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Urban planners' roles, perceptions, needs, and concerns in smart city planning: a survey of U.S. planners

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ABSTRACT

In this article, we present insights from planners on their concepts of smart cities and their roles, perceptions, needs, and concerns related to the initiation and/or implementation of smart city projects. Our analysis is based on a survey of professional planners ($n = 1,417$) throughout the United States to study the tools, efforts, and concerns related to smart city planning. We also explore the role of smart city strategies and technologies in influencing planning processes and the function of cities, planning organizations, and local governments in this process. While most planners consider smart city planning as 'proactive,' 'timely,' and 'needed,' they identify several major issues, including a lack of agreement on what constitutes a smart city; a lack of demand from policymakers and citizens, resulting in little political will to implement smart city technologies; and a gap in understanding of the related issues concerning ethics, equity, and privacy.

KEYWORDS

Planning ethics; equity; digital divide

1. Introduction

Urban planners' roles, ethical considerations, and power relations have been frequent topics of scholarly inquiry. Broadly speaking, a planner is an individual who has received education and training in the field of planning to reimagine and develop cities through a coordinated plan, bringing together principles of land use, conservation, or strategic infrastructure investments (Healey 2004; Muchadenyika and Williams 2017). In practice, this role varies greatly based on the specific context and location of a project, as societies possess different politico-economic power relations and ideologies that can influence and even limit a planner's capabilities (Kamete 2009; Williams 2000).

Historically, the planning profession was largely technical, and planners were viewed as facilitators of development who relied on objective and science-based analyses. Their duties typically focused on the provision of knowledge of legal rules and procedures without any evaluation of plans or policies (Howe and Kaufman 1979). Although planning professionals are still viewed as facilitators of development, their role has evolved to be both mediator and administrator, responsible for identifying the scope of a project, assigning tasks to each party involved in the process, as well as bolstering relationships and generating conversations amongst stakeholders (Bulkeley 2006; Campbell 2006; Fox-Rogers and Murphy 2016; Oulahen et al. 2018). This expanded role often places planners at the intersection of competing public and private development interests.

As planners attempt to reach agreements among those competing interests, they may often be responsible for implementing policies dictated by elected officials, resulting in decreased flexibility

and an inability to advocate for marginalized groups (Fox-Rogers and Murphy 2016; Wang and Hoch 2013). This restrictive responsibility heavily contrasts with many planners' beliefs that the profession should be responsible for social reform, which posits planning as a tool for the equitable redistribution of resources through actions like voluntary community development projects (Kirk 1980; Knox and Masilela 1990). There is disagreement, however, about whether planners should consider pursuing elected offices to amplify their reformist goals or to remain unbiased technicians who provide reports of data and information (Karki 2017; Lauria and Long 2017).

Regardless of whether a planner operates as a politician/advocate, technician, or somewhere in between, the role has become increasingly politicized, resulting in new ethical concerns. These concerns include an interest in pursuing the 'common good,' a balancing of competing interests in a project, a fair prioritization of the needs of relevant stakeholders; and a genuine effort to both identify what should be done based on specific ethical foundations and voice any ethical concerns they may have regarding proposed developments (Campbell 2012; Lennon and Fox-Rogers 2017). Contested politics are a major source of ethical dilemmas in the planning process, so practitioners must ensure it reflects the needs of all stakeholders, especially historically disenfranchised groups (Forester 1980; Forester 2012; Muchadenyika and Williams 2017). By ensuring all groups are equitably informed about the process, planners can redistribute power and in turn defend marginalized groups throughout the decision-making process (Forester 1999; Forester 1989).

Even in cases where planners' power is limited, they are still responsible for the facilitation of a neutral participatory process to ensure they accurately represent the interests of the public (Lennon and Fox-Rogers 2017). The presence of social media as a tool for participation, however, has complicated planners' pursuit of equitable public participation because of widely different levels of access to the Internet and popular social media platforms across regions (Afzalan and Muller, 2014; Sjöblom and Niitamo 2020). In doing so, planners can also be described as negotiators, mediating discussions between investors and citizens. Recognizing that there will be conflicting interests in the process, planners must establish a healthy 'culture of debate' and support lively disputes amongst stakeholders. Facilitating these public debates allows for the increase of citizen protests and movements that can change existing power structures (Kühn 2021).

Prior studies have used either quantitative (Knox and Cullen 1981; Knox and Masilela 1990) or qualitative (Fox-Rogers and Murphy 2016; Howe and Kaufman 1979; Muchadenyika and Williams 2017; Sjöblom and Niitamo 2020) methodologies to understand planners' perceived roles and ethical viewpoints about different aspects of planning. Although these studies are important contributions to the field, they offer little insight into planners' roles in smart city planning, which includes topics like smart homes, buildings, society, energy, mobility, and retail, as well as big data and the Internet of Things (IoT). In this article, we investigate planners' roles in and perceptions of smart city projects, along with their experiences with, needs for, and concerns about said projects. To do so, we analyze responses from a national survey of professional U.S. planners – certified by the American Institute Certified Planners (AICP) – on smart city strategies and technologies. By smart cities strategies, we refer to capacity building through collaboration (e.g. organizing hackathons); managing online environments; developing open data portals; big data analysis; and the use of geographic information systems (GIS), scenario planning, and modelling. By smart cities technologies, we refer to online participatory tools including social media and digital data collection tools.

