



TECHNOLOGICAL SOLUTIONS TO ENCOURAGE CIVIC ENGAGEMENT IN URBAN PLANNING: EXPERTS' PERSPECTIVES

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Abstract: *The smart city concept is primarily grounded on the use of technology to provide robust solutions to the complex urban problems and endorse sustainable development practices to enhance the citizen's quality of life. The use of technology for citizen participation is indispensable for effective city planning, especially at the local level. The study attempts to identify notions regarding a technological approach to city planning in the form of variables through literature and eventually categorize them as catalysts and hurdles for the eloquent participatory city planning. The study is based on a primary survey with city planning experts. The adaptability of the identified variables is assessed through the perception of the experts, weighed on the five-point Likert scale. The findings intend to facilitate policy makers and practitioners in highlighting the use of technology in a city planning framework.*

Keywords: *technology, public participation, urban planning, Local Area Plan (LAP)*

1. Introduction

Urban population is increasing at the unprecedented rate and causing urban management concerns for the local development authorities. The smart city concept has emerged as a solution and has been drawing attention of experts and planners. Nonetheless, the research reveals that the smart cities approach has not been able to yield desired outcomes in the absence of smart communities (Satterthwaite, 1986).

Technology can easily enable connections between community and government to provide practical solutions to the urban local problems and to improve the quality of life of the citizens (Knight Frank, 2012). This idea has been researched and there have

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been efforts to involve local people while planning for urban areas, especially in the developed world. There have been various approaches associated with the concept of public participation for urban development. The research shows that the consumerist approach is the most accepted and used approach to involve people in decision making. It refers to a method where people write complaints and suggestions to the development authorities and seek resolutions to problems. (Lowdnes, Pratchett and Stroker, 2001). Most of the development authorities in the world still prefer the focus group approach to seek public opinion in planning related matters and very few use consultative innovations (Lane, 2005). Few technological interventions have been used to enhance public participation for planning and decision making (Krishnaswamy, 2012).

The Government of India also realized the need to include local people as partners in the planning and development of urban areas. In 1992, the Indian parliament passed the Constitutional Amendment Act 74, which promulgated the approach to public participation and local self-governance in India. The act stressed upon the self-sufficiency and self-dependency of the Urban Local Bodies (ULBs) in urban India. Through this act, it was envisaged that people would participate in budgeting, planning, land use, zoning issues etc. This should have led to transparency, accountability and wider civic participation, that would have strengthened urban governance in municipal bodies of the country. Few of the states in India that demonstrated the positive impact of a participatory approach to planning include Kerala, Maharashtra, Karnataka, and West Bengal (Harriss, 2010). Despite the success, the majority of ULBs in Indian states have not adopted this approach in its true spirit (Leena and Sharma, 2007). In India, there are not many success stories of participatory planning. The succeeding paragraph summarizes the instances of efforts for a paradigm change to a bottom-up approach instead of a traditional top-down approach in planning. Until now, Delhi is the only Indian state to pioneer the concept of local area planning.

The Indo-USAID (FIRE-D) project was launched in 2005 with the objective to reformulate the building byelaws and to prepare draft guidelines to prepare Local Area Plans in Delhi. Based on the draft, the Delhi Development Authority tested the guidelines with the Municipal Corporation of Delhi in five diverse areas of the city, and then revised guidelines for LAP were made in 2008. Simultaneously, the Masterplan of Delhi 2021 was under preparation by the Delhi Development Authority in 2007. It is the first Masterplan of the city to describe the concept of decentralized local area planning by participatory approach. It defines the local area plan as a plan of a small area (electoral ward/or planning subzone) to be prepared and approved by the local body. The Masterplan also states that special guidelines shall be formulated by a technical committee for sanctioning the local area plan in Delhi. 2012 was marked as a year in the planning history of Delhi and based on provisions in the Masterplan of Delhi 2021 and on LAP guidelines, 33 wards out of 272 were selected in the first phase to prepare local area plans. The Mumbai Municipal Corporation also initiated the process of local area planning in 2013 but the idea was dropped in 2016. Also, the Local Area Plans for 33 wards in Delhi were not approved and the entire process halted in the absence of a statutory framework. Despite of all these efforts, no Local Area Plan

(a statutory document) has been approved and implemented in any city of India till date.

