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Creating smarter cities: Considerations for selecting online participatory tools

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ABSTRACT

The abundance of online public participation tools has made it difficult for planning organizations to decide which tool will best meet their needs. Understanding the benefits or challenges of specific tools, facilitation requirements, or how individual tools may best advance the public participation aims is not always easy. This article builds on theories of planning, organizations, and information science to discuss various factors that cities and planning organizations should consider in deciding whether and how they should choose online participatory tools. While the technical capability of online technologies in facilitating participation and decision making should be examined, the capability of planning organizations and communities in adopting these technologies should be considered as well. This article argues that planning organizations should choose a participation platform based on the capacities of their organization, the characteristics of the communities that are going to use the tool, user-community norms and rules, and the tool's capabilities.

1. Introduction

Information and Communication Technologies (ICTs) have given rise to the ideal that cities will become increasingly smart, connected, responsive, and citizen-centric (Albino, Berardi, & Dangelico, 2015; Kitchin, 2013; Townsend, 2013). This focus on the citizen-centricity of smart cities (Albino et al., 2015; Caragliu, Del Bo, & Nijkamp, 2011; Neirotti, De Marco, Cagliano, Mangano, & Scorrano, 2014) emphasizes the potential of online participatory technologies to allow citizens to actively engage in shaping their city. Participatory technologies have been growing in popularity with an increasing number of cities and planning agencies using technology to engage the public in planning processes (Angelidou, 2014; Evans-Cowley & Manta Conroy, 2006; Schweitzer, 2014). The effectiveness of these technologies may be related to a variety of organizational and contextual factors, including organizations' capacities to use technologies (DeSanctis & Poole, 1994), citizens' interest in and attitude towards participation (Arnstein, 1969), and citizen participation mandates (Hoch, 2007a, 2007b).

Online participatory tools (OPTs) refer to two types of technologies: (1) web-based tools that are particularly designed for public engagement (e.g. MySideWalk, PlaceSpeak, CitySourced, Crowdbrite); and (2) social networking sites (e.g. Facebook, Nextdoor) that are not designed for public engagement but can be used for participatory planning. Despite the popularity and availability of these participatory tools, planners report that they are unsure how to select an appropriate tool (Afzalan, 2015). The effectiveness of using OPTs in planning processes can be influenced by a number of factors, including citizens' technology literacy, planners' expertise, organizational resources, and the tools' capabilities.

While OPTs can strongly support and facilitate participatory planning processes (Evans-Cowley & Hollander, 2010; Jeffres, 2010; Mandarano, Meenar, & Steins, 2010), their inappropriate use can result in problems, such as instrumental use of citizens' mass participation (Brabham, 2009; Evans-Cowley & Manta Conroy, 2006; Schweitzer & Stephenson, 2016). With technological advances and the rise of wireless internet and social media, new types of planning or decision-support systems (See Batty, 1995; Danziger, 1977; Geertman & Stillwell, 2004; Klosterman, 1999) have emerged, focusing on bottom-up and citizen-facilitated approaches (Evans-Cowley & Hollander, 2010; Tayebi, 2013a). This emergence has resulted in the increasing availability of and range of choice in OPTs, supporting both online and face-to-face participation (Afzalan & Muller, 2014; Hampton & Wellman, 2003). With the abundance of OPTs, the question becomes how a planning organization should decide about using online participatory tools.

In this review article, we explore the following question: “What considerations should planning organizations take into account when

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they are selecting online participatory tools?" We build on theories from planning, organization, and information science to discuss considerations of incorporating new technologies in planning process for planning organizations. We argue that planning organizations should evaluate the circumstances in which the technologies are being used and measure the tools' technical capabilities when deciding whether and how to use OPTs. In four sections, this article discusses the need for OPTs and the organizational factors that influence their adoption; defines a framework to discuss in detail the role of each of these factors; and concludes with a discussion that emphasizes the importance of factors that shape the planning environment in the selection of OPTs.

2. Participatory planning and smart cities

Smart cities are variously defined. While some scholars focus on the technical capabilities of new technologies in advancing cities' efficiency, others explore the role of innovative initiatives, networks, or communities created by the technological advances (Albino et al., 2015). In this article, we argue that smart-city approaches should contribute to innovation and enhance democratic decision making (Neirotti et al., 2014) and transparency (Angelidou, 2015; Viitanen & Kingston, 2014) through public participation (Giffinger, 2007; Neirotti et al., 2014). Participatory processes play crucial roles in creating smarter cities by helping organizations respond to wicked problems (Goodspeed, 2015), democratize decision making (Angelidou, 2015; Viitanen & Kingston, 2014), learning about citizens' interests and ideas (Kitchin, 2013), or increase social capital (Lombardi, 2011).

Cities and planning organizations are increasingly using OPTs for citizen participation (Afzalan & Evans-Cowley, 2015). With the increased use of social media and new technological advancements, OPTs are emerging as new types of Planning Support Systems (PSS). While previous types of PSS have been strongly supported by the popularity of Geographic Information Systems (GIS) (Klosterman, 1997), more recent technologies are more interactive, communicative, and focused on social networking enhanced by web-based technologies (Afzalan, 2015). CommunityViz (see Bailey, Blandford, Grossardt, & Ripy, 2011; Klosterman & Pettit, 2005), UrbanSim (see Waddell, 2007), What-if (see Klosterman, 2001; Klosterman, 1999), and Envision Tomorrow (see Minner, 2015) are examples of PSS that are now becoming more participatory processes through their integration with the online environment. OPTs are diverse and have a variety of functions. For example, Crowdbrite facilitates brainstorming through combining online and face-to-face interactions; MySideWalk and PlaceSpeak provide interactive online discussion forums; CitySourced crowdsources citizens' requests; and NextDoor facilitates neighbors' social interaction. While each one of these tools has unique capabilities, they all use the Internet to facilitate collaboration or interaction.

To select the appropriate tool or method, planning organizations must start with the key elements of participatory processes. These processes focus on responding to public interest and promoting open-ended interactions to provide opportunities for participants that constantly redefine the "what" and "how" of the issues that they address (Quick & Feldman, 2011, p. 286). These processes can provide opportunities for consensus building or learning among diverse stakeholders (Goldstein & Butler, 2010), democratic decision making (Huxley & Yiftachel, 2000), mobilizing actions (Brody, 2003), engaging local knowledge (Corburn, 2005), or responding to regulations or community norms (Hoch, 2007a, 2007b).

Despite increasing emphasis over the last five decades on participatory planning and community engagement, planning organizations and local governments still face challenges in incorporating new or traditional participatory processes into their decisions and plan making. Some of these challenges include a lack of interest in participation (Fischer, 2000), decision makers' lack of trust in public participation (Kapoor, 2001), or the high cost of participatory processes caused by resource requirements (Bamberg, 2013). To address some of these challenges and increase the potential for public engagement, planning organizations have been actively trying to use various tools, including OPTs, in the last decade. However, adopting new technologies can be difficult for planning organizations (Innes & Booher, 2010; Innes & Gruber, 2005). The organizations may not have access to skilled staff who can effectively apply the new technologies and they may have trouble ensuring that participants will accept and trust the types of technology being used.

3. Adoption of online participatory tools by planning organizations

In this section, we build on literature from the organizational science field, adopting structuration theory (DeSanctis & Poole, 1994) and the "phronesis" approach (Flyvbjerg, 2006) to discuss factors that can influence the adoption of new technologies by planning organizations.

Research about planning organizations is primarily tied to the discussion of power and politics in planning and explores the role of formal and informal organizations in shaping planning practice or democratizing citizens' participation and resource allocation (Forester, 1989). While planning theory has not extensively explored the adoption of new participatory technologies or methods by planners, there is a broad literature on this topic in public policy and information science (See Brudney, 1995; Cresswell & Sheikh, 2013; Godschalk, 1996). Organizational research on participatory decision-making processes is complex since organizational functions are influenced by various internal and external factors, including availability of organizational resources for adopting new technologies, communities' levels of education, and community members' skills in using online tools (Stutzman, 2005).