In this article, we explore the role of smart city strategies and technologies in influencing planning processes and the function of cities, planning organizations, and/or local governments involved. Though conducted before the COVID-19 pandemic, our findings identify gaps in research and implications for planning scholars and practitioners that remain applicable in the post-pandemic world of smart city planning regarding key concepts, practices, and considerations for equity. We address the following research questions, organized into three categories:

- Planners, organizations, and their smart city efforts and needs

- What are the smart cities strategies and technologies, including digital public engagement tools, organizations have implemented, and which departments are involved in these efforts?
- What do planners need to pursue or enhance smart city efforts?
- Planners' roles in and experiences with smart city implementation
 - What are planners' roles in and experiences with implementing smart city tools, technologies, projects, or strategies?
 - How can planners contribute to smart city efforts in their organizations?
- Planners' perceptions of and concerns about smart cities
 - What are planners' perceptions of smart city approaches and related concerns about ethics and equity?
 - What, according to planners, are the critical aspects of smart cities?

We begin by reviewing the existing literature on smart city initiatives and their connection to urban planning before describing how this study contributes to this body of work. We then describe the survey design and findings, followed by our discussion of survey results using descriptive statistics and qualitative content analysis. We identify major takeaways for smart city scholars and professional planners in our concluding remarks.

2. A review of smart city planning

2.1. Defining smart cities and smart city planning

First introduced during the smart growth movement of the 1990s, smart cities have recently gained momentum in planning practice and policies across the Global North and Global South as governments race to promote equitable development, sustainable growth, and quality of life for their citizens (Ballas 2013; Marcus and Koch 2017; Verrest and Pfeffer 2019). Inspired by community reactions to issues like rapid urbanization, traffic congestion, school overcrowding, air pollution, and loss of open space, a city can be considered smart when its organizations, administrators, and planners have successfully leveraged digital technologies to optimize function across social, economic, and environmental dimensions of sustainability (Alawadhi et al. 2012; Dameri and Cocchia 2013; Eger 2009; Hák, Moldan, and Dahl 2007; Harrison and Donnelly 2011; Huovila, Bosch, and Airaksinen 2019; Neirotti et al. 2014). These technologies allow the system to 'sense and act,' meaning it can better understand the local context and adapt to users' needs, as well as inspire a sense of community through a bottom-up approach, where members and institutions work in partnership to transform their environment (Albino, Berardi, and Dangelico 2015; Berardi 2013; Hall 2000; Harrison et al. 2010; Marsa-Maestre et al. 2008; Nam and Pardo 2011; Neirotti et al. 2014).

Scholars eventually began criticizing the smart city concept for being too technical or for creating 'empty' spaces that disregarded the basic social dimension of the city, as was the case with corporate-designed smart cities such as Songdo (South Korea), Masdar City (UAE), or PlanIT Valley (Portugal) (Albino, Berardi, and Dangelico 2015; Cugurullo 2013; Greenfield 2013; Hollands 2008). Other scholars criticize the larger framework of smart cities and call for a radical redefinition of it because they believe it lacks environmental indicators despite highlighting the social and economic aspects of sustainable cities (Ahvenniemi et al. 2017). Much of these criticisms, however, stem from the term's overlap with other analogous ones like digital, intelligent, virtual, or ubiquitous cities, all of which differ from smart cities because they include only digital components, follow a top-down approach, and exclude the 'people' component (Townsend 2013).

As Kummitha and Crutzen (2017) rightfully point out, though, the planning and execution of smart cities have generated crucial gaps and negative consequences, largely because of the concept's lack of singular framework or consistency of use (Albino, Berardi, and Dangelico 2015; O'grady and O'hare 2012). It is difficult to establish consistency on a global level because of the contextual and

geographical differences between developed and developing nations, their political choices, urban ecosystems, technology vendors and local authorities, and their citizens' needs and habits (Neirotti et al. 2014). At the local level, the smart city planning approach is similarly inconsistent because of each city's unique contextual factors like economic development, structural urban variables, population density, and geographic location (Neirotti et al. 2014). As a result, smart cities with different pathways for development have emerged. For example, Amsterdam has a business-driven approach that puts innovation at its core, Masdar City in Abu Dhabi has technological optimism as its main essence, Barcelona focuses on social inclusion, and Dubai prioritizes ambitious leadership (Noori, Hoppe, and Martin 2020).