Though the Ministry of Urban Development reiterated the relevance of Local Area Plans in the URDPFI Guidelines and the Delhi Development Authority in its Unified Building Bye Laws for Delhi, nothing seems to be working in this regard. This certainly seeks technological solutions to promote public participation in urban planning mechanisms. Therefore, the study identifies technological indicators (Bryant and Yarnold, 1995) that in the form of variables through literature and eventually categorize them as catalysts and hurdles for the eloquent participatory city planning. The study is based on the perception of experts of urban planning, especially with respect to planning of local areas in Delhi.

2. Literature Review

Technological interventions are vital to enhance public participation in decision-making, but research indicates that such interventions should complement the existing traditional approach and tools of participation instead of completely replacing them (Kingston, Carver, Evans, and Turton, 2000; Li, Chang and Yi, 2004). Nonetheless, there are few areas in which technology seems to be the only solution. The mapping of urban areas has always been an issue of concerns for planners, policy-makers and also for residents. Geographical Information Systems have emerged as efficient mapping tools in recent years. This technology helps in connecting spatial information with socio-economic information, providing a base for effective inclusive planning, especially at local level. Technology seems to be easily available, affordable, and accessible in developed economies (Warner, 2015). There is literature to support the fact that web-based technology is a world-wide accepted mechanism for information dissemination, and a medium for partnership and communication between people and government (Wang and Bryer, 2013). Moreover, research suggests that web-based technologies are an affordable and accessible way to encourage public participation and can be easily adopted by general masses (Herranz, Romero-Gómez, Díaz, and Onorati, 2014).

At the same time, hurdles in adoption of technology have been reported, especially in developing countries, where governments are often biased towards the rich and educated (Bailey and Grossardt, 2010). Based on past experiences, people expressed that they are not consulted for planning at local areas (Enshassi and Kullab, 2014). It is also reported that if given the opportunity, IT illiteracy amongst people may discourage them to accept technology as a tool for participation in decision making (Jankowski and Nyerges, 2003; Kingston, 2002; Li et al., 2004). Moreover, since technology has not been formally used for public participation for planning procedures in India (Menon and Hartz-Karp, 2019), people perceive the adoption of technology as a behavioral and not as a logistic issue. This has been restated in many research articles (Abels, 2007; Hennen, 2002; Macintosh, 2004; Mashelkar, 2008). IT literacy is key to adopting technology, which then allows institutions or organizations to reach more people, according to literature (Roşca, 2015; Shekgola, Maluleka, and Rodrigues, 2021). Therefore, urban residents seem to be more participative in local, smart city affairs, than rural residents.

ULBs need to promote and enhance the use of technology as a means for public participation through the use of smartphones (Metallo, Gesuele, Guillamón, and Ríos, 2020; Milakovich, 2010; Oh, Jeong and Shin, 2019; Wang and Bryer, 2013) and app-based technology laptops (Díaz, Carroll and Aedo, 2016; Goodchild, 2007; Hennen, 2002; Herranz et al., 2014; Kingston et al., 2000; Li and Ma, 2006) as well as capacitate ULBs through training programs (Nallathiga, 2014) to further be able to enhance ability of the users to use and adopt technology for participation in decision making. Therefore, ULBs shall use web-based and phone-based technologies to reach out to a broader audience of citizens for suggestions (Bifulco, Tregua, Amitrano, and D'Auria, 2016; Ham, Teng, Wijaya, and Wikoprata, 2018). This shall enhance the efficiency of the urban governance.

The literature review has led to the identification of various technology related attributes that are pertinent while making Local Area Plans or other participatory plans in different developing countries. Based on the literature review and the pilot study, ten variables were chosen for the study in Delhi. The indicators identified from the literature are further categorized as catalysts and hurdles:

Catalysts (C)

- 1) People prefer the complaint and suggestion method, as a tool for public participation in decision making;
- 2) People prefer postal questionnaires, public meetings and personal interviews over web based technological interactions;
- 3) People are IT literate and willing to connect through easily available web-based tools for participating in decision making;
- 4) Technology can facilitate database creation at micro level;
- 5) Technology can enable coordination among various governmental departments;
- 6) Technology will augment efficiency, accountability and transparency of the Government offices.