To organize new procedures, planning organizations may need to make political or organizational changes, adopt new frameworks, or design more flexible procedures (Kapoor, 2001). For example, they may need to work with outside organizations to more effectively use new technologies (Palfrey & Gasser, 2012). Various factors related to the context in which a planning organization may wish to use an OPT can influence adoption and usability. A relationship exists between the effectiveness of participation based on the technology chosen and the type of projects in which the technology is used or the characteristics of the project environment (Felin & Zenger, 2014; Gil-García & Pardo, 2005). The type and mission of organizations (Gillett, Lehr, & Osorio, 2004; Townsend, 2013) or their regulatory environment (Gil-García & Pardo, 2005) can also influence the effectiveness of technology integration.

Organizational adoption of new technologies is dependent on the context in which they are being used. Flyvbjerg's (2006) phronesis approach and Gidden's structuration theories inform organizational research based on contextual factors. The phronesis approach emphasizes the role of power in institutional collaboration and deliberation on values and diverse interests. Phronesis is context-dependent and focuses on values, judgments, and social orders rather than technical or scientific knowledge (Flyvbjerg, 2006, pp. 370, 372). Organizational research should focus on small but deep, detailed, and thick questions; should value power forces and imbalances; and should go beyond looking at agency structures and explore both structures and actors (Flyvbjerg, 2006, pp. 376–377). For example, while the presence of a city office of information technology may facilitate adoption of new tools by cities, how planners or community engagement specialists at the city use these tools is also important. Similar to hermeneutic approaches, structuralism has also influenced organizational research, where the role of agencies and agents is constructed through interrelated interactions (Giddens, 1984, p. 19). Taking a sociotechnical approach, DeSanctis and Poole (1994) introduced Adaptive Structuralism Theory (AST), which studies the structure that is reproduced through humans' use of technology (DeSanctis & Poole, 1994, p. 121).

Table 1
Dimensions that influence the incorporation of OPTs by planning organizations.

Dimensions	Factors	Description
Involved groups	Planning organization	The organization that is formally responsible for planning and decision making.
	Community	Communities, citizens, and various stakeholders that should be engaged in planning process.
Task	Planning problem and participation purpose	The type of planning problem and the purpose of using online participatory tool.
Environment	Norms and regulations	The specific regulations or community norms that planners and planning organizations should consider in participatory processes.
Technology	Online participatory tool	The method or tool that is used for engaging communities and organizations in planning process.

Building their theory on structuralism (Giddens, 1984), the social technology school of thought, and the decision-making school of thought, DeSanctis and Poole introduced AST to explore the influence of computation technology on organizational effectiveness.

AST discusses the "adaptation of technology structures" as the main prompt for organizational change but also discusses contextual factors and technology characteristics as important influential forces in the process (DeSanctis & Poole, 1994, pp. 121, 122). AST explores the connection of technology, environment, the task, and a group's interaction (DeSanctis & Poole, 1994, p. 144). The theory emphasizes the importance of considering all these dimensions in exploring the use and effectiveness of technologies in organizations. The "technology" dimension refers to how new technologies influence planning tasks such as decision making or conflict resolution. "Environment" refers to the norms and rules that influence the use of technology. "Task" relates to the specific goals to be accomplished by using the tools. The "group" dimension refers to various stakeholders or organizations involved in decision making.

To translate these four dimensions to planning environments, we look at the different aspects of planning and policy organizations, including engaged actors and their coalitions; distribution of resources among the actors; rules and regulations that affect the project; and policy discourses, encompassing the participants' norms, values, definitions of problems, and approaches to solutions (Leroy & Arts, 2006) (see Table 1). Building on the phronesis approach (Flybvjerg, 2006) and structuration theories (DeSanctis & Poole, 1994; Giddens, 1984), in the following table we introduce dimensions that influence planning organizations' incorporation of online participatory tools. (See Table 1)

4. Framework

The following framework demonstrates how different factors are related to the adoption of online participatory tools. The framework considers OPTs as modes that facilitate the interaction of organizations and communities to address planning problems and encourage participation. It also considers how norms and regulations influence the participatory process (see Fig. 1).

4.1. Organization capacity

Using technology for participatory governance may require organizations to modify their culture or their resources (Brynjolfsson, 2012). Multiple factors related to the capacity of planning organizations should be considered in choosing OPTs. (See Table 2)

4.1.1. Management and control of the online participation

Planning organizations exert different levels of control over public interaction or participation (Bamberg, 2013; Rinner, 2001) based on the type of technology they use or their management attitude. While it is possible for planning agencies to have their own social media sites, community residents often create their own sites for community discussion (Fredericks & Foth, 2013). On the Nextdoor site, an online neighborhood platform, the conversation is principally dominated by neighborhood residents. With social media sites planners can facilitate conversations or clarify intentions (Afzalan & Muller, 2014) but cannot strictly control participation or social interaction. Conversely, if using tools designed specifically for online engagement, planners may have more control over participation and the topics of conversation.

In addition, organizations' attitudes towards managing and controlling the online environment can influence engagement by encouraging or discouraging particular behaviors. For example, responding to participant questions in a timely manner may result in a higher ongoing participation rate (Coleman, 2002; Gordon & Baldwin-Philippi, 2014). In turn, the types of questions that planners ask in an OPT may color responses or influence participant behavior. In less-controlled environments (e.g. social media platforms), planning organizations might face a wider range of participant perspectives compared to more controlled OPTs in which planners initiate, manage, and guide the discussion (Asterhan & Schwarz, 2010; Murphy, Mahoney, Chen, Mendoza-Diaz, & Yang, 2005). Asking participants to provide personal information (e.g. age, zip code, gender) as part of their registration process may discourage their participation, but such inquiries can provide valuable information for planners in understanding the extent to which the online community represents community demographics.

4.1.2. Organization type

The types of organizations that use OPTs may influence the tools'

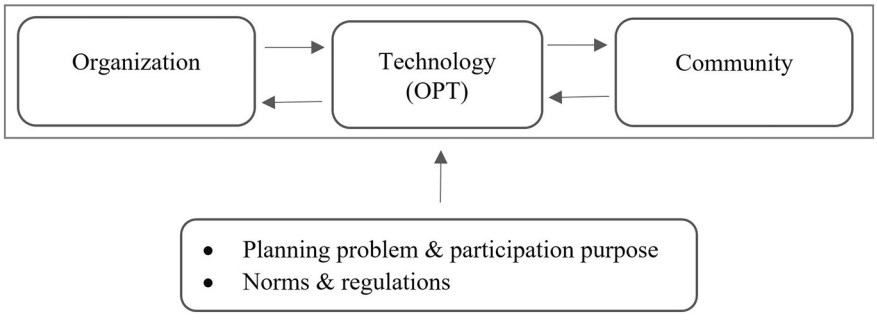

Fig. 1. Organizational adoption of OPTs.

Table 2
Organizational capacity factors that should be considered in choosing OPTs.

Factor	Type	Description
Management and Control of the online environment	Top-down control	The tool or online environment is mainly controlled or facilitated by the planning organization.
	Bottom-up control	The tool or online environment is mainly controlled or facilitated by citizens.
Organizational collaboration and organization type	Involvement of a single organization	The public or private agency has the major role in using or managing the tool in different stages of planning.
	Involvement of multiple organizations	The public and private organizations closely work together in managing and using the tool.
Planners' behavior and attitude	Planners' perception, attitude, and skill	Planners perceive the use of OPTs, and participatory methods in general, in a particular way. They may have various level of skills in adopting or using new technologies.
Tool incorporation with other tools or methods	Tightly incorporated	The online participatory method is highly incorporated with other planning methods and systems.
	Loosely incorporated	The online participatory method is loosely incorporated with other planning methods and systems and is used as a separate method.

effectiveness. Organizations have different capacities to use new participatory methods. For example, private organizations or planning consultants may be better equipped than local governments to launch an online tool or collect and analyze the data (Brown, L. J. O. T., & Brudney, 1998; Williamson & Parolin, 2012). Private and public agencies often collaborate on developing urban or regional plans. Tool performance may differ depending on which organization is taking the lead in using or managing the tool.