For the purpose of this paper, we follow the commonly understood definition of a smart city as a municipality or a metro area implementing digital and technology-based solutions or innovations (e.g. ICT, IoT), coupled with new approaches to urban planning and renewed investment in human or organizational capital. These solutions and innovations are intended to solve emerging problems related to urban living practices and conditions, enhance the delivery of services to and communication with citizens, improve citizens' quality of life, and ensure future viability and prosperity (Alawadhi et al. 2012; Dirks, Keeling, and Dencik 2009; Nam and Pardo 2011; Neirotti et al. 2014; Nijaki and Worrel 2012). A smart city's focus on technology-oriented solutions is to increase the efficiency of its various application domains (Bina, Inch, and Pereira 2020; Cugurullo 2018; Marcus and Koch 2017; Neirotti et al. 2014). The domains can be grouped into 'hard' and 'soft' categories; 'hard' domains include natural resources and energy, transport and mobility, and buildings, and 'soft' domains include economy and people, living, and government (Neirotti et al. 2014).

2.2. Planners' roles in citizen data collection for smart cities

Although digital technologies assist with the optimization of tangible assets (e.g. transportation infrastructure and energy distribution networks), planners attempt to use technology to improve intangible assets, chiefly human capital to empower urban residents to become citizen-sensors who contribute valuable behavioural data (Gabrys 2014; Neirotti et al. 2014; Rabari and Storper 2015; Vanolo 2016). Planners often passively crowdsource such data through interactive platforms like social media (Afzalan and Muller 2018; Alizadeh, Sarkar, and Burgoyne 2019; Staletić et al. 2020). They can also actively collect similar data through participatory media like 'urban citizenship engagement points' in sustainable transit systems (Gabrys 2014) or telepresence technologies in urban living quarters (Albino, Berardi, and Dangelico 2015; Halpern et al. 2013; Shwayri 2013).

Citizen engagement is critical to fostering smart city innovations; the level of engagement, however, varies according to the technical complexity of a project and the perceived value of expert scientists and practitioners (Afzalan, Sanchez, and Evans-Cowley 2017; Lea et al. 2015; Mandarano, Meenar, and Steins 2011; Meenar 2019; Meenar and Kitson 2020; Pham, Mai, and Massey 2016). By engaging citizens to drive decision-making, planners can transform the implementation of smart cities into a democratic bottom-up process by adopting a 'socio-technical' approach, which contrasts sharply with ineffective top-down, techno-centric approaches (Alizadeh, Sarkar, and Burgoyne 2019; Bull and Azzenoud 2016; Gudowsky et al. 2017; Leach, Stirling, and Scoones 2010; Meenar, Afzalan, and Hajrasouliha 2019; Nam and Pardo 2011; Staletić et al. 2020; Saunders and Baeck 2015).

2.3. Criticisms of smart city planning and implementation

Opponents of smart city planning have noted that the smart city movement may herald a new era of unmanageable complexity because of how increased reliance on digital technologies may increase municipalities' vulnerability to cyberattacks, as well as society's inability to unravel issues of confidentiality, intellectual property, and ownership (Batty 2016; Colding and Barthel 2017; Colding, Colding, and Barthel 2018; Offenhuber 2019). Moreover, because ICT companies are beholden

to their owners and not the public their interests may not align with those of the public and relying on their technology may give them an undue influence over public domains and space (Colding and Barthel 2017).

Some scholars have also criticized smart city planning efforts as undemocratic and having few environmental benefits, particularly regarding the ecological impacts of energy and water supply chain management (Cugurullo 2018). Such laissez-faire attitudes toward smart city interventions have resulted in ‘unecological and socially unjust patterns of urban development’ that continue a capitalistic model of growth that promotes overconsumption and pollution (Cugurullo 2018, 86). Other frequent criticisms of smart city policies include their lack of acknowledgment of urban diversity; potentially negative consequences regarding equity and inclusion because of the growing digital divide; lack of consideration for political, economic, and social histories; problematic implementation; centralized presence of the private sector; and failed attempts to design creative and inclusive urban spaces (Alizadeh, Sarkar, and Burgoyne 2019; Kummitha and Crutzen 2017; Shelton, Zook, and Wiig 2015; Verrest and Pfeffer 2019). Properly acknowledging urban diversity is arguably one of the most important aspects of the smart city planning process because not all citizens may be equally able or willing to participate in crowdsourcing activities (Staletić et al. 2020). Thus, planners and policymakers should collaborate to determine the best methods for investing in human and social capital to fuel equitable and sustainable growth (Jamei et al. 2017; Nam and Pardo 2011).

In summary, while there exists a robust body of literature on smart city concepts, techniques and tools, fields of application, challenges with implementation, and potential impacts on the public, a gap remains in our understanding of the ways urban planners themselves perceive the concept of smart cities, their roles in smart city planning, the tools they need to initiate or implement smart city efforts, the types of smart city efforts they are directly engaged in, and the concerns they may have about smart cities. There is also a need to understand the relationships between planners and ICT/IoT professionals, policymakers, funding agencies, and citizens, regarding the planning and implementation of smart city technologies.

