Evaluating Participatory and Technological Integration in Geodesign Practice

Matthew Kuniholm
University of Maryland, Maryland/USA · mattk@umd.edu

Abstract: This paper evaluates the integration of participatory and technological characteristics of an applied geodesign process concerning the redevelopment of a municipal park in Harford County, Maryland. The evaluation uses pre- and post-workshop survey data, follow-up interviews and participatory research methods to measure the level of technological and participatory integration evidenced by outcome indicators of participant satisfaction, value expression, and perceived environmental agency. The evaluation shows that despite the successful completion of a geodesign workshop, the process did not demonstrate the full extent of the geodesign framework's integrative capacity. The analysis points towards opportunities to improve the participatory characteristics of geodesign practice to achieve closer alignment with the geodesign framework and more fully achieve participant objectives through the design process.

Keywords: Geodesign, public participation, evaluation

1 Introduction

Changing "geography by design" (STEINITZ 2012) is an inherently dynamic, participatory, and iterative process. The pace of innovation in geospatial data and technologies has facilitated an increasing use of integrative models, software platforms, and automated technologies in geodesign practice (cf. DANGERMOND 2010, FLAXMAN 2010, GOODCHILD 2010; ERVIN 2012; MCELVANEY 2012; NYERGES et al. 2016, SLOTTERBACK et al. 2016). Yet the geodesign framework offers more than a technological means to integrate increasingly complex geospatial data and models; it effectively integrates public participation in the design process. A fundamental premise of the geodesign framework is its potential to integrate the diverse scientific and design-related knowledge of professionals with the place-based knowledge of the population in the study area (STEINITZ 2012, HOLLSTEIN 2019). Both the technological and participatory characteristics of geodesign practice are essential for facilitating this integration.

This paper shows the importance of such integrating by evaluating outcome indicators from a day-long geodesign workshop concerning the redevelopment of a municipal park in Harford County, Maryland. Using pre- and post-workshop survey data, follow-up interviews and participatory research methods, the case study evaluates: i) participant satisfaction with the geodesign process and outcome; ii) the expression of environmental values and design preferences during the geodesign process; and iii) the extent to which geodesign technology increases the scale of participants' perceived environmental agency. Each of these outcomes are dependent on the integration of the technological and participatory characteristics accounted for in the geodesign framework. Evaluating these outcomes in applied geodesign practice therefore helps identify opportunities to continuously improve geodesign practice and reflect on the strengths of the underlying geodesign framework.

Journal of Digital Landscape Architecture, 5-2020, pp. 439-446. © Wichmann Verlag, VDE VERLAG GMBH · Berlin · Offenbach. ISBN 978-3-87907-690-1, ISSN 2367-4253, e-ISSN 2511-624X, doi:10.14627/537690045.

2 Geodesign Case Study

Literature evaluating geodesign practice has taken many forms, ranging from broad comparative assessment (ORLAND & STEINITZ 2019) and taxonomic evaluation (TULLOCH 2017) to case studies of individual projects (e.g. MCELVANEY 2012, RIVERO et al. 2015, JANSSEN & DIAS 2017). Several recent studies also suggest methods to increase the rigor and structure of geodesign practice evaluations (ORLAND & STEINITZ 2019, FOSTER 2016). The case study evaluated in this paper therefore utilizes a modified version of the descriptive case study format proposed by FOSTER (2016) complemented with survey and interview data analysis. The paper adheres to the following structure: 1) project overview and purpose; 2) description of the process implemented; 3) summary of data and technology; 4) description of collaboration and participation; 5) evaluation of project outcomes; and 6) conclusion.

2.1 Project Overview and Purpose

The case study concerns the participatory geodesign process used to develop scoping-stage design ideas for the redevelopment of Edgewater Village Park, an 86-acre municipal park, as well as approximately 500 acres of the surrounding communities in the State of Maryland, USA (Figure 1). At the start of the project, representatives from the Harford County government responsible for park management acknowledged that previous municipal efforts to increase visitation and foster a sense of 'community ownership' of the park had failed to achieve the intended results. County officials therefore sought to undertake a participatory planning process and involve community stakeholders in the redevelopment of the park. A geodesign project was convened through an applied learning program affiliated with the University of Maryland and involved student facilitators from a master's-level studio course in landscape architecture. A project team was established to coordinate the logistical aspects of the project and structure the project methodology in alignment with the STEINITZ (2012) geodesign framework, as described below.

