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Towards a Participatory Infrastructure for Research in Deliberative Democracy

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Abstract. Deliberative democratic forums frequently involve conflicting values, policy concepts and problem definitions. Effectiveness in seeking consensus requires access to reliable information. It also poses very significant *cognitive* challenges due to the complexity of policy issues and the need for participants to understand alternative experiences and perceptions. Technologies such as agent-based simulation, visualisation and data mining have the potential to address some of these challenges. However, they need to be tested in realistic scenarios to allow their impact on a deliberative process to be studied by researchers from different disciplines including social science, psychology and computer science. This paper discusses the feasibility of a research infrastructure in which real-life deliberative forums can participate in experiments to help specify, test and evaluate the technologies together with researchers.

Introduction

Recently, theories and practices of deliberative democracy have challenged narrow definitions of technical expertise, advocating a decision-making process which rests upon the collective interactive discourse and mutual inquiry between multiple stakeholders across communities (see e.g. Hajer and Wagenaar, 2003).

However, such deliberative exercises (such as as citizens juries, participatory inquiries and consensus conferences) also reveal the increased complexity of the policy making process (Edelenbos and Klijn, 2006). Citizens bring to deliberative forums conflicting policy frames, values, beliefs and problem definitions. The effectiveness of such deliberative exercises depends therefore not only upon the challenges posed by the limits on access to information and the potential exclusion of competing viewpoints across communities, but also upon the capacity of participants to "step into each other's shoes" (Schön and Rein,1994) and grapple with alternative policy frames and the conscientiousness of participants to judge the issues by their merits.

In this paper, we first consider some emerging technologies that have potential to provide assistance with managing complexity and understanding alternative viewpoints, as well as to provide adaptive and reliable information services. We then discuss the possibility of a research infrastructure to test and evaluate these technologies in realistic scenarios involving online deliberation communities.

Related Work

This research shares some of the objectives of *CommunityLab* (Konstan and Chen, 2007) which is a project to conduct online field experiments. The aim of *CommunityLab* is to combine the realism of existing online communities with the controlled comparisons normally only possible in a lab situation.

The NCeSS e-Infrastructure project (Daw *et al*, 2007) is addressing many of the requirements of the infrastructure concept being outlined here, particularly with respect to availability of information sources and evidence for policy arguments. The main difference is that we are also taking into account the need for the infrastructure to adapt autonomously to changing contexts and information requirements.

Research on online cognitive assistance is very relevant to the requirements for online deliberative democracy. Educational projects include Knowledge Media Institute's *Compendium* which assists with visual thinking.[1] Tools to support policy understanding include argument mapping (Klein and Iandoli, 2008) which promotes goal-directed discussion. *KerDST* (Chamaret *et al,* 2008) supports visualisation of policy choices, scenarios and arguments.

Assumptions about Deliberative Scenarios

In a public policy scenario, the mapping of stakeholders traditionally involves the categorisation of actors into different sets of stakeholders, for example, different local agencies, politicians, user groups, community organisations and local residents. Such maps focus upon shared institutional location to impute shared interests. However, for the purposes of this research, we assume that different policy subsystems are in fact structured by competitive discourse coalitions which bring together different stakeholders grouped around shared policy narratives, beliefs and values (Hajer, 1995). These coalitions cut across narrow institutional locations, bringing together value- or belief- based coalitions of actors from government agencies, interest groups, politicians, researchers, journalists. In so doing, we equally assume that actors within such coalitions will possess *different levels of beliefs*, drawing for example upon the work of (Sabatier and Jenkins-Smith, 1993) who distinguish between the deep (normative) core or fundamental norms and beliefs which are almost impossible to change, the near (policy) core or policy positions and strategies for attaining core values which are difficult to change and finally secondary aspects or instrumental decisions and information searches which are moderately easy to change through policy learning.

Example Scenarios

We will consider scenarios where local residents participate in an online forum and discuss policies affecting their neighbourhoods. The following are examples of such policies:

- closure of local health services to be replaced by more centralised ones.
- a new house building programme in a green space.
- airport expansion

We further assume that each forum participant is representing a group or coalition which has specific concerns about the proposed policy. For example, in the health services scenario, such groups may include patients, medical and care workers, the elderly, and mothers with young

1 http://openlearn.open.ac.uk/course/view.php?name=KM

children. In the housing scenario, they may include low income groups who require affordable housing as well as environmental and conservation groups. The airport expansion scenario has been considered in (Kennedy *et al*, 2008). We assume that online forum users will belong to pressure groups or voluntary organisations acting on behalf of vulnerable groups.