3. Method and data

Data for this study was collected through a collaboration with the American Planning Association (APA) Technology Division. The second author and a collaborator created a web-based survey using Qualtrics and shared the web link with all AICP planners. We selected AICP planners as a proxy for targeting only certified professional planners who were members of the APA. We chose a web-based survey as our data collection method since it allowed us to contact all AICP planners at the time of this study ($n = 16,241$) and seek generalizable findings. The APA distributed the web link of the survey to its AICP members in February 2017 and sent them a reminder after one week. The APA’s privacy protocol did not allow the researchers to directly contact the AICP members. The survey was open for one month, and we received 1,417 valid responses to the survey—an 8.7% response rate.

The purpose of this survey was to explore planning organizations’ readiness to adopt smart city strategies and technologies in their planning practice. Most of the survey questions were multiple-choice with options for respondents to add comments. We initially tested the survey with a sample group of U.S. planners and followed up with a phone conversation to review the responses and revise the questions as needed. In total, we tested three survey drafts with twelve AICP planners.

The survey was anonymous, contained no identifiable questions, and invited feedback from planners of all experience levels. It opened with our functional definition of smart cities, and the questions were organized under three themes: (i) planners’ organizational backgrounds and their efforts and needs for smart city planning; (ii) planners’ experiences with and roles related to smart city implementation; and (iii) planners’ perceptions of and concerns about the smart city planning process.

Once the survey was closed, we imported the data from Qualtrics to SPSS and Excel for analysis. We used descriptive statistics to analyze most questions. For responses to open-ended questions, we conducted both qualitative content and interpretive analysis to identify major themes. We also created a GIS map to visualize the respondents' geographic locations based on the coordinate information Qualtrics provided.

4. Results

4.1. Planners, organizations, and their smart city efforts

4.1.1. Planners' organizational affiliations and positions

Of the 1,417 respondents, approximately 60% worked in the public sector, more than half worked for a city government, followed by a smaller percentage who worked for county, state, or regional governments. The remaining 40% worked in the private sector (e.g. private firms or non-profit organizations) or answered 'other.' Among the 152 planners who selected 'other,' 55 were retired, 33 had backgrounds in higher education, and the rest were unemployed, self-employed, or from tribal governments. Geographically, most respondents were from the states of California (11.3%), Florida (7.7%), Colorado (5.5%), Illinois (5%), New York (4.5%), Virginia (4.7%), and Texas (4.5%). [Figure 1](#) displays the locations of all respondents.

About 57% of planners working in the public sector held 'top-level' positions, identifying themselves as planning directors, CEOs, or planner IV's (e.g. planning managers or principal planners). About 23% of respondents were planner III's or senior planners, and only 1% were assistant planners or planner I's. This pattern was similar to that of private sector planners, where about 50% of respondents held 'top-level' positions and 18% of respondents were planner III's.

4.1.2. Implementation of smart cities strategies, tools, and responsible departments

The second column of [Table 1](#) presents the implementation rate of different smart city strategies and technologies, including digital public engagement tools. The majority of planners responded that their organizations had used social media; developed online GIS tools, open data portals, and/or online participatory tools; and implemented text messaging warning systems. Respondents reported several other strategies or tools their organizations implemented, including online

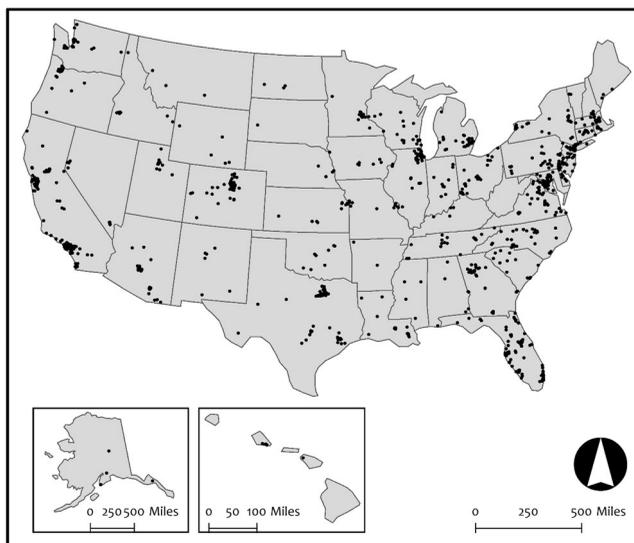


Figure 1. Location of AICP planners who participated in our survey.

reporting of citizen concerns, electronic plan review and permit processing, public WiFi, smart street lights, smart pavements, and neighbourhood electric shuttles.

One or more departments within respondents' organizations were involved in advancing smart cities or similar technology/data-focused efforts. According to the respondents, 'planning' departments led the effort (67%), followed by information technology (IT) departments (63%), mayoral or chief executives' offices (42%), public works (38%), public safety (30%), environmental services (8%), and innovation offices and public health departments (7% each). About 12% of respondents reported they did not know which offices within their organizations were engaged in the implementation of smart city technologies. About 22% reported departments that were not listed in our survey, including communications, transportation, public information, economic development, GIS, and parks and recreation.

