The future of work: How can we create more intelligent organizations?

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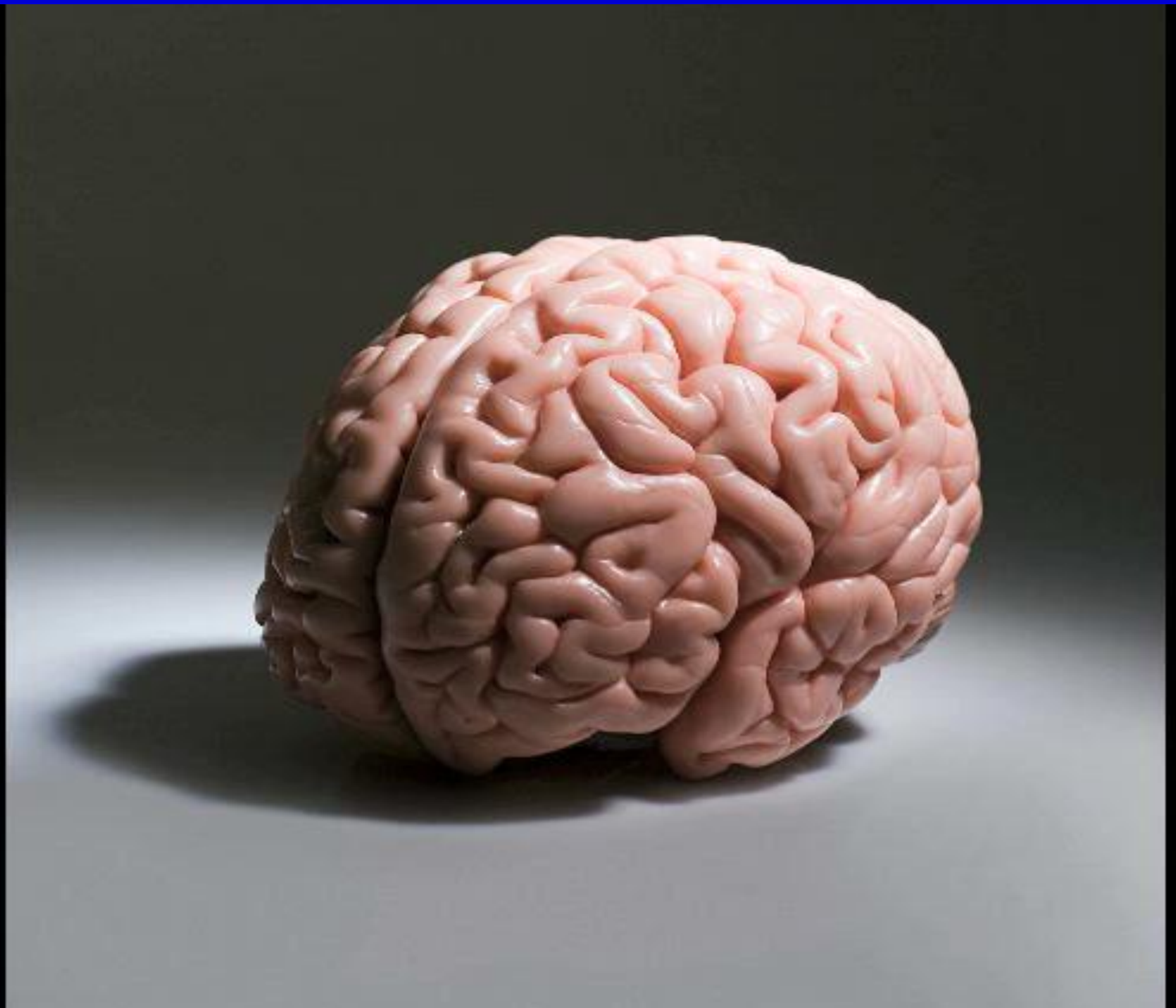

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Today's featured article

Vidkun Quisling (1887–1945) was a Norwegian politician. On 9 April 1940, with the German invasion of Norway in progress, he seized power in a Nazi-backed coup d'etat. From 1942 to 1945 he served as Minister-President, working with the occupying forces. His government, known as the Quisling regime, was dominated by ministers from *Nasjonal Samling*, the party he had founded in 1933. The collaborationist government participated in Germany's Final Solution. Quisling was put on trial during the post-war legal purge in Norway and found guilty of charges including embezzlement, murder and high treason. He was executed by firing squad at Akershus Fortress, Oslo, on 24 October 1945. During World War II, *quisling* became a synonym for *traitor*. (**more...**)

