What do people want in a smart city? Exploring the stakeholders' opinions, priorities and perceived barriers in a medium-sized city in the United States

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Abstract: Many cities in the United States are pursuing agendas to implement ICT-based solutions to tackle urban challenges, thus achieving the 'smart city' label. While the discussion on this urban development paradigm has revolved around the intensive use of technologies, the academic literature increasingly calls for shifting the focus to the people living in the cities. This paper argues that to achieve a people-centered smart city, cities should include the perspectives of all the local stakeholders. Under this assumption, this paper provides the views of the local stakeholders in a medium-sized city in Tennessee, Chattanooga. Particularly, this study explores their perceived smart city concept, the ethical standards that should guide smart city projects, the desired future projects in their community, and the barriers to implementing them. The data was collected using a combination of participatory budgeting, five focus groups, and twenty-eight interviews with city dwellers, entrepreneurs, university faculty, non-profit members, and government officials. The results suggest that, far from the image of a highly technological city, the stakeholders' envision a city dedicated to improving the quality of life and environmental sustainability. Furthermore, to achieve this smart city, the projects need to be based on full transparency and the promotion of social inclusion. In contrast to the dominant trend towards the privatization of urban space, this study finds that the stakeholders prefer public based smart city projects such as ICT-based public transport services. However, its successful implementation will have to overcome the barriers caused by funding constraints, public acceptance, and political interests. Cities may use the results of this study to design more responsible smart city projects that strike an optimal point between citizen engagement and technological applications and innovations while supporting all stakeholders' needs.

Keywords: urban design, urban governance, smart urbanism, participation, qualitative study, ethical standards

1. Introduction

In the United States, 82.7% of the population currently live in cities (Central Intelligence Agency, 2020). While urbanization offers city dwellers opportunities for innovation and business, economic development, greater access to services, and more leisure offerings (Gollin et al., 2016), it also brings challenges. Among these challenges are those produced by high population density, intensive use of polluting resources, reduced natural space, and other spatial constraints associated with pollution, mobility, health, and safety issues (e.g., Xu et al., 2019). These challenges are increasing in large and global cities in particular, where the political, economic and cultural powers are often concentrated (Sassen, 2001). To improve the management and efficiency of urban services, many cities in the United States are implementing smart city projects in which information and communication technologies (ICT) are deployed and implemented in the urban environment (Coletta et al., 2019).

The term 'smart city' was originated from the smart growth movement of the late 1990s that advocated a change in urban planning policies (Bollier, 1998). From 2005, the term 'smart city' was introduced by several technology companies to define the application and integration of complex information systems in the development of urban infrastructures and services (Anthopoulos, 2017). The term then became popular after the global financial crisis in 2007-2008 and has been used for marketing purposes, as it is associated with the implementation of technological innovations in the urban environment (Hollands, 2008). The problem is that, as no city wants to be considered 'dumb,' technologies are quickly implemented to sell the city as a 'smart city.' The city thus protects its image and improves its competitive capacity by positioning itself as an attractive city for business, citizens and tourism (Caragliu et al., 2011). This analysis is even more important since the United Nations has predicted that, in the immediate future, large migratory flows will be led by highly qualified workers, so cities will have to compete to attract and retain these workers. For this reason, cities are adopting a technocentric urban management approach based on the implementation of solutions to link technological innovations with economic, political and socio-cultural change with the primary objective of being able to advertise themselves under the 'smart city' brand.

Despite its popularity in recent years, the smart city concept is not a simple one to conceptualize. Several attempts at a consensus definition can be found throughout the literature on the topic (e.g., Nam & Pardo, 2011; Yin et al., 2015). In this paper, we have embraced the broad definition provided by Anthopoulos (2017, p. 8), which defines the smart city as 'the utilization of ICT and innovation by cities (new, existing or districts), as a means to sustain in economic, social and environmental terms and to address several challenges dealing with six (6) dimensions (people, economy, governance, mobility, environment and living).' This definition includes the three elements that we consider relevant for a city to be considered smart: first, the use of ICT and innovation; second, the focus on economic, social and environmental sustainability; and third, the addressing of several challenges within the six dimensions according to Giffinger et al. (2007): people, economy, governance, mobility, environment, and life.

Although smart city initiatives are being developed based upon the premise that technology improves efficiency, transparency, social equity and quality of life in cities (Anthopoulos, 2017), their practical application has been criticized by social scientists and

civic organizations (e.g., Clark, 2020). They argue that smart city technologies are being implemented without any consideration of their impact on society. Rather than being neutral, smart city technologies are viewed as neoliberal tools that justify practices of devolution, deregulation, and privatization (Clark, 2020; Greenfield, 2013). Smart city initiatives prioritize technological solutions over political, social and community-oriented solutions (Greenfield, 2013; Mattern, 2013), thereby providing 'work around' solutions, which benefit private industries rather than citizens and residents (Clark, 2020; Coletta et al., 2019). Furthermore, it has been argued that smart city initiatives facilitate technocratic and top-down forms of governance and government (Vanolo, 2014), based on a spirit of civic paternalism that neglects to actively involve citizens and other stakeholders in addressing urban issues (Shelton & Lodato, 2019).

This greater emphasis on the technological factor over the human factor in smart cities can be seen especially in the rhetoric surrounding their conceptualization and development (Thomas et al., 2016). On the one hand, we have identified reports produced by large tech companies such as Cisco or IBM for marketing purposes (e.g., Falconer & Mitchell, 2012; Paroutis et al., 2014); on the other hand, there is academic literature from engineering departments that describe experiences in implementing technologies in the urban environment (e.g., Chifor et al., 2017; Fell et al., 2019). Despite the increasing implementation of smart city projects, the opinions and perspectives of people living in smart cities are still scarce (e.g., Cardullo et al., 2019; Fernandez-Anez et al., 2018; Yigitcanlar et al., 2021; Zandbergen & Uitermark, 2020). For instance, the literature reviewed provided a limited answer to the following questions regarding the stakeholders' perceptions: How do they define a smart city? Which ethical principles should govern smart city projects? What are the stakeholders' priority areas for the development of future smart city projects? And, what are the perceived barriers to the successful implementation of smart city projects? The answer to these research questions has the potential to inform policymakers and city planners in the design of future smart city projects that are more aligned stakeholders' perceptions and priorities.

In order to contribute to filling this gap in the literature, this study explores the stakeholders' perceived concepts, ethical principles, priorities areas of development, and barriers related to the smart city. Instead of focusing on a single stakeholder (e.g. citizens), we explore diverse views adopting a holistic approach that includes five types of stakeholders: citizens, academia, business, government and activists (Calzada, 2016). While the abovementioned research question has been partially answered in the context of Asian smart cities (e.g., Ji et al., 2021; Praharaj & Han, 2019), research in the context of North American cities is more limited. This research is undertaken under a single case study analysis of a medium-sized city in the United States. Thus, this paper contributes to the knowledge about stakeholders' views on smart cities, particularly in this case, medium-sized cities in the United States, which can help to inform smart city policymaking.

In answering the research questions, this study is structured as follows. Section 2 presents the literature review of this study. Section 3 then describes the methodology of the study. In Section 4, the results of the study are presented, organized by each of the four research questions. Finally, the results of this research are discussed in Section 5, as well as their theoretical and practical implications and future lines of research.

