Simulations as a Dialogue Tool: Strengthening Community Engagement and Local Democratic Processes

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Abstract. Communities face innumerable challenges when adapting to changing environmental and climate conditions. These challenges necessitate the collective involvement of community members. However, divergent interests between various groups can impede the development of projects at a slow pace. To avoid resistance, it is essential to engage citizens early on in the planning process, although caution must be taken to prevent the possibility of manipulation and loss of trust. The HUMAT simulation tool has been developed to explore the effects of policy strategies before implementing them. And the project INCITE-DEM endeavours to establish the efficacy of the HUMAT framework as a participatory tool to support local decision-making. Simulations have proved promising in encouraging constructive dialogue among citizens and facilitating transparency and collaboration in local democracy. We are optimistic that the INCITE-DEM project will promote informed and inclusive decision-making in communities by transforming simulations into a dialogue tool that bridges shared perspectives and dimensions of disagreement.

Keywords: Community involvement, participatory planning, social dynamics, HUMAT, simulation

1 Introduction

Adaptation to changing environmental/climate conditions is a challenge for many communities. Many projects and plans for such an adaptation require the involvement of a community. Isolating houses, joining heat networks and sharing cars are just a few examples of changes where the involvement and effort of a community are critical for success. This involvement touches upon the very basics of democracy: how can we as a group of people with different perspectives and interests come to a shared solution that is supported by most of us?

In local policy settings often a struggle is taking place regarding the realisation of plans. On a recent field trip, we spoke with a diverse group of people about plans to make their community independent from natural gas. Even when the community at large is in agreement on the necessity of an energy transition,

the process towards realising such a transition may result in friction between people having different interests and influences. When for example a municipality proposes detailed plans, citizens may protest because they have not been heard, feel that technology is imposed on them, and they want to discuss alternatives. When very conceptual plans are being shared, citizens may respond with critique regarding the lack of justification for using certain technology and missing calculations. When a municipality does not come up with plans at all, and just waits for its citizens to take the initiative, chances are low that real initiatives kick off and citizens may complain about the lack of vision and initiative of the municipality.

Obviously, citizens discuss the planning process and may amplify each other's perspective, but also citizens may be confronted with opposite views and develop disagreements that may cause a chasm to emerge in a community. Sometimes emotions may overtake an exchange of arguments, and a meaningful dialogue becomes impossible. Earlier negative interactions may have a negative effect on the willingness of people to engage in a new planning process. As a consequence of such social dynamics, a planning process may be paused, halted or has to be restarted completely, resulting in annoyance about the slow development of the project development whereas many people feel an urgency to act.

Increasingly field experiments are taking place to have citizen participation included in the planning process. These can be more or less successful, and it seems to be that the frictions above are also playing a role in citizens' willingness to participate in such citizen advisory groups, their satisfaction with their functioning, and the actual impact of these initiatives.

Social dynamics are often a critical component in the success of transitioning communities towards more sustainable practices. On the one hand, the challenge is to have citizens as early as possible involved in developing plans, to avoid resistance against top-down policies enforcing behavioural change. On the other hand, very immature ideas may bear the risk of being rejected by some citizens as being not realistic.

It is important to actively involve the community members and stakeholders to understand the complex social dynamics. Collaborative approaches, particularly participatory modelling [1], embody the power of collaboration, ensuring the engagement of diverse stakeholders engage in the process [2]. By embracing these approaches, we can empower individuals and communities to shape their own societies by drawing on communities' collective wisdom and expertise, facilitating inclusive decision-making and developing sustainable solutions.

In the pursuit of comprehending complex systems and driving meaningful change, computer simulation emerges as a powerful tool within participatory modelling [3]. It provides a virtual realm or testing ground that advances our understanding without immediate real-world consequences. Moreover, simulation modelling serves as a valuable resource in helping stakeholders grasp system dynamics [5]. Facilitating inclusive, informed, and deliberative dialogues, empowers citizens to contribute significantly and influence issues directly impacting them and their communities. Socio-ecological systems have extensively

utilised Agent-Based Modelling (ABM) for research and analysis [4, 9], which is a simulation technique that captures system behaviour and state changes over time. ABMs excel in representing intricate interactions within diverse conditions and effectively model decentralised, autonomous decision-making processes [10].