In the news

- Liu Yang becomes the first Chinese woman in space, following the launch of **Shenzhou 9**.
- The Supreme Constitutional Court of Egypt **dissolves** the country's parliament *(Egyptian coat of arms pictured)*.
- NASA's **Nuclear Spectroscopic Telescope Array** is launched.
- More than 90 people are killed in a **series of car bombings** across Iraq.
- **Jon McGregor** wins the International IMPAC Dublin Literary Award for his novel *Even the Dogs*.
- An Australian coroner rules that a dingo

The Question

How can people and computers
be connected so that
—collectively—
they act more intelligently
than any person, group, or computer
has ever done before?

Measuring collective intelligence

- People who are good at one cognitive task are, on average, also good at others.
  - Spearman's general cognitive ability (*g*)
- Intelligence tests measure this general cognitive ability
  - First principal component in a factor analysis
  - Predicts school grades, job performance, life expectancy…
- Does such a general cognitive ability exist for groups?
  - And how can we measure it?

Results

- **Yes, there *is* a general cognitive ability for groups.**
  - **"Collective intelligence"**
- **Collective intelligence is only weakly correlated with the average and maximum intelligence of the individuals in the group.**

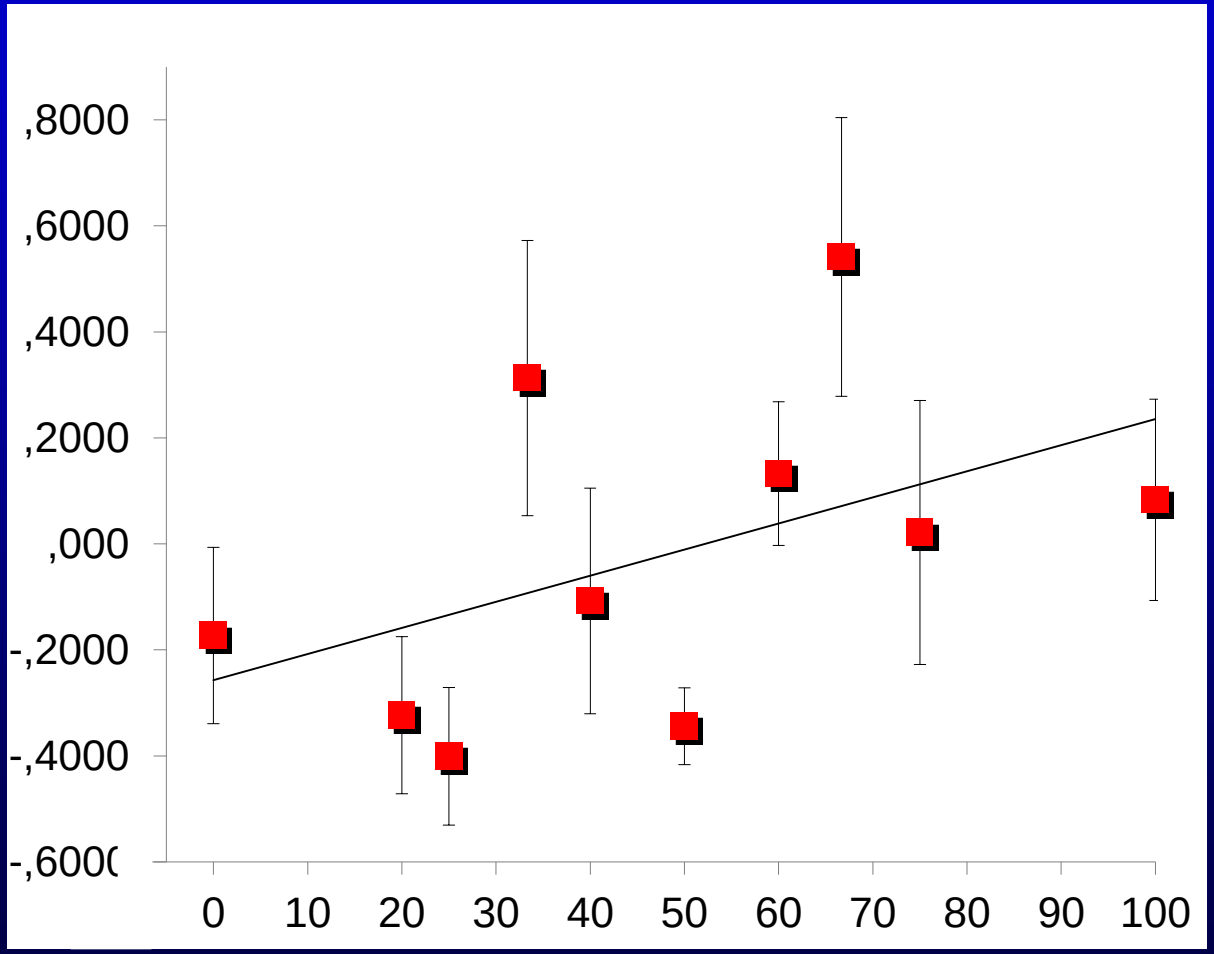
Woolley, Chabris, Pentland, Hashmi, & Malone, *Science*, 2010.