2. Literature review

Some studies have already provided partial answers to the abovementioned questions. Studies have found that smart cities are defined as cities that use technologies to achieve a specific goal (e.g. sustainability). For example, one study in India based on the responses of 179 urban developers professionals found that they associated the smart city concept with 'sustainable city' and 'smart community' (Praharaj & Han, 2019). The conclusion of the authors was that the smart city is defined by the goals it achieves (e.g. improving sustainability) and not by the technologies implemented. Another study conducted in Australian cities through the analysis of 1179 original geo-positioned tweets obtained a similar result (Yigitcanlar et al., 2021). This study found that the most frequently recurring concept alongside 'smart city' was 'innovation', including 'start-ups', followed by 'sustainability' and 'governance'. However, it is likely that the objectives vary from city to city, so studies in other cities are needed.

Studies on citizens' preferences for smart city projects show that citizens prefer projects that improve their quality of life, regardless of whether or not they are based on the implementation of technologies. For example, one study using an international focus group with 102 participants found that participants preferred projects that 'leave the space for creativity, peer matching, dialogue, research collaboration, skills, and competencies building' (Lytras et al., 2019, p. 14). Another study conducted in Taiwan with a sample of 455 citizens through an online questionnaire found that the top priority projects were those that improved the safety and stability of the social environment (Ji et al., 2021). The authors also found a clear preference among citizens for technologies that would improve the sustainable use of city resources. These studies suggest that citizens prefer the use of ICT to enhance their daily experience of the city. Coherently, some studies show that citizens are willing to use smart city services when they perceive the services as safe, useful and improving their well-being (Lin et al., 2019; Lytras et al., 2019). Conversely, concerns about ICT privacy, security and trust deter them from accepting smart city services (Lytras et al., 2019).

The abovementioned studies explored the perceptions of smart cities from the perspectives of the citizens. Besides, they analyze cities in the context of India or Europe. Studies in other contexts such as the one presented in this paper are needed in order to take into account structural differences such as the culture or the economic model. In this study, we adhere to the opinion of other scholars, thus underpinning our research design in the necessity to include all city stakeholders in the process of co-creation and promotion of collaborative innovation ecosystems in the smart city (Borghys et al., 2020; Ooms et al., 2020). This study follows Satyam and Calzada's (2017) Penta-helix model of innovation for smart cities. In this model, civil society, academia, activists, government, and entrepreneurs become central agents in the design of city policies. This model, also known as the 'multi-stakeholder' model, combines the top-down approach –i.e., government, academia, and entrepreneurs– and the bottom-up approach –i.e., civil society and activists. According to Satyam and Calzada (2017), the fifth helix of this model is key not only to transform and democratize the concept of 'smart city' but also to experiment across institutional boundaries in search of other city assets.

In this paper, we also share the perspective of Fernandez-Anez et al. (2018), who assert that, to achieve a truly smart city, three perspectives must be included: (a) city

governance and stakeholder collaboration, (b) the integration of dimensions related to the projects and initiatives implemented, and (c) the connections of these elements with city challenges. In particular, it has been argued that the integration of all elements of the city is achieved through structured governance models capable of designing and implementing participatory decision-making processes for all stakeholders (Eremia et al., 2017; Ooms et al., 2020). However, the practice of smart city governance often has to face contrasting opinions, interests, and values among stakeholders (Vidiasova & Cronemberger, 2020). In this exploratory study, we will analyze the stakeholders' perceived concepts, ethical principles, priorities areas of development, and barriers to the implementation of smart city projects in a medium-sized city in the US.

3. Methods and data

3.1 City selection

In this paper, we explore stakeholders' opinions towards smart cities in Chattanooga, the fourth-largest city in Tennessee. Located in the Hamilton County, bordering Georgia, the city was home to 182,799 people in 2019 (US Census Bureau, 2021) (see Figure **1**). We purposely selected Chattanooga as it can be viewed as an example of how smart urbanism and smart city policies can improve cities' livability (Fletcher, 2020). In the 1970s, Chattanooga was considered the 'dirtiest city in America' due to unchecked industry (Lundy, 2019). Today, thanks to technological interventions and community involvement, it is known for being built upon a start-up ecosystem and cheap, fast Internet from its citywide gigabit fiber network (Marvin, 2018).

(Figure 1)

Chattanooga's bid to become a technologically advanced city was solidified in 2019 with the creation of the "Chattanooga Smart Community Collaborative" initiative, a research partnership between The University of Tennessee at Chattanooga (UTC), the City of Chattanooga, Erlanger Health System, EPB[1], Hamilton County, Co.Lab[2], and The Enterprise Center, in line with the framework proposed by Castelnovo et al. (2016).

The speed of the Internet and the involvement of Chattanooga's stakeholders made it possible for many smart city projects to be developed in the city (e.g., Laflamme et al., 2020). This commitment was recently rewarded by the G20 Global Smart Cities Alliance, which selected Chattanooga as one of two US cities that would be part of its pilot smart technology policy roadmap[3] (Musulin, 2020). Chattanooga can be then considered an example of a medium-sized city where the smart city paradigm has not been used to guarantee the optimal quality of city services in response to the demands of a large and densely populated city (e.g. New York or Los Angeles), but rather to improve the city and the quality of life of its citizens in general. Therefore, we selected Chattanooga because of its

[1] The EPB is the publicly owned electric power distribution and telecommunications company operating in Chattanooga.
[2] The Company Lab (Co.Lab) is a nonprofit startup accelerator that supports entrepreneurial growth in Chattanooga.
[3] Along with another U.S. city, San José, the initiative includes other 34 cities from 22 countries.

current technological development and its potential to become a smart city model for other cities to emulate.

3.2 Data collection

This study uses a qualitative approach because we aimed to explore the stakeholders' opinions, priorities and perceived barriers for smart city projects, an understudied area in the US. Therefore, we employed focus groups and in-depth interviews in our research methodology. These are the recommended methods for addressing exploratory issues (Kvale & Brinkmann, 2009). Using the classification of smart city stakeholders by Satyam and Calzada (2017), we initially decided to conduct focus groups with all stakeholders to foster discussions and contrasting opinions. As a result, we were able to hold focus groups with members of academia and citizens. Specifically, we conducted three focus groups with citizens and two focus groups with members of academia. However, when we tried to organize the focus groups with business people, government officials, and non-profit members, we could not get enough members to agree to a focus group on the same day and time. As an alternative, we decided to conduct in-depth interviews, which allowed greater time flexibility for these stakeholder groups. Therefore, the fieldwork was divided into two phases. In the first phase, we conducted focus groups with citizens and academics. In the next phase, we carried out in-depth interviews with entrepreneurs, local government officials, and members of local non-profit organizations. All of the focus groups and interviews were audio-recorded with participants' consent and transcribed verbatim.

3.2.1 Focus groups

Focus groups have been identified in the literature as the appropriate method for soliciting ideas and opinions about a concept or product (Morgan et al., 1998). In the beginning, we chose to conduct this technique rather than individual interviews because focus groups resemble community forums, where residents can share their opinions about ongoing smart city projects with each other. This technique has been used in other studies on smart technologies and products (e.g., Tang et al., 2019). In total, we carried out five different focus groups, three with citizens (FG1, FG2, FG3) and two with UTC faculty (FG4, FG5).

