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PUBLIC DECISIONS AND CITIZEN SATISFACTION: THE POTENTIAL ROLE OF PUBLIC PARTICIPATION GEOGRAPHIC INFORMATION SYSTEMS

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ABSTRACT

The concept of "public participation" is currently of great interest to researchers and policymakers. The major challenge that this concept presents is the development of methods to verify the results of the effects of inclusive participation practices on decision-making processes[1]. There is also a lack of evaluation methods regarding the participation of the public through Public Participation Geographic Information Systems (PPGISs). To fill this gap, the ongoing research has two objectives: first, to develop an analytical framework through which PPGIS initiatives can be evaluated; second, to apply the above-mentioned framework to a multi-case study to analyze and evaluate the results obtained from different PPGIS projects. In detail, we investigate the level of citizens' satisfaction regarding their active participation within PPGIS projects. To achieve the above-mentioned objectives, we apply cross-case analysis and content analysis methodologies.

Keywords: Public Participation, ICT, PPGIS, Evaluation Framework

1. INTRODUCTION

The notion of citizen participation in public decisions has been discussed extensively in the scientific literature since the end of 1960, when Arnstein[2] offered her seminal contribution to the explication of the concept.

Successively, Wiedemann and Femers[3] introduced the concept of the level of public participation and the concept of the environmental scenario, considered to be alternatives to Arnstein's explanation. Public participation, in this study, is defined as the distribution of information to citizens who are concerned about environmental issues. In conclusion, Tulloch and Shapiro[4] set a framework for the classification and measurement of different levels of citizen participation in the decision-making processes regarding environmental issues. Technology brings a new element into this conceptual field. Developments in Information and Communication Technologies (ICTs) and, particularly, the increasing proliferation of the Internet, suggest that ICTs could be used to widen the spectrum of participants in the decision-making process[5, 6]. Among the information-technology tools utilized to actively involve citizens in environmental issues, public participation geographic information systems (PPGISs) have played a key role. PPGISs are increasingly recognized as valuable methods for gathering public knowledge and opinions. PPGIS has evolved mainly since the early 1990s when researchers broadened their focus from the technical to the social concerns of GIS[7]. Scholars criticized that public participation is not a function of software and hardware enhancements only but also is contingent on political context8. PPGISs involve the use of geographic information systems (GISs) to broaden public involvement in environmental decision-making processes[8, 9, 10, 11]. In addition, the popularity of the Internet and the World Wide Web has brought some important changes to the use of PPGISs [12, 13].

Yet, in contrast to the richness of these theoretical perspectives, the range of research designed for the purpose of studying the performance of PPGISs to enhance public participation has been narrow. The purpose of this study and our theoretical contribution is to develop an analytical framework through which to evaluate PPGIS projects. The following principal questions motivate such research: First, what are the effects of the use of PPGISs? Second, what is the real capacity of PPGISs to enhance public participation? Finally, is it possible to evaluate citizens' satisfaction and their active participation in public decision-making processes?

The findings in this study also highlight a number of significant implications for managers. First, by developing the key components through which PPGIS initiatives can be evaluated, this study offers project managers the opportunity to be more effective in their activities. Second, this study can help project managers be more conscious about the increasing importance of PPGIS and better understand how they should approach the implementation of PPGIS in their respective organizations.

The article is structured as follows: First, it provides a brief overview of the literature concerning participation in public decision-making processes supported by PPGISs; second, we explain the methodology applied in the paper; finally, we provide an analysis of the case studies, the main results, a discussion of the results, and the conclusions from the study.

2. LITERATURE REVIEW

The term "PPGIS" came to life in 1996 during a conference hosted by the National Center for Geographic Information and Analysis (NCGIA) concerning how to improve access to GISs among nongovernmental organizations and individuals[9, 12, 14]. PPGISs refer to participatory mechanisms involving citizens and facilitated by GISs. The major objective of PPGISs is the inclusion of the local community in order to improve policy management in spatial planning through the use of geographical technologies[7, 8].