Results (cont.)

- Collective intelligence *is* correlated with
  - "Social perceptiveness" of group members
  - Equality of distribution of turn-taking
  - Proportion of females in group
    - Largely explained by "social perceptiveness"

Woolley, Chabris, Pentland, Hashmi, & Malone, *Science*, 2010.

Results (cont.)



Collective Intelligence*

Percent Female

* avg std scores of all groups with specified percent female

Questions

- Can collective intelligence tests predict the performance of groups on other real-world tasks?
- How can we improve collective intelligence?
  - Group size
  - Group norms for interaction
  - Computer support
  - …

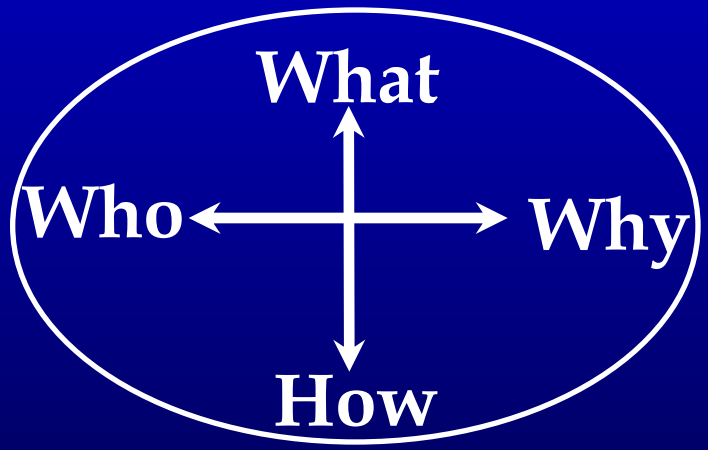
What are the basic *organizational design patterns* of collective intelligence?

- Collected over 200 "interesting" examples of Internet-enabled collective intelligence
- Identified common design patterns or "genes"

Types of organizational genes

Create
Decide

Crowd	Hierarchy



- Money
- Glory
- Love

	Crowd	
	Independent	Dependent
Create	Collection	Collaboration
Decide	Individual decisions	Group decision

Malone, Laubacher, Dellarocas, 2010.

Example: Genetic structure of Linux

Example	What		Who	Why	How
Linux	Create	New software modules	Crowd	Love Glory	Collaboration
	Decide	Which modules warrant inclusion in next release	Torvalds and lieutenants	Love Glory	Hierarchy

Malone, Laubacher, Dellarocas, 2010.

How?

	Crowd	
	Independent	**Dependent**
Create	Collection • Contest	Collaboration • Hyperspecialization
Decide	Individual decisions • Market • Social network	Group decision • Voting • Consensus • Prediction markets

Malone, Laubacher, Dellarocas, 2010.

How?

	Crowd	
	Independent	**Dependent**
Create	Collection • Contest	Collaboration • Hyperspecialization
Decide	Individual decisions • Market • Social network	Group decision • Voting • Consensus • Prediction markets

Malone, Laubacher, Dellarocas, 2010.