To get a more profound insight into the dynamics of social innovation, in the EU SMARTEES project [6], a simulation tool HUMAT as a generic platform is developed, which formalises and integrates different behavioural drivers and processes to support model development and data collection for model parameterisation [7]. This HUMAT platform has now been used to simulate a variety of empirical cases of social innovation, such as a referendum on closing a park for car traffic (Groningen) and Budapest, joining heat network projects (Aberdeen), establishing local city blocks banning transit traffic (Barcelona) and islands transitioning towards sustainable energy (Samsø, El Hierro).

The HUMAT socio-cognitive architecture constitutes artificial populations in which agents have dynamic beliefs about how satisfying behavioural alternatives are for their needs and values, and have social networks to communicate with one another about these beliefs. The HUMAT framework represents social influence in the context of the (dis)satisfaction of different needs and values as motives for action. The various cases that have been simulated open the possibility of exploring the effects of certain policy strategies before implementing them. However, this might also invite a more manipulative use of such models, which raises ethical issues. Also, citizens may feel betrayed when finding out they are being manipulated, which further jeopardises the vitality of local democracy.

Hence a key question that we try to explore in the new EU INCITE-DEM project is if and how such simulations can be used to contribute to the planning process in practice, how they can contribute to a meaningful dialogue in a community, and what requirements have to be met for such a simulation to be workable. This implies that we are searching for a participatory application of the HUMAT framework.

2 Towards a dialogue tool

As scientists we generally aim to produce models that represent aspects of reality, hence we often are focused on reproducing empirically observed dynamics. However, for a tool aimed at stimulating a dialogue, precise reproduction may not be the most effective strategy to use. This means that we should consider how simulation results can be presented to evoke a meaningful discussion. Meaningful in the context of dialogue implies that people start reflecting on their own position and the position of others, thus taking more of a community perspective rather than just their own personal perspective.

Assuming that people have good reasons/interest for their perspective of an issue, they also may have the perception of being in disagreement with people having a different view on the matter. Because people are more sensitive to differences than to similarities, focusing on disagreements may fuel conflict and polarisation in a community, even if people share many perceptions of the issue.

A dialogue might be initiated by a tool that is capable of both emphasising the shared perspectives people have and at the same time magnifying the conflicting interests. A simulation tool may demonstrate how conflicting interests may play out in a community. By magnifying the effects of conflict, the tool offers a dystopian perspective on the planning process, and hopefully, a perspective all citizens can agree upon that it is undesirable.

From this perspective, the shared interest of the community becomes more clear, and people with different perspectives may start talking about the undesirability of the outcome, and how their positions and behaviours could be represented better in the tool, thus engaging in a dialogue. This approach may sound simple, but the key question is how far should the conflicting dynamics be magnified to be effective in a certain context to catalyse meaningful discussions. This is the research question we target in our INCITE-DEM project.

Considering that polarisation is a main concern in society and a social dynamic that may problematise local democratic processes, we want to explore if we can magnify the conflicting dynamics of our dialogue tool by strengthening the social dynamics. This means that the simulated social dynamics may be an exaggeration of reality, but still recognisable as touching upon some features of the local community. When people recognise themselves, and other groups of people, and are amused about the simulated behaviours they see, the discussion may be guided towards a more connecting level. From the literature, it is known that humour and laughter may be important elements in negotiations [8].

In the context of the dialogue tool, we have to carefully consider the degree of magnification to make sure that the model does not ridicule a specific group, but rather creates a "distorted mirror" in which all groups recognise each other and themselves. At this stage, we contemplate using conservative-progressive and degree of emotional involvement as suitable factors for simulating how discussions over projects may impact community cohesion. Emotionality can be related to the different values that people have. As such it relates to the value-need in the HUMAT framework. Values such as environmental concern can collide with values such as consumptive lifestyles, and setting emotionality high in a simulation may cause the simulated people to develop negative relations. Conservative-progressive relates to the degree to which people oppose change and dislike or distrust innovation.

