Article

Title: Public Participation Using 3D web-based City Models: Opportunities for E-participation in Kisumu, Kenya.

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Abstract:

Public participation is significant for the success of any urban planning project. However, most members of the general public are not planning professionals and may not understand the technical details of a 2D paper-based plan, which might hamper their participation. One way to expand the participation of citizens is to present plans in well-designed, user-friendly and interactive platforms that allow participation regardless of the technical skills of the participants. This paper investigates the impacts of the combined use of 3D visualization and E-participation on public participation in Kisumu, Kenya. A 3D City model, created with CityEngine2016, was exported into a web-based geo-portal and used as a Planning Support System in two stakeholder workshops in order to evaluate its usability. For e-participation, 300 questionnaires given out to planning practitioners. Five indicators were developed for evaluating the usability of the 3D model while the usability of e-participation was evaluated using communication, collaboration and learning as indicators. Results showed that effectiveness and efficiency varies within different professional groups while the questionnaires showed strong preference for e-participation methods, especially SMSs/USSDs and emails. The study concludes that the use of 3D visualization and E-participation has the potential for improving the quality and quantity of public participation and recommends further research on the subject.

Keywords: Usability; Perceived Added Value; Public Participation; Planning Support System; 3D visualization; E-participation;

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1. Introduction

The importance of involving different stakeholders in the design and implementation of urban plans is widely recognized [1-5]. While traditional ways of urban planning rely on expert knowledge [6], there has been advocacy towards multi-sectoral approach to planning involving local citizens, experts, agencies and institutions. This is informed by the notion that the traditional top-down approach of urban planning is unable to cope with the growing complexity of sustainable urban management [6]. Some argue that the voices of the traditionally voiceless (e.g. poor and minority groups) are critical if plans are to succeed in achieving equity, efficiency and sustainability [7]. The importance of citizens' involvement in decision making was recognized by the United Nations over 25 years ago and anchored in Principle 10 of the Rio Declaration of 1992 [8]. However the participation of local communities and/or disadvantaged groups in planning has been difficult particularly where programs are controlled or located in powerful political and bureaucratic structures [7] and dominated by the 'haves' instead of the 'have not's' [9].

The use of 3D visualization and E-participation methods are becoming increasingly popular in urban planning and management. This is supported by continued technological innovations in computer vision and internet technology witnessed in the past few years [10-12]. Two-dimensional (2D) visualizations have always been used to present geographic information in town planning sessions. However, they are often difficult to understand [13], especially for stakeholders who have little or no experience in interpreting maps. There is sufficient evidence that 3D visualization is capable of stimulating stakeholder involvement and improving their understanding of plans presented. In their study in Catolina, Irene et al, as quoted by Milosz et al. [14], report that "the various groups of people that have participated have been very positive about the usefulness of the 3D technology. Spatial planners even considered these tools to be potential solutions to some of their most common communication problems with citizens" [14] (p. 60). Koeva , in her study of the creation of interactive web-based visualization of cultural heritage projects is Sofia (Bulgaria) concludes that "image- based modelling and panoramic visualization are simple, fast and effective techniques suitable for simultaneous virtual representation of many objects" [10] (p. 6). In Korea, Kim discusses the use of 3D simulation and visualization techniques for various applications including development control [15]. Al-Hanbali, Fadda, & Rawashdeh, in their work in 3D modelling in GIS environment demonstrated 3D modelling as a way of offering a flexible and interactive system for providing the best visual interpretation, planning and decision making process. 3D digital models makes it

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possible even for non-experts to exert more control over what they wish to see as opposed to what the planners want them to see [16].

One the other hand, the internet has provided a channel through which people, governments and other institutions communicate and exchange information planning [17]. Karakaya further argue that internet technology can be used by local authorities to increase their internal efficiency, to have better communication with their partner organizations as well as join up their services with them [5]. Peng and Hansen portend that the internet can become a forum around which community-based issues, information, alternative perspectives, and decisions evolve [18, 19]. The internet enables collective intelligence and collaborative content creation and linking by the user who contributes towards common knowledge [17].

Widespread availability of mobile phones has enabled real time participatory applications, such as FixMyStreet in mobile app in UK, Cologne City's Sag's uns" [20] or eCAALYX Android smartphone app [21]. Mobile phones are usually used as communication tools. However, they have also been used by ordinary people to mobilize others [22] who were previously passive into action. The progressive use of mobile phones has enabled the acquisition and utilization of spatial data easier, faster and cheaper [22, 23] as opposed to the traditional ways which are costly and time consuming. Furthermore, mobile phones have provided opportunities for governments and other planning agencies to explore different ways to interact with citizens, not only in the provision of information, but also to engage in dialogue [22]. South Africa's award-winning 32211 SMS tip-off crime line presents a success case study of the minimization of this fear where anonymity is guaranteed, not by government or the police, but by private enterprises [22]. 3D visualization and E-participation offer opportunities for efficient and effective public participation thus bridging possible gaps in the traditional top-down methods of planning [2]. 3D modelling and visualization facilitates the creation of different perspectives of reality through inclusive interaction of stakeholders. E-participation on the other hand creates independence of space and time offering the choice of how, when and where to participate. This study therefore aims to explore how the combined use of 3D visualization and E-participation can help in improving public participation in Kenya. The next section of the article discusses the methods and tools used during the study while the third section presents the results and further discussions on the findings.

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2. Materials and Methods

Planning being a participatory processes it is essential to develop tools that can foster faster understanding and use of the plans among different users [1, 24, 25], while promoting interaction and information exchange [12, 24, 26]. An explorative case study was carried out to establish usability (an aspect of perceived added value) of a Planning Support System (PSS) and the usability of e-communication channels in a planning process. Since it was not possible to control all the influencing factors in a quantitative experiment, an explorative case study was chosen and mixed with other qualitative methods. This is because little is known about the usability of 3D visualization and E-participation in real planning processes, making an exploratory study the best option [27, 28].