Gene: Contest

- A subtype of Collection where one or a few items in the collection are selected as winners

- Examples
  - InnoCentive
  - TopCoder
  - Netflix prize
  - Yahoo Answers
  - Goldcorp challenge
  - Threadless
  - Matlab
  - Quirky

Example: Quirky

- Consumer products company
- Community of 285,000 inventors
  - 1,500 product ideas / week submitted
  - 1 or 2 selected for development
- Company does detailed design with input from community
- Most manufacturing in Asia
- Retail sales through own website, Target, Amazon, …

Gene: Hyperspecialization

- A subtype of Collaboration in which the pieces done by different people are much smaller or more specialized than today's jobs
- Examples
  - TopCoder
  - Amazon Mechanical Turk
  - CrowdForge

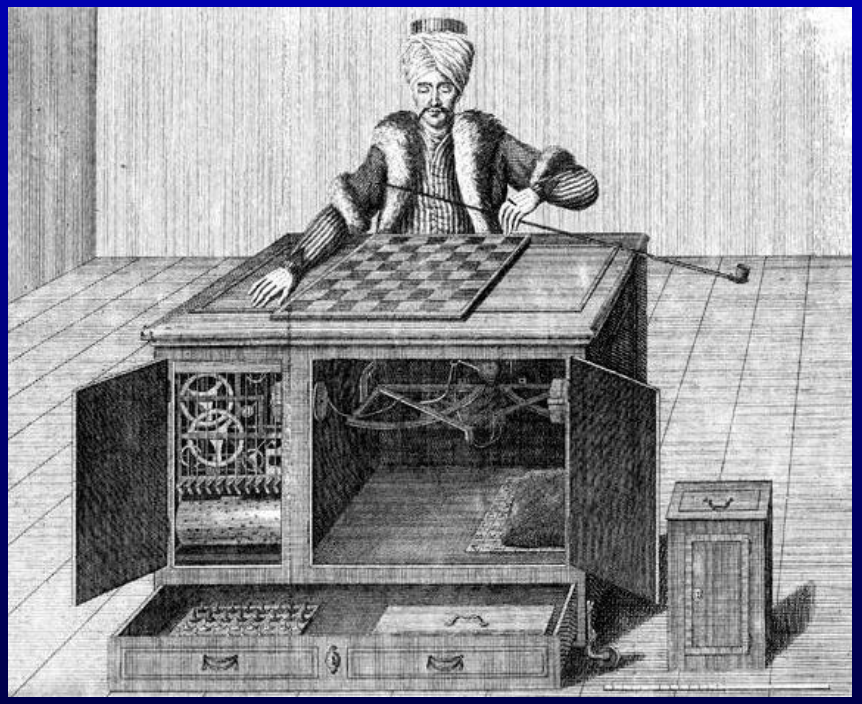
Malone, Laubacher, & Johns, 2011.

Example: TopCoder

- Software development community with over 400,000 registered freelance programmers from all over the world.
- Each project is divided into many small tasks (requirements specification, architectural design, user interface design, coding different modules, integration, testing).
- Freelance programmers compete to do these tasks and win prize money.
- Different programmers specialize in different types of tasks.

Amazon Mechanical Turk

- Name comes from 18th century chess-playing "automaton" that actually had a small chess master inside