How an organization uses a civic-engagement technology, for example, can influence the results that they gain (Gordon, Schirra, & Hollander, 2011). For example, As Williamson and Parolin (Williamson & Parolin, 2013) argue, the focus of municipal organizations on using monologue communication technologies may result in municipals' inefficiency in engaging citizens in deep dialogue-based collaborative processes.

4.1.3. Planners' behavior and attitude

Organizations' or planners' attitudes and perceptions of using OPTs, or technologies in general, can shape the tools' effectiveness (Slotterback, 2011). Some planners may be more skilled and comfortable in using online participatory tools; others may not. While some organizations may be concerned with privacy considerations, concerned about using the names of online participants in their plans, others may not be as sensitive to participant privacy (Afzalan, 2015). Some planners may engage citizens to satisfy mandates (Brody, Godschalk, & Burby, 2003; Burby, Dalton, & Dalton, 1994), others may have more genuine concerns about creating higher-quality plans that respond to public interests (Bailey et al., 2011; Edelenbos, 2005). Whether and how citizen online discussion is facilitated by a planner or staff can also influence how citizens interact or participate online (Nelson, Babon, Berry, & Keath, 2008).

Planner perceptions can also influence how organizations evaluate information or local knowledge generated through the use of OPTs. Information should be perceived by decision makers as credible, salient, and legitimate (Cash et al., 2003, p. 8086) to be effective in policy making. Credibility refers to the accuracy of the arguments and evidence. Salience involves the relevancy of the information or the assessment to planners needs. Legitimacy refers to the idea that "the production of information and technology" has been based on responses to diverse beliefs and values of stakeholders and the acceptance of "opposing views" (Cash et al., 2003, pp. 8088–8090).

In another example, we can consider behavioral differences between planners and community engagement specialists. While in some organizations participatory tools and methods are managed by planners, in others, community engagement professionals have the main role in managing the tools (Nelson et al., 2008). These two groups may have different perceptions or desires for using the tools because of their different intentions of organizing participatory processes (Afzalan, 2015).

4.1.4. Organizational collaboration

Internal and external organizational collaborations influence the successful application of new technologies and methods within institutional systems (Palfrey & Gasser, 2012). Collaboration with outside organizations can facilitate the incorporation of new technologies and data sources (Brown et al., 1998; Estevez & Janowski, 2013; Ho, 2002; Layne & Lee, 2001; Palfrey & Gasser, 2012; Townsend, 2013). In addition, effective use or management of the new technologies requires consideration of organizational resources (Brown et al., 1998; Edmiston, 2003).

4.1.5. Tool incorporation

The possibility of integrating online and non-online participatory methods (Garau, 2012; Houghton, Miller, & Foth, 2013) or incorporating data generated from online sources with other available data sources (De Longueville, 2010; Estevez & Janowski, 2013) can influence the effectiveness of participatory processes. Using online tools in public meetings can facilitate the participation of a more diverse community. On the other hand, such tools may complicate the public meetings by, for example, distracting the participants from the main goal of the meeting and focusing on the technology use (Afzalan & Muller, 2014). Organizations should find the effective threshold for integrating their participatory methods and tools more constructively (Palfrey & Gasser, 2012).

4.2. Community capacity

Citizens' characteristics and skills, and their attitudes towards using technology for participation should be also considered in choosing online participatory tools (Palen, Anderson, et al., 2010; Stutzman, 2005). Communities that will be directly or indirectly affected by plans are indispensable components of participatory processes (Hoch, 2007a, 2007b). Participant capacity can be related to their level of education, level of experience with using technologies, level of access to the Internet, level of involvement in democratic planning and participation, level of comfort with disclosing their identity or other demographic details (See Table 3).

Community-related factors should be taken into account when an organization designs its participatory process and chooses its participatory method. For example, the use of OPTs in well-educated communities can be more effective than their use in less-educated ones because of the higher proficiency of educated people in using tools (Odendaal, 2003). While several scholars have discussed the negative equity effects of using technology in planning and decision making (Dawes, 2008; Zook, Graham, Shelton, & Gorman, 2010), the current literature lacks comprehensive understanding of possible positive equity or diversity implications of technology use. The use of OPTs may result in more equitable planning outcomes in younger communities compared to older ones, by attracting the participation of the younger generation who is more comfortable with the technology use (Santo, Ferguson, & Trippel, 2010). In addition, more-complicated on-

Table 3
Community capacity factors to consider when choosing OPTs.

Factor	Type	Description
Community[a] character and involvement	Communities' attitudes and capacities of using OPTs	Communities' level of experience with using OPTs. Communities' socioeconomic background. Communities' general attitude towards participation, and particularly using online participatory technologies. The availability of technology infrastructure and accessibility for communities.

[a] The community to be served by the plan.

line tools may produce higher-quality results for planning organizations if they are used in more technology-savvy communities (Seltzer & Mahmoudi, 2012).

Citizen attitudes towards sharing information in online environments should also be considered when choosing online tools (Nelson et al., 2008). For example, some people might be concerned about sharing their identity in online environment or making their full profile information visible, as they are worried about organizational and social threats (Harrison & Thomas, 2009; Krasnova, Günther, Spiekermann, & Koroleva, 2009; Stutzman, 2005). Planners should evaluate the privacy protections of online participatory tools and consider how citizens might be affected by expressing their ideas or sharing their personal information online (Desouza & Jacob, 2014; Edmiston, 2003; Ghose, 2001).

Citizens' attitudes towards participation in decision-making processes can influence the effectiveness of online participatory tools. Peoples' lack of trust in public participation (Fischer, 2000; Ylipelkonen & Kohl, 2005) can negatively influence online tools' ability to attract diverse communities to share or discuss ideas in the online environment.

4.3. Planning problem and participation goals

4.3.1. Planning problem

In deciding whether, or what types of, OPTs to use, organizations should consider the type of planning projects they require or the problems that need to be solved (See Table 4). The type of planning problem can be related to a variety of issues, including the purposes of the plans, the scale, and the timeline. For example, the performance of OPTs can be different based on the type of planning issues for which they are used. Some planning issues are complicated and may require the engagement of stakeholders in highly interactive sessions where people should move towards building consensus and making decisions through dialogue. Other types of planning issues are less complicated and can be addressed through only information sharing or simple communicative processes. The value and performance of OPTs may differ in various projects. While place-based online forums (e.g. online neighborhood forums) can facilitate consensus building processes through dialogue (Afzalan & Muller, 2014), other tools may not have such capability.

Another example is the plans' scale. OPTs may perform differently in regional planning projects than in neighborhood ones. Using online tools in regional plans may help lower plan-making costs by reducing the number of regional meetings required. However, using the same tool in a neighborhood planning project may not provide a great financial benefit for the planning organization (Afzalan, 2015).

Another example relates to the time that an organization is planning to spend on the citizen engagement part of its plan-making process. The performance of OPTs may be different if they are used in plans with shorter public-participation windows. OPTs' usability may be different in engaging stakeholders in long-term plans rather than in disaster-response activities (Palen, Vieweg, & Anderson, 2010).

4.3.2. Participation goals or desired outcomes

Before using an OPT an organization must clearly define the goals for the tool's use. Is the main goal of using the OPT to inform and educate citizens, follow up with citizens about particular aspects of the plan, engage citizens in a consensus-building process, resolve tensions between conflicting ideas, or build trust in communities? Is the goal of using OPTs to attract those who usually do not or cannot attend public meetings, or is the purpose of using OPTs to encourage excitement about a project in a community? (See Table 4). For example, if the purpose of using OPTs in a touristic village is to attract seasonal visitors to share their ideas, the OPT might be very useful to the planning organization in allowing them to hear from a new community. However, if the purpose of using the OPT in the same village is to engage low-income residents in consensus building, face-to-face dialogue sessions may be more effective due to the considerations of digital divide or technology literacy (Piatkowski, Marshall, & Afzalan, 2016).

