Identifying Strategic Planning Patterns of Smart Initiatives. An Empirical Research in Spanish Smart Cities

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Abstract. The Smart Cities' projects favor the improvement and efficiency in public services, as well as the dis-closure and access more information, offering extraordinary opportunities for cities to spark a new wave of wealth creation. However, despite the relevance and complexity of designing strategic planning for smart city development, it continues to be ignored. This research contributes to prior research through the analysis of the demographical and citizens profile of SCs, identifying key patterns in the strategic planning processes of the smart initiatives in city governments in order to ensure the success of SCs initiative implementation. To achieve this aim, this paper has sought to analyze strategic planning process in a number of Spanish SCs under the microscope examining a total of 1,635 smart initiatives with the aim at identifying patterns in the strategic planning design. Findings show that smaller-size cities with a higher proportion of older people usually perform formal strategic planning processes.
Keywords: Smart cities, strategic planning, smart initiatives, planning patterns, citizens' profile.

1 Introduction

In the last decades, cities have had to face numerous challenges concerning the adoption of technological advances, economic growth, urban development, operation processes, governance or environment sustainability, giving place to the so-called smart cities (SCs) [1]. These cities have been involved in undertaking new socioeconomic environments based on the introduction of emergent and new information and communication technologies (ICTs) to face these challenges for all residents [2]. This way, public managers and politicians have designed and planned new strategies implementing smart initiatives, which are based on ICTs to enhance city performance and sustainability with the aim at providing efficient public services and improving citizens' quality of life [3] [4].

Thus, the SCs provide infrastructure and services that improve its citizens' lives in a sustainable way [5], undertaking smart initiatives in different domains (mobility, economy, governance, environment, living and people) [1]. These projects favor the improvement and efficiency in public services, as well as the disclosure and access

more information, offering extraordinary opportunities for cities to spark a new wave of wealth creation [6].

However, despite the relevance and complexity of designing strategic planning for smart city development, it continues to be ignored [1], considering an abstract idea and a largely unknown field [3]. So, Yigitcanlar [7] and Mora et al. [8] are promoting prospective research and further critical debates and report of current practices about strategic planning tools used in smart city development because it needs to be carefully and critically revisited.

Although these smart strategies and initiatives could be implemented in different levels of public administration, like in national or in local governments [3], special attention should be paid to strategies that can be applied by city governments because, according to Harrison and Donnelly [9], the focus on cities is relevant to analyze the functions assigned to them like the construction of urban infrastructures, the performance of strategic planning and process as well as the implementation of local policies and investment of financial resources.

Based on these previous comments, this study aims to analyze the smart city phenomenon and its current strategic planning practices on smart initiatives with the aim at identifying patterns in strategic planning approaches. In order to achieve this aim, we have analyzed smart city strategies and planning approaches of 1,635 smart initiatives undertaken by a number of the Spanish SCs (n=12) through the lens of the demographic and citizens' profiles of sample SCs, which have demonstrated to be relevant attributes that could influence on public policies regarding both the introduction and use of new technologies [10] [11].

The remainder of this paper is as follows. The next section presents the demographical and citizen' profile's attributes of SCs and shows the research questions of our research. Then, we describe the research methodology and data collection methods, analyzing the sample selection and the attributes examined in this research. Also, we describe the main results of our study. Finally, the discussion and conclusions bring the paper to an end.

2 Strategic planning of smart initiatives for smart governance

The development of SCs is a complex procedure, as it involves multiple interactions between several stakeholders and dimensions into a "networking" strategy of governance [12], which requires an integrated view of technology, processes, products, services and participants [13]. Due to this complex structure, scholars emphasize the need of a road map to guide stakeholders and dimensions involved in the development of SCs to reach the ambitious target efficiently [13]

Nonetheless, the different demographic urban profile could lead to different patterns in governing smart cities [14] and, therefore, in the strategic planning processes in these cities. In this paper, strategic planning processes are understood as the organization's process of defining its strategy, or direction, and making decisions on allocating its resources to pursue this strategy. It may also extend to control mechanisms for guiding the implementation of the strategy (Wikipedia). Prior research has demon-

strated that the planning objectives and the type of smart city initiatives that cities implement in these cities are highly diverse [7]. This way, it could be interesting to analyze how strategic planning in SCs are being performed under different demographic profile of these cities.