PPGISs involve the notion that the spatial visualization in GISs represents a unique opportunity to enhance citizen involvement in public environmental decisions[5, 13, 15]. Their use, in fact, facilitates the understanding of environmental problems and allows players to immediately highlight their points of view on maps[10]. Modern PPGIS applications include the new ICTs such as chat tools, emails, forums, and blogs that allow for bi-directional communication[14]. The use of maps as the central tool of the web-based system immediately allows users to know instantly the location in which the public participation process is taking place. Users can thus relay a considerable amount of information quickly and clearly to a wide audience. The new ICTs, mentioned above, improve the use of PPGISs because maps become dynamic and interactive and allow the user to elicit greater detail about environmental issues and problems[12]. At its core, the growing interest regarding PPGISs focuses on the growing role of the powerful GIS technology in a democracy. The key to understanding the importance of the relationship between GISs and society is to first acknowledge that a GIS is not just a "tool designed to solve one aspect of a particular problem[15]." Rather, "the development of GIS, or any other, technology is a social process"[15]. A number of scholars[16, 17] noted that one drawback of this process is that the use of GIS can make it difficult for average citizens to participate in ongoing policy debates.

In recent years, GIS technologies have become more open and accessible because of the development of the Internet. This growth has facilitated the democratization of spatial information, making it more accessible and easier to use. The development of tools such as Google Maps and Google Earth has greatly facilitated user participation in e-participatory

processes thanks to the immediacy of interactions[13]. The rapid growth of Web 2.0 applications determines the adaptation of Web GISs to the Web 2.0 environment. From a PPGIS perspective, the strength of the Web 2.0 platform for enhancing citizen participation is that ordinary citizens can intuitively use it. Users can also add information to online maps. With newer generations of smartphones (equipped with both GIS and GPS capabilities) and social networking sites such as Facebook, PPGISs have the power to harness public participation in real time. Local governments, citizens, and businesses can receive as well as send location-specific information using multiple forms of media (e.g., videos, text, maps, sound) in real time[18]. The utilization of both GISs and Internet-based PPGISs allows the public to be actively involved in the topics discussed anywhere and at any time on the Web. They have the potential to reach a wider audience and to allow public participation at a very early stage in planning and decision-making processes[8, 11].

3. METHODOLOGY

We used an inductive multiple-case research design[18] and a content analysis. The research setting was public administrations that have implemented PPGISs. Our focus was on citizens' satisfaction concerning their active participation within PPGIS projects. The projects chosen were the Landscape Observatory of the Region of Puglia, the e21 projects of the municipalities of Pavia and Vimercate, and the Geoblog of the Municipality of Canzo. The projects chosen all have the following common characteristics: they deal with public administrations, they have the objective of involving citizens in environmental impact processes by using internet tools, and they all utilize maps and geo-charts.

The Landscape Observatory of the Region of Puglia is a project that enables citizens to express their opinions on the quality of environmental degradation. In particular, each citizen can indicate famous, historical, or ignored sites or report places or objects that the citizen believes are responsible for deterioration in the quality of the territory and for which the citizen believes it is necessary to plan improvement and redevelopment. The two e21 projects involve 10 municipalities that promote environmental sustainability for territorial management. The Canzo Geoblog is an online blog through which citizens can communicate what they would like their municipality to accomplish.

We relied on two primary data sources: interviews (see Appendix) and comments given by the citizens on the website blogs dedicated to PPGIS projects. We began data collection using semi-structured interviews conducted during 2009 with key informants in four local administrations.

These interviews were based on a common set of questions designed to elicit information on the PPGIS projects, and they were conducted with project managers, the most-informed people on how best to implement PPGISs. The interview questions were designed to elicit qualitative responses, and the interviews were administered via email using the email address provided in the project's website. To create feasible semi-structured interviews, we considered both the contributions provided by Rowe and Frewer[1] and the procedures outlined by Macintosh[19]. Rowe and Frewer[1] focused on the identification of a set of criteria to determine whether public participation in decision making was successful. Macintosh[19] developed a characterization framework for e-participation to compare and contrast such projects.

We continued data collection using a second primary source: comments given by the citizens on the website blogs dedicated to PPGIS projects. The analysis of these comments was conducted using Textstat software. By merely running the data through the software, we identified frequently used words and phrases, which assisted us in categorizing recurrent themes. We found four main themes: level of participation, influence, transparency, and satisfaction. These themes were consistent with the themes that emerged from the questionnaires administered to those responsible for the implementation of the PPGIS projects. Subsequently, we looked for synonyms of these words to ensure that all instances of the meaning were captured. The next step was data linking and searching for combinations of words or themes that citizens used in concert. The software also allowed us to identify any text that linked two concepts in a co-occurrence analysis to determine why citizens mentioned these themes together.