In exploring the implementation of a particular case into the dialogue tool, it is an option to allow for different subgroups of citizens to have particular settings for conservatism-progressive and emotional involvement. However, if there is a risk that this would result in ridiculing a particular group, it would be counterproductive. Hence it is best that a representative of a group is responsible for setting the variables for conservatism and emotionality. This means that the model settings are chosen in a co-creative setting. If this still remains sensitive, it is also an option to define conservatism-progressive and emotional involvement for the whole simulated community.

The dialogue tool will be parameterised by the user, who will define a few prototypical groups in the community and their basic characteristics, on the basis

of empirical data on socio-economic-geographical data, and on their perceptions and preferences (values), using e.g. interviews and survey data.

When plans are developing in a community to make changes that will affect many of its citizens, the dialogue tool can be used in an early stage to make an inventory of the barriers, beginning with a setting magnifying conflicting dynamics. When for example the simulation shows that an agent representing one group is resisting change, and agents with a different perspective respond very emotionally with breaking ties or worse, this may help the community to become aware of the negative social implications of the planning process. This helps in acknowledging the perspective of other people, which may serve as an important precondition for a dialogue to start. Moreover, as the agents start this process, people that usually are less verbally present in such settings, or do not even show up (more vulnerable groups) will be much better represented in this process.

Rerunning a model with different settings for conservatism-progressive and emotional involvement could result in community dynamics that are more realistic and support further discussion, in particular when everybody recognises situations where some people still are not happy if plans are developed in a certain manner.

In the just-started INCITE-DEM project, we hope to learn if and under what conditions a dialogue tool contributes to the strengthening of the local democratic process in times of transition. This will require close collaboration with communities and a very careful collaborative process. Full transparency of the goals of the project, and a very respectful interaction with communities are critical conditions for exploring the possible contribution a dialogue tool may offer to a community.

3 Simulations strengthening participation and engagement

Utilising simulations as a means to foster inclusive and participatory democracy is an innovative and scientifically supported approach [11]. By incorporating simulations into the dialogue process, citizens are actively engaged in decision-making, leading to interactive discussions that transcend diverse backgrounds and perspectives. Through simulations, participants delve into scenario exploration, visualising intricate systems, facilitating communications and cultivating a shared understanding [12]. The iterative nature of simulations within a safe environment allows for continuous learning, enabling participants to refine ideas and collectively advance understanding through ongoing dialogue.

When employing simulation tools to facilitate dialogue, the involvement of stakeholders becomes crucial. These stakeholders can be individuals or groups who have a direct interest or are impacted by the issues under consideration. Examples of such stakeholders include governments, companies, citizens, particularly those from disadvantaged groups, and researchers. All of them embrace a participatory approach. Here are some illustrative instances:

Governments (municipalities) can actively participate by employing interviews and surveys to collect valuable insights, preferences, and data, which can inform the simulation model. Additionally, governments have the opportunity to experiment with various scenarios and engage in collective discussions and negotiations to explore potential solutions. This approach allows them to play an active role in the simulation process and contribute to the development of effective strategies.

Engaging citizens in the simulation tool for dialogue, we not only foster inclusivity but also enhance democratic decision-making. To achieve this, it is imperative to leverage forums and online platforms that enable us to gather citizen input, ideas, and feedback regarding the simulation tool. This approach ensures broader participation, particularly from individuals who may be unable to attend physical meetings and from disadvantaged groups, such as ethnic minorities, migrants, and people with disabilities, whose voices are often overlooked. By embracing this inclusive approach, we can empower all members of society to actively contribute to the dialogue and create a more equitable and representative decision-making process.

Scientists occupy a pivotal position in the utilisation of simulation tools, as they bring forth invaluable expertise, data, and insights to inform both the development and outcomes of the simulations. Their contributions are multi-faceted, as they play a vital role in refining the simulation model, gathering pertinent data to shape simulation inputs, analysing simulation outputs, and facilitating the interpretation of results for diverse stakeholders. Their involvement ensures that the simulation tool is grounded in rigorous scientific principles and aids in delivering comprehensive information to all relevant parties.