To begin with, several research studies have shown that population size affects both the adoption of new technology in public sector [10] and the innovation of city governments [15]. On one hand, larger SCs are engaged in the development and delivery of more complex and efficient services [16], which makes necessary the engagement of citizens with different competing interests into the public sector delivery [10]. By contrast, smaller communities often possess their own powerful sense of place and identity, which helps in obtaining consensus and collaboration [17]. In brief, according to prior research, it is expected to find different patterns in strategic planning of SCs according the municipal size (based on the Cambridge dictionary, a pattern is defined as a particular way in which something is done, is organized, or happens). Therefore, our first research question in this study is the following:
RQ1 – Are there patterns in the strategic planning of smart initiatives based on population size?

The citizens are increasingly an active part of the development of SCs [18], which makes us to question about the profile of citizens that demands the implementation of new technology as well as their participation in the strategic planning process of SCs.

In addition, recent prior research has put emphasis on the need of digital awareness of citizens [13]. In this regard, several scholars have showed that young people increasingly demand the adoption of new technologies to enable their quality of life [11]. In fact, they have a more proactive attitude to use and test new technology than elder people because young people are aware that the learning of using ICTs and its use leads to a greater accessibility to labor market and education, resulting in better work opportunities and, in turn, an increased per capita income [20].

Therefore, it seems that strategic planning of SCs could be different according to the different citizen age structure of the city. Hence, the following research question is derived:
RQ2 - Are there patterns in the strategic planning of smart initiatives based on the age of inhabitants?

Finally, both education and income per capita are the most powerful predictors for the adoption of new technology to improve services delivery efficiently [21]. Local governments with a well-educated and higher income population demand the adoption of new technology to access information and the development and delivery of services efficiently [22]. Additionally, these local governments obtain more resources to implement projects on ICTs into their cities [23].

As with e-government, SCs growth has a closely relationship with education and income per capita, since availability of finance play a significant role in building this human capital and lead to the development of smart city [24]. Local governments with higher skilled people experience stronger growth in the quality of life, and have a proactive attitude towards the implementation of smart initiatives [25]. In fact, different research studies show that cities with more educated population have better employment opportunities, resulting in a more growth in quality of life [28]. As indicated

by Foth [18], in order to make cities smarter, we need to make people smarter in the first place.

As for income per capita, in a specific case, Basu [11] showed that the upper middle-income and middle-income groups (30% and 28.75%, respectively) were mostly inclined in the use of mobility application aimed to smart mobility improvement in India. However, the lower income group used less this service comparatively. Based on these prior findings, the last research questions in this study are:

RQ3 - Are there patterns in the strategic planning of smart initiatives based on the level of education?

RQ4 - Are there patterns in the strategic planning of smart initiatives based on the income per capita?

In brief, this study analyses smart cities strategy and planning approaches of smart initiatives in Spanish SCs from the demographic lens and citizen's profile, since it might be significant to identify patterns of behavior in smart initiatives planning experiences in SCs in order to ensure the success of SCs initiatives implementation.

3 Research Methodology

3.1 Sample Selection

Prior research [27] has showed that SCs in Spain, UK, Germany, Italy and France are those that have undertaken a higher number of smart initiatives and projects into their cities. It makes interesting to focus our attention in SCs in these countries and collect evidences from the analysis and exploration of their smart initiatives. Thus, this paper is focused on the analysis of the smart initiatives implementing in SCs in Spain as a first approach of this issue, which could be interesting for SCs in other countries.

