Supporting Large-Scale Deliberation: The MIT Deliberatorium

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The Challenge

The Internet enables unprecedented opportunities for large-scale knowledge sharing.

Can it foster large-scale deliberation - i.e. the synergistic (additive or even super-additive) channeling of many minds towards solving complex problems?

- Idea synergy
- The long tail
- Many eyes

- Wisdom of the crowds
- Many hands
- Critical mass incentives
What’s Wrong with Current Deliberation Tools?
**Time-Centric Tools (email, blogs, forums …)**

- **scattered content**
  - temporal rather than logical structure
  - balkanization

- **spotty/shallow coverage**
  - what’s missing?
  - parallel vs cumulative

- **low signal-to-noise ratio**
  - what’s already there?
  - getting the last word
  - lots of low-quality material
  - no/poor quality control
A Typical Example

Intel ran a web forum on organizational health: 1000 posts from 300 participants.

A team invested 160 person-hours to summarize these posts (10 minutes a post).

They found lots of redundancy, little genuine debate, and few actionable ideas.

In the end, most of the ideas came from the analysis team itself.
What About Wikis?

It’s true: wikis are organized *topically*, one article per topic.

But: wiki articles by their nature capture *consensus*. When applied to controversial topics, they:

- produce “least-common-denominator” content
- involve massive time-centric discussions and wasteful “edit wars”
  - e.g. Wikipedia on climate change
    - Article: 6500 words
    - Talk pages: ~1.5 million words
- and thus are prone to the same limitations as other deliberation-support technologies

Idea Sharing/Q&A Tools

Idea sharing tools present questions each linked to collectively generated and rated answers.

But: sheer volume undercuts added-value

- **Redundancy**: Google project10tothe100 generated 150,000 ideas, mostly repetitions or minor variants of each other - they needed 3,000 volunteers & 9 additional months to sort through.

- **Lock-in**: users tend to rate only the highest-rated ideas, ignoring potentially superior ideas buried below (cf Watts & Sagalnik).

- **Volume vs depth**: users tend to submit lots of simple ideas, instead of a few detailed ones, because there is no mechanism for collaborative refinement.
Incomplete and often flawed content

Hard to find the good stuff amongst all the noise
Argument Mapping Can Help!

Argument mapping can address these limitations by the simple but powerful trick of organizing contributions by topic, rather than by time.

Contributions are broken down into issues, ideas, and arguments; each unique point occurs just once in the place it logically belongs.

<table>
<thead>
<tr>
<th>issue</th>
<th>a problem that needs to be solved</th>
</tr>
</thead>
<tbody>
<tr>
<td>idea</td>
<td>an approach for addressing that issue</td>
</tr>
<tr>
<td>argument</td>
<td>an point for (pro) or against (con) an idea</td>
</tr>
</tbody>
</table>
What government policy can best meet our targets for reducing greenhouse gas emissions?

- Use carbon tax

- Use cap and trade
  - Prone to be gamed by industry
  - You’re right - see EU experience
  - How will certificates be distributed?
    - Given away for free by the government
    - Sold to the highest bidder

Better, more complete content (easy to find gaps, rate)

Small voices can be heard (not lost in the crowd)

Easier to find the good stuff (organized and compact)
Planeta.com (5/1/08) had a 13-page discussion on carbon offsetting pros and cons.
This discussion, in argument map form, becomes:

**Is Carbon Emission Offsetting a good idea?**

- **Yes**
  - Carbon offsets do reduce greenhouse gas emissions (if not fraudulent)
  - It is getting easier and easier to find good carbon offsets
  - Many major meetings are using them

- **No**
  - It fosters complacency, distracting from more important measures
  - It's too easy to cheat; may not always decrease carbon emissions
The MIT Deliberatorium

Integrates argument theory with large-scale social computing

- Open authoring to enable many eyes/hands effects
- Meta-contributors to manage process
- Watchlists/rollbacks for self-healing
- Rating to incent quality contributions
- Social translucence to mediate attention
**Unbundle** – break your thoughts into points that each contain just one issue, idea, or argument.