We hope that the early explorations of community dynamics using simulation will be able to encourage constructive dialogue among diverse groups of people during local democratic processes, with the ultimate goal of promoting informed and inclusive decision-making. Our simulation provides a comprehensive and interactive model of a community's behaviour, and we envisage the use of simulation as a potent tool for facilitating transparency and collaboration in local democracy.

4 Parameterising and testing the dialogue tool in field situations

The aim of the development of the dialogue tool is to have a simulation model that is easy to use in practical settings, supporting workshops on a variety of community projects. This requires that project leaders, which probably are employees of a municipality, should be capable of setting up a dialogue tool session with citizens. Currently, in the INCITE-DEM project, we are at the early stage of exploring together with case managers and other people involved in supporting transitional community projects what really would make a dialogue tool interesting for them to use. In the project, we aim to develop a very simple-to-use tool first and discuss and play with concept models with practitioners until they

indicate that they feel confident to test it in a field setting. A few field cases will be selected by the case managers to serve as testing grounds for the dialogue tool. We aim to test if it is possible to parameterise the model in a group discussion, and what case settings can/should be parameterised beforehand. Parameterising beforehand may save time, but bears the risk of the citizens not agreeing with how they are represented. The parameterisation process together with the citizens is also something we have to explore. We expect to learn a lot from earlier participative modelling projects as reported by Voinov et al, van Bruggen et al, Le Page et al. [1, 2, 5]. Specifically, we will explore how a simple workshop format can be developed that makes the parameterisation a pleasant exercise to engage in.

The testing of the tool in practical cases is the litmus test, proving if it really contributes to a strengthening of the democratic process. Considering the complexity of many citizen projects, an experimental design will not be possible. Instead, we aim for debriefing talks with all the participants in a dialogue tool session to collect information on the positive and negative experiences they had. Two key aspects we will focus on are (1) if the participants got a better understanding of people having a different perspective than theirs, and (2) if people that usually have less voice in discussions indicate that they feel their perspective is sufficiently taken into account in the dialogue. If the dialogue tool is both simple to use and serves the democratic process two major critical conditions for practical use are being met.

5 Early exploration with a simulation

To create a simulation that captures the dynamics of community behaviour, we employed NetLogo 6.3 programming. The model interface, illustrated in Fig.1, comprises three distinct elements: a command interface, a control interface, and an output interface:

- Commands such as setting or initialising the system (SETUP), carrying out a single execution (GO ONCE), and performing continuous execution (GO) can be issued through the command interface.
- The system's control interface is designed to enable the adjustment of various parameters, allowing for the creation of different scenarios. The primary means of parameter manipulation is through the use of sliders, such as "num-agents", which determines the population size of the community, and "conservative-progressive", which controls an agent's tendency to maintain or alter prior behaviours. A value approaching 1 indicates the agent is open to change, while a value approaching 0 reflects a preference for the status quo. "involvement" is linked to an agent's values; the higher the value, the more significant the role values play in decision-making. Finally, there is "normative-influence", which measures the degree to which an agent adopts the choices of other agents in its social network.
- The visualisation of the system's operating results is displayed on the output interface. Researchers can obtain a clear understanding of the system's