First, any Chattanooga resident over the age of 18 could be eligible for the study for the citizen focus groups. Participants were recruited through informational flyers and intentional snowball sampling. We selected participants across a broad spectrum of demographic characteristics to maximize variation in age, education level, economic standing, social class, and ethnicity. Three focus groups with citizens were conducted. Each focus group was composed of 6 to 10 citizens. In total, 26 citizens participated in the focus groups. Focus group recruitment ended when no new themes related to our research objectives emerged from group discussions (Miles & Huberman, 1994).

Second, the participants for the focus group with academics were recruited from among the faculty at the UTC by using intentional sampling. Intentional sampling is a sampling technique widely used in qualitative research to identify and select information-rich cases related to the phenomenon of interest (Palinkas et al., 2015). We selected members from several academic departments at UTC and divided them into two focus groups: (FG4)

members of Science, Engineering, and Health Departments; and (FG5) members of Social Sciences, Arts, and Humanities Departments. Our final sample consists of 18 UTC Faculty members. The socio-demographic distribution of all study participants can be found in Table 1.

(Table 1 about here)

The focus groups lasted between 90 and 120 minutes. All focus groups were held in the UTC facilities. Before starting the session, participants were requested to sign an informed consent and complete a short socio-demographic questionnaire. Two researchers, a faculty member from UTC and a graduate student, guided the focus group discussions following a semi-structured discussion guide.

3.2.2 Semi-structured interviews

We conducted 28 semi-structured interviews with local business people (n = 11), Chattanooga government officials (n = 5), and members of local non-profit organizations (n = 12). The members of the group of entrepreneurs all came from technology companies developing smart city projects in Chattanooga. The group of government officials interviewed were all heads or senior managers of departments involved in the development of smart city projects. Finally, all the non-profit organizations from which our participants came worked for the economic and social development of the city. We purposefully identified and selected respondents whose work was related to ICT and smart city design and/or urban design and sustainability. The snowball sampling technique was used to identify potential participants in all three categories. We recruited the participants until we reached 'theoretical saturation', where no new data emerged, and all the research objectives had been met (Creswell, 1998). The interviews lasted between 30 and 90 minutes. The socio-demographic composition of the interviewees can also be found in Table 1. In the end, all participants –focus groups and interviews– received a $20 gift card in compensation for their time.

3.2.3 Semi-structured guide and budgeting activity

The semi-structured interview guide was designed so that the questions were broad enough to allow for open conversation and extensive discussion, facilitating the generation of rich perspectives (Wilkinson, 1998). Our semi-structured guide was created *ad hoc* for this study, according to its exploratory approach. We followed the same semi-structured guide to conducting both focus groups and interviews to obtain comparable results (see Appendix). We structured the guide into four sections, which corresponded to our four research questions. First, we asked participants to provide their definition of a smart city and whether Chattanooga could be considered, in their opinion, a smart city.

Related to the definition of smart city, we asked the participants to answer what ethical standards should govern smart city projects, whether they believe that those ethical standards were currently being met in smart city projects, and the most important ethical standards for smart city projects applications.

Then, to answer the second research question, a budgeting activity was carried out in both the focus groups and the interviews. First, participants were asked to rank five smart

city areas of development (i.e., mobility, energy, healthcare, waste and water management, and public safety) and a list of 24 potential smart city projects associated with each of the five areas. Both the areas of development and projects were selected by the research team based on the most likely projects for future development in a medium-sized city. Participants were then asked to distribute $1 million among the smart city projects. This allowed us to rank priority smart city areas and projects for stakeholders based on their decision as to which of the projects to allocate the most money to. Later, the choices made by each of the participants were shared and discussed in the focus groups; in the interviews, we asked participants to explain the reasons for their answers. Additionally, we asked them to express what other smart city projects the city needs.

Finally, we asked participants to list and discuss the barriers they perceived for the suggested smart city projects to be successfully implemented in Chattanooga.

3.3 Data analysis

We used content analysis to outline common themes mentioned by the five stakeholder groups. The five focus groups and the 28 interviews were transcribed and imported into NVivo, creating 34 documents for analysis. We used a combination of deductive and inductive coding approaches because we wanted to start from the participants' perception of smart cities. The process of category development and coding was non-linear, and we undertook several rounds of revisions of our codebook as recommended by Charmaz (2004). If new topics emerged from the data from focus group participants or respondents, we created new codes and added them to the codebook in the coding process. In total, 22 final codes emerged, compiling a total of 727 segments of content. In order to ensure the reliability of the coding process, two members of the research team separately coded all the data using the final 22 codes. We then checked for any inconsistencies. The coding process concluded only when all researchers agreed on the final codebook and the codification of the segments.

4. Results

4.1 The smart city concept

In our focus groups and interviews, two major themes emerged when stakeholders were asked how they would define a smart city: smart city buzzwords and the ability to meet the needs of a diverse population.

All five of the stakeholder groups conceptualized a smart city using buzzwords, such as 'innovation,' 'integration,' 'data,' or 'connected'. These conceptualizations firmly placed technology at the center of a smart city. However, at times, the explicit discussion of the technology itself was absent in this conceptualization. Citizens, entrepreneurs and non-profit members were more likely to describe a smart city in this way. For example, one citizen viewed a smart city as one whose processes are streamlined, either with or without technology. This view is based on the belief that if basic processes are not already built within the institutions and not working efficiently, the presence of technology may not improve it. Others conceptualized a smart city as a city that 'adjusts' or is adaptive to information it receives, or one that learns from what has worked in other cities and does not waste time by 'reinventing the wheel', or one that is proactive rather than reactive to problems. Here,

citizens, non-profit professionals and entrepreneurs did not view technology itself as the sole progenitor of a smart city, but rather the presence of efficient and efficacious processes as a necessary basis for facilitating a smart city.

In addition to placing technology at the center, every stakeholder group conceived of a smart city as one that is community-centered; and that leverages technology and existing resources to improve the quality of life for its citizens. Some stakeholders envisioned a smart city as one that is cognizant of and sensitive to the fact that urban populations are not monolithic and is responsive to the diversity of the city's population. An academic participant stated, 'it's a city that accounts for the diverse populations, but also kind of the different units across the population and the way that some segments of society may have different things going on that they need that others necessarily don't, but trying to balance those things.' (FG5).

Others extended the idea of centering the needs of the community by leveraging technology, thus bridging the two to address local needs that uplift and enhance communities. A citizen participant expressed, 'To me, a smart city would be a city that leverages technology, innovation, encourages a well-designed, well-implemented network of communication, transportation, and education' (FG2). This sentiment was echoed by a member of a local non-profit: 'A smart city is a city that has been very deliberate in its choices about growth and development. When I think of smart cities… I think [of] a smart infrastructure which might be the technology capabilities but also the way roads, bike lanes, parks, residential areas… are all planned out to create something that makes it easy for residents and workers to get in and get out to interact with one another in a friendly way to have access to goods and services close to where they live' (Interview).