4.1.3. Planners' needs to pursue or enhance smart cities efforts

Respondents also rated seven options they may need to pursue or enhance their jurisdictions' smart cities efforts using a five-point Likert scale (Figure 2). Approximately 70% of all planners (public and private sectors combined) identified 'Training or educational resources' as the most needed resource, followed by 'Funding or revenues' (69%), 'Increased access to technical staff' (60%), 'Collaboration with industry or private organizations' (46%), 'Support from higher-level leaders in the jurisdiction (e.g. elected officials, city managers)' (45%), 'Collaboration with other departments or groups inside my organization' (37%), and 'Collaboration with non-profit organizations' (28%). Notably, planners were divided over collaboration: while public sector planners wanted more collaboration with internal departments or groups, private sector planners wanted more collaboration with external agencies (e.g. nonprofit organizations, industries, and other private organizations).

Many planners elaborated on their selections or offered new ideas to pursue or enhance smart city efforts. They pointed out the lack of awareness about smart cities within both their organizations and their constituencies, noting there was not enough public demand for such projects. Many asked for increased political mandate and will, leadership, public support, acceptance by senior staff/elected leaders, and willingness from non-tech savvy/aware staff. Planners also responded to what was needed to pursue or enhance smart city efforts. Based on our qualitative content analysis, these responses varied across seven categories:

Table 1. Smart cities strategies or tools: Implementation rates and experiences.

Smart cities strategies or tools	% of organizations implemented strategies or tools	Planner's level of experience with strategies or tools					
		Public			Private		
		Low	Medium	High	Low	Medium	High
Analyzing data collected from social media or smart sensors	45%	67%	19%	14%	61%	18%	20%
Developing tools/apps for providing information about public services	38%	81%	13%	6%	85%	8%	7%
Developing online GIS mapping tools or apps for public use	80%	46%	23%	31%	61%	20%	19%
Developing open data portals for public access	60%	72%	16%	13%	74%	16%	11%
Developing plans or strategies for high-speed Internet access	47%	80%	13%	8%	86%	7%	8%
Using new data collection tools	46%	76%	15%	9%	72%	14%	14%
Using online participatory tools for public engagement or information sharing	58%	52%	26%	22%	54%	20%	27%
Using social media for public engagement or information sharing	85%	36%	30%	34%	41%	23%	36%
Using text-messaging warning systems	55%	75%	13%	12%	79%	14%	7%

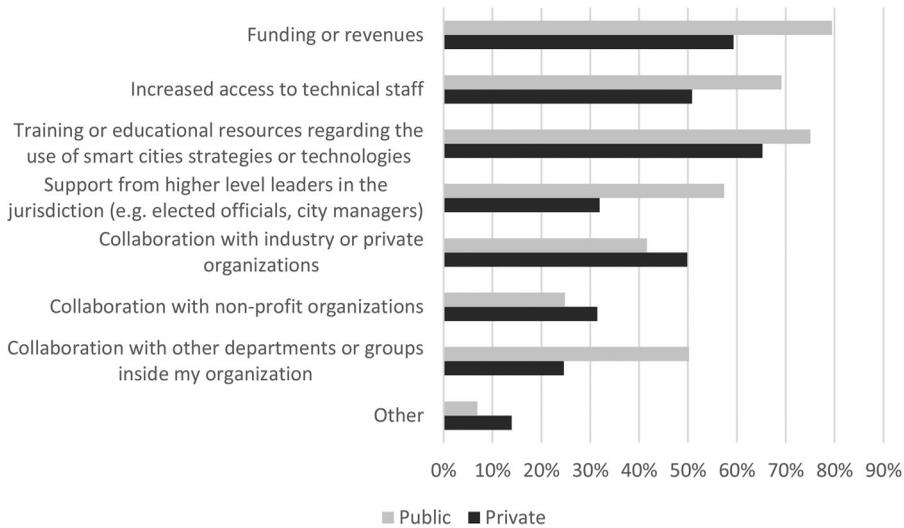


Figure 2. Things needed to further pursue or enhance your jurisdictions' smart cities efforts, reported by public and private sector planners.

- (1) **Conceptual clarity:** There was a consensus about a lack of clarity around the concept of a smart city. Planners thought there should be a universal definition that is easy to understand and provides a common language for people to effectively communicate.
- (2) **Education or outreach:** Respondents also emphasized the importance of education, training, and outreach programmes for both professional planners and the general public—including college-level internship programmes—to address misconceptions about smart city strategies and initiatives.
- (3) **Time and staffing:** Many planners agreed the success of these initiatives depends on having a staff capable of understanding new and advanced technologies, as well as adequate time for the organization to adjust.
- (4) **Demand and interest:** Some planners said the success of smart cities projects or initiatives depends on the demand or interest from the public, administrators, and policy makers, although they highlighted the 'sharp divide between people who see the value of smart technology and people who don't.'
- (5) **Technology access:** Planners expressed concerns with the lack of access to technology in many communities, stating the majority of citizens would need more advanced forms of technology like smartphones and 'high-speed connectivity infrastructure.'
- (6) **Funding:** The cost to implement new technologies may pose an issue for many smaller cities that do not have the funds and lack guaranteed return on investments from clients.
- (7) **Smart data collection and analysis:** With policy and plan development in mind, some planners advocated for the 'incorporation of higher-level data analytics for more strategic decision making.'