Participants should be given assistance to understand the potential consequences of the proposed policy, not only for their own group, but also for others. For example, this may be about the understanding of cultural sensitivities or the pressures of living in a deprived neighbourhood. Ideally all participants should reach a consensus on an acceptable policy, along with arguments in support of it. In practice, a consensus is often not possible due to conflicting values. In such cases, however, the forum should provide a space for the different communities to learn more about each other's concerns as well as to discover new policy options or new issues that may be relevant to the debate.

Requirements for Technological Assistance

We can identify two main requirements for deliberative democracy which may be met by technology:
-access to usable and reliable *information sources*
-*cognitive assistance*: support for understanding and learning about complex policy issues.

We discuss these in turn and consider the potential of emerging technologies to help satisfy them.

Access to Information Sources

Forum participants should be able to question the evidence on which arguments for proposed policies are based. For this purpose, reliable online information needs to be available. This might include, for example, peer-reviewed literature on the effects of similar policies in the past, or references to undisputed general knowledge, for example relating to environmental health or aircraft noise. We assume that the same kinds of services used by policy-makers and researchers (e.g. *PolicyGrid,* Chorley *et al*, 2007) can also be made available to community forums (in the sense of "open source" access). Clearly, however, additional educational tools are required to make the information available using non-specialist language and visualisations. Some projects in this area are ongoing (e.g. Globalsensemaking.net).

The following technologies are beginning to be used by social science and policy researchers:

Agent-based simulations: Agent-based simulations have the potential to help explain developments in society (for example, emergence of segregation in communities (Schelling, 1978)), provided they are coupled with effective visualisation tools. Simulations and their visualisations can also show the causal relationships between agents and actions as they develop in time (Epstein, 2006).

Data mining and Text Mining allow the discovery of hidden patterns and structure in masses of data including text. Some of these methods are being applied to the social sciences (Gibson et al, 2007).

Semantic Web technologies allow the retrieval of information based on semantic content, provided the data items have been classified according to an agreed set of concepts (an ontology). In addition to the *PolicyGrid* work, examples of social science web portals using

Semantic Web technology include *Madiera* (www.madiera.net/) and the *Data Chronicles* demonstrator (http://ulyanov.ncess.ac.uk/chronic/demonstrator/).

Folksonomies are classifications of online content which are determined by user-created tags (labels), e.g. *Flickr*. They can contribute to a "bottom-up" emergent classification instead of a top-down taxonomy. Folksonomies have the advantage of being accessible to non-specialist users. However, they do not have the rigour and explicit formalisation of meaning used in an ontology which is necessary for exact sharing of knowledge for scientific purposes. To address this problem, both methodologies can be combined. Machine learning such as data-mining can be used to generate an ontology from a folksonomy. Research is ongoing in this area (e.g. van Damme *et al*, 2007). Text mining can also be used to automatically generate ontologies or to extend or populate existing ontologies (e.g. Cimiano *et al*, 2006). Text available of blogs and online forums may be mined, along with more traditional surveys in which free text is used.

To be useful for non-technical social scientists, these technologies need to be incoporated into usable web portals that allow social scientists to carry out a research process (a workflow). One example of such a workflow that may become possible is the iterative and data-driven development of agent-based models which we investigated as part of the *AIMSS* project[2]. One conclusion resulting from this project is that the *automated management* of the information-providing infrastructure needs to adapt dynamically to the problem solving context (Kennedy *et al*, 2007).

Cognitive Assistance

The asynchronous nature of online forums can promote the "thoughtfulness and reflection" required for deliberative democracy (Fishkin, 2005) because responses can be delayed. Furthermore a detailed study (Min, 2007) has not revealed significant disadvantages for online forums when compared with face-to-face communication. However, most problems are not solved by online forums alone. Cognitive science and social psychology can provide valuable inputs to the design of additional tools that can assist forum members. We can identify four main requirements as follows, along with potentially useful technologies:

(1)*Focused and goal-directed discussion*: this includes ability to identify the relevant issues and maintain the discussion on them, while resisting distraction by irrelevant or emotive issues. Existing projects on online deliberation are addressing these challenges (e.g. Klein and Iandoli, 2008, Chamaret *et al,* 2008).