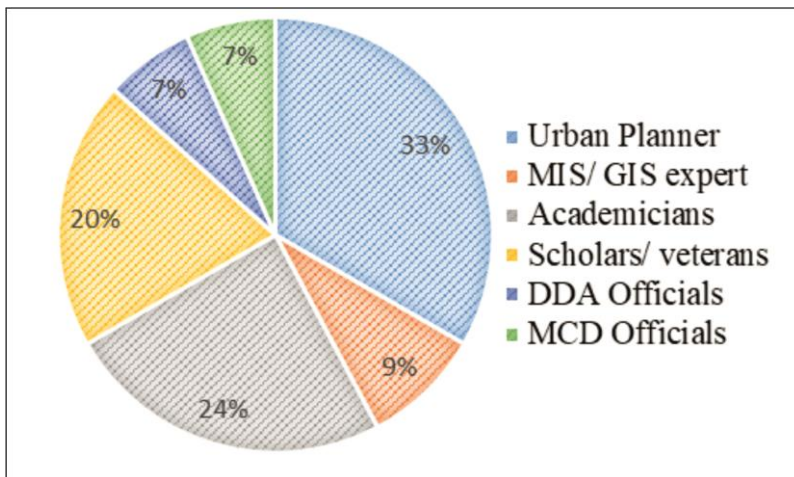
Hurdles (H)

- 7) People do not adopt technology as many of them are IT illiterate;
- 8) Technology is a costly intervention in the government affairs;
- 9) Technology is not easily accessible to the common man;
- 10) Behavioral issues discourage people to adopt technology.

3. Methodology

A qualitative study is considered most suitable when the research is based on the perception of people (Stake, 2010), such as this study, which is based on perceptions of experts about the technological variables and their significance in local area planning in India. The identified variables were converted into a questionnaire which was used for data collection. A five-point ordinal Likert scale was used to measure the responses. 100 planning experts were surveyed, a sample size deliberated as sufficient while conducting research (Green, 1991). The experts consisted of practicing urban planners, allied academicians, officials of the Development Authority and Municipal Corporations, MIS (Management information system) & GIS scholars, and veterans of the related fields and subjects. Snowball sampling or chain-referral sampling technique was used to choose the sample respondents. Officials of the Municipal Corporation of Delhi and of the Delhi Development Authority were surveyed, as well as experts working in institutes such as All India Institute of Local Self-Government, Participatory Research in Asia, the International Council for Local Environmental Initiatives, the School of Planning and Architecture in New Delhi, INTACH, Jamia Millia Islamia University, Indraprastha University or the Association of Municipal Corporations and Development Authorities. As a limitation, there existed the fear of sampling bias since the initial samples tend to suggest people that they know as samples for the study. The distribution of the sample is demonstrated in Figure 1.

Figure 1: Composition of Expert Sample Respondents



Source: Author's own representation

4. Analysis and Findings

The data analysis started with the critical understanding of the data characteristics. Descriptive statistics (mode, mean, standard deviation and error) were conducted and verified. An attempt was made to assess the normality of the dataset created for experts. Table 1 presents the descriptive statistics. The mean of each question indicates the perception of the experts. Experts largely disagreed with the variables identified as hurdles and supported technology as a catalyst for successful local area planning.

Table 1: Descriptive Statistics of Experts

Technological Indicators	mean	mode	StDev	StErr
People prefer the complaint and suggestion method, as a tool for public participation in decision making.	2.11	2	1.1	0.2
People prefer postal questionnaires, public meetings and personal interviews over web based technological interactions.	2.20	2	1.1	0.2
People are IT literate and willing to connect through easily available web-based tools for participating in decision making.	4.13	4	0.9	0.1
Technology can facilitate database creation at micro level.	4.29	4	0.7	0.1
Technology can enable coordination among various governmental departments.	4.20	4	0.8	0.1
Technology will augment efficiency, accountability and transparency of the Government offices.	4.31	4	0.7	0.1
People do not adopt technology as many of them are IT illiterate.	1.84	2	1.0	0.2
Technology is a costly intervention in the government affairs.	2.11	2	1.1	0.2
Technology is not easily accessible to the common man.	2.13	2	1.1	0.2
Behavioral issues discourage people to adopt technology.	1.84	2	1.0	0.2

Source: Author's compilation

The viewpoint of the experts is crucial to understand if the government officials are also well capacitated to adopt technology for participatory planning at local level. In the existing framework, the traditional method of complaints and suggestions is not the most implemented tool of public involvement and people are ready to adopt technology for public participation. People access technology largely through their smartphones (Roşca, 2018). Therefore, the majority of experts thinks that the illiteracy of the general public with respect to technology is not the reason for not adopting the technology. According to them, technology is not used for public consultation and planning due to behavioral issues.

According to the experts, adopting technology for public participation is affordable. Moreover, it is easily accessible to all classes of society. They believe that technology will facilitate coordination among different departments and organizations and will enhance transparency and accountability. The majority of experts think that technology (GIS) will increase the efficiency of ULBs.

