Integrating online deliberation into transportation investment decision-making:
Preliminary reflections on a field experiment

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1.0 Introduction

Transportation agencies across the U.S. are challenged in their efforts to engage the public in the problems of prioritizing regional transportation improvement projects--such as highway expansions or new light rail lines--and determining how to fund such improvements. These decisions are typically shaped by a variety of local, state, and federal laws as well as the competing transportation and land use priorities of different communities and municipalities within a metropolitan region. Most commonly, the Metropolitan Planning Organization (MPO) and State Department of Transportation (DOT) fulfill the federal mandate for public involvement by publishing a draft transportation improvement program (TIP) for public review and then convening public meetings to facilitate the gathering of comments (Lowry et al. forthcoming). In other words, the MPO and DOT produce a list of transportation projects and funding sources allocated to pay for those projects and *then* ask the public if the list is acceptable. Involving the public at such a late point in the decision process severely limits their ability to shape the goals of the TIP as well as which kinds of projects and funding mechanisms to consider. The Participatory GIS for Transportation (PGIST) research project[2] set out to develop and test an alternate, and potentially more meaningful, way to engage members of the public *throughout* the transportation improvement programming process. Given the interdisciplinary nature of this project, our research team consisted of scholars with backgrounds in social science, geographic information science, information science, decision science, transportation engineering, and web interaction design. The result is an innovative new website called Let's Improve Transportation which combines web mapping and online deliberation capabilities with a structured five-step decision-making process designed to enable large groups (200+) of participants to asynchronously collaborate in the construction, evaluation, and selection of their own transportation improvement program.

In this exploratory paper we discuss what we feel are the innovative components of the website and provide some preliminary results of a recently completed field experiment conducted using the website. The paper proceeds in three parts. First, we describe the research design as informed by social science research methods and interaction studies. Second, we describe the website, highlighting what we feel are innovative contributions to online deliberation support. Third, we describe the preliminary results of the online deliberation experiment. We conclude by discussing insights gained from this experiment and outline how further research may proceed with this archive of participant activity.

2.0 Research Design

Our overarching research question is, what online deliberation technologies can improve large-group public participation in transportation investment decision making? To address this research question, a field experiment was designed wherein citizens of the Seattle area were recruited to participate in a 28-day decision-situation facilitated using online deliberation tools located at

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http://www.letsimprovetransportation.org. To conduct research on the use of this website, a set of data collection strategies were developed including pre-, mid-, and post-experiment questionnaires, interaction recordings of computer screen and user voice, semi-structured interviews, and user event monitoring. More detailed research questions were distilled, as motivated by Jankowski and Nyerges (2001) socio-behavioral research about technology-supported, participatory decision-making and by *The Deliberative Democracy Handbook*, wherein Levine, Fung, and Gastil (2005) outline a research agenda for the application of deliberative democracy. Broadly, these data collection strategies sought to measure:

- the quality of online deliberation,
- the participants' interest in online deliberation,
- the relationship between website structure/design and deliberative process/outcomes,
- the relationship between online technologies and group process, and
- the relationship between social-cultural-political influences and online participation.

This website was tested in a field experiment modeled upon a real transportation investment decision problem facing the Seattle, Washington metropolitan region. Regional transportation agencies constructed a single package of projects and funding sources (new taxes and fees) to place on the ballot for voter approval (or rejection). For a variety of reasons, our research team was not able to collaborate with the agencies to facilitate a formal public involvement process before the final ballot measure was set in stone. Instead, our research team devised a hypothetical field experiment which was conducted in the month prior to the election, while regional transportation was a hot issue in the local media. Participants who registered for the experiment were asked to engage in a hypothetical situation. Specifically, they were asked to imagine that they were a member of a large citizen advisory committee, charged with providing Seattle area policy makers their recommendations regarding a regional transportation ballot measure. The participants' task was to determine which projects to build and which funding mechanisms (such as taxes or tolls) should be used to pay for them. The challenge for participants was to identify which package of projects and funding options they could collectively recommend.