(2)*Ability to change one's mind* or discover new issues or options not previously considered or known about. Discovery of new issues and options may be assisted by online tools such as mining of text and data.

(3)*Hypothetical reasoning* about complex policy consequences. Due to the complexity of policy issues, participants are unable to predict all side-effects of their implementation. Agent-based simulation may assist with complex "what-if" reasoning.

(4)*Understanding experiences of other groups*. Forum members need to understand the concerns and experiences of others who may have different views but whose underlying concerns may be similar. When opposing views are based on fundamental values (which people are not willing to change) these values also need to be understood.

2 Adaptive Intelligent Model-Building for the Social Sciences http://www.cs.bham.ac.uk/research/projects/aimss/

Agent-based simulations have the potential to support hypothetical reasoning and understanding of other groups' experiences. Users may be better able to predict an end-point of the various synthetic scenarios developed in a deliberative process if (a) they have the technology to 'run' a simulation and (b) are given external working memory support. Working memory support enables actors to 'bank' and display one outcome of a 'what-if' scenario in a window while simultaneously developing a parallel scenario, and being able to switch between them – e.g. to let their visual system compute similarities and differences between the future possibilities.

The use of shared simulations and visualisations may also promote understanding among different groups. There is now considerable emerging evidence that one way of facilitating an understanding of another person's actions is if two actors jointly interact with the same simulation. Even if tasks within the common simulation are performed independently, the data suggest that a user has an internal representation of the task goals and actions of the other actor (e.g. Sebanz *et al*, 2003).

In the context of online forums, joint interactions with simulations may be possible in the form of role-playing games (e.g. Guyot and Honiden, 2006). Furthermore, if participatory methods are used to construct different simulations (and visualisations) of the same scenario, forum members can interact with all of them and obtain a view of other groups' experience of the world, which may not be possible using verbal communication only. More details on participatory methods are in (Kennedy *et al*, 2008).

Towards a Research Infrastructure

To test the above technologies and methods in realistic environments, a research infrastructure is needed in which their impact can be evaluated by different user groups. Such users include:

- communities participating in forums: to provide qualitative feedback.
- computer scientists: for iterative testing and improvement of technologies.
- social scientists: to study the social shaping of the technology and its potential for e-Government.
- cognitive and social psychologists: to study the effectiveness of technologies in providing cognitive assistance.

Psychology researchers normally carry out controlled experiments. If members of a deliberative forum participate in such experiments, the ability of tools to provide the required kinds of cognitive assistance can be measured in a controlled way. Experiments can help determine, for example, the effect of joint engagement with a simulation on participants' ability to change their understanding of other groups in policy scenarios. Objective quantitative measures are possible due to trace data provided by forum logs and might involve, for example, the time to converge to a joint decision or the delay due to conflicts or misunderstanding. Qualitative evaluations may be provided by user feedback and surveys. An example methodology is given in (Min, 2007) which compares online with face-to-face deliberation.

In addition to behavioural researchers, computer scientists also require experimental testbeds on order to develop adaptive information management and improve usability of tools. To address the needs of the different research communities, we define the infrastructure as a composition of two different environments: one for researchers and one for online forums.

Environment for e-Researchers

Figure 1 shows a generic diagram for an e-social science research environment, providing access to modelling and analysis tools as well as data sources. Two different research communities are represented: computer scientists and behavioural researchers (including social scientists and psychologists). Computer scientists *conduct experiments* to test and evaluate components of the infrastructure. This is shown by the red boxes and arrows. Social scientists (and other researchers in humanities and psychology) *use* the infrastructure and can provide feedback (blue boxes and arrows).