4.4. Norms and regulations

Planning organizations should consider various regulations or accepted norms in their jurisdictions or communities when a they decide about a method or technology for the planning process (Allwinkle & Cruickshank, 2011; Kitchin, 2013) (See Table 5). These regulations and norms are specifically related to how the organizations respect citizens' privacy, or their governmental transparency and responsiveness (Johnson & Sieber, 2012). For example, some Canadian provinces ask local governments to store the online participants' information in servers located in Canada. This regulation prohibits those local governments from using the tools on servers based in the United States or other countries, unless they have a secured server in Canada (Afzalan, 2015).

Table 4
Factors related to planning problems and participation goals to consider when choosing OPTs.

Factor	Type	Description
Planning problem	Time sensitivity	Long-term planning (e.g. Comprehensive plans) or short-term planning (e.g. Area plans). Immediate interventions (e.g. Fixing the city infrastructure or disaster response)
	Scale	Includes large-scale plans, such as comprehensive plans or regional plans. Includes local-scale plans, such as neighborhood plans, local district plans, urban design plans.
Goals or desired outcomes	Informing citizens	The tool is used for information diffusion or stakeholder education.
	Learning about citizens' ideas and interests	The tool is used for learning from local knowledge.
	Building consensus and resolving conflicts	The tool is used for consensus building or conflict resolution.
	Finding potential stakeholders	The tool is used for recruiting stakeholders or identifying volunteers.

Table 5
Factors related to regulations and norms that should be considered in selecting OPTs.

Factor	Type	Description
Regulations and norms	Regulations	Regulations relevant to respecting citizens' online identity and privacy. In addition, regulations regarding using online methods for public participation.
	Community norms	Community attitudes, expectations, and norms of participation in planning processes.

Table 6
Factors relevant to the capacity of OPTs that should be considered by organizations.

Factor	Type	Description
Tool capacity	Decision process and leadership	• If the tool is promoting a particular type of decision process or leadership. • Whether and how the tool allows planners to monitor the participation.
	Efficiency	• If the tool facilitates creation of a more efficient public participation process. • If the tool provides efficient way for generating useful and valid local knowledge for planners. • If the tool creates more efficient consensus building processes.
	Conflict management	• If tool helps with resolving conflicting ideas or promoting discourses among participants. • Whether and how the tool allows planners to facilitate dialogue.
	Atmosphere	• If the tool promotes a formal or informal environment for interaction and participation. • If the tool helps creation of a comfortable environment for citizens to share or discuss ideas.

Community norms can also influence the organizations' decision towards using new technologies (Allwinkle & Cruickshank, 2011). Cities' efforts towards creating open data portals or developing transparency advisory boards are examples of such activities (Bertot, Jaeger, & Grimes, 2010). For example, online participatory tools provide different methods of notification to inform citizens of the plan progress or about how their ideas have been addressed. For example, MySideWalk, one of the most popular citizen-engagement tools, provides a feature for planners to send out notifications to online participants about how the plan has changed or modified based on their comments. SeeClickFix, another participatory tool, notifies participants when their report about an infrastructure issue in town has been addressed by the city. Community norms vary across geography (Iverson, Wang, & Dayrell, 2009; Latkin, Forman, Knowlton, & Sherman, 2003) and that variance should be considered by organizations selecting online tools.

4.5. Tool Capacity

Different online participation tools have different capabilities in facilitating communication or engagement. While some are capable of facilitating citizen interaction and dialogue (Afzalan & Muller, 2014; Bamberg, 2013; Williamson & Parolin, 2012); others are mainly designed for providing information for planning organizations (Rhoads, 2010; Schweitzer, 2014); allowing planners to manage or facilitate the online interaction (Deng, Lin, Zhao, & Wang, 2015; Gordon et al., 2011; Nelson et al., 2008), or providing opportunities for planners to broadcast their projects to a large population (Schweitzer & Stephenson, 2016).

While the technical capabilities or the structures of online participatory tools may not lead to a particular behavior, they can promote creation of certain behaviors. While some of them encourage dialogue, others may encourage quick and short responses. Building on adaptive structuration theory, we categorize the structure of online technologies based on the following factors: decision-making process, leadership, efficiency, and conflict management (DeSanctis & Poole, 1994, p. 127)[1] (See Table 6).

[1] While this section provides ideas for classification of online participatory tools, it does not intend to develop a comprehensive argument on OPT typology. The main goal of this section is to emphasize the importance of OPT types when planners want to select them as new participatory tools.

4.5.1. Decision process

Decision processes can be promoted based on use of different technologies. For example, while online neighborhood forums (e.g. Nextdoor) can provide opportunities for residents and planners to discuss ideas through valid dialogue (Afzalan & Muller, 2014; Hampton & Wellman, 2003), one-way communication tools such as CitySourced for reporting pothole issues may not do so. The technical capacities of online participatory tools may facilitate specific types of decision-making processes by providing opportunities for deep dialogue (Afzalan & Muller, 2014), quick information sharing (Schweitzer, 2014), or social mobilization (Tayebi, 2013b). The type of technology may not directly influence the entire decision making process; but, it may promote certain types of processes by guiding how people can share or discuss ideas (Williamson & Parolin, 2012).

4.5.2. Leadership

Different tools may promote specific types of leadership. The current tools that are designed specifically for planning purposes (e.g. MySidewalk, PlaceSpeak) are usually managed and led by planning organizations. However, some of the open social media groups, such as Facebook, create an opportunity for people from the local community or city staff to take the lead in the conversation (Afzalan & Evans-Cowley, 2015; Deng et al., 2015). In some projects, planning organizations may prefer to have a strong role in leading and managing peoples' participation. For example, if an organization needs to design a tool that allows quick and easy citizen participation it may need to use a particular tool that facilitates such participation through voting and can be managed easily by city staff (Gordon et al., 2011). Conversely, if the organization is dealing with a complicated planning topic requiring management by local communities, it may use a tool that is designed for promoting dialogue and deep discussion (Gordon & Baldwin-Philippi, 2014). The capability of online tools in allowing different types of leadership or facilitation by different parties should be considered when selecting online planning tools.

4.5.3. Efficiency

Online participatory tools are popular because they can facilitate faster interactions and quicker public participation (Evans-Cowley & Hollander, 2010; Schweitzer, 2014). For example, their capacity in crowdsourcing helps planning organizations attract a large population to participate in planning processes in a short amount of time (Brabham, 2008; Howe, 2006; Sanchez & Brenman, 2013). However, OPTs' performance in facilitating quick participation of citizens

varies. While some tools do not require user registration or provision of personal information, others require those steps. Low barriers to entry usually make participant use of the tool easier and faster, allowing the planning organizations to attract a larger number of participants in a shorter amount of time (Schroeter & Houghton, 2011). This can however, create concerns about the validity of peoples' participation because of the anonymity of the participants.

In addition, tools have different capabilities in minimizing the amount of time required for consensus building. Some types of tools (e.g. online neighborhood groups) may facilitate faster consensus-building processes by allowing people to clarify their intentions, resolve ambiguities, or track the discussion at their leisure (Cornelius & Boos, 2003). Some tools can help people continue their conversation via face-to-face meetings (Hampton & Wellman, 2003). Consensus-building processes can sometimes take a lot of time in person, but may be conducted faster in the online environment by allowing people to continually engage in the discussion (Deng et al., 2015; Johnson & Sieber, 2012).

4.5.4. Conflict management

Tools have different technical capabilities in augmenting conflict awareness or shifting the participants' viewpoints. Some of the highly interactive technologies facilitate participants' awareness through augmenting social learning (Goodspeed, 2013). MySideWalk allows people to discuss proposed topics with the other participants, respond to the requests made by the planning organization, or follow the online discussion by reading the discussion thread. These features may help participants start a dialogue and move towards building consensus. Other tools, such as CitySourced or SeeClickFix, work mainly as one-way applications for reporting infrastructure issues in cities and do not have the capability of managing or resolving conflicting ideas among a group of users.