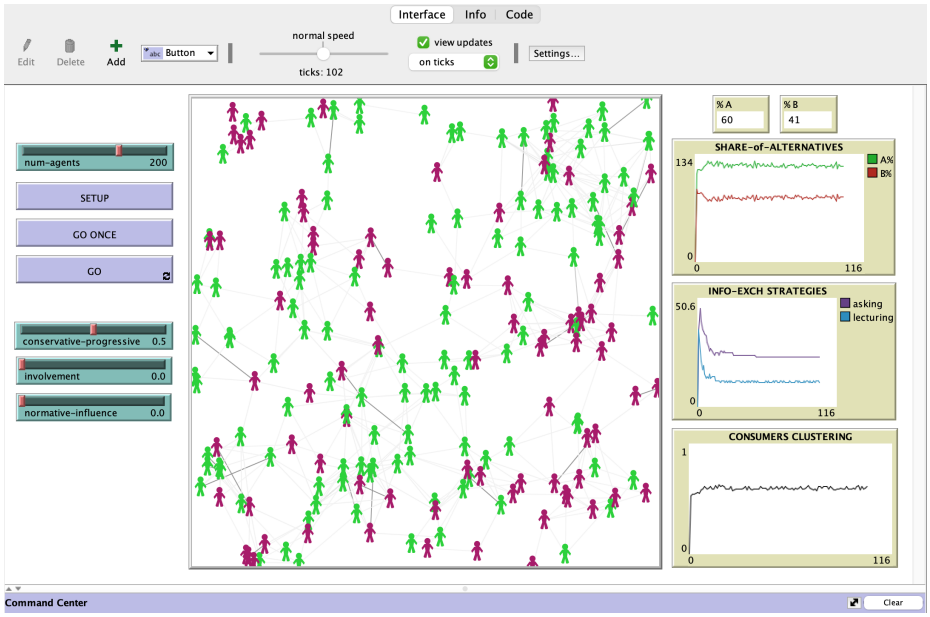


Fig. 1. Interface for the model

performance under various parameters. The model depicts the percentage of people's support and choice for alternative options, their primary communication strategies or interactions, and the overall aggregation status within the community.

In this model world, 200 agents are assumed to be present. The light grey network in Fig.1 serves as the communication channel among agents. Two distinct options are available, and the community members will choose their preferred option based on their unique needs. They may either support option A (green agents) or option B (red agents). As time goes by, people will persist in interacting with one another, employing either persuasion or self-persuasion techniques to alleviate their own cognitive dissonance following the rules as described in the HUMAT framework [7]. As these exchanges occur more frequently, the links between individuals will solidify, bringing them closer together and represented by darker links in Fig.1.

In a first attempt to explore the effects of conservative-progressive orientation and social norms on community cohesion, we manipulated the corresponding sliders on the interface. Through repeated experiments, we found that, to a certain degree, conservative-progressive orientations and social norms influence the behaviour of individuals within a community, the level of community connectivity, and the extent of community clustering, the details are as follows.

Fig.2 and Fig.3 provide a compelling illustration of how social norms can have a profound impact on community connectivity and behaviour over time. The data show how individuals' support for two different alternatives evolves

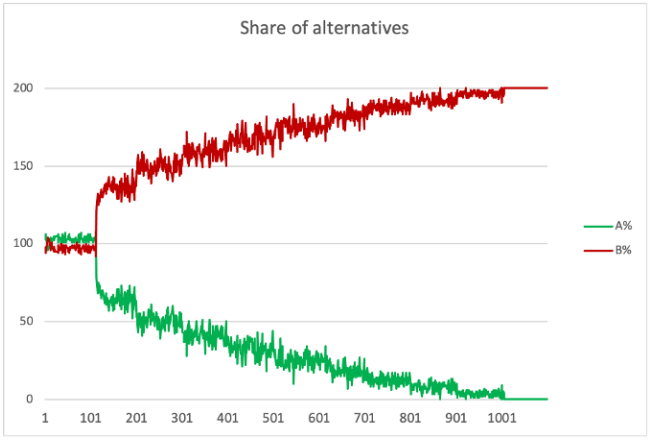


Fig. 2. Changes in the share of Alternatives A and B over time

as the social norm parameter is gradually increased from 0 to 1 every 100-time steps, with increments of 0.1.

As the graph of Fig.2 and Fig.3 initially, there is negligible difference in support for the proposed schemes, but as social norms become stronger, we witness a gradual shift in support towards one alternative, option B, leading to the unanimous adoption of this option. The figure captures this shift in support visually, making it easy to appreciate the powerful impact that social norms can have on shaping group behaviour. Moreover, the darker links in the network in Fig.3 represent more frequent interactions between certain community members. This highlights the critical role of community connectivity in driving the adoption of shared social norms and values.

Therefore, to ensure enduring success in bringing about change within a community, it is necessary to consider all these aspects and subtly approach the issue. In essence, the data displayed in Fig.3 accentuates the importance of comprehending how social norms can influence group behaviour and affiliations in the long run.