According to Harrison and Donnelly [9], we focused on the large-size SCs because it allows a more efficient innovation development that creates many challenges for the planning, design, finance, construction, governance and operation of urban infrastructure and services. Also, these cities are highly competitive economies and get a higher knowledge about urban problems and more flexibility of governance models to face them, as well as the possibility to get insights of smart solutions from others similar cities [3]. Finally, our sample selection is composed by cities having globally recognized as a SCs in the different leading world rankings.

In this sense, with the aim at collecting a wide range of Spanish cities, data collection of this research has been gathered following two steps. Firstly, we analyzed a sample composed of large-size Spanish cities (cities from 200,000 to 4 million inhabitants), which have been labelled "smart" by a European project sponsored by Asset One Inmobilienentwicklungs AG -see http://www.smart-cities.eu-. Taking into account the information, classification and factors considered from this European SCs ranking [28], we collected seven Spanish SCs to the sample selection.

Secondly, we also analyzed large-size Spanish cities that are members of the EUROCITIES network (http://www.eurocities.eu). This network is composed of the local governments of the major European SCs with the objective of strengthening the

important role that they should play in the adoption and implementation of smart governance structures. This second step allows us to collect five new Spanish SCs to our study aim. Therefore, our sample selection is composed of a total of twelve large-size Spanish SCs.

As for the methodology used in our research, based on Yigitcanlar [7], the selection criteria for determining the strategy documents of sample cities were: (a) The strategy or policy report having a specific focus on SCs and developed for a particular city -rather than a part of the city, region or nation-; (b) The full-text report being available for download from an official website of the city -rather than an executive summary or highlights- and; (c) The report having listed the department responsible of the project in the smart city, the smart city domain, stakeholders involved, vision, objectives, policies or strategies on the smart city transformation of the city; (d) The search was conducted in August-September 2019— only including policies published and made available online until this date.

After a thorough web search, in total 1,635 case smart initiatives were determined fulfilling the mentioned selection criteria. The policy documents of these SCs were downloaded from the official city government websites and their vision or aims, smart domains and smart city strategies or policies were obtained and checked, i.e. we selected the projects taking into account their content and objectives. Table 1 lists the number of smart initiatives on each one of the sample SCs.

Table 1. Sample selection and number of smart initiatives included in this study.

City	Number of Smart Initiatives	City	Number of Smart Initiatives	City	Number of Smart Initiatives
A Coruña	127	Barcelona	56	Bilbao	40
Gijon	252	Málaga	204	Madrid	103
Murcia	28	Seville	132	Terrassa	499
Valencia	15	Valladolid	47	Zaragoza	132
TOTAL			**1,635 Smart Initiatives**		

3.2   Smart Initiatives Attributes and Variables Analyzed

As for getting insights about the way that sample SCs are performing strategic planning of smart initiatives, this research characterizes the smart initiatives examining whether the sample SC has a global strategic planning of the city in which the smart initiatives are included, the formal/informal approach used, the scope of the smart project application (horizontal/vertical pattern), the project development approach (bottom-up/top-down) and, finally, the responsible body of the smart project (the city government or the city government jointly with other stakeholders).

Although other variables could be relevant like the structure of the local government or the level of decision-making decentralization, in this paper, we focus our analysis on the demographical city and citizens' profile attributes with the aim at finding patterns in strategic planning of smart initiatives. In this regards, four attributes

are used in this study and consistent with previous studies [12] [29]: population size of the smart city and age of inhabitants, as demographical city profile, and level of education and income per capita, as citizens' profile, due to their relevance in finding patterns in e-government policies, and online information disclosure [29].

As for the attributes analyzed, in this paper we focus our efforts in the main ones that characterize the different patterns of organizing the strategic planning of smart initiatives in a SC and, specially, regarding the type of strategic planning performed (formal/informal), the scope of the smart initiatives (vertical/transversal) and the stakeholders involved into the strategic planning process (collaboration). Table 2 shows the definition and calculation method of each of the attributes analyzed in this research.