Participants should disclose their identity to participate in a dialogue or conflict management activity (Innes & Booher, 2010). However, online tools have different requirements for allowing people to start using the tool. While some tools allow people to participate anonymously, some other ones require people to provide information about their background (e.g. age or zipcode) in order to be able to start participation.

Conflict management in online environments has its own challenges. The discussion and participants' interactions should be constantly facilitated by a professional facilitator who is familiar with online environments to ensure the accuracy and quality of the participation (Afzalan & Muller, 2014; Mandarano & Meenar, 2015).

4.5.5. Atmosphere

Some of the tools are tightly structured around a particular type of interaction or activity and are formally managed by planning organizations. Others are loosely structured and not monitored. Examples of such tools are social-networking sites that allow people to discuss various social or community-related topics, such as trading second-hand goods or arranging social gatherings.

While most OPTs are designed and used for a specific planning or decision making, others are designed to promote various activities, including those not directly related to planning. For example, MindMixer is mainly designed to facilitate participants' interaction for deliberation, information sharing, or decision making around particular topics or projects and is usually controlled formally by a planning consultant and a jurisdiction and is used to address the organizations' goals. Conversely, Nextdoor, an online neighborhood forum, is designed to foster neighbors' social interaction and allows informal community groups to control the environment. While planners can join an online neighborhood group like Nextdoor to engage neighbors in a project, the group is also used for other non-planning-related purposes including selling or buying used furniture, and is directed by community members (Afzalan & Evans-Cowley, 2015; Ertiö, 2015).

Citizen interactions in formal online planning environments are usually controlled by planners or community engagement specialists to monitor the accuracy of the information or make sure that the environment is not being misused (McGrath, 2015). However, in less-formal environments, all of the participants can manage the environment since they may feel more ownership or feel that they are free to share or manage ideas. This can result in creating more open or deeper discussion that may or may not be related to a particular project or topic (Afzalan & Evans-Cowley, 2015; Foth, 2006).

5. Conclusion

In this paper, we built on planning and organization science theories to discuss various factors that cities and planning organizations should consider when deciding upon new online participatory tools. We argued that planning organizations should select OPTs based on technical capabilities, their organizational capacity to adopt new tools, the community capacity and interest in using these tools, regulations, and community norms (See Fig. 2).

The importance of considering the context in defining planning goals and processes is not a new concept. The issue of context-sensitivity may require more attention from planning organizations that try to choose new technologies. Cities are overwhelmed with the availability of new communication technologies and the opportunities that the technologies offer. This issue also exacerbates with the social pressure they receive from citizens who expect the implementation of smarter governance systems. While some cities and planning organizations are rushing into experimenting with participatory tools, we argue that slowing down and taking time to evaluate the planning context help cities with making more appropriate decisions in choosing technologies or deciding whether they want to use a new technology.

While some cities try to proactively experiment with new participatory technologies, some other ones may take a more conservative approach by taking more time for adoption. The ideas offered in this article respond to some of these issues by providing a guide for cities to choose OPTs. While some of the online participatory tools may advance organizations' efficiency, as one of the main intentions of creating smart cities (Belanche, Casaló, & Orús, 2016), they may distract planners and decision makers from their main goals. Planning and decision making is not all about efficiency, but also about responding to the public interest and community needs (Booher & Innes, 2002). We argue that smarter cities should adopt new participatory technologies to facilitate and advance their collaborative processes, considering not only the capabilities of their organization and tools but also the capacities and needs of communities. These considerations require rigorous inter-organizational or inter-departmental collaboration. Departmental collaboration is required in defining and allocating resources for technology implementation or for exploring the norms, regulations, and community characteristics. Public works departments in cities are actively involved in implanting smart cities technologies, such as participatory data collection sensors for gathering data about traffic or environmental pollution. Their collaboration with the planning department may help them learn more about the context for more effective implementation of technologies—e.g. where people gather or how the public spaces are being used in different times of the day.

Collaborative or participatory planning theories (Forester, 1989; Healey, 1998; Innes & Booher, 2010), informed by the concepts of communicative rationality (Habermas, 1985), help us understand the role of OPTs. Participatory planning theory guides the adoption or selection of participatory tools by providing normative insights on ways of creating collaborative processes that are inclusive, just, and communicative. However, more discussion about the organizational implementation or adoption of new participatory methods or tools in the participatory planning literature is needed. This article attempts to address this need.

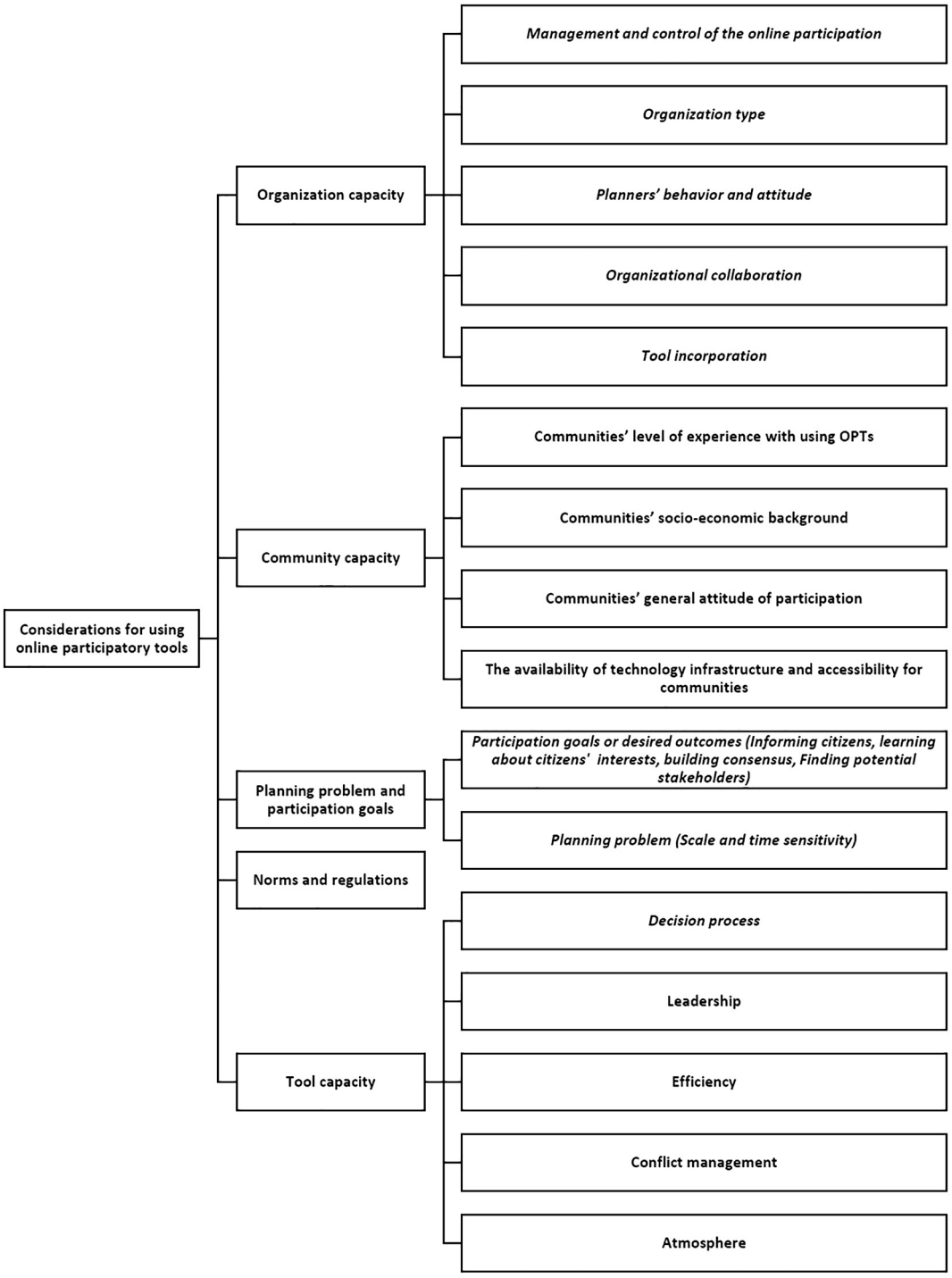

Fig. 2. Considerations for using online participatory tools.