Perceived added value of a new tool, such as a PSS, can be studied using three factors; the support capabilities of the PSS, its usability, and the context [29]. Usability in this context is defined as the extent to which a product can be used by specified users to achieve certain goals effectively, efficiently and satisfactorily in a specified context of use [30]. The variables used for the study were usability and communicative ability of the abstract and realistic 3D visualization. Usability was tested using three indicators as proposed by different authors. These include efficiency, effectiveness and satisfaction [13, 29] while communicative ability was tested using communication, collaboration and learning outcomes [29, 31, 32]. The usability of E-participation on the other hand was measured using the concepts of communication, collaboration and learning.

2.1. Study Area

This study was carried out in Kisumu, an inland Port city along the shores of Lake Victoria, Kenya. Kisumu, the third largest city of Kenya, is located on the North tip of Winam gulf, part of Kavirondo Gulf of Lake Victoria (Fig 2). The study was carried out in the Central Business District, with particular focus on a proposed redevelopment area owned by the Kenya Railways Corporation. In Kisumu, just like in other towns in Kenya, the public is never involved at the initial stages of plan conceptualization and preparation, but only at the presentation of the draft or final plans. These presentation meetings have sometimes suffered from stakeholder apathy, with reported cases of boycotts or lack of attendance. In Kisumu, the current planning practice does not promote or enhance public participation. The use of new technologies to promote public participation has largely been ignored or unexplored.

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120 Despite Kenya government's focus on improving public participation to incorporate local knowledge and
121 solutions into the urban and community planning processes, most planning processes in Kisumu have
122 not paid attention to the possibilities that 3D visualisation and e-participation may offer in improving the
123 quality and quantity of public participation.
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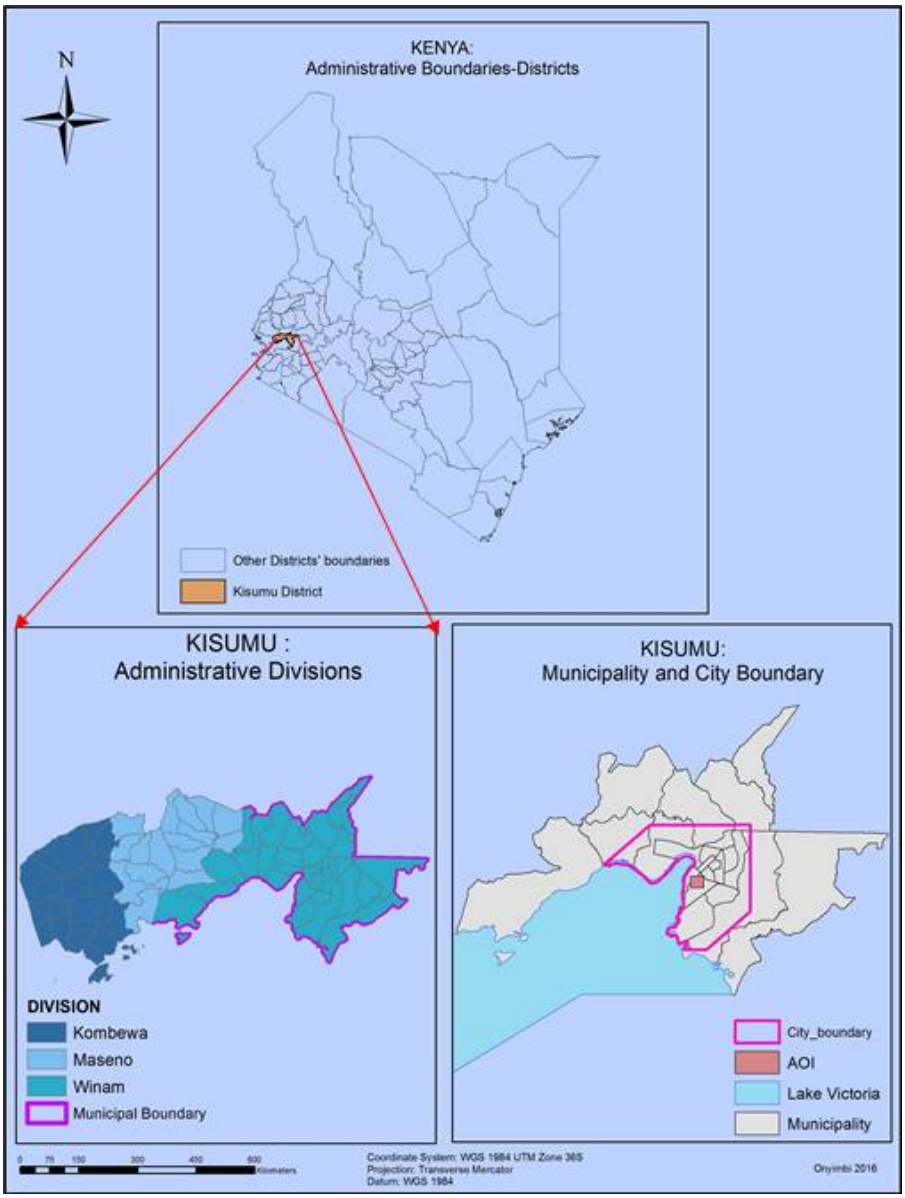

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128 Figure 1: Study Area. Source: Author's Construct
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130 **2.2. 3D Modelling and visualization**

131 For this study, a 3D City web geoportal was created and used during stakeholder workshops. The main
132 objective of designing the 3D scene was to test how different users accept, interact with and perceive the
133 use of 3D web-based visual representations against 2D abstract representation in planning processes.