Table 2. Definition of attributes analyzed in this study.

Attribute	Acronym	Definition	Calculation
Type of Strategic Planning	FSP[a]	Approach used for strategic planning into the Smart City	Formal Informal
Scope of Smart Initiative	TSP[a]	Smart initiatives can involve 1 department (vertical) or, 2 or more departments (trans-versal)	1 = Vertical 2 = Transversal
Strategic Planning Approach	APP[a]	Strategic planning approach when a Smart City initiative is implemented	Bottom-Up Top-Down
Collaboration	COB[a]	Responsible body of the smart initiative	City government/collaborative/public-private partnership
Population	POP[b]	Population residing in the municipality	Number of inhabitants
Age of Inhabitants	AGE[b]	Age of inhabitants	Age 15 from 24 Age 25 from 34 Age 35 from 64
Level of Education	SECEDU[b]	Level of inhabitants with secondary education	Inhabitants with secondary education
	SUPEDU[b]	Level of inhabitants with superior education	Inhabitants with superior education
Income per capita	INCO[b]	Income per capita	Income (thousand euros) per capita

Notes: [a]Local Government Website and [b]National Statistical Institute (INE) (www.ine.es/)

4 Analysis of results

4.1 RQ1 – Are there patterns in the strategic planning of smart initiatives based on population size?

Table 3 shows the characterization of the main attributes of strategic planning in sample SCs based on the population size of the sample municipality. Results reveal

that local governments with lower inhabitants mostly develop formal smart strategic planning and, in turn, offer the entire information to their citizens (97.95% of smart initiatives). By contrast, the no-formalization of smart strategies increases as the size of the municipality increases (cities with more 500.000 inhabitants show more than 90.80% of informal smart strategic initiatives).

As for the scope in the implementation of the smart initiatives, cities between 292,879 and 506,124 inhabitants develop smart initiatives involving more than one department or area (vertical versus horizontal) (97.50% of smart initiatives). However, local governments with lower inhabitants mainly adopt smart initiatives which do not involve multiple departments (28.21%). They focus all efforts on one single department, which leads the smart strategic initiatives.

Moreover, results show that local governments are the main promoters of strategic planning of SC initiatives in all cities regardless of its size (99.54% and 98.29%, respectively).

Finally, the last attribute related to strategic planning under study (collaboration), it seems to be that the local governments with between 292,879 and 506,123 inhabitants encourage collaboration public-private in smart initiatives (10.34%). By contrast, non-collaborative smart initiatives are mainly concentrated in both smaller-size and larger-size cities (94.08% and 93.68%, respectively).

Table 3. Characterization of main attributes of strategic planning in sample SCs based on the population size of municipalities.

Population	FSP		TSP		APP		COB	
	Formal	Informal	Vertical	Transversal	Bottom	Top	Yes	No
0 – 292,878	97.95%	2.05%	28.21%	71.79%	0.46%	99.54%	5.92%	94.08%
292,879 – 506,123	50.43%	49.57%	2.50%	97.50%	2.30%	97.70%	10.34%	89.66%
506,124 – 714,028	58.33%	41.67%	26.62%	73.38%	2.14%	97.86%	8.97%	91.03%
714,029 – 3,182,981	9.20%	90.80%	26.09%	73.91%	1.72%	98.28%	6.32%	93.68%

Note: Population has been catalogued by quartiles

4.2 RQ2 - Are there patterns in the strategic planning of smart initiatives based on the age of inhabitants?

In table 4, we can observe that there are some patterns related to the relationship between formal/informal smart strategic planning and the age of inhabitants. In this regard, the information about smart initiatives is formalized and disclosed when the inhabitants are older citizens (92.45%), meanwhile that the information is not formalized in cities with young people (54.98%), in opposition to the related literature. It suggests that the teenagers are mostly engaged in the adoption and the use of ICTs and, in turn, demand more information from public institutions [29] [11].This controversy can be caused by the fact that our study takes into account too young people (between 15 and 24), whose role is primarily applicant of delivery of services than contributor.