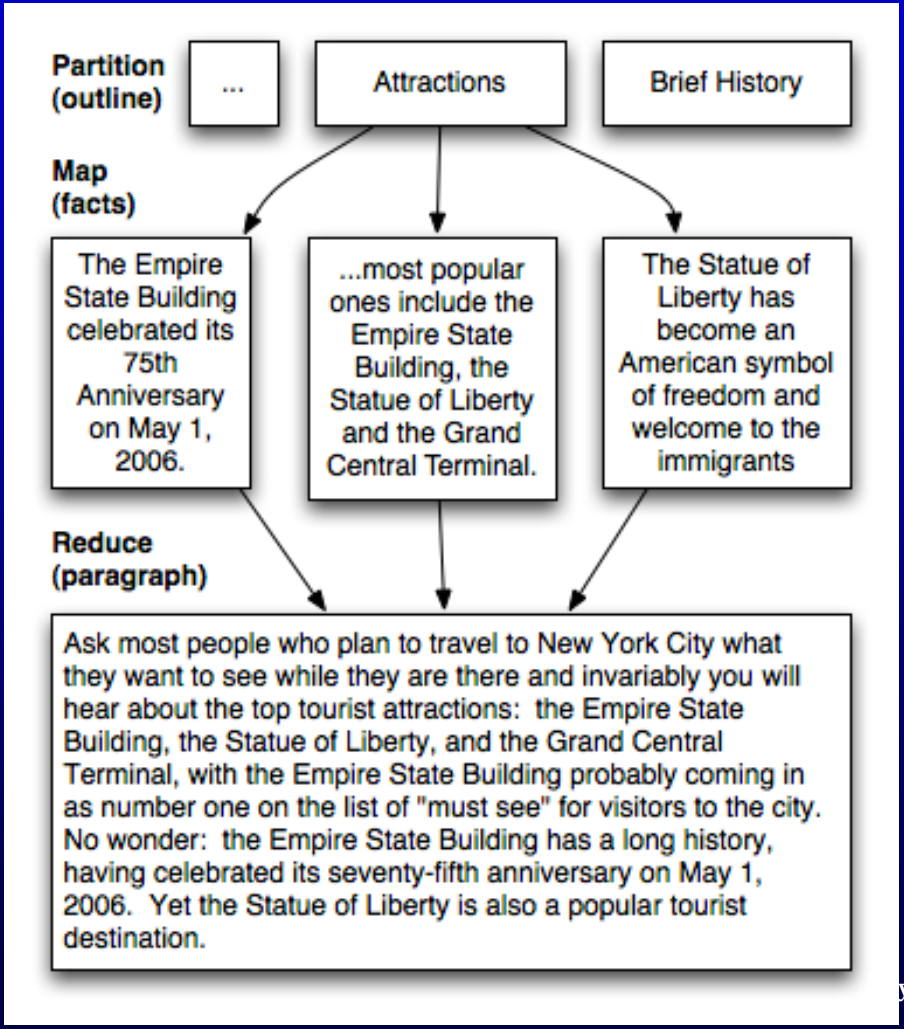
Amazon Mechanical Turk

- On-line marketplace for work that requires human intelligence (and can't be done by computers)
  - Transcribing audio
  - Understanding news articles
  - ...
- Many tasks are very small and pay only a few cents.

CrowdForge

- By Kittur, Smus, & Kraut at Carnegie Mellon University
- Crowds write documents (or perform other complex tasks) through microtasks done via Amazon Mechanical Turk
- Examples:
  - Writing an encyclopedia article on New York City
  - Developing a product comparison table for cars

CrowdForge (cont.)



CrowdForge (cont.)

- Independent judges rated articles written by the crowd as:
  - Better than similar articles written by individuals (for the same cost)
  - Equivalent to the Simple English Wikipedia article on the same topic

Gene: Voting

- Reddit
- IBM Jams (evaluation phase)
- Schaumburg Flyers
- Ebbsfleet United
- Kasparov v. the World
- Threadless

Schaumburg Flyers

- Minor league baseball team near Chicago
- Through Internet voting, fans decide batting order, pitching rotation, starting line-up, and which players to trade
- Goal: Reality Baseball with fans all over the world visiting the web site frequently
- Result: Team had disappointing season. Some people blamed voting for bad results.

Ebbsfleet United

- UK football (soccer) team
- Shares purchased by over 30,000 members in over 80 countries
- Membership fee: £50 / yr (appx. $77)
- Members vote on team selection, final budgets, player trades

Kasparov vs. the World

- Players:
  - Gary Kasparov (world chess champion, 1999) vs. the rest of the world (moves decided by majority vote)
  - Kasparov heavy favorite before play began.
  - Used on-line discussions, and suggestions by 5 well-known chess experts
- Result: Kasparov won after 62 moves in 4 months.
- He said it was the hardest game he ever played.