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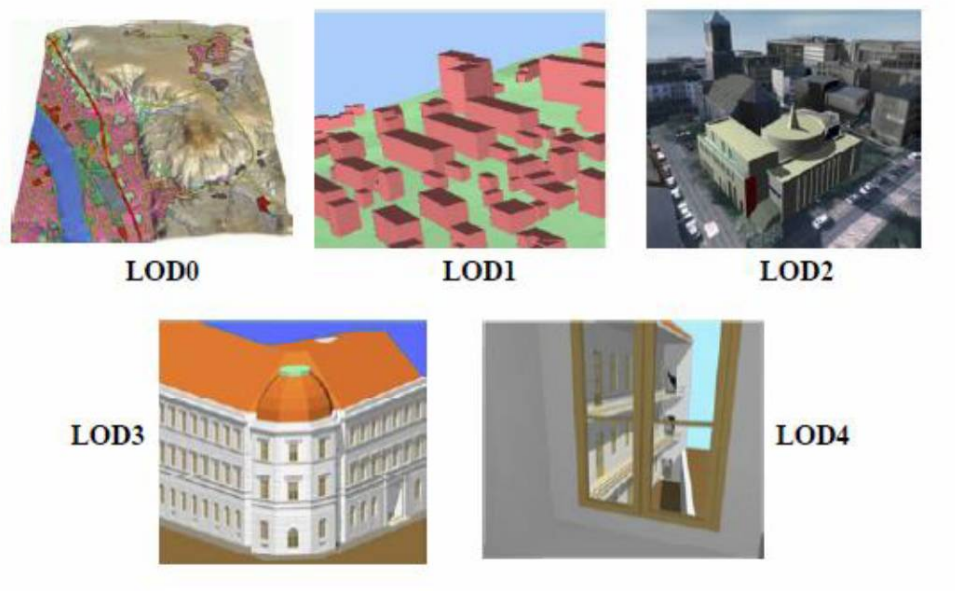
134 3D modelling is done in various levels of detail (LoD). These multiple scales range from LOD0 to LOD4
135 as defined by City GML specifications (Fig 2).



136
137 Figure 2: Levels of Detail in CityGML
138

139 Using Procedural Rule Based Modelling offered by CityEngine, 3D model was created and exported into
140 an online geo-portal provided by ArcGIS Online. The 3D model of the selected part of the city (Area of
141 Interest in Fig 2) was created by using a 0.50m resolution GeoEye Mono satellite image (2009) as a raster
142 base. A 90m resolution Shuttle Radar Topography Mission (SRTM) Digital Elevation Model (DEM) was
143 used as the base terrain. To start the modelling process, the satellite image was draped over the DEM.
144 Shapefiles of the 2D building footprints, road network, land parcels and planning zones obtained from
145 the local government were imported into Esri CityEngine 2016 for creating 3D model. Building heights
146 were measured from the ground using laser distance measuring gadget. This was the cheapest option
147 given that the cost of obtaining stereo pair of high resolution images of the study area which could be
148 used to extract heights was high. CityEngine provides easy and flexible options for editing and texturing
149 using Computer Generated Architecture (CGA) shape grammar based 3D procedural modelling. The
150 CGA rule file allows changes in different parameters of objects such as height, position, texture, surface
151 type, direction among others. Rule files (.cga) are authored and modified in the Rule Editor of
152 CityEngine. Using building heights and single-line CGA rule file, LoD1 model was created by extruding
153 the buildings from the footprints. LoD2 model of the buildings was generated by texturing of LoD1
154 model with the images of buildings obtained from Google Earth to obtain a realistic view. The edited rule

files were then applied to generate the 3D model of the study area. The observed advantage of Rule Based Modelling is the easiness with which texturing can be performed with minimum effort. The 3D model was generated as a *.cej file and exported as a CityEngine WebScene Model (*.3ws) with a series of ancillary documents.

2.3 Planning Workshops

To assess the perceived added value of the created 3D PSS, two workshops were organized. The goal of the workshop was to evaluate the usability of the PSS and E-participation channels used. The first workshop involved students from the school of planning and architecture, Maseno University. The second workshop was for professionals including physical planners (5), Architects (3), Surveyors (5), Civil Engineers (2) and others (4) from Kisumu. The professionals were chosen since they deal and interact with spatial matters in most of their daily work

There are a variety of ways of evaluating usability. However, two groups are distinguishable: *Usability Testing* and *Usability Inspection* [14]. The difference lies in the level of expertise required to perform the evaluation. For usability inspection, the evaluation is performed by experts [14, 24, 25] while for usability testing, the designed product is assessed by end users [1, 14, 33]. For this study, usability testing was adopted since it involved different users testing the developed 3D geo-visual model. Three main factors for measuring usability of visualizations are task completion time (faster interpretation-*efficiency*), task completion correctness (number of correct answers-*effectiveness*) and general opinions of the respondents (*satisfaction*). Apart from quantitative measures, qualitative user data has been assessed in the past to discover patterns in users' behaviour [27, 34]. This was also significantly used in evaluating satisfaction.

This model was used with pre-designed two sets of tasks during the workshop sessions. In task 1, a list of ten (10) feature names was presented in numerical order. On an A3 size paper, the 2D plan showing the plot numbers and road networks for this area was presented to the participants. Each participant was required to select a name of a feature from the provided list and then using their spatial knowledge of the city, to locate the feature in the provided 2D map. Upon locating a feature, each participant was expected to indicate on the 2D map the number corresponding to the name on the list provided. This task was performed in 10 minutes, after which all the maps were collected from participants.

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Task 2 involved the use of the 3D city model visualized in the web-based geoportal. In a similar format as Task 1, features were marked with letters A-J on the geoportal. A sheet of paper with the letters A-J was also provided to each participant. The task required each participant to identify a feature marked by a letter on the 3D city model in the web-based geoportal and write the name against the corresponding letter on the sheet of paper provided. This task was also timed for 10 minutes. Finally, the proposed redevelopment area was presented to the participants in the 3D web-based geoportal. Participants were asked to navigate through, compare and analyse the layers of the areas as it is and the two proposed redevelopment scenarios created by the author. A questionnaire was administered at the end of all the tasks and a short general discussion thereafter to find out participants perceptions. The author and two research assistants controlled the environment, issuing task materials, guiding layer navigation, monitoring time and guided the discussions thereafter.