Participants for this field experiment were recruited primarily through online advertising within the Seattle metropolitan region, posters in libraries and other public gathering places, and targeted email invitations to specific groups of interest. A limited number of stipends for paid participation were available in each of five different geographic regions, made available on a first come, first served basis. The payment was not large, but we hoped it would provide additional incentive to ensure greater geographic and economic diversity of representation than could be achieved in a purely self-selected volunteer sample. Therefore our recruitment efforts also targeted particular hard-to-reach populations before making a wider call to the broader public. These populations included lower income residents, residents who live further away from the City of Seattle, and ethnic and racial minorities.

The website and field experiment were designed to require minimal human moderation. Two moderators (the authors) each spent approximately 10 hours per week during the 28-day period doing tasks such as prompting and facilitating asynchronous online discussions, synthesizing participant concerns, advancing each step of the decision process, summarizing progress and foreshadowing next steps, and composing the final report. Each task was supported by special web moderation tools and interfaces. Some of the features of this interface are described below. A moderator diary was kept during the experiment, allowing both moderators to comment on the process and take particular notice to interesting contributions being made or withering threads.

Over the 28-day field experiment, users participated in five questionnaires: an entrance questionnaire, a day-4 questionnaire, a day-17 questionnaire, a day-23 questionnaire, and an exit questionnaire. Eight paired questions were created for the pre- and post-experiment questionnaires, measuring shift in participant response about, for example, interest in participating in online discussions, their ability to

influence other participants in online deliberations, and perceived utility of online deliberation for understanding transportation problems. In most cases, the first question inquired about their expectation for what will happen during the experiment, while the later inquired about their perception of what actually happened during the experiment. The three mid-experiment questionnaires were used to gather information about specific tools on the website. In addition to the questionnaires, event logs were generated for all user activity on the website, from zooming in on a map of proposed transportation improvements, to inputting concerns, voting, and discussing. A sub-group of 18 users completed interaction recordings, where the users worked for 30 minutes on a computer equipped with audio recording software and screen recording software, generating a total of 26 recording sessions. These recordings were captured throughout the five stages of the process. Users were encouraged to work through the steps of the system, without direction from the observer. Also, a sub-group of 20 users were selected for semi-structured, 1-hour interviews following the completion of the experiment. Interviewees were asked to narrate the entire 28-day experiment in their own words, reflect on moments of conflict and consensus, and discuss how this experiment was similar and dissimilar to the real-world process of transportation decision-making as they understood it.

3.0 The LIT website

The Let's Improve Transportation (LIT) website was originally conceived as a flexible Internet portal composed of decision support modules that could be flexibly arranged to enable various decision situations of up to 10 or more steps in length (see Nyerges, Ramsey, and Wilson 2005). In its current state, the LIT website is composed of five progressive, yet overlapping, stages customized to the specific decision situation described in section 2. The website is built on a flexible workflow architecture which allows for relative ease in reconfiguration to enable similar decision problems. The five steps (and 12 sub-steps) are outlined in Table 1. During the field experiment, the website's automated agenda manager allowed access only to those steps that were currently available for participation. Here we will highlight four particularly innovative technologies included in the LIT website: structured discussion, concerns brainstorm and synthesis, package option generation, and glossary.

Step 1. Discuss concerns
1a: Map your daily travel
1b: Brainstorm concerns
1c: Review summaries
Step 2. Assess transportation improvement factors
2a: Review factors
2b: Weigh factors
Step 3. Create transportation packages
3a: Discuss projects
3b: Discuss funding options
3c: Create your own package
Step 4. Select a package for recommendation
4a: Discuss candidate packages
4b: Vote on package recommendation
Step 5. Prepare group report
5a: Review draft report
5b: Vote on report endorsement

Table 1: The steps in the decision process.