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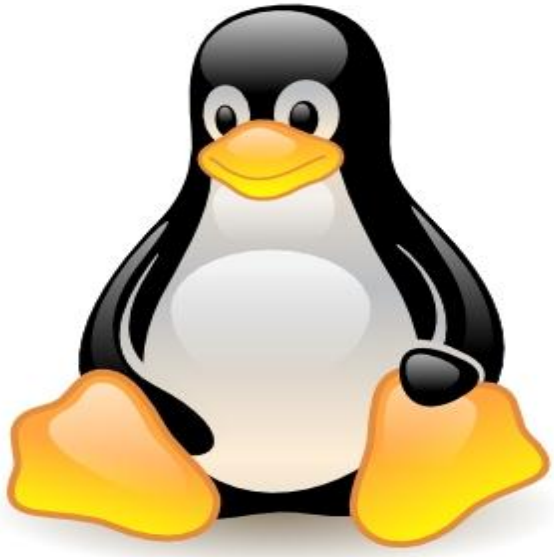
Linux



Google

In the Climate CoLab, you can work with people from all over the world to create proposals for what to do about climate change.

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The Climate CoLab is a project of the MIT Center for Collective Intelligence in collaboration with many other organizations

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Building efficiency: Social Actions

What social actions can encourage adoption of physical actions that increase building efficiency?

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dickmcmanus added comment to Running on Empty Caucus of USA Democrats in Building the CoLab

1 day ago

Proposal for Contest 2011: Global by dennis

2010 Winners Combined

DESCRIPTION | MODEL RESULTS | CONTRIBUTORS 1 | COMMENTS 9

Show history

Pitch

Description

Executive summary

This is an attempt at combining the three winning proposals of the 2010 contest. All three proposals have an emphasis on easing global negotiations.

Setting modest initial targets makes an initial agreement easier to achieve, paving the way for more aggressive action later.

Setting a price on carbon, instead of caps, allows countries to negotiate a single price they all agree on, instead of a separate cap for each country. This also makes it easier to renegotiate later.

Regional agreements are easier to accomplish than global ones. Adding carbon tariffs between the regions compensates for the economic inefficiencies that would otherwise result.

Each regional agreement should include both developed and developing nations, with the developed nations bringing developing nations along by assisting with climate adaptation. Focusing on adaptation initially helps build the foundation for more aggressive mitigation efforts later.

7 supporters Support proposal

Subscribe

PROPOSAL SUMMARY

2010 Winners Combined

Team Proposal: Only team members will be able to edit this proposal.

By: dennis

Contest: Contest 2011: Global
How should the global economy evolve through 2100, given the risks of climate change?

MODEL RESULTS SUMMARY

CO2 concentration
607 ppm in 2100

Temperature Increase
3.0 °C

Mitigation Costs
-4.2% to 0.0% %GDP in 2100

Proposal for Contest 2011: Global by dennis

2010 Winners Combined

DESCRIPTION | MODEL RESULTS | CONTRIBUTORS 1 | COMMENTS 9

Model: This contest used the MIT Composite Model.

Actions

Developed countries emissions change
Fossil Fuel Emissions Change -30%
Start Year 2012 Target Year 2050

Rapidly developing countries emissions change
Fossil Fuel Emissions Change 100%
Start Year 2012 Target Year 2050