2.2 Stages of the Geodesign Project

The project proceeded through three phases: (1) preparation – including program design, articulation of goals, preparing the geodesign software platform, and logistical set-up; (2) a day-long geodesign workshop; and (3) design and presentation of park redevelopment concepts based on the results of the geodesign workshop.

In the preparation phase, the project planning team established a problem statement and objective for the geodesign process. The problem statement was not limited to the physical design of the park; the municipal planners also stressed the importance of increasing 'community ownership' and use of the park. The project team agreed that the participatory elements of the geodesign approach offered an opportunity for greater expression of community interests and design preferences which was intended to facilitate community support for the process. The project objective and characteristics of the geodesign process, however, were determined without public input. While university-affiliated members of the design team described the potential advantages of incorporating direct or representative public involvement to increase 'community ownership' of the process, county staff were reluctant to do so due to the limited time and resources available for the project.

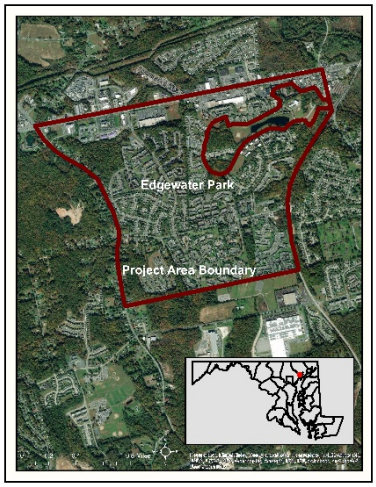

Fig. 1:
Edgewater Village Park Geodesign Project Area

Fig. 2:
Screenshot of Decision model from GeodesignHub.com platform during Edgewater Village Park geodesign workshop

The second phase of the project involved a day-long geodesign workshop to implement the process defined by the project team. Approximately 30 participants attended, including members from the design team and approximately twenty participants from the Harford County government and neighbourhoods surrounding the park. The workshop began with a description of the design challenge and an overview of the geodesign process, followed by a facilitated tutorial of the GeodesignHub.com platform (described in the *Data and Technology* section, below) and a summary of the tasks to be completed during the workshop. The introduction was followed by a facilitated discussion during which participants described their goals for attending the workshop and provided feedback on the problem statement. Participants expressed diverse motivations for their participation, ranging from neighbourhood residents interested in the park redevelopment process, to business owners wanting to contribute to the development of the neighbourhood, and county government officials whose attendance was required.

Each participant was provided a laptop for use during the workshop. Once all participants had successfully logged in and learned how to utilize the GeodesignHub platform, the workshop proceeded through a consolidated version of key geodesign workshop activities, including: sketching design interventions, conducting role-play activities in groups to evaluate design interventions based on assumed stakeholder priorities, group development of composite designs, and negotiation between stakeholder groups to agree on a consensus version of the proposed design (Figure 2). The activities utilized the dynamic and participatory capabilities of the GeodesignHub platform, including live editing and comparison of designs. However, by the end of the workshop some participants were visibly tired and approximately one third of the participants had left the workshop early at different points throughout the day. The workshop concluded when all remaining participants agreed they had achieved sufficient consensus on the final plan to satisfy the objectives of their hypothetical stakeholder groups.

The third phase of the geodesign project culminated in the presentation of proposed design interventions developed by the student facilitators based on the outcome of the geodesign workshop. The presentation took place approximately one month following the geodesign workshop. Student designers were free to utilize the results of the geodesign process to inform their design proposals but were not limited only to those design elements resulting from the geodesign process. The designs were presented at a public open-house event in the same location where the geodesign workshop had been held. Visitors walked through open-house stations where each student-designer presented their park redevelopment concepts. Participants were primarily county government staff who had participated in the geodesign workshop. These presentations marked the conclusion of the geodesign process despite the lack of any obvious commitment from municipal staff to implement a design or incorporate the outcomes in their park redevelopment process.