While stakeholders identified commonly used buzzwords to describe smart cities, they also rejected a purely technocratic approach in defining what makes a city smart. They regarded a smart city as one that could integrate with an already robust municipal apparatus and leverage the innovation produced for the greater good of the community. Instead of thinking of smart city technology as a universal, objective good, stakeholders believed that the technology must coalesce around community needs in order to be considered a good, exposing the tension between how smart cities are envisioned by top-down technocrats versus urban residents on the ground. Stakeholders in our sample desire a smart city that incorporates what is referred to as 'appropriate technology' (Schumacher, 1993), which moves toward the balance of top-down, bottom-up governance resulting in technology that is socially and environmentally appropriate (Bennett et al., 2017). This conception of smart cities understands that urban planning cannot be "reduced to algorithms" (Mattern, 2017, p. 6).

4.2 Ethical principles

Participants were asked what ethical principles they felt should be prioritized in developing smart city applications and projects. Stakeholders of every category were unanimous in their belief that equity, social inclusion, and transparency should be prioritized in smart city development.

When discussing social inclusion and equity, the two ethical principles were often mentioned in conjunction with one another. Social inclusion and equity in this context meant

that smart city initiatives would not exclude traditionally marginalized segments of society from any of its benefits, and those benefits would be equitably distributed across the population. For citizens, smart city initiatives that lack a social inclusion and equity component threaten to create a city with great inequities. For example, 'the greatest [ethical principles] would be social inclusion and equity. I've been reading a lot lately about how the most innovative cities are the most in-equal, the most segregated. They have all this amazing technology, all these amazing features, but only for this "zip code"' (Citizen, FG2). Another stakeholder did not see the utility in outfitting a city with the latest technology if this same technology was exclusive: 'I feel like it's all pointless unless this technology is available to all sectors of society…we're just making things better for people that already have it good' (Government, interview). A non-profit stakeholder believed that social inclusion and equity not only needed to be one component of smart city initiatives but rather centered throughout the lifecycle of the project: 'I just think that as we look forward that we've got to get more intentional about how we advance with and keep inclusion, equity, transparency and those things at the forefront at the center of the work that we do as communities' (Interview).

This brings us to the other category all stakeholders felt should be prioritized in smart city initiatives, transparency. Transparency was oftentimes discussed with social inclusion and equity in a way that implied that one was an integral part of the other. For example, '… if people don't understand [what] you're designing, and you just roll out a plan and tell them what a smart city is, you know it's not going to go well' (Non-profit, interview). Transparency is seen as something that facilitates social inclusion and equity by being open to critique when plans for the project is laid out and available for multiple stakeholders to see. As a participant from the non-profit sector argued, 'if we're transparent, we can admit that something we're doing may not be efficient at the beginning or may not be as simple or sustainable at the beginning but that that's a goal somewhere along the way' (Interview).

Areas of divergence among stakeholders centered around accessibility, sustainability and simplicity. All stakeholders except for the government officials expressed a desire for potential applications to be accessible in as many ways as possible to as many people as possible. The theme of accessibility emerged in conversations with citizens more than any other stakeholder group. In fact, some of them worked with more vulnerable segments of the population and saw first-hand how existing structural inequalities could hamper a technology's intended benefit to the community overall, especially the most marginalized. One of these citizens asserted, 'Not everyone has a smartphone. I mean, the majority of people do, but not everyone, so I feel like equality can be pretty much an issue because I feel like not everyone has the ability to access any of that stuff' (FG1).

4.3 Future areas of development and smart city projects

Stakeholders considered mobility to be the biggest priority area on which to develop smart city projects in Chattanooga (see Table 2). Specifically, projects related to making mobility more efficient and improving public transportation were particularly desired by citizens. Stakeholders argue that mobility should be a priority because it is an area that affects them on a daily basis. Mobility favors equity in cities and benefits all people, especially if it aims to improve public transport. For example, 'I think mobility creates equity. So, someone is not penalized for not having a car. You're creating a public service that increases the opportunity

for someone, so they're not limited by geography' (Entrepreneur, interview). The critical issue, according to one of the non-profit women interviewed, is that information about public transportation should allow residents to plan their routes accurately: '… one of the things that I prioritize (d) toward the end was to have the real-time public transportation information. So, if I really knew when the buses were going to come close to my home, I wouldn't need to stand out there and wait for 20 minutes.'

(Table 2 about here)

The second preferred area was energy, which was closely related to environmental conservation. For example, one citizen said, 'I put energy just because … whether we know it or not, we're wasting so much and there's a lot of improvement since the environment is getting worse' (FG1). As with mobility, energy was identified as a priority area as it is the basis on which other smart city projects can be built. This was particularly voiced by government interviewees, for whom waste and water management projects, for example, cannot be addressed without first addressing price control and proper management of electricity resources.

With regard to healthcare, participants had a preference for projects that facilitate remote medical assistance since 'no one really wants to be in a hospital. So, if you are able to be [at] home, [you will] be more comfortable. I think that it would help people get better faster' (Entrepreneur, interview). In addition, participants agreed that these projects would allow access to health resources at any time and in any place. This would offload the hospitals from minor queries, which are the vast majority, in order to focus resources on the most serious cases.

In Chattanooga, participants agreed that ensuring adequate water quality is critical to the health of the population. As can be seen in Figure 2, in which the results of the weighted preferences in relation to the allocated budget by the group of stakeholders are presented, water quality monitoring is considered among the most important smart city projects in Chattanooga. In fact, Figure 2 shows that stakeholders allocated the largest amounts to water and waste management projects, energy and health projects, even though they listed mobility as the first priority area. Besides, a greater distribution of the budget among different projects can be observed among citizens, whereas the rest of the stakeholders showed clearer preferences for selected projects.

(Figure 2 about here)

We found that participants generally consider public safety the lowest priority area in Chattanooga. Some stakeholders pointed out that, while important, the other areas of the city were higher priorities than public safety. In addition, citizens were skeptical about the real usefulness of some projects, such as predictive policing or real-time crime mapping. They also expressed concerns about the use of personal data by law enforcement agencies. In particular, some citizens said that they had witnessed how the police had abused technology. This opinion was not shared by government officials, business people and members of non-profit organizations, who were keener on supporting public safety projects. These stakeholders, in contrast to the citizens, pointed out that the city must start by being safe for the citizens in order to be truly smart. Projects to improve mobility or health would be useless if citizens do not feel safe. For example, 'I follow the local news, and there's always a ton of business reports every week about gunshots somewhere. What happened recently with the (name) club… Someone left off 15 shots into the air. I think they shot three people

or something. It feels like that people were, and it was like I think it's a huge effort in trying to prosecute because of a ton of police patrols across the area… we are trying to solve the symptoms and not the actual root of the problem.' (Entrepreneur, interview).