Structured discussion

Each of the steps involves both a deliberative component and a task for individual participants to complete. To support deliberation, we developed a system for two-dimensions of threaded discussion: topics and posts. We also provided a keyword-tagging system and basic site-wide search capabilities for discussion submissions. Additionally, participants were able to voice their agreement or disagreement of any post simply by clicking a 'thumbs-up' or 'thumbs-down' icon. Much like the functionality familiar to users of Amazon.com or Digg.com, the results of these votes allowed users to quickly sort and identify posts based on level of agreement or disagreement. We termed this collection of functionality Structured Discussion, as discussions are structured by the two-dimensionality of the threads, by the analytical steps of the website, and by the moderator prompts. Built on top of the Structured Discussion engine, each step included additional analytical modules which enabled activities such as the synthesis and review of concerns, the review and weighing of project evaluation factors, the review of proposed transportation projects on a Google map interface, the creation of personal transportation packages and review of "candidate" packages (described below), and the facilitated review and editing of a final group report.

Concerns brainstorm and synthesis

Drawing on an evaluation of methods of structured participation, particularly the idea-generation phases

of Nominal Group Theory and Technology of Participation (Wilson 2005), we created an online process of concern brainstorming and synthesis. Users were asked to comment on their concerns with the transportation system in the Seattle area. Additionally, participants were asked to provide keyword tags for each of their concerns, which allowed other users to sort concerns by participant-generated categories (similar to collaborative tagging systems, see Golder and Huberman 2006). After a period of brainstorming (3 days), the moderators synthesized these concerns using an online moderator tool for clustering keyword tags into meaningful categories of concerns. Summaries for these categories were then composed by the moderators, based on the clusters of concerns, and these summaries were then 'published' for participant review. Participants could then review the clusters of concerns associated with each summary, and comment on unsatisfactory summarization or new insights. Based on this review, the moderators would analyze the consensus around a particular revision (based on user votes of agreement), and would offer a revised version of the concerns summary. In Section 5 below, we discuss ways this method may be improved.

Package option generation

A common format for public involvement processes is to present the public with a small number of pre-constructed "options" or "alternatives" and then ask them which one they prefer and why. As we discussed above, the problem with this format is that it involves the public *after* the options are already designed, preventing them from providing input which might inform the design of options. However the alternative, involving the public in the design of options, is extremely difficult to do in a meaningful way. We use an innovative approach to address this problem (for details, see Lowry et al. forthcoming). After allowing participants to review and discuss a variety of proposed transportation projects and funding options, individual participants can then create their own package. Once all (200+) participants have had a chance to create their own packages, the moderator initiates an automated clustering process which groups the packages based on similarities in their composition and differences from the packages of other clusters. The moderator determines the number of clusters--usually between 3 and 7. Next, one "representative" package is automatically selected for each group. The 3 to 7 representative packages become the short-list of "candidate packages" discussed and evaluated by participants in Step 4. To aid in this evaluation, the projects in a particular package could be displayed in a Google Map (using Google's API). In Section 5 below, we evaluate the success of this method and discuss ways it may be improved.

Glossary

Deliberation requires the construction of a shared language and shared meanings. A significant concern of the research team was centered on the inequities among participants around expertise in using the jargon of transportation planning. Therefore we constructed a glossary of transportation terminology as well as functionality that would automatically highlight glossary terms wherever they appear on the LIT website. The hyperlink on the highlighted terms leads to a page where a definition and additional readings can be found. Motivated by the importance of foregrounding the production and multiple (even conflicting) interpretations of information resources, highlighted in Ramsey and Wilson (forthcoming), the glossary is explicit in its citation of sources and also enable participants to offer their own comments and suggested corrections in a weblog-style discussion forum connected to each term. Participants can also submit new terms to include in the glossary.

4.0 Preliminary Results

We are just beginning to analyze the results of the field experiment and can only provide some preliminary analysis of what happened. Our recruitment efforts resulted in 244 total participants registered for the study. 179 of those were eligible for subject payment based on geographic quotas, while 65 were volunteers. Of these registered participants, 153 were active at some point during the 28-day experiment and 135 contributed at least one concern, discussion comment, vote, or package (or, in other words, they did more than "lurk").

As might be expected for a 28-day process, we had some participant attrition during the experiment. For example, 57 participants voted on package recommendation (Step 4b) and 47 voted on report endorsement (Step 5b). Among those who did participate in these votes, there was a relatively high degree of consensus. 61% of voting participants endorsed the winning candidate package (1 of 5 packages). 81% of voting participants endorsed the final report[3] that described the result of the decision process.