2.3 Data and Technology

The scope of data and technology necessary for a geodesign process depends on the specific nature of project objectives and the anticipated level of participant input. Given this project's objective to prioritize efficiency and facilitate scoping-phase idea generation during a single, day-long workshop, the team chose to use the GeodesignHub.com platform due to its ease of use, pre-set models, and suitability for public workshops. The GeodesignHub.com platform accounts for all six models proposed in the STEINITZ (2012) geodesign framework and has been used extensively in similar workshop settings (e.g. WARREN-KRETZSCHMAR et al. 2016, BORGES & BALLAL 2017). Given the constraints of this workshop, the data for the first three models were generated by the GeodesignHub facilitator and data for the change, impact and decision models were contributed by participants during the workshop.

2.4 Collaboration and Participation

Despite the logistical constraints, the project facilitators emphasized that geodesign is an integrative process which requires support and collaboration from representatives from the geographic science and design professions, information technologists, and "people of the place" (STEINITZ 2012, 4). Each of these groups was represented in this case study: the design team included county government staff responsible for managing the park, students and professors of landscape architecture, and a geodesign facilitator who ensured the integration and use of GIS models, data and evaluation tools in the GeodesignHub platform. The participation of the fourth group, the 'people of the place', was limited to their input during the workshop. While the project facilitators encouraged county staff to ensure that representatives of all relevant stakeholder groups were invited to participate, the county government was ultimately responsible for sending invitations and coordinating the logistics of the workshop. As a result, representatives from some demographic groups in the surrounding community were notably absent. Very few residents from the surrounding park or park users were present at the geodesign workshop and none participated in the preparatory or follow-up tasks. Public participation in this project was therefore considered indirect; the workshop represented a single instance of contributory participation rather than collaborative participation throughout the geodesign process. Most importantly, and despite the municipal government's stated objective to increase community ownership, the process was implemented with no explanation of how public input would be incorporated into future park management decisions.

3 Evaluation of Outcomes

If evaluated on directly observable outcomes, this project resulted in three primary outcomes: i.) participants in the geodesign workshop reached a hypothetical consensus on priority design elements for park redevelopment; ii.) six park redevelopment design proposals were subsequently developed and presented; and iii.) participants learned more about the geodesign framework, the GeodesignHub software, and the general characteristics of Edgewater Village Park through the use of geospatial data and collaboration during the workshop.

Notwithstanding these directly observable outcomes, evaluating participant satisfaction and other subjective outcomes provides additional insight on the level of integration between the participatory and technological characteristics of the geodesign practice. Pre- and post-workshop participant survey data and follow-up interviews were therefore used to evaluate questions regarding the following outcomes requiring integration between participatory and technological characteristics of geodesign practice: i.) Did the project satisfy participant expectations and objectives for the design processes? ii.) Did the project facilitate the expression of participants' environmental values and design objectives? And iii.) did the project expand the scale of participants' perceived environmental agency?

For each research question, pre- and post-workshop survey data was analysed using descriptive statistics or the non-parametric Wilcoxon signed-rank statistic. The survey data was then compared to qualitative data collected from follow-up interviews and participant observation to evaluate each research question.

3.1 Participant Satisfaction

Previous evaluations and reviews of participatory planning and design have yet to identify a single indicator or survey item suitable to measure participant satisfaction in participatory planning processes (ROWE & FREWER 2004). Given the range of potential indicators and the lack of agreement on the most important factors of satisfaction, this evaluation uses a pluralistic approach to measure participant satisfaction using process and outcome indicators. For the purpose of this research, 'effectiveness' of public participation is understood to be the extent to which the geodesign process satisfies a range of participant objectives. A variety of statements regarding the extent to which the geodesign process and outcomes met participant objectives were therefore derived and evaluated based on a five-item Likert-scale.

Average satisfaction with the geodesign process among all participants was 4.125 based on the five-item Likert scale, indicating that participants were "satisfied" by their participation in the geodesign workshop. Average satisfaction with the results of the workshop was lower (3.625), but still within the "moderately satisfied" range of the 5-point Likert-scale. However, comparison of pre- and post-workshop survey data also identified opportunities to improving certain aspects of the geodesign process and use of technology. These opportunities were confirmed by exit interviews and are summarized in the concluding section below.

3.2 Expression of Environmental Values and Design Preferences

The second theme addressed in the pre- and post-workshop survey was the extent to which the geodesign process facilitates the expression of participants' environmental values and design objectives. Such indicators help evaluate the extent to which participants engage in the geodesign process, learn from one another and reconsider their own design preferences.

The evaluation used the survey instrument development by KLAIN et al. (2017) which accounts for intrinsic, instrumental, relational and metaphoric value constructs, all of which can be expressed by participants in the geodesign process.