Although the related literature established that the teenagers have more proactive attitude to use and test new technology than elder people, because they have a positive perception of them related to the positive impact of ICTs in the improvement of the quality of life [20]; we can observe no patters concerning the age of inhabitants. In order words, smart initiatives are usually promoted by the administration, which takes the lead in implementing technological advances that favor the creation of a smart and sustainable environment in cities, regardless of the age of its inhabitants.

Finally, there are also no patters when we analyze the relationship between the scope in the implementation of the smart initiative and the age of inhabitants (vertical versus transversal) as well as the relationship between the collaboration model for implementing these initiatives and the age of inhabitants.

Table 4. Characterization of main attributes of strategic planning in sample SCs based on the population aging in sample municipalities.

Age of Inhabitants	FSP		TSP		APP		COB	
	Formal	Informal	Vertical	Transversal	Bottom	Top	Yes	No
Young population	45.02%	54.98%	26.54%	73.46%	2.02%	97.98%	8.26%	91.74%
Older population	92.45%	7.55%	26.56%	73.44%	0.62%	99.38%	6.32%	93.68%

Note: We have calculated median and formed two groups: *Young population* (citizens over the median of inhabitants from 15 to 24 years old + citizens over the median of inhabitants from 25 to 35 years + citizens over the median of inhabitants from 36 to 64 years) and *Older population* (citizens under the median of inhabitants from 15 to 24 years + citizens under the median of inhabitants from 25 to 35 years old + citizens under the median of inhabitants from 36 to 64 years).

4.3   RQ3 – Are there patterns in the strategic planning of smart initiatives based on the level of education?

Table 5 shows that the information disclosed is mainly formalized when the level of education of citizens in the sample SCs are below the median (94.67% and 93.49%). However, in SCs with higher educated citizens, the information disclosed is not formalized (80.59%), contrary to the related literature. Higher educated people experience stronger growth in the quality of life, and have a proactive attitude towards the implementation of smart initiatives and the demand of public information [18] [25].

Table 5. Characterization of main attributes of strategic planning in sample SCs based on the level of education of the population in sample municipalities.

Level of Education	FSP		TSP		APP		COB	
	Formal	Informal	Vertical	Transversal	Bottom	Top	Yes	No
Over the median	19.41%	80.59%	30.94%	69.06%	2.97%	97.03%	10.05%	89.95%
Intermediate	94.67%	5.33%	1.59%	98.41%	0.82%	99.18%	4.51%	95,49%
Under the median	93.49%	6.51%	28.21%	71,79%	0.43%	9.57%	6.38%	93.62%

Note: We have calculated median and formed three groups: SCs in which educated population is over the median in both secondary education and superior education, SCs in which educated population is under the median in both

secondary education and superior education and a third group with the rest of the options

Regarding the score in the implementation of the smart initiative (vertical versus transversal) and the smart initiatives approach, there are no patterns. Local governments mostly develop smart projects involving multiples departments or areas; in addition, local governments are the main promoter of smart initiative, regardless of the education level. Similarly, the education has no influence over the collaboration model for implementing smart initiatives.

4.4   RQ4 – Are there patterns in the strategic planning of smart initiatives based on the income per capita?

In table 6, we can observe that the information about smart initiatives are formalized in SCs with a lower income per capita than the median (93.98%). By contrast, in SCs with an upper income per capita than the median, the information disclosed is no formalized (60.50%).

As for the score in the implementation of the smart initiative (vertical versus transversal), the smart initiatives approach and the collaboration public-private to develop smart initiative, there are no patterns. In this sense, smart initiatives are mainly leaded by the administration and involved multiple departments and, in turn, the no-collaboration public-private is predominant, regardless of the income per capital.