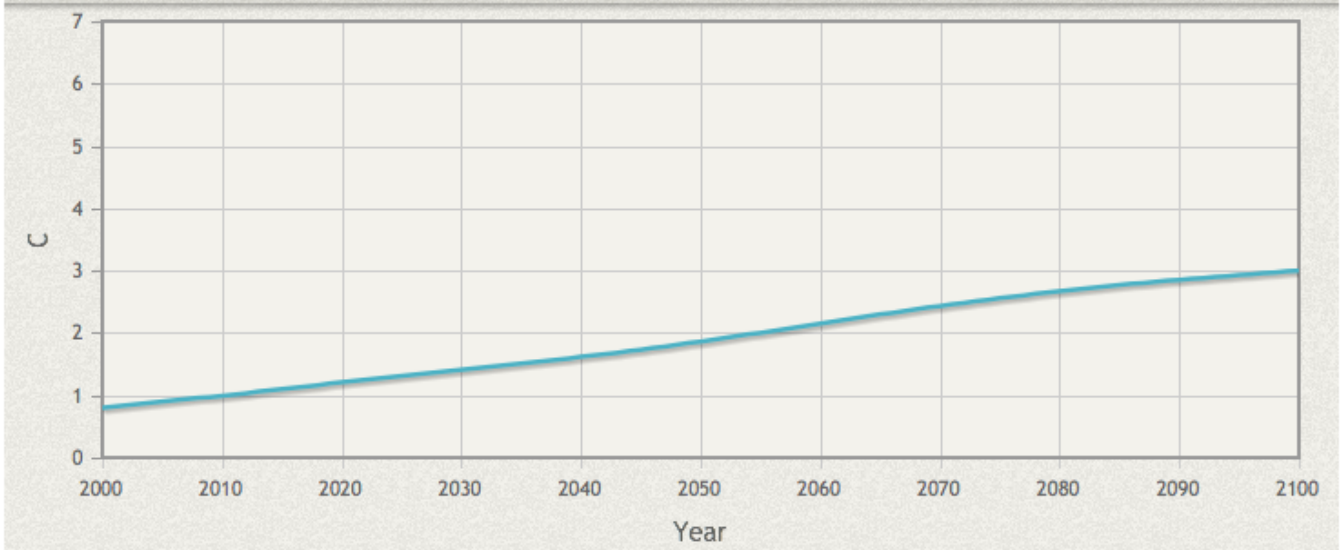
Other developing countries emissions change
Fossil Fuel Emissions Change 100%
Start Year 2012 Target Year 2050

Deforestation
0.5

Afforestation
0.5

Impacts

Fossil Fuel Emissions | CO2 Concentration | Temperature Change | Sea Level | Mitigation Cost | Damage Cost | Physical Impacts



Global mean temperature change above preindustrial values (degrees Celsius, 1 degree Celsius = 1.8 degrees Fahrenheit)

Contest 2011: Global

Contest ended Contest phases: **Voting phase** Second phase First phase

How should the global economy evolve through 2100, given the risks of climate change?

Voting has now ended and the contest results will be announced on November 16. Winning proposals will be featured in briefings now being planned at the United Nations and U.S. Congress. For more information, see contest overview.

What: Any actions **Where:** Global **Who:** Any organizations or individuals

Discussion

3 proposals

Proposal name / Author(s)			Modified	Contributors
2010 Winners Combined / dennis	7	9	10/28/11	team only
The Planet Or Your Plate: mitigate climate change by going meatless / beach-babe-in-fl Mitigate climate change by a rapid reduction of the short lived warming gases by advocating for less meat consumption globally	77	49	11/1/11	team only
RewirePlus: Behaviour change and value change for the emerging green economy / zannahmae A shift to a green economy will require changes in behaviours and values all the way down to the individual. Here's how we get started!	16	6	10/31/11	team only