It should be noted that several additional factors should be considered along with those introduced in this article. The article introduced a handful of influential factors based on a theoretical overview. Discussing these factors with planners and decision makers, technologists, and communities who use the tools will add insights on identifying new considerations for implanting online participatory technologies. One consideration could be ethical concerns of using or adopting these technologies. While e-government ethics is a growing field, there are still questions about ethical considerations of organizational adoption or implementation of new technologies that remain to be addressed.

References

Afzalan, N. (2015). *Participatory plan making: Whether and how online participatory tools are useful*. University of Colorado Denverhttp://search.proquest.com/openview/bb7fdb6a4d01cf298581df82246d75d4/1?pq-origsite=gscholar&cbl=18750&diss=y.

Afzalan, N., & Evans-Cowley, J. (2015). Planning and social media: Facebook for planning at the neighbourhood scale. *Planning Practice and Research*, *30*(3), 270–285.

Afzalan, N., & Muller, B. (2014). The role of social Media in Green Infrastructure Planning: A case study of neighborhood participation in park siting. *Journal of Urban Technology*, *21*(3), 67–83.

Albino, V., Berardi, U., & Dangelico, R. M. (2015). Smart cities: Definitions, dimensions, performance, and initiatives. *Journal of Urban Technology*, *22*(1), 3–21.

Allwinkle, S., & Cruickshank, P. (2011). Creating smart-er cities: An overview. *Journal of Urban Technology*, *18*(May 2015), 1–16.