2.4 Interviews

Planning professional, other key informants and sampled residents were also interviewed. This was carried out to gain a general insight into the professional planners‟ perspective of the use of E-participation and 3D visualization in planning processes in the country in general and Kisumu city in particular. Emphasis was put on comparing the use of 2D versus 3D representations and traditional (paper adverts and notices) versus digital ways (E-participation) of inviting and conducting public participation exercises. A total of 78 residents were interviewed and 300 questionnaires sent to planners. However, only 207 questionnaires were filled and returned. Key informants interviewed included a city planning officer, the Dean of school of planning and architecture, Maseno University, County Architect, a private physical planner and a CBO project manager. The list of the key informants and interview dates/time are presented in the Table 1.

Table 1: List of Key Informants Interviewed

No.	Responsibility	Date of Interview	Place	Experience (years)	Mode	Consent
1	City Planning official	Thurs. 6/10/2016 10.30am	City Hall	7	Guided Interview	Consent sought,
2	Deans, SoP (Maseno)	Tues 11/10/2016, 2.00pm	Deans Office	15	Guided Interview	Consent Sought

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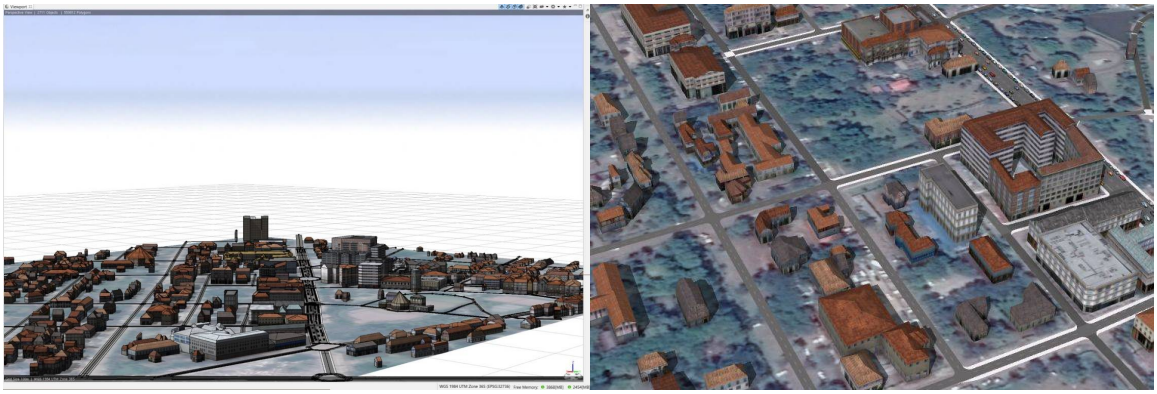
3	Practising Private Planner	Wed 5/10/2016, 12.30pm	After worksho p	20	Guided Intervie w	Consent sought
4	Architect, County Govt. Kisumu	Fri 14/10/2016, 10.00am	Architec ts Office	5	Guided Intervie w	Consent sought,
5	Project Manager, Muungano CBO	Fri 14/10/2016, 3.00pm	Manager 's Office	5	Guided Intervie w	Consent sought

3. Results

3.1 Modelling and PSS Application.

A 3D model was created and exported into a web-based geo-portal supported by Esris ArcGIS online (http://arcg.is/2k68mrQ). The 3D model was used during the two workshops as a PSS. The Figure 3 shows the various captions of the final model, with (c) showing a comment left by a user about a particular building.



(a.) (b.)

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(c.) Jomo Kenyatta Sports Ground

Figure 3: Captions of parts of the 3D city model of Kisumu.

3.2 Questionnaire return rate

A total of 300 questionnaires were dispatched to planners via email and other social media channels. From the 300 dispatched questionnaires, 207 were filled and returned giving a response rate of 69.0%. However, some questionnaires had mandatory questions unanswered. Only a total of 185 questionnaires were fully answered. From the workshops, a total of 38 questionnaires were given out, all filled and returned while for the household survey, only 78 out of the 90 printed questionnaires were correctly filled and returned. According to Fincham (2008) and Glaser (2008), acceptable response rates vary by how the survey is conducted [35, 36]. For Mail 60-70% very good, Phone 70-80%, Email: 40-60%, Online: 30% average and Face-to-face: 80-85% response rates are acceptable. Therefore, the return rates presented in Table 2 were appropriate for data analysis and discussion for this study.

Table 2: Questionnaire return rate.

Category	**Issued**	**Filled and returned**	**Valid**	**Return rate**
Workshops	38	38	38	100.0%
Household	90	78	78	86.7%
General	300	207	185	69.0%
Total	428	323	301	70.3%

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3.3 Usability and communicative ability of the 3D model

Usability of the PSS was evaluated using three indicators; Efficiency which referred to the amount of time spent in answering the questions provided in the exercises. Effectiveness referred to the number of correct answers given by the respondents within the specified time while Satisfaction pointed to respondents' preference of use of the provided 2D or 3D options. Communicative ability was evaluated based on the PSS's ability to communicate information (communication), promote interaction and exchange of information (Collaboration) and the new ideas/information obtained by users from the PSS (learning outcomes).

Effectiveness was tested on the basis of the number of correct answers given within the set timeline. Each professional group showed different characteristics as shown in Figure 4.