Breaking the problem into pieces

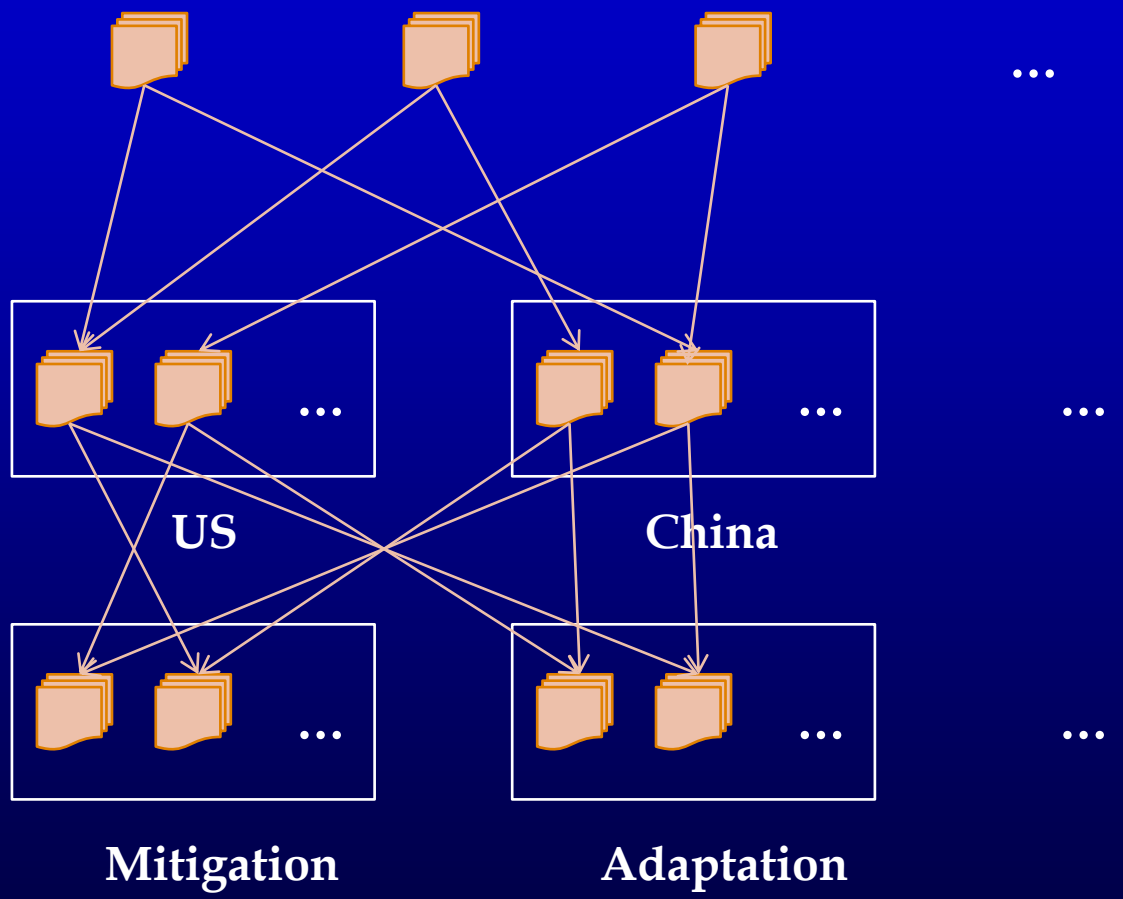
- What can electric utilities do to generate electricity with lower carbon emissions?
- What can city governments do to adapt to rising sea levels?
- What social actions could most effectively change cultural attitudes about climate change?

Putting the pieces back together

Integrated global proposals

Integrated regional proposals

Action proposals



References

- **Measuring collective intelligence**
  - Woolley, A. W., Chabris, C. F., Pentland, A., Hashmi, N., & Malone, T. W. Evidence for a collective intelligence factor in the performance of human groups, *Science*, 29 October 2010, *330* (6004), 686-688; Published online 30 September 2010 [DOI: 10.1126/science.1193147] . http://www.sciencemag.org/cgi/content/abstract/science.1193147
  - Woolley, A., & Malone, T. Defend your research: What makes a team smarter? More women, *Harvard Business Review*, June 2011, 89 (6): 32-33 http://hbr.org/2011/06/defend-your-research-what-makes-a-team-smarter-more-women/ar/1
- **Collective intelligence genome**
  - Malone, T. W., Laubacher, R., & Dellarocas, C. The Collective Intelligence Genome, *Sloan Management Review*, Spring 2010, *51*, 3, 21-31 (Reprint No. 51303).http://sloanreview.mit.edu/the-magazine/articles/2010/spring/51303/the-collective-intelligence-genome/#1
  - Malone, T., Laubacher, R., & Johns, T. The Age of Hyperspecialization, *Harvard Business Review*, July-August 2011, 89(7/8): 56-65. http://hbr.org/2011/07/the-big-idea-the-age-of-hyperspecialization/ar/1

References (cont.)

- **Climate CoLab**
  - Introne, J., Laubacher, R., Olson, G. & Malone, T. The Climate CoLab: Large Scale Model-based Collaborative Planning. *Proceedings of the International Conference on Collaboration Technologies and Systems* (CTS 2011), Philadelphia, PA, May 23-27, 2011 (Winner of Outstanding Paper Award). http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=5928663&tag=1&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxpls%2Fabs_all.jsp%3Farnumber%3D5928663%26tag%3D1
  - http://climatecolab.org
- **Global brain**
  - Bernstein, A., Klein, M., & Malone, T. W. Programming the global brain. *Communications of the ACM,* May 2012, 55 (5): 41-43. http://cacm.acm.org/magazines/2012/5/148531-programming-the-global-brain/abstract
- **Center for Collective Intelligence**
  - http://cci.mit.edu