Before finalizing the budgeting activity, we asked participants what other smart city projects were needed in the city. We collected a total of 23 additional smart city projects ideas in addition to those we had proposed. The full list can be found in Table 3. These new projects introduced new areas of smart cities development (e.g., government management). Out of these projects, 30.4% were related to mobility, 17.4% to government management and 17.4% to public safety. Proposals for mobility projects related to public transportation and bike were formulated by stakeholders from academia, citizens, and government. In contrast, initiatives of a more private nature such as electric scooters or car-sharing were formulated by entrepreneurs. Meanwhile, projects related to greater transparency in government management and publicity of city data were proposed by entrepreneurs and, above all, non-profits members. In general, we observe in the stakeholders' suggestions the need for more efficient management of the city's resources through data collection, analysis and management. For example, 'I think a lot of smart city data is heading towards vehicle-related analytics, and I think that you know cities are made of human beings and I think that the more that we can collect data about what human beings are doing, the better off will be and understanding how we activate public space.' (Non-profit, interview). Some of these projects, are not based on the use of ICT-based technologies (e.g., bike lanes), which suggest that stakeholders sometimes prefer non-ICT-based solutions to tackle the city needs (e.g., mobility).

(Table 3 about here)

4.4 Barriers for the implementation of smart city projects

We asked stakeholders what they considered to be barriers to the implementation of smart city applications and projects in Chattanooga. Three themes were identified from stakeholders as potential barriers to the implementation of smart city projects: funding, public buy-in, and politics.

4.4.1 Funding

For stakeholders in academia, prioritizing projects within the context of actual budget constraints and the need for funding in other areas was considered a potential barrier. One stakeholder specifically focused on how to disperse funds among the different smart city projects: 'I think (financing is) the biggest thing because I think that one of the major challenges is that the smart city concept is very broad. How do you prioritize and give any single project the money that it needs to be successful?' (Academia, FG4). A non-profit stakeholder expressed concerns about funding for smart city projects when there is already limited funding for existing public projects: 'I think resources from the public sector would be a challenge. We're already underfunding most things related to a lot of aspects of this' (Interview). Another participant, involved in overseeing smart city development, felt the budgetary challenge would lie in convincing the city that to allocate funding to any given smart city project in question would be in their interest: 'I think that, if, if we don't present

it in good light and have (a) good support use case built, then it's going to be difficult to sell to some elected officials to ... budgetary freedom to move forward' (Government, interview).

4.4.2 Public buy-in

In addition to procuring funding for smart city projects, there was a consensus among stakeholders that public buy-in could be a barrier to the implementation of these projects. Here, an academic describes the prerequisite for citizens to see a particular smart city application or project as one that is satisfying an existing need, or at least a manufactured one: 'No one will adopt a new innovation unless they perceive that they need it. So, you have to communicate that there's a perceived need and that this (project) will fill that need that the individual has' (FG5).

Resistance to the adoption of new technology was another perceived encumbrance to the public buy-in of some projects. An entrepreneur felt that some end-users would be resistant to integrating and adapting to some of the technologies discussed: 'Health care, I feel, [there] is going to be a pushback from medical officials. There's one thing that we kind of noticed is that it's not so much that the technology is not there. It's that doctors who've been in the industry for 20, 30 years they love writing down things on paper. They don't know how to work a computer even though you need to have an MD' (Interview).

Other stakeholders identified those smart city applications that may be perceived as threatening to specific communities and to which those communities, and others, could be resistant. A citizen focus group participant expressed this sentiment regarding their own trepidation about certain smart city applications: 'So obviously the police force and crime mapping stuff, the body cam stuff, I'm neutral towards. Again, it depends on what controls are in place, but predictive policing and real-time crime mapping were huge red flags that I don't think I would personally buy into regardless of the case that was made' (FG2).

Stakeholders from both the non-profit and government sectors viewed privacy concerns about smart city applications and a lack of understanding about what the technology does, respectively, as potential barriers to public buy-in. These concerns connect back to the previous discussion of the ethical standards that should guide smart city projects, transparency. These concerns suggest that buy-in necessitates transparency, which was considered an important ethical standard that should characterize smart city projects by every stakeholder category. And while government officials who are knowledgeable in this understand the technology, the question of how this knowledge gets transferred to the general population in a way that translates into their acceptance of the technology and trust of those implementing it remains to be answered.

4.4.3 Politics

The final theme that emerged from participants in every stakeholder group was the belief that a myriad of political forces could hinder the implementation of smart city projects. A member of the government explained, 'Oh, politics for sure, but also like lobbying power and who can influence the most. And you know you might just have a couple of industries that, even though it just seems smaller in terms of the input, but the money and political

power is so much louder than a whole community. So that can be really tricky and frustrating' (Interview).

One political interest of concern for stakeholders were those in real estate development potentially thwarting 'well-intentioned' smart city projects. A non-profit participant argued, 'Contractors (and) developers having their hands, having leverage on saying "yes we're still going to build. We don't care about that. How people get their water and where it comes from, where it goes. We just want to build our buildings and get people in and make our money". And I could see that the city not being strict on holding (them accountable)' (Interview).

Regardless of the specific interest, some stakeholders believed that it was ultimately the power that influenced politics, which in turn would determine whether or not smart city projects would be implemented. One of the citizens believed that any smart city project that would directly benefit low-income citizens, such as public transit, would not get implemented because it does not directly benefit those making decisions about these projects: 'With mobility, I see a lack of interest, because very much the people who run the city, they have cars, they have money, they don't live in these neighborhoods where people cannot get out' (FG2). This concern is a valid one as political will and active engagement can be the difference between a smart city initiative that languishes and one that is propelled forward (Bennett et al., 2017).

It is worth noting that participants from every stakeholder group, except government, voiced concern that smart city initiatives might exacerbate existing inequalities. The implication that some smart city applications could have an unintended negative effect on marginalized communities was seen as a threat to the community as a whole, 'Or if this monitoring system signals a whole, you know ten police cars in there and they end up once again raiding someone's house or doing something, somebody's getting sued on that one...' (Academia1, FG), and subsequently presenting a challenge to the adoption of smart city initiatives: 'I think that just incentivizes animosity against anyone who is working in security too, for individuals who live in the area. If you feel like you are hyper-policed, and every move you make is being watched, you feel like you've been put in a tank like you're somebody's little pet project, and I don't think that will reap positive benefits in society' (Citizens, FG).

These stakeholders also expressed concern that the smart city projects that might be prioritized and ultimately funded would be those that only benefit the privileged. For example, 'So, the underlying equity issues will be the biggest challenge to implementing these things. And you're going to see the resources to distribute as they have historically distributed, which is folks who have, yeah, maybe it's more who gets... Maybe that's the challenge' (Non-profit, interview). Here we see two sides of the coin of smart city governance: the necessity of government to push and implement smart city initiatives and those outside of government recognizing the need for power to lie within the collective in order to shape how smart city initiatives impact communities. Balancing top-down and bottom-up approaches in smart city governance is indeed the challenge.

(Table 4 here)

5. Discussion and conclusion

In this study, we explore the case of Chattanooga, a city that has particularly benefited from the implementation of ICTs, to answer four research questions: How do stakeholders define a smart city? Which ethical principles should govern smart city projects? What are the stakeholders' priority areas for the development of future smart city projects? And, what are the perceived barriers to the successful implementation of smart city projects? Our analysis of the stakeholders' interviews and focus groups data provides the following insights and implications for smart city development.