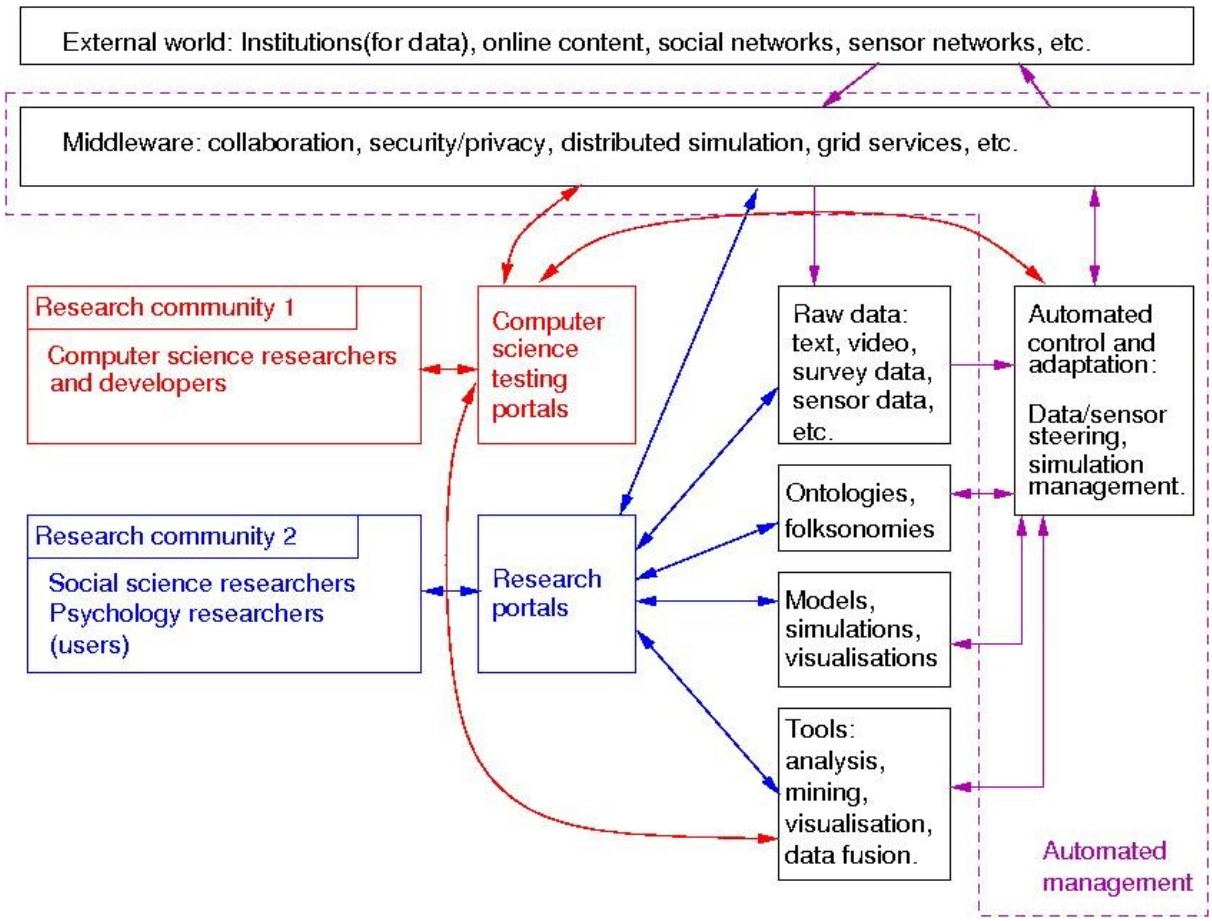

Figure 1: Environment for e-Researchers

Both communities work together but have different needs, which are represented by different kinds of research portal. For example, computer scientists will require unimpeded read/write access to the components they are aiming to debug and improve. This may involve components such as security and distributed simulation engines (the "middleware" box), since they may need to be adapted to the requirements of online deliberation and research experiments. Therefore, the infrastructure also acts as a *testbed for emerging technologies*.

Emerging technologies play a key role in *automated management* (components within purple dashed line). This includes an adaptive infrastructure for the generic middleware (e.g. distributed simulation) as well as reconfigurations and adaptations *in response to semantic content*. Although these components may be accessed as tools via a portal (particularly for computer science) they would normally be active continuously as background processes. Some examples may include the following:

1. automated adaptation of data collection and modeling to meet the demands of different users in a way that is sensitive to changing priorities and task requirements.

2. background machine learning involving data mining and content extraction (e.g. using text mining and image understanding algorithms). Output may be suggested ontology extensions, for example.

3. adaptation of data collection, integration and analysis in response to semantic content of raw data and simulation output.

4. alerting users to anomalies (contradictions) between model predictions and available data.