**Locate** – search the argument map to see where your point(s) belong.

**Enter** – If it’s a new point, create a new post, else refine existing post.

**Certify well-structured posts** - a *coaching role*

**Rate** to highlight worthy posts

The **live-and-let-live** rule: only edit a post to strengthen it

The **honest broker** rule: remain strictly content-neutral

Only certified posts can be viewed by readers
Major Evaluations

- University of Naples (Italy)
  - 3 weeks, 200 authors. bio-fuels

- University of Zurich (Switzerland)
  - 4 weeks, 300 authors, split across wiki, forum, and deliberatorium, bio-fuels

- BLM (USA)
  - 40 users, 10 agencies, water use

- Intel (USA)
  - 70 users, 2/3rds from outside, computing policy

- PD (Italy)
  - Forthcoming, hundreds of users(?), electoral law

- mWater (Spain)
  - Forthcoming, water rights
The Naples Evaluation (5.2007)

200 users, ~5000 posts, 2 moderators
Most Posts Were Well-Mapped from the Start

About 2/3rds required no changes before certification
Users Improved Over Time

The number of moderator inputs needed to get certified decreased 35% with time (p < 10^{-8}).
About 70% of arguments addressed posts by other authors
a large non-expert community comprehensively covered a complex contentious topic in just a few days with no one in charge

**Map Quality**

**Deliberation Map**

- How to reduce the barriers to the spread of biocidal products...
  - reducing the impact on the environment and health...
  - through appropriate subsidies from the state aprte
  - increase the availability of local raw materials...
  - By introducing appropriate sanctions
  - reducing conflicts and local self-interest
  - Weakening of the opposition of the multinationals...
  - reducing the "competition for land" and increasing...

- What future for biofuels in Italy?
  - The future of green energy committee is already in Italy...
  - How to enhance the production of bi...
  - How can Italy 'supplies and use...
  - To what extent and how the production of biochar...
  - To what extent will spread in Italy 'use...
  - What effects the development of biofuels try...
Challenges Moving Forward

- Attention mediation
  - Seeing the forest for the trees

- Crowdsourcing
  - Harnessing the crowd to radically reduce authoring and moderation costs

- Convergence
  - Finding good solutions with inter-dependent components
Even moderate communities can rapidly generate very large maps too large to easily comprehend

See Naples map

How can people see the forest for the trees?

Authors: where can I contribute most?
Managers: where are the problems (groupthink, balkanization …)
Customers: which branches are ready to “harvest”?
Deliberation Analytics

Emergent effect: everyone works where they personally can *do the most good*
“ideal” deliberation model

development of stronger community among participants

development of small-world connectivity structure

identify goals
- identify all relevant goals
- get input from all relevant perspectives

identify possible decisions
- full coverage of ideas space
- diverse range of idea contributors
- contributors are incented to contribute ideas
- benefits of contributing ideas are high
- cost of contributing ideas is low
- contributors allocate their efforts to gaps areas
- easy to identify gaps
- high-quality ideas

place in deliberation map

deliberation engine

evaluate decisions wrt goals
- complete evaluation
- high-quality evaluation
- back up evaluations with solid arguments
- arguments are well-founded
- arguments are complete
- contributors are incented to contribute arguments
- easy to identify missing arguments

community rates arguments to separate wheat from chaff

metric: show propagated support values

place in argument tree

select the best decision
- individual select solutions rationally
- based on mature deliberation
- based on complete evaluation
- based on fully enumerated idea space
- consensus-based fair outcome
- fair decision procedure
- input from all stakeholders
- rational (pareto-optimal) outcome
Goals -> Exceptions -> Handlers

P: Deliberation Process

- has-part P: evaluate solutions

- requires ❤ complete evaluation

- has-part ❤ includes all relevant arguments

- raises ⚠ incomplete argumentation

- is-handled-by P: detect: few/no arguments on idea

- is-handled-by P: detect: inconsistent propagated vs actual ratings
Other Examples

- Author alerts
  - posts interesting to people like me
  - controversial topics
  - irrational bias

- Topic manager alerts
  - Balkanization/preaching to the choir
  - Groupthink/attentional focusing

- Customer alerts
  - Issues to ideas to arguments to rating
  - Reduced rating churn

Using standard techniques ...
- Singular vector decomposition
- Social network analysis
- Clustering
- Belief propagation

(over 120 metrics so far)
The Surprising Power of Large-Scale Argumentation

Large-scale argument maps allow *much* more powerful analytics than conventional social media.