4.2. Smart city implementation: planners' experience and role

4.2.1. Planners' experience with tools or strategies

Most respondents indicated their organizations have used some common smart city tools but planners' individual levels of experience varied by the specific type of technology (Table 1). For example, a larger percentage of respondents identified a higher level of familiarity with online GIS mapping,

social media use, and online participatory tools than text messaging warning systems, plans for high-speed internet access, public service tool/app development, or open data portal development.

4.2.2. Planners' roles in implementation

Many respondents reported they did not personally play a role in implementing smart city technologies, but rather served as liaisons to other departments or other organizations (43% and 29%, respectively), while 32% reported they had no role in implementation. Approximately 21% reported they oversaw the overall management of technology usage or served as online communication facilitators/managers, and about 16% served as data analysts or providers. Although many respondents reported their familiarity with GIS mapping and social media in previous questions, they did not directly engage in mapping, social media posting, or social media data analysis, but instead relied on analysts, interns, and/or public relations personnel to perform such tasks. Finally, the use of technology appeared to be more ad-hoc than intentional, with over 80% of respondents identifying no formal smart city initiatives within their organization.

4.2.3. The ways planners can contribute to smart cities efforts in their organizations

To better understand planners' roles in smart cities, respondents listed ways they could contribute to smart city efforts within their organizations. A total of 315 planners from both public and private sectors responded to this question, and we identified five major themes based on a content analysis:

- (1) Be the leader: About 18% of planners wanted to advocate for, promote, participate in, or lead smart city efforts.
- (2) Educate yourself: About 13% of planners wanted to educate themselves or learn about smart tools.
- (3) Educate colleagues: About 11% wanted to educate co-workers and colleagues and increase technical support/training. Some planners highlighted how this process needs to involve 'raising awareness of the technology's potential ethical issues.' They also highlighted the planner's role in developing smart technology and ensuring equitable access to it.
- (4) Engage the public: About 10% of planners wanted to increase citizen engagement and educate the public. To do so, one respondent explained how planners must be able to 'articulate the value to the community in clear terms that resonate with diverse groups,' as explained in one of the responses. Another planner called for the 'demonstration of [a] specific benefit to an existing goal or responsibility' to prevent the smart city moniker from sounding like empty 'tech window dressing.'
- (5) Engage public officials: About 8% of planners emphasized increased engagement with public/elected officials and decision-makers at the local, state, and federal levels to request their involvement in pursuing smart cities efforts. As one respondent noted, 'If planners are clear on how and why to implement smart cities, they can communicate the cost/benefits to decision-makers,' especially as these initiatives relate to climate change.

Other respondents offered suggestions for how to share and utilize smart data, as well as how to incorporate smart city concepts into broader professional development initiatives.

4.3. Planners' perceptions and concerns

4.3.1. Planners' perceptions of the purpose of smart city planning

We asked planners to rate five major purposes of smart city planning (Figure 3). About 48% of all planners (public and private sectors combined) assigned the highest rank to 'Optimizing day-to-day public facility/service operations (e.g. smart traffic management),' followed by 'Developing higher quality urban plans and processes' (35%); 'Promoting longer-term resilience of the City (e.g. predictive analytics to prepare for flood events)' (35%); 'Enhancing residents' well-being (e.g. by

providing educational resources or enhancing their mobility)’ (33%); and ‘Advancing more equitable planning (e.g. more fully engaging diverse communities)’ (29%). Although respondents generally agreed all five prompts would be helpful, some public sector planners cautioned not to ‘adopt new technologies for the sake of technology’ instead of adopting it only as it relates to improving the ‘quality of life for residents/stakeholders.’

4.3.2. Planners’ perceptions of ethical, privacy, or security issues

The majority of respondents chose 3 on a 5-point Likert scale when asked to rate any ethical and/or privacy issues created by smart city efforts. About 28% of respondents rated ethical or privacy concerns as a 4 or 5, while about 26% reported they were unsure of any ethical concerns. Public sector respondents identified these concerns as more pressing than their private-sector peers, with nearly one-third of public sector planners identifying these concerns as a 4 or 5 compared to roughly one in five private-sector planners offering similar ratings.

Many planners mentioned that ethics, privacy, and security were major concerns for their organizations, where those concerns generally fell into five major categories: (i) hacking or tracking of private or sensitive data, (ii) the use of inappropriate or harassing language on social media platforms, (iii) negative impacts on the quality of life and public health, (iv) the danger of sharing public data by private groups, and (v) the disadvantages of ‘smart’ ideas. As one respondent elaborated: ‘I think a lot of cities are just looking at the cool factor and not relating it back to the average citizen,’ with another respondent adding that the ‘APA should provide planners with case studies that highlight both the advantages and disadvantages of smart technologies’ to prevent the concept from sounding like ‘a loaded, meaningless piece of jargon.’