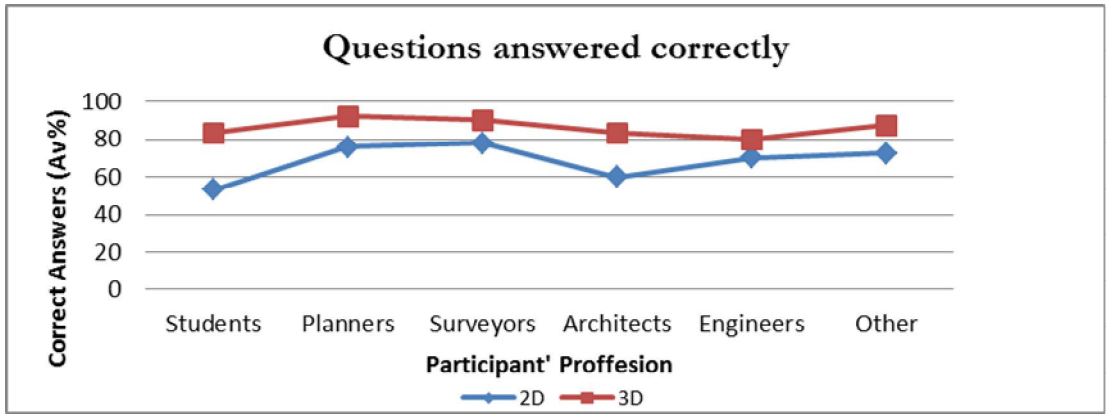

Figure 4: Percentage correct answers categorized per profession.

Generally, the entire professional groups answered more correct answers in the 3D task as compared to the 2D task. Students performed fairly low in the 2D task (53%), while engineers performed low in the 3D task. Engineers and surveyors however had very minimal difference in the number of correctly answered questions in 2D and 3D tasks.

Efficiency measured the effectiveness in respect of time spent to answer the questions. Planners took shorter time average in answering questions related to 3D than 2D while the student group took the longest times (12) for both 2 and 3D tasks (Figure 5). On average, no particular group managed to get all the correct answers in the specified time.

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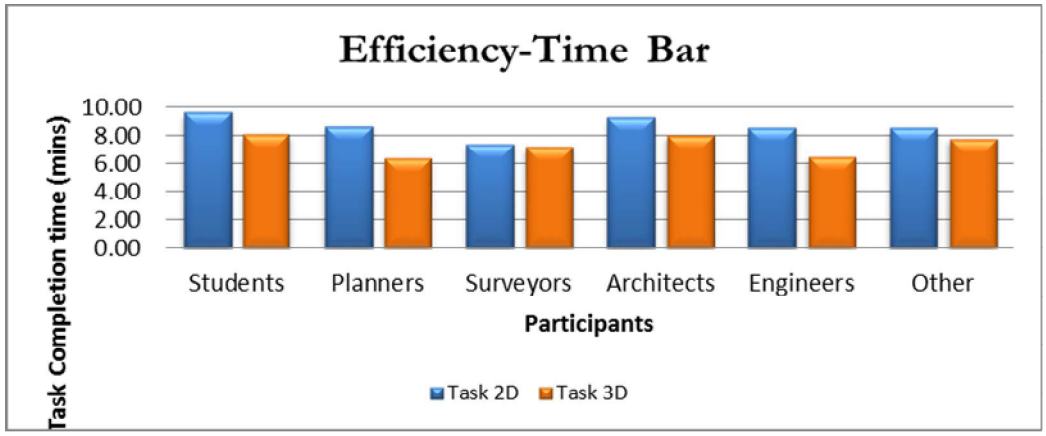

Figure 5: Task completion time per participant's group.

Responses from the questionnaire pointed to a likely preference for 3D over 2D where 83% of the 37 respondents preferred the use of 3D over 2D representation.

The communicative and collaborative ability of the PSS was evaluated based on its flexibility and the ability to convey information that triggers a change of thought of the participant. 89.2% of the respondents were of the opinion that 3D representation was more flexible to deal with than 2D.

Learning was evaluated based on the participant's perception on the tool's ability to improve their understanding and knowledge of the planning scenario(s) and the thought-changing process triggered by the PS tool presented. 81% of the respondents) indicated that the 3D representation had improved their understanding of the plan and the area, as opposed to 56.7% indicating that their understanding improved when 2D presentation was used.

3.4 E-Participation

The main goal of E-participation is to ensure sufficient access to the tool by all users and the possibility to 'participate' at any time or from any location, anonymously or not. The 3D web-based geo-portal made this participation possible. The participants were able to view and navigate through the different objects in the model, and even leave comments, particularly on the redevelopment area.

Results from the key informant interviews, survey respondents and participants (Table 3) pointed to the interviewee's preference for E-participation methods, especially SMSs/USSDs and emails.

Table 3: User preference for different e-participation channels

Category/	Very Satisfied	Somewhat Satisfied	Satisfied	Least Satisfied	Not Satisfied	Dissatisfied	Don't Know	Total
SMS/USSD	130 (70%)	45 (25%)	95%	2 (1%)	0	1%	8 (4%)	185
E-mails	44 (24%)	60 (32%)	56 %	43 (23%)	35 (19%)	42%	3 (2%)	185

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Online forum	50 (27%)	78 (42%)	69%	42 (23%)	11 (6%)	29%	4 (2%)	185
SmartApps	10 (6%)	41 (22%)	28%	59 (32%)	58 (31%)	63%	17 (9%)	185
No. of Participant: 130=Absolute, (70%)=Percentage								
Satisfied= (VS+ SS)				Dissatisfied= (LS+NS)				

From the results, it was evident that most planners preferred e-participation channels as opposed to the traditional city-hall planning meetings and workshops. Reasons cited for their preference included time and cost saving, convenience, no victimization, participation independent of space and time of day, ability to bring more participants on board, some degree of transparency, audit trail (accountability) among others.

4. Discussion

The results revealed useful insights into the characteristics of the participants and their use of both 2D and 3D representations of the geographic space and scenarios. It also pointed to how the integration of a 3D model in a web-based geoportal, with other E-participation methods can impact public participation in planning processes.