First, the definition of 'smart city' by stakeholders coalesced around the notion that innovation for the sake of innovation is not smart, but rather a city that *is* smart is one that is intertwined with and responsive to its community, in line with critical positions in the literature on smart cities (Anthopoulos, 2017; Cardullo & Kitchin, 2019; Hollands, 2008, 2015). This conceptualization sees the smart city as one that –with or without technology– functions efficiently at its core, whereas the ICT-based solutions are not seen as the panacea to solve dysfunctional problems and make the city' smart' (Coletta et al., 2019; Greenfield, 2013). We also found some contrasting perspectives, as citizens were particularly concerned about accessibility, perhaps because they do not represent primary stakeholders that are normally involved in the decision-making around smart city initiatives (Agbali et al., 2019; Cardullo & Kitchin, 2019; Kitchin, 2019). The perspectives of the stakeholders help to provide us with our own definition of a smart city. Based on their feedback, we posit that a smart city is one that is efficient, sustainable and equitable for all citizens. While this case study focuses on a medium-sized city in the southern US, the stakeholder's values for a smart city are consistent with some of the European Union's top institutions (see Kollar et al., 2018).

Second, we found that stakeholders envision a smart city built on clear ethical principles. This research provides new evidence that supports the need for models of the smart city focused on the ideas of citizenship, social inclusion, public goods, equity, and sustainability (Kitchin, 2019). Our respondents were able to think of each of the ethical principles beyond their own potential silos and instead envision a symbiosis among the principles. The themes that emerged from the respondents suggest the possibility of an ethical framework for smart city applications and projects that can be used by those involved in its design, development and deployment (Kitchin, 2016; Mark & Anya, 2019).

We also found areas of divergence in the views of stakeholders. These differences reflect the, at times, contrasting priorities between end-users and those who are tasked with the implementation of the technology. While a divergence on the surface, underneath, the desire for sustainability from institutional actors and the desire for social inclusion, equity and transparency from non-institutional actors are indeed connected. Transparency and social inclusion of diverse stakeholders are needed in order to direct the socio-technical transition of a smart city initiative into an equitable, and thus, a sustainable one. Perhaps in this context, social inclusion and equity are those smart city ethical principles that coalesce around common values shared by all and through co-production, creating cities that are smart not as a function of its smartness, but rather as a function of its social inclusion (McLaren & Agyeman, 2018). Here, smart cities can be reimagined by not seeing citizens as passive consumers or beneficiaries of smart city initiatives, but instead, as active co-creators

grounded in 'civil, social, and political rights and the common good' (Kitchin, 2018, p. 221), allowing for reorganizing how these initiatives are implemented. This lays the groundwork for a diverse array of stakeholders to coalesce around the common values they share in order to direct innovation in such a way that produces a sustainable future (see Doyon, 2018; Loorbach & Rotmans, 2010). As already stated by other authors (e.g., Praharaj & Han, 2019), these proposals should be based on local realities and contextual studies, such as the one presented here. In particular, unlike countries in Europe or Asia, the US could be considered a 'corporatocracy' where there is less government regulation and less overall input from different stakeholders, especially citizens as it relates to private enterprise. This reality means that new smart city projects in the US must pay particular attention to the ethical principles on which they are built.

Third, determining the stakeholders' priority areas for the development of future smart city projects requires specific, local case studies. This study contributes to increasing the knowledge about inhabitants' preferences for smart city services, a line of research recently initiated in some Asian cities (see Ji et al., 2021). The results of the present study suggest that the smart city imagined by Chattanooga's stakeholders would have improved the environmental sustainability and the quality of life rather than have intensively implemented ICT-based solutions (see Giffinger et al., 2007). According to our analysis, the smart city desired by citizens is far from the trend that US cities are moving towards. Particularly, the projects preferred by citizens are not in line with those desired by other stakeholders, as they prioritize the projects which improve the city public services, in contrast with the privatization of the urban space in the US, supported to a greater extent by entrepreneurs and government officials (Hefetz & Warner, 2007). This result is even more relevant as previous research suggest that the market-based development model implemented in Chattanooga –and other medium-sized cities in the US– is in practice exacerbating the racial cleavages already existing in the city (Fletcher, 2020). This negative impact could be mitigated by including citizen participation mechanisms in the smart city policymaking process as suggested above (Panagiotopoulou & Stratigea, 2017), as well as by implementing holistic governance models such as the one proposed by Castelnovo et al. (2016). In this regard, experiences of participation in the design of smart Dutch cities can serve as examples of how to increase of awareness and understanding of, and empathy for, the interests of other stakeholders (e.g., Ooms et al., 2020; van Waart et al., 2016).

Finally, we explored the potential barriers to the implementation of smart city projects. In our results, we differentiate three major barriers: funding constraints, public acceptance, and political interests. Funding constraints could be a major barrier in the US, where staunch neoliberal ideology drives local governments to promote private urban design initiatives over publicly owned initiatives. Unlike cities in Europe, where barriers derived from regulations required legal-based solutions (e.g., Bjørner, 2021), cities in the US should pursue public-private partnerships –such as the Smart Community Collaborative in Chattanooga– as a solution to assure that the private initiatives also promote the public interest. In turn, these initiatives can discourage some key actors from trying to use smart city projects for political gain.

The barriers to public acceptance, or buy-in, are in line with the studies on innovation adoption and technological acceptance, which indicate that a low perception of usefulness can be a barrier to technological implementation (Davis, 1986; Habib et al., 2020; Rogers,

2003; Tang et al., 2019). And even if the public does perceive the technology to be useful, there may be attitudinal barriers to accepting the technology, such as privacy concerns or lack of knowledge about the technology, both of which are factors related to 'trust in technology' in the context of smart cities (Habib et al., 2020). These barriers could slow down the implementation of smart city projects. Beyond advertising campaigns, the transparency of public-private initiatives for the development of smart city projects could mitigate this perception among stakeholders. Transparency can be achieved through publicity of smart city indicators, a clear and well-communicated roadmap, informed decisions with up-to-date data and open government initiatives.

This study has some limitations, which serve as a basis for future studies. First, we aimed to answer our research question using an exploratory approach, which motivated the qualitative design of the study. While we provide profound conclusions, the results are not representative of the population of Chattanooga. Particularly, the use of a hypothetical budget activity to collect the stakeholders' views proved its usefulness weighing the stakeholders' preferred smart city projects, from which we could provide suggestions for a future roadmap towards a smarter Chattanooga. This data collection method, however, may lead to richer results if representative samples of the city are used, also including participants from different socio-demographic backgrounds.

Second, this study explores the case of a medium-sized city in the southern US, a region characterized by an embrace of small government and privatization of traditionally public services. However, the opinions of our participants were not overwhelmingly conservative. This result might be due to the fact that the City Council in Chattanooga is playing a central role in the development of smart city services, along with other public and private actors. Studies carried out in other cities of the same size US might obtain more skeptical attitudes toward government support of public services. Third, the respondents held similar values as it pertains to what a smart city should be. We believe this may be due to the fact that Chattanooga has built its public reputation from that of a dirty industrial city to a 21st century smart, livable city. Many of its residents are both aware of this and embody a spirit of progress. Regardless, we believe that our results are relevant in terms of providing the stakeholders' view of a city that, despite developing smart city projects, does not appear in the smart city rankings conducted to date.