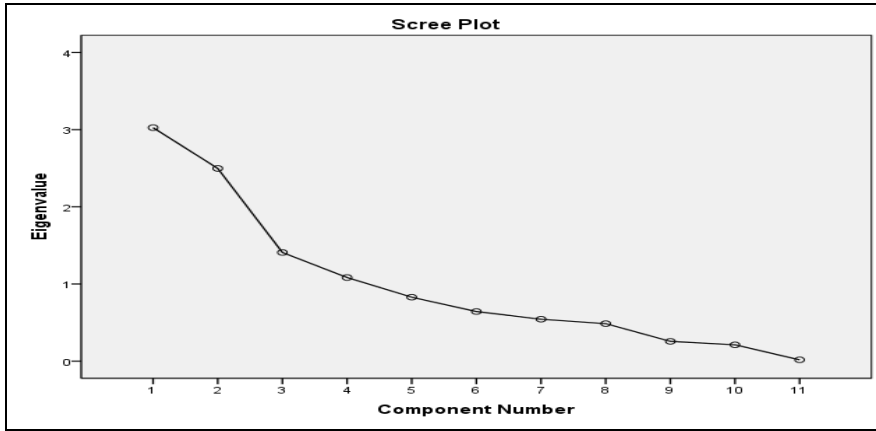
The results from the descriptive analysis have been validated by Principal Component Analysis (PCA). The sampling appropriateness can be measured by examining the Kaiser-Meyer-Olkin (KMO) (Hair, Anderson, Tatham, and Black, 1995; Kaiser, 1970). Results showed that the PCA is valid (Ulanowicz, 1986). Therefore, it is an appropriate technique for further analysis of data. Table 2 shows the eigenvalues of the attributes.

Table 2: Eigenvalues of selected attributes

Total Variance Explained								
Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
3.026	27.507	27.507	3.026	27.507	27.507	2.878	26.168	26.168
2.497	22.703	50.209	2.497	22.703	50.209	2.558	23.258	49.426
1.408	12.799	63.009	1.408	12.799	63.009	1.473	13.393	62.819
1.084	9.852	72.861	1.084	9.852	72.861	1.105	10.041	72.861
829	7.533	80.393						
643	5.845	86.238						
543	4.935	91.173						
486	4.418	95.591						
256	2.331	97.922						
212	1.923	99.845						
017	155	100.000						
Extraction Method: Principal Component Analysis.								

Source: Author's representation based on SPSS Results

The PCA yielded four factors by merging the appropriate attributes. The first factor has the maximum variance and therefore has the highest eigenvalues. The following factor accounts for the leftover variance. Attributes with factor loadings greater than 0.5 have only been considered for the groupings. In this study, the first 4 factors explain 72.861% of variance. This has been shown in the scree plot (Figure 2).

Figure 2: Scree Plot for Technology Indicators: Perception of Experts

Source: Author's own representation

Table 3 demonstrates the rotated factor loadings demonstrating and correlations between the variables. This table helped in clubbing of the variables to identify the final factors.

Table 3: Rotated Component Matrix of selected attributes

Codes	Rotated Component Matrix	Component			
		1	2	3	4
C_1	People prefer the complaint and suggestion method, as a tool for public participation in decision making.	.775	-.240	.338	.064
C_2	People prefer postal questionnaires, public meetings and personal interviews over web based technological interactions.	.613	-.403	.478	-.063
C_3	People are IT literate and willing to connect through easily available web-based tools for participating in decision making.	.840	-.358	.290	.032
H_1	People do not adopt technology as many of them are IT illiterate.	.137	-.080	.668	.169
H_2	Technology is a costly intervention in the government affairs.	.443	.250	-.563	.243
H_3	Technology is not easily accessible to the common man.	.837	-.311	-.335	.002
H_4	Behavioral issues discourage people to adopt technology.	-.009	-.034	.263	.916
C_4	Technology can facilitate database creation at micro level.	.182	.668	.041	-.161
C_5	Technology can enable coordination among various governmental departments	.337	.760	.083	.180
C_6	Technology will augment efficiency, accountability and transparency of the Government offices.	.375	.613	.137	-.175

Source: Author's representation based on SPSS Results

The factors are congregated and each group of factors is named to represent the grouped factor. 4 factors explain the variance in performance of the variables as shown in Table 4. There are two catalyst and two hurdle factors for implementable Local Area Plans.