- A little formalization goes a long way
- A little information (per user) in abundance is a lot
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Incentives
a cost/benefits analysis
Cost vs Benefits

- Mapping Cost
- Compression Benefit

Graph showing the relationship between cost and benefits, indicating redundancy as the compression benefit.
Moderators = super-users
Technical Issues

- How enable high-quality *structure*?
  - Many people are poor at argument mapping
  - Large volume may lead to competing issue skeletons

- How enable high-quality *content*?
  - Controversial topics elicit sabotage, gaming, noise

- How manage impact of *change*?
  - Changes have non-local impacts in an argumentation structure

- How mediate *attention sharing*?
  - How deal with sheer size of complex issue spaces?
  - How ensure systematic coverage without co-location & central mediator?
  - How avoid balkanization & lost voices? How maximize cross-fertilization?

- How determine *consensus*?
  - In complex domains, issues are *interdependent*, creating vast decision spaces
  - Simple selection must give way to *collective nonlinear optimization*
How enable high-quality content?

❖ Wiki “anyone can edit anything” model
  ◆ Ensures diverse perspectives and self-healing content
  ◆ Amateurs can over-write experts -> motivation issue
  ◆ Muddies credit assignment for reputation tracking
  ◆ Controversial topics lead to edit wars

❖ Forum “one author many commentors” model
  ◆ Encourages expert contributions
  ◆ Single author bottleneck
  ◆ Posts are usually static, so comments do not impact quality

❖ Collaboratorium design choices
  ◆ Anyone can create a post
  ◆ Only authors (or their designated proxies) can edit it
  ◆ Anyone can make/endorse suggestions
  ◆ Users get credit for highly rated posts or suggestions

❖ Intended consequences
  ◆ Each post represents a single perspective
  ◆ A committed self-selected cadre gathers to express that perspective as clearly and fully as possible, enriched by substantial community feedback
  ◆ Alternative perspectives are captured in separate posts - no need for edit wars
How enable high-quality structure?

- Initial issue ‘skeleton’ created by experts
- Search tools find matching branches, annotated with activity level
  - So users can find *most-attended* relevant branch
- Intended consequences
  - Fracturing is reduced by coherent initial skeleton
  - Users usually put posts in right “ballpark”
  - Editors ensure proper argument mapping
  - Users are motivated to develop argument mapping skills
  - “stigmergic” self-reinforcing convergence process
How manage impact of change?

- Watchlist and search functions, extended to notify users about changes to *linked* posts, to enable self-healing
How mediate attention sharing?

- Active, “hot”, and highly-rated branches are visually salient and can constrain search
- Users can tag items as “hot” (using token budget)
- Users can create/search for “calls-for-input”
- Intended consequences
  - You feel part of a team because you can “see” it act
  - Users rapidly exploit “fertile” areas (stigmergy) and attend to posts that need improvement
How enable consensus?

- A special “proposal” branch consists of unique combinations of ideas from other branches
- New proposals can extend existing ones
- Users can endorse proposals
- Intended consequences
  - Users pool expected utility judgments to guide a collective optimization search process
Strategic Issues

In what contexts, with what people, will this give good results?
# Possible Applications

<table>
<thead>
<tr>
<th></th>
<th>Exploration</th>
<th>Convergence</th>
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</thead>
<tbody>
<tr>
<td>Citizenship</td>
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<td>Change agents</td>
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<td>Governance</td>
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<td>Business</td>
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<tr>
<td>Education</td>
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A trail of crumbs ...

Can we design a sequence of applications that develop self-sustaining communities for a broadening range of uses? e.g.