Although this approach can only provide an indirect indicator, data comparing the pre- and post-survey responses allows for the identification of changes in the expression of environmental values and design preferences before and after participation in the geodesign workshop. Survey results show that participant support for all but one of the environmental value constructs decreased between the pre- and post-workshop survey. Thus the survey found no evidence that the geodesign workshop increased participants' engagement with their underlying pro-environmental values or facilitated a reconsideration of their design preferences. Follow-up interviews confirmed that the workshop "did not go that deep" (interview respondent), suggesting that the day-long workshop format may not have provided sufficient time for meaningful engagement and expression of design objectives, despite satisfying participant's stated expectations.

3.3 Scale of Perceived Agency

A third means to evaluate outcome indicators resulting from the integration of technological and participatory characteristics of geodesign practice is the extent to which geodesign expands the scale of participants' perceived environmental agency. Individuals acting alone have limited capacity to describe, analyse or design geographies at scales beyond their individual awareness and influence. Geodesign practice, however, has the potential to facilitate collaborative action aided by geospatial technologies, allowing participants to assess and propose design interventions for landscapes well beyond the individual scale.

Survey items pertaining to the scale of participants' perceived environmental agency were therefore developed to evaluate the alignment between the scale of participants' perceived environmental agency with and without the geodesign process. By comparing participants' perceived environmental agency in a variety of contexts, the survey data enables an evaluation of the extent to which the geodesign process increases the scale of participants' perceived environmental agency. When compared to the pre-workshop survey, the results of the post-workshop survey indicate a decrease in perceived environmental agency at each scale (Table 1), suggesting that participants perceived their agency to be greater when acting alone rather than when their actions are mediated through the geodesign process.

Table 1: Perceived significance of environmental agency pre- and post-workshop

Scale of Agency through:	Behaviour at Home	Land Use	Social Network	Civil Society Orgs.	Public Sector
Pre-Workshop	3.800	4.267	4.133	3.800	4.267
Post-Workshop	2.533	2.800	2.800	3.000	3.467
Difference	–1.267	–1.467	–1.333	–0.800	–0.800
% Difference	–33.3 %	–34.4 %	–32.3 %	–21.1 %	–18.8 %

4 Conclusion

This case study confirms the importance of integration between technological and participatory characteristics of geodesign practice but do so by identifying the deficiencies in the man-

ner in which this project was implementation. Participants did not consider the project to have provided a means for expressing their values, interests and design objectives. Nor did the project increase the scale of participants' perceived environmental agency, despite their satisfaction with the workshop and integrative technologies. These results are explained by the limited role of public participation in the preparatory and follow-up tasks of the geodesign project: public participation in this project was indirect, the relevance of participants' input was not clear, and their participation was limited to a single opportunity at one step of the geodesign process.

This approach to project implementation contrasts with the iterative and collaborative role of the 'people of the place' envisioned by the geodesign framework. Participants in this case were therefore unable to engage at a deeper level to advocate for their interests, express their values, and take advantage of the opportunities intended by the geodesign framework. While participants were 'satisfied' by the workshop itself, the benefits of the participatory activities were counteracted by the lack of representation among participants, the lack of an applied purpose, and the limitations in public participation during the overall geodesign process.

This case demonstrates the challenge of implementing the complete geodesign process in a single, day-long workshop, but the results also suggest opportunities to improve the participatory characteristics of geodesign practice to more fully implement the geodesign framework. Most fundamentally, this evaluation shows the need for more robust public participation at each stage of the geodesign process, not just during the workshop. This can be achieved using existing technologies and pragmatic adjustments to geodesign practice implementation. Tools to facilitate digitally-enabled participatory planning, such as online surveys or polls, could allow input on the first three models of the geodesign process while minimizing the need for additional in-person meetings (ROTH & GRUEHN 2014, ATZMANSTORFER et al. 2014). Inviting participation from all interested stakeholder groups would provide more meaningful interaction and result in more realistic outcomes. Clearly communicating the project purpose and outcome, for example through e-newsletters or municipal website, could increase public interest in the process. And explaining how project results will be used by decision-makers would increase the perceived importance of public engagement and decrease participant attrition.