4.3.3. Planners’ perceptions of equity and digital divide issues

The digital divide (i.e. IoT/computer accessibility for all) is another important topic in the literature about smart and connected communities. A majority of respondents identified the digital divide as a high concern (i.e. rated it a 4 or 5), although private planners tended to express more concern for this topic than their public counterparts (55% versus 45%). Specific concerns related to equity included rural and aging populations, as well as individuals who might not be as technologically-savvy. As one respondent warned, ‘Putting computers in their hands is not an adequate substitute for face-to-face engagement in their own language.’

4.3.4. Planners’ critical opinions on smart city strategies and technologies

Based on our content analysis of respondents’ critical opinions, we identified five major issues related to smart city strategies and technologies.

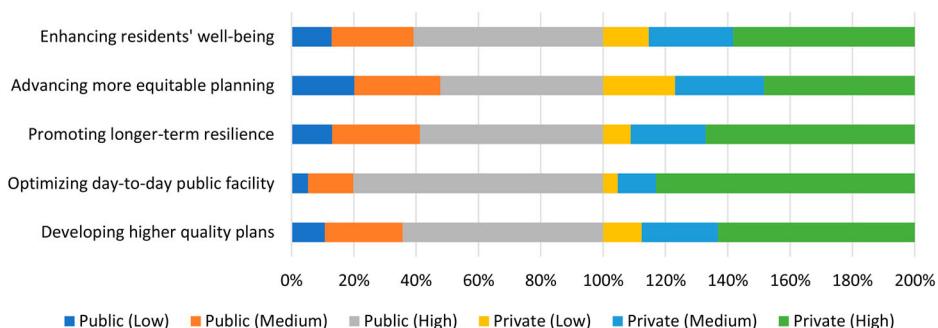


Figure 3. Public and private sector planners’ assessment of the purposes of smart cities efforts.

- (1) Negative mental health impacts: Respondents expressed concerns that smart city initiatives may negatively impact mental health because of the hyper-connected lifestyle they encourage.
- (2) Problematic terminology: Some of the planners found the term ‘smart city’ to be insulting to those who may not understand or use ‘smart’ technologies.
- (3) Political motivation: Smart city technologies, according to some respondents, could be politically motivated and implemented even if there is no community interest.
- (4) Inequity and misleading promises: Some respondents argued it is important to pilot smart city initiatives to ensure equity amongst all stakeholders and observe their overall effects on the local community. Additionally, some commented there is the risk that the parties responsible for executing smart initiatives may make misleading promises to constituents to increase revenue.
- (5) Problematic approach: Finally, some respondents cautioned the increased use of technology may overshadow the fundamentals of planning, including policy development, public engagement, and big-picture goals like mitigating pollution and climate change.

5. Discussion and conclusion

This study offers an important contribution to the literature on planners’ roles in and perceptions of smart city planning. Table 2 summarizes key findings related to planners’ perception of the need to pursue/enhance smart city efforts, the ways they might contribute to these efforts in their own organizations, and their critical opinions on smart city efforts. While most results presented in this table or in the previous section are consistent with prior research on planners’ roles in other planning efforts (e.g. Ahvenniemi et al. 2017; Albino, Berardi, and Dangelico 2015; Araral 2020; Batty 2013; Colding and Barthel 2017; Neirotti et al. 2014; Vanolo 2016), this study is unique because the findings are based on planners’ actual perceptions, insights, and opinions collected through the first-ever national survey of planners of this magnitude in the U.S.

This study culminates in three major takeaways regarding planners’ roles in and perceptions of smart city planning that contribute to existing literature on the role of the planner and provide guidance for professional planners. *First*, there is substantial confusion about the purpose, meaning, and process of smart city planning. Although the majority of planners who participated in our survey believed smart city technologies could optimize day-to-day public service operations, assist in

Table 2. Highlights of planner’s roles and perceptions in smart city planning.

What is needed to pursue or enhance smart city efforts in general?	What are the ways planners can contribute to smart cities efforts in their organizations?	What are planners’ critical opinions on smart city efforts?
<ul style="list-style-type: none"> • Develop a universal definition of smart cities, providing a common language to effectively communicate. • Initiate education, training, and outreach programmes to address misconceptions about smart city strategies. • Have access to capable staff and adequate time to understand and test new technologies. • Understand the demand from the public, administrators, and policy makers. • Increase access to community technology. • Understand funding mechanisms and the return on investments. • Analyze data to feed into policies and plans. 	<ul style="list-style-type: none"> • Advocate, promote, participate, or lead smart cities efforts. • Learn from research about smart tools. • Educate colleagues by increasing technical support or training. • Increase citizen engagement and educate the public. • Engage the public officials and request their involvement to pursue smart cities efforts. 	<ul style="list-style-type: none"> • May lead to negative effects on mental health. • The term ‘smart city’ may be insulting to many. • Could be politically motivated. • May not ensure equity amongst all stakeholders and may offer misleading promises