Majority of respondents from the household survey mentioned local leaders as their primary source of invitation to participate in the project. This is open to manipulation by 'influential stakeholders and politicians' who may use the leaders to front their personal, sectorial or political agenda [4, 37, 38]. The development and use of these PSS tools can play a great role in mitigating such risks. An interactive web-portal opens communication channels, which can minimize the influence of local leaders and powerful politicians and stakeholders in the process by reducing potential contact with participants. For example, SMS linked to a geoportal can facilitate an anonymous participation option, ensuring not only more but also equitable participation, eliminating discriminatory invitation by leaders. Majority of residents interviewed showed particular interest in contributing ideas to the planning processes rather than for financial compensation, expressing both their instrumental and normative goals. This further solidifies the claim by Ngau (2013) that residents may be willing to participate, but perhaps the channels used to disseminate information or invitations to participate do not achieve optimum circulation. This is

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also seen in the results from practising planners, where 77.3% of respondents observed that the medium used to invite public participation has not achieved optimum or satisfactory levels.

Participants showed that the use of the 3D web-based tool was more effective than the 2D paper-based representations. Effectiveness varied with the different professional groupings, with planners and surveyors scoring higher than other groupings. However, we conclude that the two methods are all effective, only varying in degrees of effectiveness. A correlation analysis performed showed that the Ease of Use and participants' consideration of 3D over 2D had a strong positive correlation to the professional background of participants (0.266 and 0.186 respectively). The differences noted among various groups confirms the assertion by te Brömmelstroet (2015) that differences in use of such tools depend on differences in professional backgrounds, languages and/or skills.

Participant's satisfaction was gauged based on their preferential choices between 2D and 3D. From the results, it is observed that 83.8% of the respondents from the workshops felt satisfied with the 3D tool and its capabilities and may consider 3D over 2D presentations in future planning work. This may be related to the learning concept where over 80% of respondents opined that the 3D tool improved their understanding, thus increasing satisfaction rating. From the comments made by respondents in the questionnaires, we conclude that the respondents identified more with realistic and precise representations in 3D as opposed to 2D. A similar observation was made by Milosz et al (2007).

Another important role played by PSS is to enhance interdisciplinary communication through learning [39]. In both tasks, some level of communication was reached based on the learning curves. However, the 3D web-based tool scored higher in this respect. Some participants were more concerned with what they actually learnt from the PS tool (outcome) rather than how the tasks were done (process). This corroborates views held by Pelzer et al. (2016) that learning is perceived by users to be the most important added value of any PSS applications. Pelzer & Geertman, argue that tool involvement prior to or during workshops seems to be both an important prerequisite for learning, and a learning process in itself.

It is however important to point out that all the two workshops were semi-mediated and guided (facilitated), where users were taken through what to do. Perhaps such a workshop setting may produce different results from those where the PSS is chauffeured or fully mediated, or even in cases where each individual may be let to run the PSS outside a workshop set-up.

5. Conclusions

The analysis of the study results show a consistency with what most researchers have argued for, that different PSS have potential impacts on public participation. The study showed a convergence in agreement among the various professionals, students and the general public that 3D presentations have greater potential to improve public participation due to its ability to depict scenarios as close to reality as possible. The addition of interactive capabilities makes it more flexible and easier to use, enabling information exchange and learning. It is however noteworthy that every PSS may trigger different reactions from the users depending on the complexity of the tool, the design and its purpose, hence the argument that PSS should be context-specific.

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Annexes

i) 2D Map Sheet of Study Area

ii) Task Sheets

a). 3D Tasks

Instructions: Navigate through the scenes, click on the symbols (demonstrate) and a letter will appear. Identify the objects labelled with letters on the 3D web portal. Navigate

A……..
B……
C……
D……
E……
F……
G……
H……
I……..
J…….

b). 2D Tasks

Mark the location of the following places on the map provided. Once you have identified the object on the map, Use the corresponding numbers below to mark it on the map

1. Ardhi house
2. Huduma center
3. ACK cathedral
4. Kisumu high court
5. Provincial police Headquarter
6. Jomo Kenyatta sports ground
7. Mega Plaza
8. Reinsurance plaza
9. Alpha House
10. Tivoli centre

iii.) Survey Questionnaire

Impact of 3D visualization and E-Participation on Public participation: Case of Kisumu City

Impacts of 3D visualization and E-participation on public participation.

Impacts Survey

This survey is part of a research project on assessing the impact of 3D visualization and E-participation in planning processes. The research is conducted by Onyimbi Ragot, an MSc student at Faculty of Geo-Information Science and Earth Observation at the University of Twente, the Netherlands. Your participation is highly appreciated and is of great help to the realization of the project objectives. I confirm that the responses and feedback will be kept anonymous and confidential and will solely be used for this research project. Please fill this form as part of your participation in helping develop more understanding on this research. Thank you for your cooperation.

Please respond to the following questions on your knowledge and satisfaction with the use of 3D visualization and E-participation for public participation in planning processes.

(Please tick one choice per question unless otherwise indicated)

1. How long have you been in planning practice?

- ○ 0-2yrs
- ● 2-4yrs
- ○ 4-6yrs
- ○ 6-8yrs
- ○ >8yrs

2. Have you ever been involved in a planning project that required public participation?

- ● Yes, I have been involved
- ○ No, I have not

3. Are you aware of any statutory regulations (Acts, by-laws, etc) requiring public participation in planning processes? (Give examples)

- ● Yes
- ○ No

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4. Give examples of the regulations in Q3 above.

the constitution of kenya, the county government act and local laws in each county in kenya give room for Public

5. Based on your experience, how would you describe how the public currently gets involved in planning processes?

	Fully Involved	Partially Involved	Not Involved
Problem identification & policy setting	●	○	○
(Provide a brief explanation for your choice			
the people are used in identifying the problems and prioritizing the needs			
Alternative solutions/scenario development	○	●	○
(Provide a brief explanation for your choice			
much of this is done by experts who weigh alternatives and choose the best for people alt			
Project selection	○	●	○
(Provide a brief explanation for your choice			
similar to the alternatives development. Selection of project depends much on experts an			
Project implementation	●	○	○
(Provide a brief explanation for your choice			
i have seen many projects were people are ion control. This is seen in how they take part			
Monitoring & Evaluation	○	●	○
(Provide a brief explanation for your choice			
Development control	○	○	●
(Provide a brief explanation for your choice			
its more of policy affairs.			