While the deficiencies in the participatory characteristics of this project explain the evaluation results, the case also demonstrates the utility of evaluating outcome indicators associated with the integration of participatory and technological characteristics of geodesign practice. Such evaluation can be achieved through the inclusion of digital surveys before and after geodesign workshops to address a variety of topics of pragmatic and academic interest. Evaluating such outcomes will not only help identify opportunities to continue to improve existing technologies through more robust public participation but will also increase the effectiveness of geodesign practice by improving the participatory experience of the 'people of the place'.

References

ATZMANSTORFER, K., RESL, R., EITZINGER, A. & IZURIETA, X. (2014), The GeoCitizen-approach: community-based spatial planning – an Ecuadorian case study. Cartography and geographic information science, 41(3), 248-259.

DANGERMOND, J. (2010), Geodesign and GIS – Designing Our Futures. Peer Reviewed Proceedings of Digital Landscape Architecture, Anhalt University of Applied Science, Germany.

ERVIN, S. (2012), A System for GeoDesign. In: BUHMANN, E. et al. (Eds.), Peer Review Proceedings of Digital Landscape Architecture 2012. Wichmann, Berlin/Offenbach.

FLAXMAN, M. (2010), Fundamentals of Geodesign. Proceedings of Digital Landscape Architecture, Anhalt University of Applied Science, Germany, 2, 69-72.

FOSTER, K. (2016), Geodesign Parsed: Placing It Within the Rubric of Recognized Design Theories. Landscape and Urban Planning, 156, 92-100.

GOODCHILD, M. F. (2010), Towards Geodesign: Repurposing Cartography and GIS? Cartographic Perspectives, (66), 7-22.

HOLLSTEIN, L. M. (2019). Retrospective and reconsideration: The first 25 years of the Steinitz framework for landscape architecture education and environmental design. Landscape and urban planning, 186, 56-66.

JANSSEN, R. & DIAS, E. (2017), A Pictorial Approach to Geodesign: A Case Study for the Lower Zambezi Valley. Landscape and Urban Planning, 164, 144-148.

KLAIN, S. C., OLMSTED, P., CHAN, K. M. & SATTERFIELD, T. (2017). Relational values resonate broadly and differently than intrinsic or instrumental values, or the New Ecological Paradigm. PloS one, 12(8),

MCELVANEY, S. (2012), Geodesign: Case Studies in Regional and Urban Planning. Environmental Systems Research Institute.

NYERGES, T., BALLAL, H., STEINITZ, C., CANFIELD, T., RODERICK, M., RITZMAN, J. & THANATEMANEERAT, W. (2016), Geodesign Dynamics for Sustainable Urban Watershed Development. Sustainable Cities and Society, 25, 13-24.

ORLAND, B. & STEINITZ, C. (2019), Improving our Global Infrastructure: The International Geodesign Collaboration. Proceedings of the Journal of Digital Landscape Architecture, Dessau, Germany, 22-25.

RIVERO, R., SMITH, A., BALLAL, H. & STEINITZ, C. (2015), Promoting Collaborative Geodesign in a Multidisciplinary and Multiscale Environment: Coastal Georgia 2050, USA. Digital Landscape Architecture, 42-58.

ROTH, M. & GRUEHN, D. (2014). Digital Participatory Landscape Planning for Renewable Energy–Interactive Visual Landscape Assessment as Basis for the Geodesign of Wind Parks in Germany. Peer Reviewed Proceedings of Digital Landscape Architecture, 84-94.

ROWE, G. & FREWER, L. J. (2004). Evaluating public-participation exercises: a research agenda. Sci Technol Hum Values, 29 (4), 512-556.

SLOTTERBACK, C. S., RUNCK, B., PITT, D. G., KNE, L., JORDAN, N. R., MULLA, D. J., ZERGER, C. & REICHENBACH, M. (2016), Collaborative Geodesign to Advance Multifunctional Landscapes. Landscape and Urban Planning, 156, 71-80.

STEINITZ, C. (2012), A Framework for Geodesign: Changing Geography by Design. Esri Press, Redlands, CA.

TULLOCH, D. (2017), Toward a Working Taxonomy of Geodesign Practice. Transactions in GIS, 21, 635-646.

WARREN-KRETZSCHMAR, B., LINCOLN, C. & BALLAL, H. (2016), Geodesign as an Educational Tool: A Case Study in South Cache Valley. Journal of Digital Landscape Architecture, 222-232.