Table 6. Characterization of main attributes of strategic planning in sample SCs based on the income per capita of the population that live in sample municipalities.

Income per capita	FSP		TSP		APP		COB	
	Formal	Informal	Vertical	Transversal	Bottom	Top	Yes	No
Upper median	39.50%	60.50%	28.00%	72.00%	2.81%	97.19%	12.56%	87.44%
Lower median	93.98%	6.02%	26.06%	73.94%	0.20%	99.80%	3.79%	96.21%

Note: We have calculated median and formed two groups: SCs with an upper income per capita than the median and SCs with a lower income per capita than the median.

5   Conclusions and discussions

Findings show that some patterns can be identified according to both the demographical city profile and the citizen profile living in the SCs. Regarding demographical attributes of the sample SCs, although prior research has demonstrated that formal strategic planning where public managers are involved in could have a strong positive relationship with strategy implementation success [30], our findings suggest that both smaller-size cities and those with a higher proportion of older people usually perform formal strategic planning processes. These findings seem to confirm prior research which points out that larger-size jurisdictions may make strategic planning more diffi-

cult for them to do so effectively [31], perhaps due to the presence of so many stake-holders with a multiplicity of goals and conflicting accountabilities [32], which makes these municipalities to adopt other different approaches.

As for the young people, the European Union, strongly from the beginning of the 2010s decade [33], has promoted the young people involvement into public decisions as a key aspect for building cities with the aim at ensuring that they have a say in the democratic processes that shape Europe's future. Our findings show that SCs with a high proportion of older population are used to undertake formal strategic planning processes, which is a novelty result of this research, because it is not linked to the highly education level of this section of the population [34] as it could be expected. Indeed, findings of our paper indicate that SCs with a high proportion of highly educated population seem to undertake informal strategic planning process.

Concretely, findings show that in SCs, where intermediate and low levels of both educated and low-income people live in, city governments usually undertake formal and transversal strategic planning processes. Therefore, citizen profile also seems to modulate the way that city governments are undertaking strategic planning process of smart initiatives.

As for the scope of the smart initiatives, Guenduez et al. [13] found that participants and interviewees in a sample survey highlighted the importance of aligning and embedding the smart government strategy in the overall strategy of the government body in question. Our research shows that although general nowadays, transversal type of strategic planning in smart initiatives (using the transversal approach) is mainly performed in medium-sized municipalities (between 292,879 – 506,123 inhabitants) and where intermediate and high level of education people are living in. This finding could be linked to the previous one because formal strategic planning process usually takes an integral view of the strategic planning process.

By contrast, prior research has not obtained consistent findings concerning the strategic planning approach to be conducted by public administrations. While some scholars advocate the top-down or centralized approach [35], others find the bottom-up or decentralized approach as preferable [36]. In any case, in both cases, scholars highlight that the more participation in the planning process (including citizens, external stakeholders and public managers at all levels of the public administration), better results will be obtained [37]. Nonetheless, recent research has demonstrated that these prior findings could be context-depend because in the Nordic context, the formal strategic planning and the strategic types may have had little impact relative to stakeholder involvement [38].

In brief, demographical and citizen profile seems to be attributes that could be relevant in the way of undertaking strategic planning processes into SCs. Nonetheless, this research is a first approach to this issue and some limitations are present such as, for example, the low number of sample SCs and the similar context in which the SCs are located.

Therefore, future research should extend this research to other SCs in different countries and contexts with the aim at identifying similarities and differences. In addition, future research could include other variables that could influence on the strategic planning patterns of smart initiatives in SCs. As recent research has indicated, suc-

cessful smart initiatives should focus not only on new technologies, but also on managing organizational capabilities, addressing environmental requirements, building leadership, and developing common strategies and standards [13]. Finally, future research could analyze the impact of strategic planning patterns on both the efficiency and efficacy of the smart initiatives implemented, and on the outcomes produced by these smart initiatives.

Acknowledgement

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