the development of higher quality plans, and/or promote resilience, they found considerable obstacles to the adoption of those technologies. One such obstacle is the lack of conceptual clarity on the definition and meaning of smart city planning among planning professionals, which starkly contrasts with the general consensus about the concept among individuals in other sectors of planning (e.g. environmental, transportation, and housing). Additionally, planners cited the dearth of resources, access to and education on the technology, time for experimentation, and funding as impediments to smart city investments, which is consistent with prior research (Williams 2000). Planners also mentioned that a lack of awareness and demand from policymakers and citizens could result in little political will to pursue these technologies, similar to Kamate's (2009) findings that legal environments and ideologies can greatly limit capabilities. Nevertheless, even in cases where planners' power is limited, they still need to engage in a participatory planning process to ensure equitable engagement across platforms (Lennon and Fox-Rogers 2017; Sjöblom and Niitamo 2020).

Second, our survey results indicate that planners, while acting as advocates and liaisons, will likely play a large role in educating each other, policymakers, and citizens on smart city technologies. These results are consistent with prior studies about general planners' roles across the profession, which include technician, facilitator, mediator, and administrator—all with similar goals of bridging gaps between stakeholders, policymakers, politicians, and technical experts (Bulkeley 2006; Campbell 2006; Fox-Rogers and Murphy 2016; Kirk 1980; Knox and Masilela 1990; Lauria and Long 2017; Oulahen et al. 2018). Planners are both interested in and working toward the implementation of smart city technologies through the use of web-mapping tools, social media, and open data portals, although they are not always primarily responsible for the implementation of these technologies. While this finding may suggest planners do not need to drive research on the implications of smart city technology implementation, these responses are likely more reflective of the managerial responsibilities associated with most respondents' roles (e.g. directors, managers, and senior planners).

Finally, because of the increasing nature of planners' roles coinciding with politics, ethical issues such as equity and the digital divide are likely to be common, in addition to concerns related to cyber security, cyber bullying, and digital ethics. Planners who participated in our survey, however, were evenly divided on whether there are ethical and/or privacy issues related to the introduction of smart city technologies. These responses may suggest that a gap in understanding exists, and further research is warranted to examine specific ethical/privacy issues that planners have encountered. Concerns related to the digital divide or equity were similarly divergent. Many responses indicated this was not a significant issue, while others pointed to smart city technologies as a wedge that could foster inequities. While these findings were unique to our study, there were other ethical concerns consistent with prior research, chiefly the belief that smart city ideas should not be imposed upon a community without addressing the genuine needs of its stakeholders (Campbell 2012; Forester 2012; Muchadenyika and Williams 2017).

Despite these valuable contributions, our study has several limitations, including a low response rate, inability to control responses based on the size of their organization, and lack of responses from junior planners who may be more familiar with smart city concepts and technologies. Additionally, the survey may have attracted more technology-oriented planners, although we welcomed responses from all planners regardless of their knowledge and experience with smart city technologies. The survey also had a geographic bias as it was conducted only in the U.S. and the perceptions of smart city planning may vary among professionals in other countries.

This study, however, has strong implications for planning scholars and practitioners because the topics or concerns our participants raised can be relevant to both the pre – and post-COVID-19 world, especially now that planners are using digital technologies more than ever before. Based on our survey results, scholars should explore the following factors related to smart cities: equity, planners' readiness and training, evidence of successes or failures, and a critical dialogue on smart cities. The concerns around equity are particularly relevant now that the pandemic has forced

planners and relevant professionals to conduct most stakeholder engagement activities virtually (Tobin, Mavrommati, and Urban-Rich 2020). Anecdotal reports suggest that while this transition may not have been graceful, the pandemic accelerated the adoption of new technology by populations that were historically reticent or unable to embrace such platforms (Allam and Jones 2020; Jaiswal, Agarwal, and Negi 2020; Kunzmann 2020; Olmos-Gómez et al. 2020; Sonn and Lee 2020).

Most planners would like to advocate for, promote, participate in, or lead smart city efforts and would like to be familiar with relevant research and learn about smart tools. Many planners, however, do not have the expertise or experience to get involved in the actual implementation of smart city programmes. Planners' expertise in smart city technology can be tied to existing planning curricula, although more research is needed to identify gaps between academic training and job responsibility as it relates to digital technologies (Mandarano and Meenar 2015).

Future work on this topic can explore planners' involvement in the technical aspects of smart city initiatives, focusing on planners acting as programmers, data analysts, or app developers. It may also be beneficial to question planners about what implications, if any, the adoption of smart city technologies has for those working to educate future planners. Finally, future studies should address the following four actions: (i) fostering critical dialogues on smart city initiatives, paying specific attention to their impact on quality of life, security, and access; (ii) recognising how smart city approaches on their own do not necessarily result in better, more inclusive plans; (iii) attempting to achieve a functional level of clarity in defining what constitutes a smart city; and (iv) exploring the negative use of social media, political motivation, and the possibility of taking attention away from other more pressing planning topics across the globe.

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