Angelidou, M. (2014). Smart city policies: A spatial approach. *Cities*, *41*, S3–S11.
Angelidou, M. (2015). Smart cities: A conjuncture of four forces. *Cities*, *47*, 95–106.
Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of Planners*, *35*(4), 216–224.
Asterhan, C. S. C., & Schwarz, B. B. (2010). Online moderation of synchronous e-argumentation. *International Journal of Computer-Supported Collaborative Learning*, *5*(3), 259–282.
Bailey, K., Blandford, B., Grossardt, T., & Ripy, J. (2011). Planning, technology, and legitimacy: Structured public involvement in integrated transportation and land-use planning in the United States. *Environment and Planning. B, Planning & Design*, *38*(3), 447–467.
Bamberg, J. (2013). Engaging the public with online discussion and spatial annotations: The generation and transformation of public knowledge. *Planning Theory & Practice*, *14*(1), 39–56. http://dx.doi.org/10.1080/14649357.2012.738306.
Batty, M. (1995). Planning support systems and the new logic of computation. *Regional development dialogue*, *16*, 1–17.
Belanche, D., Casaló, L. V., & Orús, C. (2016). City attachment and use of urban services: Benefits for smart cities. *Cities*, *50*, 75–81.
Bertot, J. C., Jaeger, P. T., & Grimes, J. M. (2010). Using ICTs to create a culture of transparency: E-government and social media as openness and anti-corruption tools for societies. *Government Information Quarterly*, *27*(3), 264–271.
Booher, D., & Innes, J. (2002). Network power in collaborative planning. *Journal of Planning Education and Research*, *21*(3), 221–236.
Brabham, D. (2008). Crowdsourcing as a model for problem solving an introduction and cases. …: *The International Journal of Research into New …*.
Brabham, D. C. (2009). Crowdsourcing the public participation process for planning projects. *Planning Theory*, *8*(3), 242–262.
Brody, S. D. (2003). *Education and research measuring the effects of stakeholder participation on the quality of local plans based on the principles of collaborative ecosystem management*. http://dx.doi.org/10.1177/0739456X03253022.
Brody, S. D., Godschalk, D. R., & Burby, R. J. (2003). Mandating citizen participation in plan making: Six strategic planning choices. *Journal of the American Planning Association*, *69*(3), 245–264 http://doi.org/10.1080/01944360308978018.
Brown, M. M., Jr., L. J. O. T., & Brudney, J. L. (1998). Implementing information technology in government : An empirical assessment of the role of local partnerships. *Journal of Public Administration Research and Theory*, *8*(4), 499–525.
Brudney, J. L. (1995). The adoption of innovation by smaller local governments: The case of computer technology. *American Review of Public Administration*, *25*(1), 71–86.
Brynjolfsson, E. (2012). Big data: The management revolution. *Harvard Business Review*, 61–67 (October 2012).
Burby, R. J., Dalton, L. C., & Dalton, C. (1994). Plans can matter! The role of land use plans and state planning mandates in limiting the development of hazardous areas. *Public Administration Review*, *54*(3), 229–238.
Caragliu, A., Del Bo, C., & Nijkamp, P. (2011). Smart cities in Europe. *Journal of Urban Technology*, *18*(2), 65–82. http://dx.doi.org/10.1080/10630732.2011.601117.
Cash, D. W., Clark, W. C., Alcock, F., Dickson, N. M., Eckley, N., Guston, D. H., … Mitchell, R. B. (2003). Knowledge systems for sustainable development. *Proceedings of the National Academy of Sciences of the United States of America*, *100*(14), 8086–8091. http://dx.doi.org/10.1073/pnas.1231332100.
Coleman, B. (2002). Collaborative online learning in virtual discussions. *Educational Technology*, *30*(1), 3–17.
Corburn, J. (2005). *Street science: Community knowledge and environmental health justice (urban and industrial environments)*. The MIT Press.
Cornelius, C., & Boos, M. (2003). Enhancing mutual understanding in synchronous computer-mediated communication by training trade-offs in judgmental tasks. *Communication Research*, *30*(2), 147–177.
Cresswell, K., & Sheikh, A. (2013). Organizational issues in the implementation and adoption of health information technology innovations: An interpretative review. *International Journal of Medical Informatics*, *82*(5), e73–e86. http://dx.doi.org/10.1016/j.ijmedinf.2012.10.007.
Danziger, J. N. (1977). Computers , Local And the Governments , to Litany. *Public Administration Review*, *37*(1), 28–37.
Dawes, S. S. (2008). Th e evolution and continuing challenges of E-governance. *Public Administration Review*, *68*(s1), s86–s102.
De Longueville, B. (2010). Community-based geoportals: The next generation? Concepts and methods for the geospatial web 2.0. *Computers, Environment and Urban Systems*, *34*(4), 299–308.
Deng, Z., Lin, Y., Zhao, M., & Wang, S. (2015). Collaborative planning in the new media age: The Dafo temple controversy, China. *Cities*, *45*, 41–50. http://dx.doi.org/10.1016/j.cities.2015.02.006.
DeSanctis, G., & Poole, M. (1994). Capturing the complexity in advanced technology use: Adaptive structuration theory. *Organization Science*, *5*(2), 121–147.
Desouza, K. C., & Jacob, B. (2014). Big data in the public sector: Lessons for practitioners and scholars. *Administration and Society*. http://dx.doi.org/10.1177/0095399714555751.
Edelenbos, J. (2005). Managing stakeholder involvement in decision making : A comparative analysis of six interactive processes in the Netherlands. *Journal of Public Administration Research and Theory*, *16*(3), 417–446. http://dx.doi.org/10.1093/jopart/mui049.
Edmiston, K. D. (2003). State and local E-government: Prospects and challenges. *The American Review of Public Administration*, *33*(1), 20–45. http://dx.doi.org/10.1177/0275074002250255.
Ertiö, T.-P. (2015). Participatory apps for urban planning—Space for improvement. *Planning Practice and Research*, *30*(3), 303–321. http://dx.doi.org/10.1080/02697459.2015.1052942.
Estevez, E., & Janowski, T. (2013). Electronic governance for sustainable development — Conceptual framework and state of research. *Government Information Quarterly*, *30*, S94–S109. http://dx.doi.org/10.1016/j.giq.2012.11.001.
Evans-Cowley, J., & Hollander, J. (2010). The new generation of public participation: Internet-based participation tools. *Planning Practice and Research*, *25*(3), 397–408.
Evans-Cowley, J., & Manta Conroy, M. (2006). The growth of e-government in municipal planning. *Journal of Urban Technology*, *13*(1), 81–107.
Felin, T., & Zenger, T. R. (2014). Closed or open innovation? Problem solving and the governance choice. *Research Policy*, *43*(5), 914–925. http://dx.doi.org/10.1016/j.respol.2013.09.006.
Fischer, F. (2000). *Citizens, experts and the environment: The politics of local knowledge*. Durham, NC: Duke University Press.
Flyvbjerg, B. (2006). Making Organization Research Matter: Power, Values and Phronesis. In B. Czarniawska, & G. Sevon (Eds.), *The Northern Lights: Organization Theory in Scandinavia*(pp. 357–381). Copenhagen: Liber Abstrakt & Copenhagen Business School Press.
Forester, J. (1989). *Planning in the face of power*. Berkeley and Los Angeles, CA: University of California Press.
Foth, M. (2006). Facilitating social networking in inner-city neighborhoods. *Computer*, *39*(9), 44–50.
Fredericks, J., & Foth, M. (2013). Augmenting public participation: Enhancing planning outcomes through the use of social media and web 2.0. *Australian Planner*, *50*(3), 244–256.
Garau, C. (2012). Focus on citizens: Public engagement with online and face-to-face participation—A case study. *Future Internet*, *4*(4), 592–606.
Geertman, S., & Stillwell, J. (2004). Planning support systems: an inventory of current practice. *Computers, Environment and Urban Systems*, *28*(4), 291–310. http://dx.doi.org/10.1016/S0198-9715(03)00024-3.
Ghose, R. R. (2001). Use of information technology for community empowerment: Transforming geographic information systems into community information systems. *Transactions in GIS*, *5*(2), 141–163. http://dx.doi.org/10.1111/1467-9671.00073.
Giddens, A. (1984). *The constitution of society: Outline of the theory of structuration*. Berkeley and Los Angeles, CA: University of California Press.
Giffinger, R. (2007). *Smart cities ranking of European medium-sized cities*. *vol. 16*. Centre of Regional Science.
Gil-García, J. R., & Pardo, T.a. (2005). E-government success factors: Mapping practical tools to theoretical foundations. *Government Information Quarterly*, *22*(2), 187–216. http://dx.doi.org/10.1016/j.giq.2005.02.001.
Gillett, S. E., Lehr, W. H., & Osorio, C. (2004). Local government broadband initiatives. *Telecommunications Policy*, *28*(7–8), 537–558. http://dx.doi.org/10.1016/j.telpol.2004.05.001.
Godschalk, R. (1996). Adopon factors in of Geographic systems local ase study Goverrnment. *Public Administration Review*, *56*(6), 554–567.
Goldstein, B., & Butler, W. (2010). Expanding the scope and impact of collaborative planning: Combining multi-stakeholder collaboration and communities of practice in a learning network. *Journal of the American Planning Association*, *76*(2), 238–249.
Goodspeed, R. (2013). *Planning support systems for spatial planning through social learning*. Massachusetts Institute of Technology.
Goodspeed, R. (2015). Smart cities: Moving beyond urban cybernetics to tackle wicked problems. *Cambridge Journal of Regions, Economy and Society*, *8*(1), 79–92. http://dx.doi.org/10.1093/cjres/rsu013.
Gordon, E., & Baldwin-Philippi, J. (2014). Playful civic learning: Enabling lateral trust and reflection in game-based public participation. *International Journal of Communication*, *8*, 28.
Gordon, E., Schirra, S., & Hollander, J. (2011). Immersive planning: A conceptual model for designing public participation with new technologies. *Environment and Planning. B, Planning & Design*, *38*(3), 505–519. http://dx.doi.org/10.1068/b37013.
Habermas, J. (1985). *The theory of communicative action: Volume 2: Lifeword and system: A critique of functionalist reason*.
Hampton, K., & Wellman, B. (2003). Neighboring in Netville: How the internet supports community and social capital in a wired suburb. *City & Community*, *2*(4), 277–311.
Harrison, R., & Thomas, M. (2009). Identity in Online Communities: Social Networking Sites and Language Learning Identity in Online Communities. *Social Networking Sites and Language Learning*, *7*(2), 109–124.
Healey, P. (1998). Building institutional capacity through collaborative approaches to urban planning. *Environment & Planning A*, *30*(9), 1531–1546.
Ho, A. T. (2002). Reinventing local governments and the E-government initiative a paradigm shift of public service. *Public Administration Review*, *62*(4), 434–444.
Hoch, C. (2007a). How plan mandates work. *Journal of the American Planning Association*, *73*(1), 86–99. http://dx.doi.org/10.1080/01944360708976138.
Hoch, C. (2007b). Making plans: Representation and intention. *Planning Theory*, *6*(1), 16–35. http://dx.doi.org/10.1177/1473095207075148.
Houghton, K., Miller, E., & Foth, M. (2013). Integrating ICT into the planning process: Impacts, opportunities and challenges. *Australian Planner*, *3682*(December 2014), 1–10. http://dx.doi.org/10.1080/07293682.2013.770771.
Howe, J. (2006). The rise of crowdsourcing. *Wired Magazine*, *14*(06).
Huxley, M., & Yiftachel, O. (2000). New paradigm or old myopia? Unsettling the communicative turn in planning theory. *Journal of Planning Education and Research of Planning Education and Research*, *19*(4), 333–342.
Innes, J., & Booher, D. (2010). *Planning with complexity: An introduction to collaborative rationality for public policy*. Routledge.
Innes, J., & Gruber, J. (2005). Planning styles in conflict: The metropolitan transportation commission. *Journal of the American Planning Association*, *71*(2), 177–188. http://dx.doi.org/10.1080/01944360508976691.
Iverson, J., Wang, Z., & Dayrell, E. (2009). Landscape and urban planning what will the neighbors think ? *Cultural Norms and Ecological Design*, *92*, 282–292. http://dx.doi.org/10.1016/j.landurbplan.2009.05.010.

Jeffres, L. W. (2010). The communicative city: Conceptualizing, operationalizing, and policy making. *Journal of Planning Literature*, *25*(2), 99–110. http://dx.doi.org/10.1177/0885412210369455.

Johnson, P. A., & Sieber, R. E. (2012). Motivations driving government adoption of the Geoweb. *GeoJournal*, *77*(5), 667–680. http://dx.doi.org/10.1007/s10708-011-9416-8.

Kapoor, I. (2001). Towards participatory environmental management? *Journal of Environmental Management*, *63*(3), 269–279. http://dx.doi.org/10.1006/jema.2001.0478.

Kitchin, R. (2013). The real-time city? Big data and smart urbanism. *GeoJournal*, *79*(1), 1–14. http://dx.doi.org/10.1007/s10708-013-9516-8.

Klosterman, R. (1997). Planning support systems: A new perspective on computer-aided planning. *Journal of Planning Education and Research*, *17*(1), 45–54. http://dx.doi.org/10.1177/0739456X9701700105.

Klosterman, R. (1999). The what if? Collaborative planning support System. *Environment and Planning. B, Planning & Design*, *26*, 393–408.

Klosterman, R. E. (2001). Paper 10 the what if? Planning support system. *Planning support systems: Integrating geographic information systems, models, and visualization tools* (pp. 263–284). ESRI Press.

Klosterman, R., & Pettit, C. (2005). An update on planning support systems. *Environment and Planning. B, Planning & Design*, *32*(4), 477–484. http://dx.doi.org/10.1068/b3204ed.

Krasnova, H., Günther, O., Spiekermann, S., & Koroleva, K. (2009). Privacy concerns and identity in online social networks. *Identity in the Information Society*, *2*(1), 39–63. http://dx.doi.org/10.1007/s12394-009-0019-1.