Processes (3) and (4) have already been investigated as part of the *AIMSS* project but need to be tested and developed further in realistic scenarios.

Environment for Online Deliberative Forums

Figure 2 shows an "open source" environment where citizens have access to the same e-infrastructure that researchers use. The blue arrows show read access for modelling and data analysis tools and read/write access to raw data and folksonomies (Web 2.0). A major addition is *learning resources* which provide "plain English" explanations and visualisations.

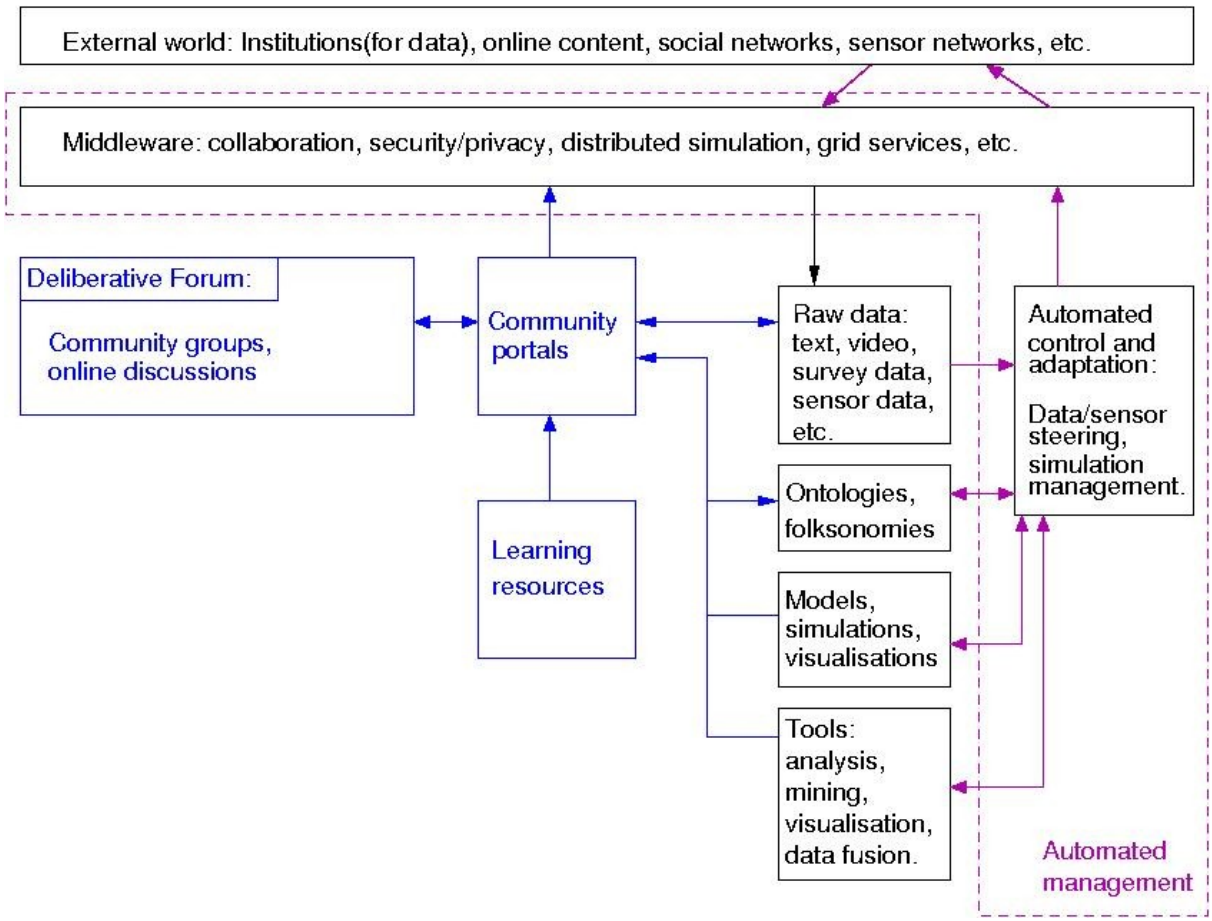

Figure 2: Deliberative forum with "Open Source" access to e-Science infrastructure

Combined Infrastructure

Figure 3 shows a combined infrastructure in which researchers study online deliberation (in red and blue boxes respectively). The two research communities in Figure 1 are included together in the one component because they are both playing a similar role, that of running experiments to study the impact of technology.