- Start with wikipedia for climate change interventions, to develop a knowledge base and expert community
- Invite change agents/businesses/executives to use the idea handbook and pose questions to the community
- Develop enough credibility/impact to become the forum of choice for policy debate
Our approach

**Technical**: Trade-off between scalability and structure, defining suitable formats for on-line arguments, Argument evaluation and scoring (quality & impact), Robustness to attacks and unfair ratings, …

**Organizational**: Roles & rules, Incentives, Manage the trade-off between exploration and convergence, …

**Strategic**: Identify users and stakeholders, critical mass, companies and other organizations involvement, …
Design the argumentation community

On-line community as a virtual organization

Incentives
- Attract
- Motivate

Voluntary members

Mission
- Attract
- Motivate

Voluntary members

provide
- attention
- knowledge

provide organize rate

deliberation

Exploration → Convergence

produce
- decisions
Design the argumentation community

The on-line argumentation process in a proxy democracy scenario
The design of the knowledge format

IBIS
Concklin, 2003

Argument Scheme
Walton, 2006

Ground+warrant
Toulmin, 1959

Issue

Idea

Evidence

Scheme

Evidence

Scheme

Pro Argument

Con Argument
Scale-Enabled Incentives

- Finding your tribe
- Having an impact (becoming a hero)
- Reputation
- Networking
- Profit
- Self-definition
- Entertainment
- Self-development
Virtuous Emergence

- Idea synergy
- Diversity (the long tail)
- Wisdom of the crowds (Condorcet jury theorem)
- Many eyes
- Many hands
- Small worlds (connecting people)
- Quality competition
- Ad hoc organizations
- Matchmaking (tasks to resources)
- Economies of scale
- Building communities
- Bird’s eye view
A Scenario

Kara, an MIT PhD student, wants to learn more about something she read in the newspaper, about a plan to add iron to the oceans to help with climate warming somehow. So she uses the search function to look for articles that mention iron:
A Scenario

... and finds a relevant match
A Scenario

... she clicks on the article

![Article on iron fertilization of ocean](image-url)
Now she can see why people would consider putting iron in the ocean: it encourages the growth of living things that sequester carbon dioxide, a greenhouse gas. Interested in learning more, she clicks on the discussion tab to see what comments other people have left on the topic.
She can see that iron fertilization is controversial. It's time to step back and see if the same goals can be achieved with fewer negative effects. By looking at nearby articles in the topic tree, she can see that there are other ways to sequester greenhouse gases by encouraging plant growth, which have fewer negative points, judging from the “pro” and “con” articles linked to them, than ocean fertilization.
A Scenario

Kara sees that the topic has a score and she also knows that these scores are not like a traditional poll, but that they keep into account people votes as well as the strength of the pro’s and con’s supporting or attacking the arguments.
Kara found that she was particularly influenced by articles that were authored, or endorsed, by organizations she felt she can trust. Every user has a reputation score and a collaboratorium home page where you can learn about their interests, as well as see what they have contributed. When Kara found an article she liked, she checked out the author’s home pages to learn more about them. She could see, for example, that the Climate Change Center at MIT has authored many highly-rated articles: she’ll keep her eye out for their work in the future.
Kara was impressed by the depth and breadth of the contributions. The material covers a wide range of topics, ranging from ideas for making houses more energy-efficient, to climate-related governmental policies.

The contributors represent scientists, educators, policy makers, engineers and so on from think tanks, corporations, university research centers, and NGOs from around the world. Many are able, by virtue of their access to specialized expertise and sophisticated simulation models, to make authoritative contributions concerning the strengths and weaknesses of different climate-related technologies and policies.

People of all background and political stripes are represented. Everybody gets to make their own pitch, and all the ideas or arguments on a given subject appear side-by-side so they can be compared directly with one other. Nobody can dominate the discussion because each idea and argument appears just once, in its own article. There seems to be a real community ethos built around the idea of careful well-founded critical thinking. You can tell: the highest-rated articles, and the most active and respected members of the community, all seem to reflect this aspiration.