Latkin, C. A., Forman, V., Knowlton, A., & Sherman, S. (2003). *Norms, social networks, and HIV-related risk behaviors among urban disadvantaged drug users*. *56*, 465–476.

Layne, K., & Lee, J. (2001). Developing fully functional E-government: A four stage model. *Government Information Quarterly*, *18*(2), 122–136. http://dx.doi.org/10.1016/S0740-624X(01)00066-1.

Leroy, P., & Arts, B. (2006). Institutional dynamics in environmental governance. In B. Arts, & P. Leroy (Eds.), *Institutional Dynamics in Environmental Governance (Environment & Policy)* (pp. 1–19). Springer Netherlands. http://dx.doi.org/10.1007/1-4020-5079-8.

Lombardi, P. (2011). New challenges in the evaluation of smart cities. *Network Industries Quarterly*, *13*(3), 8–10.

Mandarano, L., & Meenar, M. (2015). E-participation: Comparing trends in practice and the classroom. *Planning Practice and Research*, *7459*(June), 1–19. http://dx.doi.org/10.1080/02697459.2015.1017933.

Mandarano, L., Meenar, M., & Steins, C. (2010). Building social capital in the digital age of civic engagement. *Journal of Planning Literature*, *25*(2), 123–135.

McGrath, M. (2015). Hampton, Virginia: Civic engagement as a management strategy. *National Civic Review*, *104*(4), 28–33. http://dx.doi.org/10.1002/ncr.21251.

Minner, J. (2015). Planning support systems and smart cities. In S. Greetman, J. Ferreira, R. Goodspeed, & J. Stillwell (Eds.), *Planning Support Systems and Smart Cities* (pp. 409–425). Springer International Publishing. http://dx.doi.org/10.1007/978-3-319-18368-8.

Murphy, K. L., Mahoney, S. E., Chen, C., Mendoza-Diaz, N. V., & Yang, X. (2005). A constructivist model of mentoring, coaching, and facilitating online discussions. *Distance Education*, *26*(3), 341–366. http://dx.doi.org/10.1080/01587910500291454.

Neirotti, P., De Marco, A., Cagliano, A. C., Mangano, G., & Scorrano, F. (2014). Current trends in Smart City initiatives: Some stylised facts. *Cities*, *38*, 25–36. http://dx.doi.org/10.1016/j.cities.2013.12.010.

Nelson, A., Babon, A., Berry, M., & Keath, N. (2008). Engagement, but for what kind of marriage?: Community members and local planning authorities. *Community Development Journal*, *43*(1), 37–51. http://dx.doi.org/10.1093/cdj/bsl038.

Odendaal, N. (2003). Information and communication technology and local governance: Understanding the difference between cities in developed and emerging economies. *Computers, Environment and Urban Systems*, *27*(6), 585–607. http://dx.doi.org/10.1016/S0198-9715(03)00016-4.

Palen, L., Anderson, K. M., Mark, G., Martin, J., Sicker, D., Palmer, M., & Grunwald, D. (2010a). A vision for technology-mediated support for public participation & assistance in mass emergencies & disasters. *Proceedings of the 2010 ACM-BCS visions of computer science conference* (pp. 8–). British Computer Society.

Palen, L., Vieweg, S., & Anderson, K. M. (2010b). Supporting "everyday analysts" in safety- and time-critical situations. *The Information Society*, *27*(1), 52–62. http://dx.doi.org/10.1080/01972243.2011.534370.

Palfrey, J. G., & Gasser, U. (2012). *Interop: The promise and perils of highly interconnected systems*(1st ed.). New York: Basic Books.

Piatkowski, D., Marshall, W., & Afzalan, N. (2016). Can web-based community engagement inform equitable planning outcomes? A case study of bikesharing. *Journal of Urbanism: International Research on Placemaking and Urban Sustainability*, *9175*(December), 1–14.

Quick, K. S., & Feldman, M. S. (2011). Distinguishing participation and inclusion. *Journal of Planning Education and Research*, *31*(3), 272–290. http://dx.doi.org/10.1177/0739456X11410979.

Rhoads, M. (2010). Face-to-face and computer-mediated communication: What does theory tell us and what have we learned so far? *Journal of Planning Literature*, *25*(2), 111–122. http://dx.doi.org/10.1177/0885412210382984.

Rinner, C. (2001). Argumentation maps: GIS-based discussion support for on-line planning. *Environment and Planning. B, Planning & Design*, *28*(6), 847–863. http://dx.doi.org/10.1068/b2748t.

Sanchez, T., & Brenman, M. (2013). Public participation, social equity, and technology in urban governance. In C. Nunes Silva (Ed.), *Public participation, social equity, and technology, in Nunes Silva*. University of Lisbon: Institute of Geography and Spatial Planning.

Santo, C.a., Ferguson, N., & Trippel, a. (2010). Engaging urban youth through technology: The youth neighborhood mapping initiative. *Journal of Planning Education and Research*, *30*(1), 52–65. http://dx.doi.org/10.1177/0739456X10366427.

Schroeter, R., & Houghton, K. (2011). Neo-planning: Location-based social media to engage Australia's new digital locals. *Proceedings of Planning Institute of Australia National Conference 2011*. Planning Institute of Australia.

Schweitzer, L. (2014). Planning and social media: A case study of public transit and stigma on twitter. *Journal of the American Planning Association*, *80*(3), 218–238. http://dx.doi.org/10.1080/01944363.2014.980439.

Schweitzer, L., & Stephenson, M. (2016). Planning, development, and media: A case study of the Woodrow Wilson bridge. *Journal of Planning Education and Research*, *36*(2), 239–254. http://dx.doi.org/10.1177/0739456X15620280.

Seltzer, E., & Mahmoudi, D. (2012). Citizen participation, open innovation, and crowdsourcing: challenges and opportunities for planning. *Journal of Planning Literature*, *28*(1), 3–18.

Slotterback, C. S. (2011). Planners' perspectives on using technology in participatory processes. *Environment and Planning. B, Planning & Design*, *38*(3), 468–485. http://dx.doi.org/10.1068/b36138.

Stutzman, F. (2005). *An evaluation of identity-sharing behavior in social network communities, (July)*. 1–7.

Tayebi, A. (2013a). "Communihood:" A less formal or more local form of community in the age of the internet. *Journal of Urban Technology*, *20*(2), 77–91. http://dx.doi.org/10.1080/10630732.2013.769317.

Tayebi, A. (2013b). Planning activism: Using social media to claim marginalized citizens' right to the city. *Cities*, *32*, 88–93. http://dx.doi.org/10.1016/j.cities.2013.03.011.

Townsend, A. (2013). *Smart cities: Big data, civic hackers, and the quest for a new utopia*. NY: WW Norton & Company.

Viitanen, J., & Kingston, R. (2014). Smart cities and green growth: Outsourcing democratic and environmental resilience to the global technology sector. *Environment & Planning A*, *46*(4), 803–819. http://dx.doi.org/10.1068/a46242.

Waddell, P. (2007). UrbanSim. *Journal of the American Planning Association*, *68*(3), 37–41.

Williamson, W., & Parolin, B. (2012). Review of web-based communications for town planning in local government. *Journal of Urban Technology*, *10*(1), 43–63.

Williamson, W., & Parolin, B. (2013, October). Web 2.0 and social media growth in planning practice: A longitudinal study. *Planning Practice and Research*. Taylor & Francis.

Yli-pelkonen, V., & Kohl, J. (2005). The role of local ecological knowledge in sustainable urban planning : perspectives from Finland. *Sustainability, Science, & Policy*, *1*(1), 1–14.

Zook, M., Graham, M., Shelton, T., & Gorman, S. (2010). Volunteered geographic information and crowdsourcing disaster relief: A case study of the Haitian earthquake. *World Medical & Health Policy*, *2*(2), 6–32. http://dx.doi.org/10.2202/1948-4682.1069.