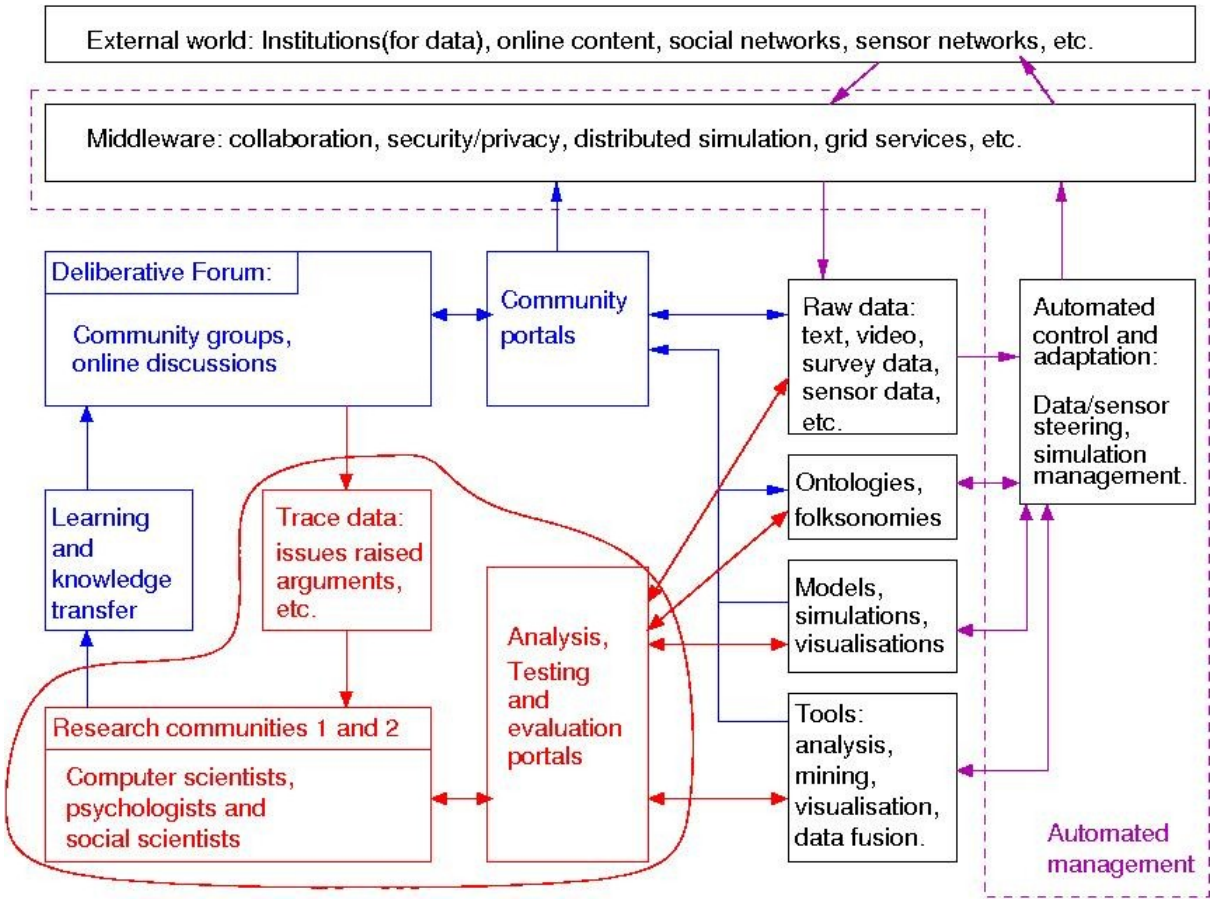

Figure 3: Combined infrastructure

Summary and Conclusion

There is significant potential for deliberative democracy to be enhanced by Internet communication, provided that suitable online tools are available for reliable information services and for cognitive assistance. Some emerging technologies show promise in providing these kinds of assistance. However, their impact on real-life deliberative forums needs to be evaluated collaboratively by multi-disciplinary researchers from social science, psychology and computer science.

We have outlined a concept for an experimental infrastructure which serves the needs of the different research communities and enables controlled experiments in which real-life deliberative forums can participate.

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