Designing for an Informal Learning Environment: Towards a Participatory Simulation Design Process for Public Policy Planning

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Abstract: Modern planning practices recruit stakeholders to add specialized expertise to the planning process, but this expertise often remains inert, leading to superficial and circular discussions. By encouraging stakeholders co-construct an external shared representation, more nuanced debates could emerge. This work reports on formative interviews that will inform the design of software that will allow stakeholders to articulate and share their knowledge, and to inspect the underlying assumptions of others and the outcomes of the system.

Introduction

Watershed planning brings together diverse representatives (e.g. local govts., advocacy groups, business, industry, and academia) to contribute *specialized* knowledge to water use policy, but devising effective recommendations requires a *comprehensive* understanding of outcomes emerging from interactions between natural processes and human actions (Zellner, 2008). This work's ultimate aim is to design a computer-based tool to encourage stakeholders to share knowledge, learn from one another, and develop a systemic perspective.

Study & Findings

We observed one public session to understand meeting dynamics, and conducted telephone interviews with four stakeholders representing business, municipality, county government, and academia/public interest to assess their perceptions regarding modeling tools. Our preliminary findings focus on the *means*, *content*, and *context* of presenting models to stakeholders.

Means – Tools & processes to support stakeholder participation

Unlike Decision Support Systems (DSS) which are designed for a specific case and thus have limited reusability and require extensive data and resources to build (Densham, 1991), we are interested in repurposable software that can leverage the knowledge of attending stakeholders. Existing attempts at creating stakeholder-accessible models (e.g., MetroQuest, http://www.metroquest.com) tend to mask the system complexity by only eliciting pre-defined inputs and presenting pre-defined outputs. Our interviews found that this restriction on decision makers' ability to modify the model caused some of the stakeholders to view them as an unreliable "black box" as evidenced by this remark: "I feel it [software] was biased… I looked at the results and said it's not worth something to look at. This was a conclusion that somebody had and they wrote a survey and study to come to that conclusion." Another stakeholder, whose ideology was more aligned with the outcome of the software, indicated complete confidence in the outcome. Both respondents seemed to be suffering from a confirmation bias (Lord, Ross, & Lepper, 1979). These black-box models thus do not allow for the skeptics to explore how the outcomes emerge and do not encourage the believers to question their assumptions.

One strategy to address the black box problem is to migrate to more transparent Agent Based Models (ABMs), which *allow stakeholders to inspect the system's rules* and potentially even *use their expertise to modify or create rules for agents.* Our goal is to maximize participation so that every stakeholder's ideas and viewpoints get reflected. We found that stakeholders are more likely to bring mobile devices than laptops, which suggests *an "audience response system"-style form factor,* seen in participatory simulations augmented with a shared display (Wilensky & Stroup, 2000). This has the added benefit of grounding the conversation in a shared artifact, allowing the stakeholders to learn from their peers and to build a more nuanced mental model of the policies and their effects. Some findings (e.g., Brignull & Rogers, 2003) suggest that anonymity improves participation in such contexts but we found that stakeholders strongly felt that ideas and actions needed to be attributed to the creators. Thus *a mechanism is needed for clearly identifying the originator of any changes to model settings*, as evidenced by this quote: "No I don't think [anonymous contributions are] a good idea. There are many groups represented by the planning group members and they bring up many viewpoints and it's important that those viewpoints be acknowledged as belonging to that particular group."

Content – What is to be simulated?

Some classroom-based implementations of ABMs required students to build entire systems so that they have an understanding of all the agents in the system (Wilensky & Reisman, 2006). However, it is impractical at best to ask each of the more than 35 stakeholders to build a model of an entire system when they often lack an

understanding of or an interest in issues outside of those which affect them directly, as indicated by the following quote: "I never speak up during the meeting… [the local government] viewpoint is well represented and I don't think there are major issues for us as there are for the environment and business." The interviewee seems to believe that policies that concern business and environmental interest groups will not impact the local government. There is obviously a need for the gestalt understanding that one could get by virtue of building everything, but an alternate strategy may be to present the model content so as to *emphasize the inter-connectedness between model elements*, so that even when stakeholders do not fully understand the position of another interest group, they are at least aware of how their interests intersect.

Sometimes, though, disconnects result from the difficulty in understanding how actions compound over time: "[We] have maintained wetlands, even created wetlands [and] open space, have … water facilities that meet & exceed the EPA standards… [The cities don't] and yet we keep hearing [from them and environmentalists] that [we] need to have growth control, slow down or stop to avoid urban sprawl." The interviewee is justly upset over a perceived "do as I say, not as I do" argument originating from city officials, but neglects that over time, their community may begin to resemble the city. *Making the trajectory of the decision path evident* (i.e. when a decision was formalized, identifying what model elements informed the decision, identifying what elements are affected by that decision, and characterizing the effect on those dependent elements, etc.) might help in identifying and planning for "unintended" consequences of decisions.

Context – Where, how long, and how often.

Interviews revealed the stakeholders were willing to use a computer-based tool for the entire duration of the meeting if it did not distract them from interacting. For example: "If the software is a facilitation tool, it can be used to run the meeting," or, "[It] should not distract from meeting – interaction should be live and not dependent on software." However, most existing classroom-based ABM projects require extended interaction with the model over several weeks (e.g., Klopfer, Yoon, & Um, 2005). This kind of interaction is not feasible in our context, where stakeholders meet once every month for 3 hours. Consequently, we have to *consider facilitating participation and interactions between the stakeholders outside the meeting space.* We found that the stakeholders had internet access at home and were willing to use the model outside the meeting setting for about 10-20 hours every month. In order to support extended interaction, the ABM tool should provide multiple access points for the stakeholders so that they can access the model from any location. Also, while allowing multiple accesses, we have to ensure that all the content generated for the model is credited to their creators.

Conclusion

The design guidelines that emerged from these preliminary findings were italicized above, and are summarized here. With relation to the *means* of presenting models, we found that model-based tools for diverse adult users in an informal learning environment should allow for inspection (and alteration/creation) of the underlying model rules, suggesting the use of ABMs. With respect to the *content* of the models, we found that contributions to the models must be clearly credited, and the model should emphasize element interconnectedness and decision trajectories to help stakeholders adopt a more comprehensive perspective. With respect to the *context* of use, we found that stakeholders will need multiple points of access, even outside meetings. Future work will be focused on implementing and refining these recommendations.

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