4. ANALYSIS OF RESULTS AND DISCUSSION

To analyze the cases, we used Eisenhardt's method combining a within-and-cross-case analysis[20] and a content analysis to evaluate participant satisfaction. The within-case analyses summarized the data and developed preliminary findings; thus, we gained a richer understanding of the decision-making processes. Each public administration allocated decision-making power to its citizens through interaction with a PPGIS. The outcomes of the within-case analyses were compared during the cross-case analysis to improve the rigor and quality of the results. Charts and tables were used to facilitate comparisons among the cases[21]. To analyze citizens' satisfaction concerning their active participation within PPGIS projects, we used content analysis. Qualitative content analysis is a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or

patterns[22]. This method focuses on the characteristics of language as communication while also giving attention to the content or contextual meaning of the text[21, 23, 24, 25, 26] and extends beyond merely counting words to examining language intensely for the purpose of classifying large amounts of text into an efficient number of categories that represent similar meanings[27]. The goal of content analysis is "to provide knowledge and understanding of the phenomenon under study"[23]. This combined analysis arrived at a definition of a framework in the form of an eight-item list of criteria, hereby summarized as connectivity, accessibility of resources, cost/benefit ratio, task definition, level of participation, influence, transparency, and participant satisfaction.

The criterion "connectivity" evaluates the PPGISs and Internet accessibility by citizens and is sub-divided into two parts, "Policies" and "Infrastructures"[28]. The "accessibility of resources" criterion establishes whether during a PPGIS project activation participants had adequate accessibility to a variety of resources that allowed them to fully use the PPGIS tools. The "accessibility of resources" criterion is divided into two components, "information" and "access to the competence of experts"[28]. The "cost/benefits ratio" criterion evaluates the methods chosen for the advancement of the decision-making process and the extent to which they are really capable of reaching the objectives set by the project[29]. The "task definition" criterion indicates whether the public administration (PA) clearly defined the nature, scope, and modality of decision-making processes[29]. The "level of participation" criterion considers the extent of citizen involvement in the decision-making process[19]. The "influence" criterion is an evaluation to examine whether the results of the involvement in the decision-making processes are capable of influencing final decision making[30]. The "transparency" criterion examines whether the public is capable of controlling procedures and the outcome of the decision-making process[29.] The "participant satisfaction" criterion focuses on the public administration that promoted the PPGIS project and whether it was capable of setting up tools in order to obtain adequate participant feedback[31] as stipulated in the framework described. Data analysis shows different results across the criteria.

The criterion that produced the worst results was the connectivity criterion, subdivided into two sub-dimensions, "policies" and "infrastructures." From the analysis of the answers provided, it is evident that public administrations only partially attempted to improve the access to the new ICTs. None of the promoting public administrations provided specific funds for the purchasing of computers. Furthermore, for only two projects (Landscape Observatory and e21 Vimercate project) were specific Internet access points put into place to allow citizens to easily access the

Internet. Regarding accessibility of resources, the promoting administrations provided a variety of answers, and all were capable of providing both general and specific information useful to citizens. The answer provided by the Region of Puglia (Landscape Observatory) was particularly interesting because it allowed participants to directly communicate with specialized personnel while online. The project manager stated, "Participants have direct contacts with the site manager with a political representative and two expert[s] of technical secretariat."

Table 1. Results

Criterion	Landscape Observatory	e21 Project Pavia	e21 Project Vimercate	Geoblog Municipality of Canzo
Connectivity: Policies	Medium	Low	Low	Low
Connectivity: Infrastructure	Medium	Low	High	High
Accessibility of resources: Information	Medium	Low	Low	Medium
Accessibility of resources: Access expert competence	High	High	High	Low
Cost-benefit ratio	High	Low	High	High
Definition of tasks	High	High	High	High
Level of participation	Medium	Medium	Medium	Medium
Influence	High	Medium	Medium	Medium
Transparency	High	Low	High	High
Participant satisfaction	High	Low	Low	High

The cost-benefit ratio criterion establishes that only one project, the e21 Pavia, did not accomplish the goals that were set in this area because of "*a lack of direct involvement by local body Directors and Administrators*," as stated by the person interviewed.

