service, has already been used by 74 participants and 132 have never used it.

The App Lisboa 24 allows users to receive notifications and have access to a broader set of useful information in real time for those who live, work, study and visit Lisbon, such as occurrences, interventions, and the state of traffic. This application was/is used by 17 participants and 189 never used it.

In My Street LX, is a portal that allows you to report occurrences in the city of Lisbon that require intervention, which includes an internal module for managing these requests. Despite its usefulness, only 15 participants have used/use the portal, and 191 have never used it.

Finally, Lisbon Participates is a portal that aims to promote democratic practice involving political power and civil society, through the promotion of participatory democracy, enhancing digital channels and strengthening governance priorities. This digital platform brings together different participation instruments, such as the Participatory Budget, Lisbon in Debate, Citizenship Forum and LisBoaIdeia.

Despite the advantages of its use, only 13 people have used it and 193 have never used it. It should be noted that, in all cases, the lack of use is caused by the lack of knowledge of the platform

Table 5. Smart Platforms in Lisbon

Which of the following platforms do you use?	Average	Standard Deviation
My SNS	2.26	1.244
Lisbon City Council website (ww.lisboa.pt)	1.91	0.930
App Lisboa 24	1.45	0.811
Open Lisbon Portal	1.40	0.776
Smart Open Lisbon (promotion of open data in Lisbon)	1.90	1.031
Smart Lisbon Site	1.39	0.749
Lisbon Participates	1.37	0.712
On My Street LX	1.32	0.755

After presenting some projects and platforms created in Lisbon, the dissemination of these initiatives to the population was questioned. 34% of the sample considers that the initiatives have poor publicity, 31.6% that they have neither good nor bad publicity and 22.3% believe that they have good publicity. With a lower percentage, 8.7% consider that the initiatives have very low dissemination and 3.4%, excellent dissemination.

3.3   Potential measures/incentives to promote democratic participation

Since the municipality is concerned with creating initiatives to promote the city's intelligent development, it was asked which stimuli would be more appropriate to promote greater participation by the population. The most consensual option was to invest in education in schools, followed by various supports created by the municipality (Table 6).

Table 6. Stimuli to promote initiatives

To what extent do you think the following stimuli could be adopted to publicize ongoing initiatives:	Average	Standard Deviation
Education in schools	4.36	0.675
Support from the municipality	4.28	0.716
Financial/Financial Benefits	4.11	0.816
Disclosure of the results of each initiative	4.10	0.670
Promotion of initiatives by public figures (for example)	3.64	1.011

When an open response was asked which other stimuli would be important, the bet on social networks was most mentioned, followed by options such as: participation in technology; education of the general public on television channels and the demystification of the subject; television and/or radio

exposure; financial incentives; and introducing tools in youth study programs so that they grow to give them the necessary utility and thus promoting their effectiveness and prevalence.

Regarding the measures that could increase the population's participation in the construction of the smart city, the most chosen measure was the dissemination of the initiatives on television and on news websites (Table 7).

Table 7. Measures to ensure participation

How do you think the following measures would ensure participation in building the smart city?	Average	Standard Deviation
Disclosure on TV.	4.18	0.709
Disclosure on news sites.	4.11	0.704
Disclosure by radio.	4.01	0.799
Billboards around the city.	4.00	0.787
Creating a website.	3.97	0.805
Creation of social networks about Lisbon Intelligent City.	3.90	0.805

When questioning what other measures might be important, it was suggested that the topic be debated on television; dissemination through mobile messages; creation of development policy events associated with culture to attract more citizens; interconnect the various initiatives, so that if we know one of the initiatives, it promotes another in its sphere of communication; and pamphlets for seniors.

Finally, to understand whether for the sample, Lisbon was considered a smart city, we asked, as to its degree of development, how they considered the city. 55.8% believe that Lisbon is a city with several elements of smart city (under construction); 19.9% don't know; 16.5% consider a city with few smart city elements; 6.3% consider Lisbon a smart age; and 1.5% an ordinary city - not smart.

4 CONCLUSIONS

In conclusion, a smart city intends to optimize and monitor the use of resources; improve infrastructure; promote sustainable development; promote economic growth and the empowerment of its citizens, using technologies and the creation of participatory governments. In a certain part, an intelligent city can be seen as a utopia, something desirable, but it is difficult to achieve, at least in its fullness, because it works in several axes of the city. Getting each city to look at its citizens and their real problems, and allow them to live a full, sustainable life, with the desirable quality of life, covering every dimension of the city, can be something increasingly difficult to achieve, especially in the current context of the health, economic and social crisis we are experiencing. In addition to the possibility of utopia, the inclusion and participation of the entire population in life in society, there is also the danger of creating an even more stratified society, where only part of it has access to technologies, innovations, new resources and skills needed.

In the case of Lisbon, according to the participants in this study, we verify that, sustainability is one of the most dimensions associated to smart cities, on the contrary, citizens being conscious, independent, and self-decisive, is the least associated. One justification could be the growing importance that sustainability has had in recent years, and the lack of full perception of the importance of citizens in the construction of smart cities. Regarding what mainly defines a smart city, the concept of sustainability, together with efficiency and innovation, is once again highlighted, even surpassing technology. Regarding what mainly defines a smart city, the concept of sustainability, together with efficiency and innovation, is once again highlighted, even surpassing technology. Despite a lot of scary news about the bad side of technology, people control was the concept least associated with smart cities, along with privacy and security.

As for the need to create smart cities, it is considered that it is very important and that cities should start their planning as soon as possible, and many considered that despite being important, it is not justified for all cities. As for the advantages of smart cities, improving the quality and access to public services and the quality of life of citizens were the ones that generated more agreement, leaving behind aspects such as access to state-of-the-art technologies, security, and municipal transparency. We may conclude that citizens can see the smart city, much more than a technological centre, but as a stage of opportunities to solve world problems that do not only affect the city.

Regarding the ongoing projects in Lisbon, we noticed a general lack of knowledge about them, as suspected, the best known being intelligent public lighting. The same happened with the platforms presented, most of them unknown and never used by the sample. The most recognized platform was My SNS, which despite being a platform that seeks to give a better response from hospitals in Lisbon, in a more organized way, is a national platform. As for the dissemination of initiatives and platforms available in Lisbon, in favour of the intelligent development of the city, it was considered that their dissemination is weak or that there is neither good nor bad dissemination, which may show a lack of perception of their importance.

To compensate for this failure in dissemination, it was considered that the bet to educate children from an early age in schools with this theme and support from the municipality, would be the most effective. As for the measures that could be taken to increase citizens participation in the projects presented, dissemination on television and news sites was the most consensual. This shows that people are looking for an effective and clear disclosure, that you don't have to look too hard. Something that enters our house, through all the screens we have.

Finally, we ask: will Lisbon be considered a smart city, despite the efforts made so far? Although the consensus is not that of Lisbon as a smart city, half of the subjects believes that Lisbon is making a good effort in the path of city intelligence and that it has several elements of a smart city. It is therefore necessary to think more about the dissemination of ongoing projects and the platforms created, so that they can fulfil their purpose and reach most of the population.

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