75 participants filled out our post-experiment questionnaire. The responses indicated a relatively high level of satisfaction with LIT as a model of public participation in transportation improvement decision making. For example, 73% agreed (or strongly agreed) with the statement: "I believe the LIT Challenge is an example of a meaningful and productive way in which members of the public could participate in decisions regarding how to improve our transportation system." 88% agreed with the statement: "I believe my own understanding of the transportation system, and ways to improve it, can be enhanced through discussions with other members of the public who may have different perspectives than my own." Slightly less (75%) agreed with: "I am interested in having these kinds of discussions". Finally, we were curious to discover that their agreement continued to fall (to 66%) when asked "I am interested in having these kinds of discussions on the Internet."

Of the eight paired questions in the pre- and post-experiment questionnaires (discussed in section 2 above), two demonstrated statistically significant difference (with 70 total participants completing each questionnaire). We need more analysis to provide context for this demonstrated difference; however, it is interesting that each of these pairs demonstrated a difference in the negative direction (albeit, mostly in the agreement-end of the Likert spectrum): participants' perception that online discussions about transportation helped them understand transportation problems, and participants' interest in having discussions about transportation on the Internet (see above). More analysis is necessary before we can draw conclusions about these shifts.

Preliminary analysis of the semi-structured interviews mirrored the generally positive responses seen in the post-experiment questionnaire. Interviewees (n=20) generally reflected that, even given certain technical glitches, online discussions were both useful and convenient -- as an educational tool, as outreach, and as a venting of frustration. Several even commented that they learned more through discussions with other participants than they did through reading the "expert" analysis of transportation projects available on the LIT website. The moderator's own informal and subjective reviews of the website discussion confirms these claims. Participants who reported these optimistic impressions about the deliberation also tended to be some of the most active in online discussions. Therefore we plan to examine in more detail the differences in experience and satisfaction between those who are most active in discussions and those who did not actively contribute to discussions.

5.0 Discussion

The following are some initial reflections based on our observation of the field experiment.

Moderator synthesis of concerns

Moderator synthesis of concerns worked quite well, as a way to organize concerns, relate them, and synthesize them. However, our use of keyword tags was not entirely straight-forward for some participants, according to the semi-structured interviews. Allowing participants to see how moderators are categorizing their keyword tags and concerns, to contest this, might be an alternative approach. Returning to the structured method of Technology of Participation, might point to the need for having participants play a more active role in the clustering and synthesis process -- although, this becomes an issue of group size and participant motivation, as synthesis is a intense, tedious process.

[3] You can read this final report at www.letsimprovetransportation.org.

Package option generation
The five candidate packages identified in the automated package clustering process each had unfortunate idiosyncrasies unique to the preferences of individual participants. For example each package had a different geographic bias in project locations. This led to some frustration by participants about the quality of the choices available to them. Such outcomes appear to be an inevitable bi-product of the design of our candidate package selection methodology. A better solution, we believe, is to generate a new "representative" package based on the overall characteristics of the individual packages in a cluster. The algorithm for generating this new package could be configured with rules selected by the experiment managers (or even the participants themselves) such as ensuring a fair geographic distribution of projects or consistency in the application of new tolls.

Mixed-method strategies for online deliberation research
Our preliminary analysis has shown that mixed-method research presents a multiplicity of findings (sometimes contradictory). We are intrigued by this multiplicity and look forward to further exploration of these collusions and corroborations across the user event logs, questionnaires, semi-structured interviews, and interaction screen recordings.

Other ideas
Several features did not make it into this version of the LIT website. Conveniences like RSS feeds, mobile device support, and system-wide keyword tag browsing would have provided a more familiar interface for our more web-savvy participants. Also, more map-enabled concern and discussion support would have allowed participants from across the region to organize their concerns and discussion posts, not just by participant generated categories (keyword tags), but also by geographic localities. Regarding the organization of the decision process, we might have grouped the participants into geographic areas, to allow them to have more detailed discussions of the transportation needs of their particular regions -- reporting back to the larger group with a prioritized list. This might alleviate the need to provide discussion synthesis throughout the process and might compensate for the geographic biases of a self-selected sample.

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