Fourth, the focus groups and interviews were conducted in a world before the Covid-19 pandemic and the social protests that occurred throughout the US and other countries of the world over the murder of George Floyd by a police officer in Minneapolis. While there is no reason to assume that these two events have changed the definitions of smart cities, the ethical principles on which they should be planned, and the perceived barriers to implementing smart city projects, they may have changed stakeholders' preferences regarding the priority areas for smart city development. In particular, if the study were conducted at this time, we would expect to find a greater preference for smart health projects and an even lower preference for smart public safety projects. In fact, regarding the former, some cities have been already implemented health smart city projects to better monitor the evolution of the pandemic (see, e.g., Sonn et al., 2020). As society shifts and adapts to life after a pandemic, future studies should examine what stakeholder preferences are for smart city projects in the post-Covid-19 world.

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Tables

Table 1. Descriptive statistics for study participants (*N* = 72).

	Focus groups		Interviews		Total	
Variable	*n*	%	*n*	%	*n*	%
Gender						
Male	19	43.2	20	71.4	39	54.2
Female	25	56.8	7	25	32	44.4
Androgynous	-	-	1	3.6	1	1.4
Age						
18–29	18	40.9	7	25.9	25	35.2
30–39	12	27.3	9	33.3	21	29.6
40–49	7	15.9	6	22.2	13	18.3
50–59	5	11.4	2	7.4	7	9.9
60 and up	2	4.5	3	11.1	5	7
Ethnicity						
Non-Hispanic White	22	50	24	85.7	46	63.9
African American	5	11.4	1	3.6	6	8.3
Latino or Hispanic	3	6.8	3	10.7	6	8.3
Asian	12	27.3	-	-	12	16.7
Multiple Ethnicity	2	4.5	-	-	2	2.8
Education						
Less than high school	1	2.3	-	-	1	1.4
High school or equivalent	10	22.7	1	3.6	11	15.3
Some college but no degree	3	6.8	1	3.6	4	5.6
Associate	2	4.5	-	-	2	2.8
Bachelor	8	18.2	15	53.6	23	31.9
Graduate	20	45.5	11	39.3	31	43.1
Disability						
Yes	4	9.1	-	-	4	5.8
No	40	90.9	25	100	65	94.2

Table 2. Respondent references for smart city areas and future projects.

Smart city areas and projects	Ranking						Weight (*)	RW	Project weight	RPW
	NI	1st	2nd	3rd	4th	5th				
Mobility		25	15	15	7	10	254	1		
Intelligent traffic signals	8	25	24	9	4	2			258	1.00
Real-time public transit information	27	13	9	11	8	4			154	.60
Real-time road navigation	27	14	9	7	9	6			151	.59
Smart parking	21	4	7	13	8	19			122	.47
Autonomous vehicles	29	8	3	17	3	12			121	.47
Integrated multimodal information	35	5	7	8	13	4			107	.41
Vehicles sharing	33	4	9	5	9	12			101	.39
Energy		23	18	10	15	6	253	.99		
Home energy automation systems	1	34	21	15	1	-			301	1.00
Dynamic electricity pricing	3	22	27	20	-	-			278	.92
Smart streetlights	3	12	23	33	1	-			253	.84
Healthcare		16	10	26	13	7	231	.91		
Telemedicine	5	29	7	13	8	10			238	1.00
Remote patient monitoring	5	7	20	27	10	3			219	.92
Data-based public health interventions for maternal and child health	5	16	16	7	17	11			210	.88
Real time-air quality information	7	14	8	8	17	18			178	.75
Lifestyle wearables	9	5	21	11	10	16			178	.75
Waste and water management		13	14	10	7	28	193	.76		
Water quality monitoring	1	44	21	6	-	-			322	1.00
Leakage detection and control	3	20	40	9	-	-			287	.89
Optimization of waste collection routes	6	7	8	51	-	-			220	.68
Public safety		5	17	10	19	21	182	.72		
Real-time crime mapping	8	36	8	12	4	4			260	1.00
Predictive policing	18	8	14	21	4	7			174	.67
Disaster early—warning systems	12	14	9	8	12	17			171	.66
Body-worn cameras	14	6	14	10	16	12			160	.62
Gunshot detection	20	3	19	11	12	7			155	.60
Data-driven building inspections	38	6	4	3	12	9			88	.34

Note: Entries represent the number of respondents who report the projects as their first, second, third, fourth or fifth preference for being designed and implemented in Chattanooga. Weight (*) is based on five points for the first preference, four points for the second preference, three points for the third preference, two points for the fourth preference, and one point for the fifth preference. Both relative weight (RW) and relative project weight (RPW) are the weighted total divided by the highest weight (i.e., mobility for the areas). NI = 'not included in the ranking'.

Table 3. Smart city projects desired by stakeholders not initially included in the budget activity.

Project	Area	Focus	Segments
Urban sensors to detect flooded streets	Water management	Sensors	5
Tramway, subway or other alternative public transport	Mobility	Public infrastructure	4
Air quality monitors	Health	Sensors	3
Bike lines	Mobility	Public infrastructure	3
Data-driven city design	Government	Data	3
Sustainable city transit app	Mobility	App	2
Integrated open data portal	Government	Data	2
Electric scooters	Mobility	City services	2
Renewable energy	Energy	Renewable resources use	2
Smart school management platform	Education	App	2
911 accident prediction	Public safety	Data	1
Car sharing	Mobility	App	1
Data-driven public transport	Mobility	Data	1
Energy-efficient smart buildings	Energy	Data	1
Integrated data security management	Public safety	Data	1
Motion detector street lights	Public safety	Sensors	1
Public education in STEM	Education	Education	1
Real-time city-data wall panels	Government	City services	1
Real-time location-based safety alerts app	Public safety	App	1
Smart payment for parking system	Mobility	App	1
Smart recycling machines	Waste management	City services	1
Sustainable agriculture	Health	Education	1
Transparent housing pricing	Government	Data	1
Total			41

Table 4. Barriers to the implementation of smart city projects.

Category	Segments
Budgeting/Financial	22
Public buy-in	12
Politics	8
Cultural	7
Inequality	6
Undereducated workforce	3
Existing problems	3
Total	61

List of figures

Figure 1. Map of the city of Chattanooga, located in the Hamilton County (Tennessee) (Source: OpenStreetMap).