The data presented in Fig.4 strongly supports the notion that the conservative-progressive orientation is a crucial factor in determining community agreement. A conservative orientation, demonstrated by a shift of the conservative-progressive parameter to the left, indicates that individuals within a community prefer to maintain pre-existing norms and habits, rather than embracing newer or alternative ones. Conversely, a progressive orientation, demonstrated by a shift of the parameter to the right, encourages people to be more open to change and accepting of new ideas.

Fig.4(1) and Fig.4(2) show how social norms shape behaviour. In Fig.4(1), the conservative-progressive value remains constant at 0.5, while Fig.4(2) presents a decreasing conservative-progressive value that ultimately reaches 0. We observe

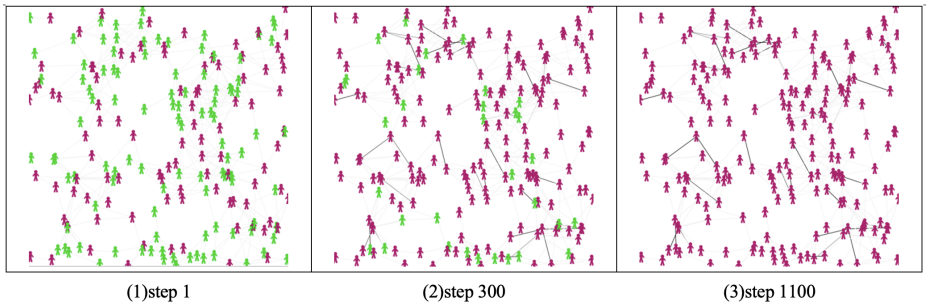
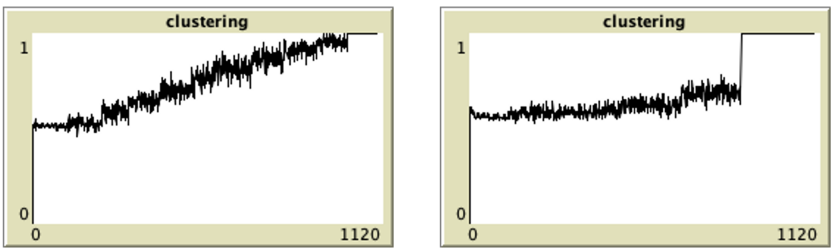


Fig. 3. Changes in connectivity within a community over time

that social norms have a significant impact on initial behaviour as individuals tend to follow the preference of the community (red option).

The experiment also indicates that as individuals become more conservative (as indicated in Fig.4(2)), their propensity to adhere to their customary choices increases, resulting in a diminished impact of social norms on their conduct. This resistance to change implies that conservatism weakens the impact of social norms, resulting in a slower clustering process.

Moreover, when the conservative-progressive values approach 0 (at step 900 in Fig.4(2)), following the mechanism in the experiment, people's behaviour will be influenced by social norms before conservative tendencies. Therefore, they are inclined to choose the option that is favoured by the majority in their community, which in this instance is option B. Subsequently, people tend to maintain habitual choices as they all embrace conservatism, resulting in everyone consistently opting for option B.



(1)conservative-progressive does not change

(2)conservative-progressive gradually decreases

Fig. 4. Clustering of communities under different conditions

These findings emphasise the importance of reflecting on the conservative-progressive orientation when entering a participatory process in a community. A balance of conservative and progressive values is crucial for long-term suc-

cess, and interventions should take a comprehensive approach that considers the interplay of social norms, behaviour, and connectivity within a community.

6 Conclusion

To summarise, our discussion delved into how social norms and conservative-progressive orientation play a fundamental role in shaping group behaviour and promoting positive change within a community. To design interventions that can generate sustained behaviour change, a balanced approach that takes into account both conservative and progressive values is vital. Creating a supportive culture that endorses positive change while also recognising the community's conservative-progressive orientation is essential for such interventions. In conclusion, our conversation underscores that behaviour change is multifaceted, and designing effective interventions requires a holistic approach that factors in social norms, conservative-progressive orientation, and connectivity.

In the INCITE-DEM project, we aim to transform these simulations into a dialogue tool that can support communities in discussing what they share, and on what dimensions they have different perspectives regarding a plan.

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