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6. Choose the methods used currently to invite public participation in planning processes?

	Verbal Invitation by a leader	On-site paper advertisement	Print media: Newspapers, flyers etc	Notice Boards in public offices	Electronic media: Raido, Tv, sms, email etc
Ways of Inviting Public Participation	☐	☐	☑	☑	☑

Describe the Method(s) chosen

methods are used for different groups. I learn from a research i did that government use various methods including vernacular TV/Redio stations

7. Do you feel the method(s) above achieve optimum public participation? Give reasons)

- (●) Yes
- ( ) No

Reasons

I realised that many counties in kenya for example use different methods to reach different people group. it was soo effective

8. What would you suggest to improve public participation in the future?

capacity building . if people know the importance, they will participate

9. Are you aware of the use of 3D visualization for plan/project presentations?

- ( ) Yes, I am Aware
- (●) No, I am not aware

10. Have you ever used 3D visualization for plan presentations?

- ( ) Yes
- (●) No

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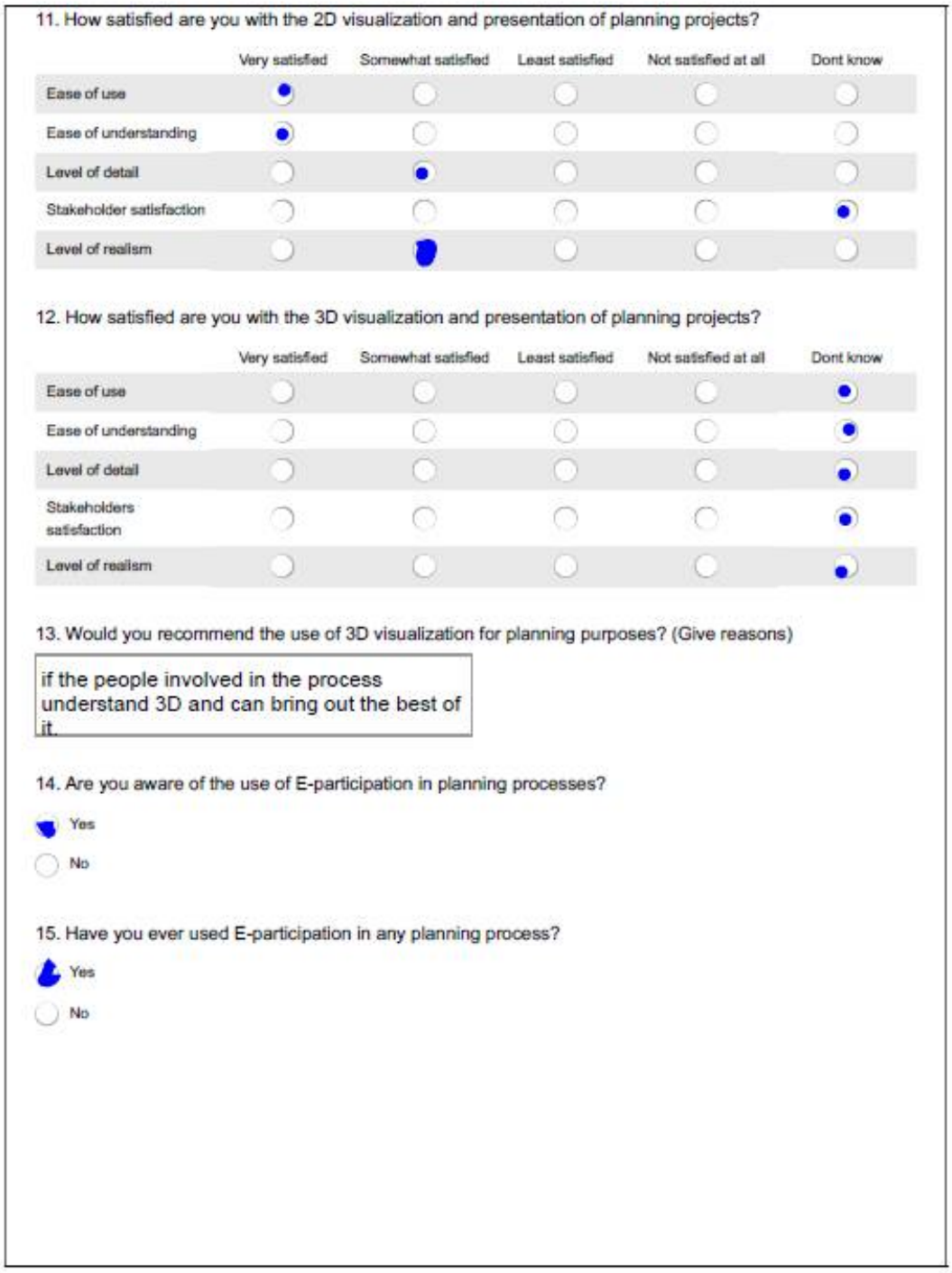

11. How satisfied are you with the 2D visualization and presentation of planning projects?

	Very satisfied	Somewhat satisfied	Least satisfied	Not satisfied at all	Dont know
Ease of use	●	○	○	○	○
Ease of understanding	●	○	○	○	○
Level of detail	○	●	○	○	○
Stakeholder satisfaction	○	○	○	○	●
Level of realism	○	●	○	○	○

12. How satisfied are you with the 3D visualization and presentation of planning projects?

	Very satisfied	Somewhat satisfied	Least satisfied	Not satisfied at all	Dont know
Ease of use	○	○	○	○	●
Ease of understanding	○	○	○	○	●
Level of detail	○	○	○	○	●
Stakeholders satisfaction	○	○	○	○	●
Level of realism	○	○	○	○	●

13. Would you recommend the use of 3D visualization for planning purposes? (Give reasons)

if the people involved in the process understand 3D and can bring out the best of it.