Table 4: Identified Significant Factors

Factors	Variable included	Description of the factor
C1	<ul style="list-style-type: none"> • People prefer the complaint and suggestion method, as a tool for public participation in decision making. • People prefer postal questionnaires, public meetings and personal interviews over web based technological interactions. • People are IT literate and willing to connect through easily available web-based tools for participating in decision making. • Technology is not easily accessible to the common man. 	Public consultation to be promoted using conventional methods along with technological interventions as the officials are ready to adopt the technology.
C2	<ul style="list-style-type: none"> • Technology can facilitate database creation at micro level. • Technology can enable coordination among various governmental departments. • Technology will augment efficiency, accountability and transparency of the Government offices. 	Technology should be used to create databases, to coordinate among different departments, to enhance transparency and therefore increase efficiency of the urban local bodies.
H1	<ul style="list-style-type: none"> • People do not adopt technology as many of them are IT illiterate. 	IT literacy of the masses and of officials should be promoted to encourage them to adopt the technology for public participation.
H2	<ul style="list-style-type: none"> • Behavioral issues discourage people to adopt technology. 	Creating institutional arrangements in policy to gain people's trust for public involvement in decision making.

Source: Compiled by the Authors

5. Discussions

The use of geographic information system (GIS) technology to enhance efficiency and coordination and real-time data updating is reported to be the most critical catalyst, identified by experts. This factor indicates that technology can facilitate coordination

among different departments and organizations (Duncan and Moriarty, 1998) and can increase the efficiency of the ULBs to use social media, mobility, analytics and cloud-based technologies in governance (Yavetz and Aharony, 2020). The future of governance might well lie in the Internet of Things (IoT), a tool towards transparent and accountable governance (Malhotra, 2016). This has led to the advent of Information and Communications Technology (ICT) as policy priority to enable reforms in local governance. Despite this, some areas seek intervention, including that in ULBs (Cordella and Iannacci, 2010; Heeks, 2002). The technology-led driver (i.e. “Use of appropriate ICT tools to facilitate E-Governance”) is yielded from the discussion with the experts.

The driver refers to the ICT-supported local level governance. Numerous studies claim that e-governance is a new approach and is widely accepted as a tool for interaction between governments and citizens (Cegarra-Navarro, Garcia-Perez and Moreno-Cegarra, 2014). It was realized that ICT can dramatically help in enhancing accountability, transparency and efficiency of the ULBs (Cordella and Iannacci, 2010). This shall also give impetus to the participatory approach to planning. People tend to comment on what they see or perceive. There has to be a system that allows its users to vote for their preferences. It is perceived that visual information is easier to understand and react upon (Krishnaswamy, 2012).

1. GIS shall be adopted by ULBs to create, maintain and update real-time databases (Goodchild, 2010; Li, Batty and Goodchild, 2020; Lu, 2009);
2. At the same time, modeling software shall be used to generate an interactive smartphone-based application which will allow access to the easily interpretable visual information, since smartphones are becoming an increasingly used platform for augmenting realities (Castells, 2009; Goodchild, 2020; Rowe and Frewer, 2000). Such a system where people can visualize proposed urban developments or can give feedback to the government would give people the ability to participate in planning decisions in their own time, without attending any meetings or presentations (Wimmer, Grimm, Jahn, and Hampe, 2013);
3. The public participation system shall be linked to many daily used sites as a required field. The satisfaction level of the people can be assessed through close-ended questions. This can further be linked with a tax exemption or any other incentive that should be given to a conscious and responsible citizen. Such innovations would lead to increased public participation and thereby ensuring transparent and accountable governance.

The concept of E- participation is found to be acceptable by the majority of the stakeholders in different economic strata and age groups. It has been evident that people now can locate themselves on a map, especially while booking cabs. This implies that it is more important to be technology-literate than just simply literate to participate through smartphone app-based in public consultations on the planning process. Therefore, ICT tools shall be encouraged to enhance E-governance at the local level.

6. Conclusions

This paper aimed to investigate the technological attributes that can enhance the efficacy of local area planning. Ten indicators were recognized from literature. Subsequently, each hurdle and catalyst was tested for its adaptability in the context of local area planning in Delhi through the perception analysis of the identified experts. The use of GIS technology to enhance efficiency and coordination and real-time data updating is reported to be the most critical catalyst. This article might also be useful for policy makers and practitioners to define adaptable local area planning frameworks. This work can be extended to examine the perception of users in Delhi and its adjoining cities with respect to the identified indicators.

Authorship

The authors contributed equally to the research. Dr. Devendra Pratap Singh helped in conceptualization and framing the objectives and provided overall supervision.

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Declaration of conflicting interests

The author declares no conflicting interests.

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