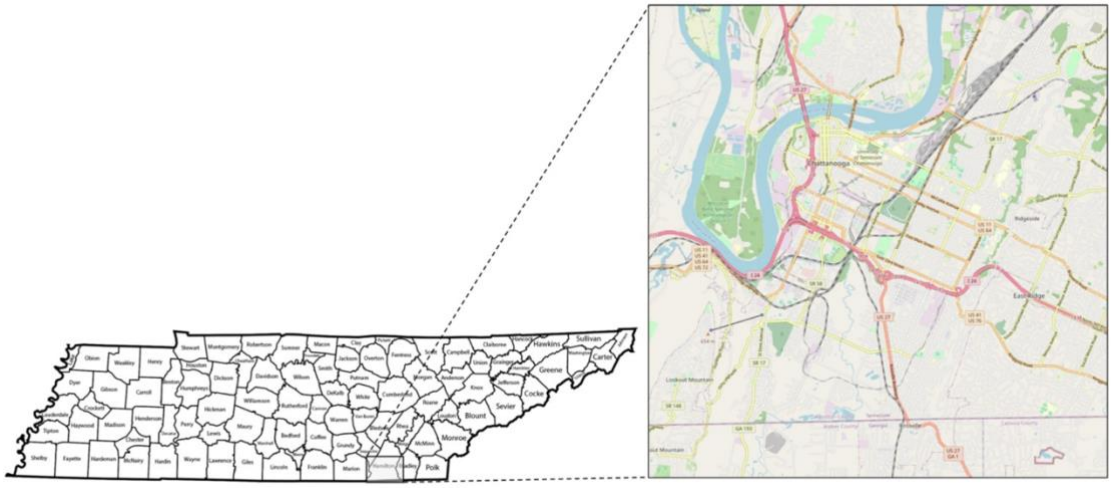
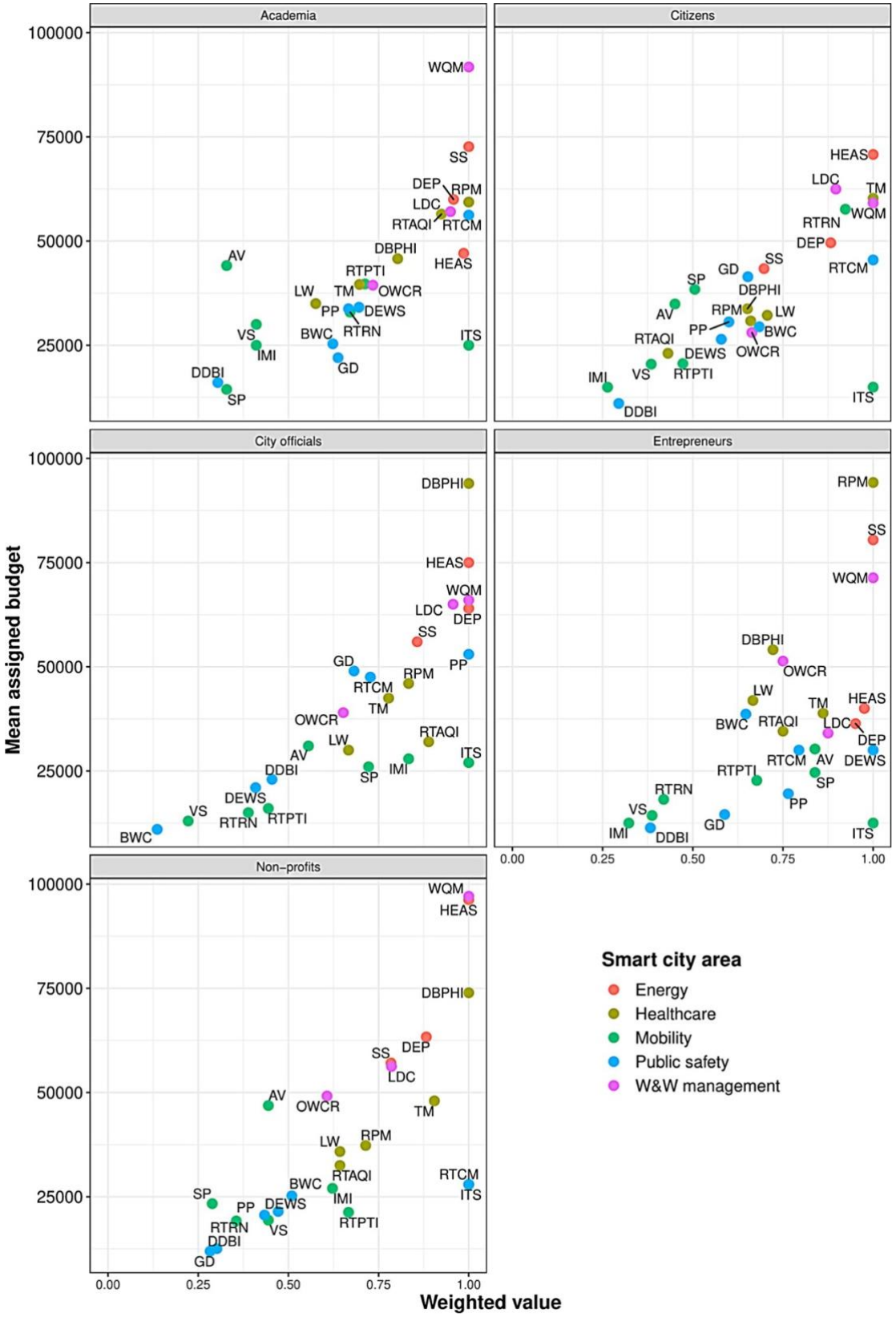


Figure 2. Scatter plot representing the location of smart city projects based on weighted ranking preferences and assigned budget by stakeholder group.



Note: Smart city projects acronyms are ITS = "Intelligence traffic signals", RTPTI = "Real-time public transit information", RTRN = "Real-time road navigation", SP = "Smart parking", AV = "Autonomous vehicles", IMI = "Integrated multimodal information", VS = "Vehicle sharing", HEAS = "Home energy automation

systems, DEP = "Dynamic electricity pricing", SS = "Smart streetlight", TM = "Telemedicine", RPM = "Remote patient monitoring", DBPHI = "Data-based public health intervention", RTAQI = "Real-time air quality information", LW = "Lifestyle wearables", WQM = "Water quality monitoring", LDC = "Leakage detect and control", OWCR = "Optimization of waste collection routes", RTCM = "Real-time crime mapping", PP = "Predictive policing", DEWS = "Disaster early-warning systems", BWC = "Body-worn cameras", GD = "Gunshot detection", DDBI = "Data-driven building inspections".

Appendices

Appendix. Interview and focus groups guide.

1. The smart city concept

1.1. What do you think a smart city is?

1.2. What is it about Chattanooga that makes you think (or not think) of it as a smart city?

2. Ethical principles

2.1. What ethical principles do you think should govern smart city projects?

2.2. Do you think that these ethical principles are currently being met in smart city projects?

2.3. What are the most important ethical principles for smart city applications. Why?

3. Future areas of development and smart city projects

3.1. [*Participants received cards with future smart applications distributed among five areas: public safety, healthcare, mobility, energy, and water and waste management*] Here, you have five cards. Please, first, decide how relevant each area is for you (ranked from 1st to 5th). After that, please distribute 1 million dollars among each of the areas. It is very important that all of you write down the reasons for your choice.

3.2. [*After the general policy areas, participants had to discuss specific smart city projects for public safety, healthcare, mobility, energy and water and waste management*]. Now, please distribute the amount already allocated in each category to the specific smart city projects following the same procedure as before: first, please rank the projects; second, please allocate the money to each of the projects.

3.3. How do you think these projects can improve your quality of life?

4. Barriers for the implementation of smart city projects

4.1. What kind of barriers do you perceive for these projects to be successfully implemented in Chattanooga?

4.2. What kind of threats do you perceive from these projects? Why?

4.3. What information or approach do you need for you to accept the implementation of these projects?