The task definition criterion demonstrated positive results in all of the administrations because the objectives of the four projects had been clearly and precisely communicated by using a variety of channels. As for the level of participation, it should be noted that all projects were promoted by the public administrations. The lack of public initiatives promoting citizen involvement in the online decision-making process signifies shortcomings in citizen involvement. As for the criterion of influence, the results are encouraging because three of the administrations utilized the results of decision-making processes obtained from using PPGISs. The public administration involved with the e21 Vimercate project is the only one that has not contemplated the use of the results obtained from the participation process. Regarding the transparency criterion, the e21 Pavia project is the only one that scored poorly in this area; in fact, it is the only public

administration that does not allow for visibility and the consultation of policy decisions. Finally, as for the criterion of satisfaction of participants, only the Landscape Observatory and the e21 Vimercate projects considered the level of participant satisfaction.

The utilization of these criteria to analyze the PPGIS project produced differing results. Regarding the "Landscape Observatory of the Region of Puglia" project, our content analysis showed that citizens expressed considerations only in the area of environmental practices (both positive and negative). No citizens expressed any opinions concerning the quality of the PPGIS project, so we cannot provide insight regarding the level of participation and satisfaction from citizens for the project itself.

The levels of participation of the other projects are displayed in table 2. The levels of participation can be accessed through the analysis of the frequency and concordance of particular words such as "project," "forum," "initiative," "democracy," "participation," "agora," and "idea."

Table 2. Criterion of level of participation

Project	Frequency	Positive	Negative
e-21 Project Pavia	1.84%	0.86%	0.98%
e-21 Project Vimercate	1.17%	0.55%	0.62%
Geoblog Municipality of Canzo	0.49%	0.29%	0.20%

The analysis shows (tab. 2) that the data confirm the results obtained through the questionnaires provided by the administrators of PPGIS projects. These results highlight shortcomings in citizen involvement. Regarding the -21 Pavia project, the statement provided by the citizens that best expresses a low degree of citizens' involvement is "the project give[s] us only the possibility to discuss and express our opinion on initiatives that have been proposed." Conversely, there are also some examples of positive statements; in the case of Vimercate e-21, one such positive statement was "Good idea of participation in the discussion on the Plan of Government of the Territory."

The influence criterion can be assessed through the analysis of the frequency and concordance of these words: "influence," "administration," "township," "choice," "decision," and "consultation" (tab. 3).

Table 3. Criterion of influence

Project	Frequency	Positive	Negative
e-21 Project Pavia	0.68%	0%	0.68%
e-21 Project Vimercate	0.95%	0%	0.95%
Geoblog Municipality of Canzo	0.40%	0%	0.40%

The findings demonstrate that we are in a situation characterized by an initial phase of participation from citizens and public administrations. These findings also show that there is no real influence from citizens on the final decisions. Regarding the e-21 Pavia project, our analysis shows that the results can be conceptualized in the following phrase: "I wonder why the public administration is so interested for this site to work and why [it is] interested in people's views." In the case of the e-21 Project Vimercate, the most relevant statement was "Ready to work constructively." Finally, in the Geoblog Municipality of Canzo, the users expressed opinions such as "It could be a 'big problem' to understand Canzo." The transparency criterion (tab. 4) evaluates whether the public is able to monitor procedures and outcomes of decision making. To analyze the different comments, we decided to verify the presence of the following words in the text: "report," "documents," "results," "content," "publication," "public," and "censure."

Table 4. Criterion of transparency

Project	Frequency	Positive	Negative
e-21 Project Pavia	0.23%	0.06%	0.17%
e-21 Project Vimercate	0.67%	0.46%	0.21%
Geoblog Municipality of Canzo	0.099%	0.099%	0%

The analysis shows that the data obtained confirm the results of the public administration questionnaires. The e21 Pavia project is the only one in which the public administration does not allow visibility and consultation in decision-making processes; not all of the citizens' comments are published on a website. Regarding the e-21 Project Pavia, the users expressed opinions such as "I do not think (or hope) for complaint, but despite having already initiated a discussion on the topic, I cannot find […] in the forum." In the Geoblog Municipality of Canzo, the users expressed opinions such as "I cannot find in the forum the first reports of the participants' meetings."