14. Are you aware of the use of E-participation in planning processes?

● Yes

○ No

15. Have you ever used E-participation in any planning process?

● Yes

○ No

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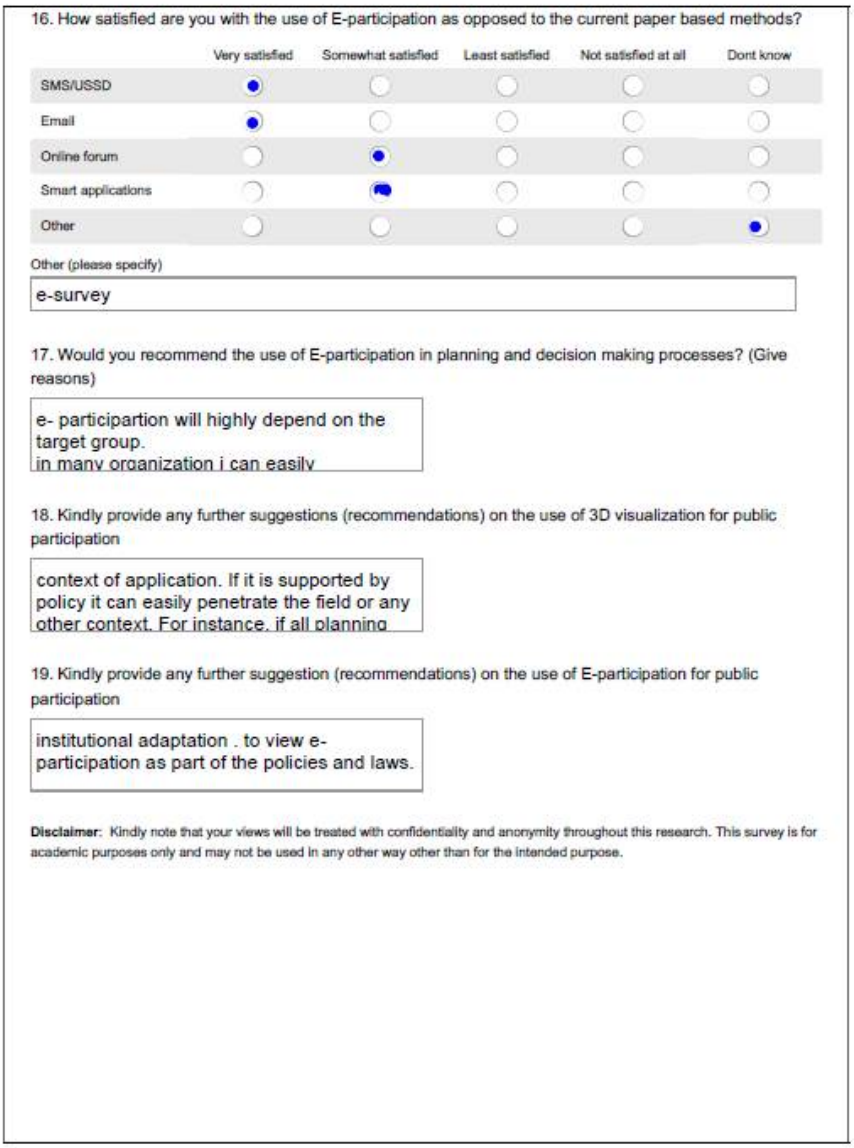

16. How satisfied are you with the use of E-participation as opposed to the current paper based methods?

	Very satisfied	Somewhat satisfied	Least satisfied	Not satisfied at all	Dont know
SMS/USSD	●	○	○	○	○
Email	●	○	○	○	○
Online forum	○	●	○	○	○
Smart applications	○	●	○	○	○
Other	○	○	○	○	●

Other (please specify)

e-survey

17. Would you recommend the use of E-participation in planning and decision making processes? (Give reasons)

e- participartion will highly depend on the target group.
in many organization i can easily

18. Kindly provide any further suggestions (recommendations) on the use of 3D visualization for public participation

context of application. If it is supported by policy it can easily penetrate the field or any other context. For instance, if all planning

19. Kindly provide any further suggestion (recommendations) on the use of E-participation for public participation

institutional adaptation . to view e-participation as part of the policies and laws.

Disclaimer: Kindly note that your views will be treated with confidentiality and anonymity throughout this research. This survey is for academic purposes only and may not be used in any other way other than for the intended purpose.

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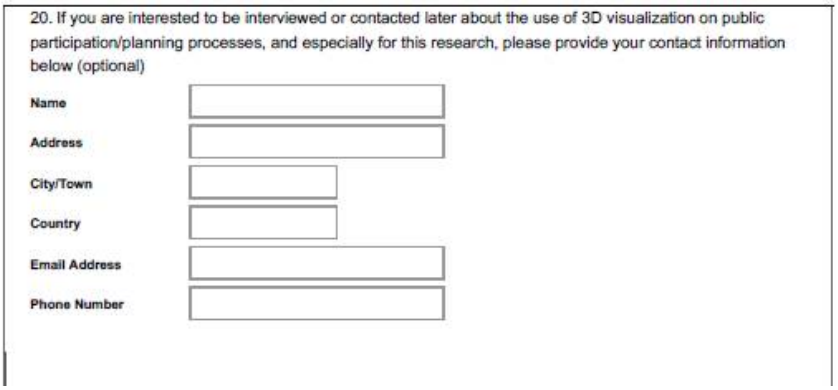

20. If you are interested to be interviewed or contacted later about the use of 3D visualization on public participation/planning processes, and especially for this research, please provide your contact information below (optional)

Name	
Address	
City/Town	
Country	
Email Address	
Phone Number	

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