The last criterion deals with whether the users are actually satisfied with the projects promoted by government. To analyze the different comments and statements, we decided to verify the presence of the following words in the text: "good," "beautiful," "satisfaction," "positive," "improve," "interesting," "constructive," and "benefit" (tab. 5).

Table 5. Criterion of participant satisfaction

Project	Frequency	Positive	Negative
e-21 Project Pavia	0.63%	0.63%	0%
e-21 Project Vimercate	0.56%	0.51%	0.05%
Geoblog Municipality of Canzo	1.09%	0.59%	0.5%

The findings demonstrate that the users of the three projects tend to use words having a positive connotation, and this aspect shows that they consider this type of participatory process interesting and useful to engage in. The comments provided by citizens highlight that they consider PPGIS tools interesting, but they make no reference to the possibility of implementation of their ideas and opinions by public administration decision makers. In the analysis of comments in the e-21 Project of Pavia, there are some statements such as the following: "I consider the effort to help improve communication between citizens and administration as very positive" and, for the e-21 Project Vimercate, "A very good exercise in democracy for all." Finally, in the third project, one statement was "I agree[;] it seems to be a very interesting proposal."

5. CONCLUSION

The objective of this study was to develop an analytical framework through which PPGIS projects can be evaluated. Moreover, another aim of this research was to explore and evaluate the participants' satisfaction and their active participation by employing a content analysis of comments given by the citizens on the website blogs dedicated to PPGIS projects. Empirical studies have demonstrated that PPGISs provide an innovative approach to make citizens engage in decision making, thanks to its goal to incorporate spatial information and local knowledge to increase interactions between citizens themselves and public administrations[5, 9, 10, 14, 18]. The conditions for making the adoption of a PPGIS easier are as follows: local governments have to enable citizens access to the data, information has to be understandable and clear, and public administrations also have to improve PPGISs' accessibility over time[18]. Nevertheless, the data obtained through the administration of questionnaires do not support these statements completely. The local governments have not made the level of commitment necessary to enable citizens to access data. Moreover, information is not always clear and easily accessible. In particular, the criterion that showed the worst results (as shown in table 1) is connectivity; as a result, the policies implemented by public administrations are not able to establish substantial participation by citizens[9, 12]. The data analysis demonstrated excellent results concerning the definition of the objectives and the dissemination of information (definition of tasks), while good results were

obtained in terms of both the cost-benefits ratio and the transparency and accessibility of resources regarding one of the key principles of PPGISs: the comprehension of decision making processes[12]. On the other hand, other criteria have shown only sufficient results. The content analysis confirms the results obtained through the analysis of the questionnaires administered to the administrators of the PPGIS projects. In reference to the criterion "participation satisfaction," the users showed interest in using the PPGIS, but the results are not sufficient to evaluate this criterion. The projects analyzed demonstrate sufficient but not excellent results, and PPGISs do not show elevated levels of citizen participation in this phase.

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APPENDIX

Questionnaire to measure the inclusiveness of PPGIS projects

Criterion of connectivity

- Policies: Has the promoting body invested funds for the purchase of computers in order to improve accessibility of citizens to the Internet?
- Infrastructures: In what way is the access to the website enhanced?

Criterion of accessibility of resources

- Information: Were informative meetings set up with the citizens before the phases of activation of the website?
- Access expert competence: Do participants have direct contact with competent personnel when interacting on the website?

Criterion of cost-benefit ratio

- What was the objective set out by the promoting body for the utilization of the web? Was the objective reached?
- What are the reasons for failure of the project? What can they lead to?

Criterion of definition of tasks

- Was the objective of the project communicated to citizens in a clear and precise way?
- In what ways was the project objective made available to the public?

Criterion of level of participation

- What was the goal of citizen inclusion in sharing the choices of the promoting body?
- Are citizens actively involved in requiring that the promoting body activate the website?

Criterion of influence

- Were the results obtained by using this tool utilized by the public administration? In what way?
- Was there a clear position by public administrations on the use of the results obtained from the website?

Criterion of transparency

- Are the decisional acts taken at public council meetings made easily

available to citizens?

- Can citizens acquire information regarding the results of participation?

Criterion of participant satisfaction

- Was participant satisfaction measured? If yes, in what way was it evaluated?
- What were the results of the evaluation?