The Intelligence Community by 2015

Collective Intelligence and Knowledge Ecosystems

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Excerpt from VISION 2015 Overview Briefing, “Creating a Globally Networked and Integrated Intelligence Enterprise”

The Intelligence Community by 2015

From ODNI’s “VISION 2015”:

- Traditional distinctions between intelligence and information, strategic and tactical, are increasingly irrelevant, challenging conventional definitions of intelligence itself

Excerpt from Global Trends 2015 Report, published December 2000

Turbulent Environments

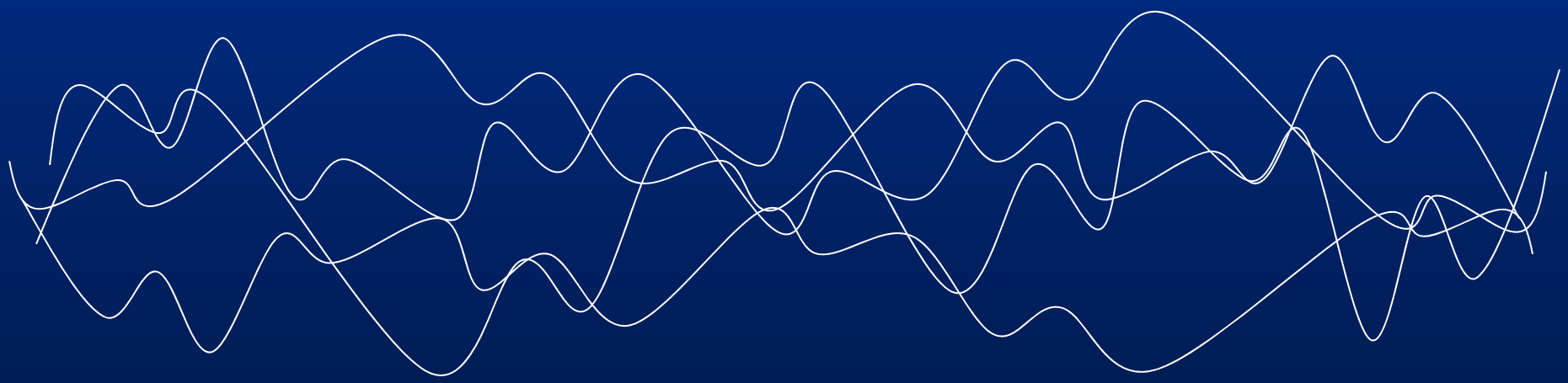
From CIA's "Global Trends: 2015"

- Unrestricted flows of information, ideas… effective governance will increasingly be determined by the ability and agility... to exploit increased information flows

- published in 2000

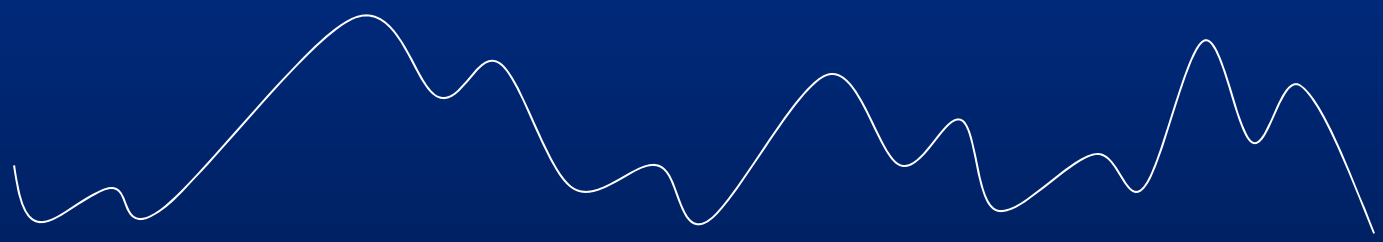
Turbulent Environments

The external environment to IC is changing more rapidly than the IC is presently



Turbulent Environments

The challenge of turbulent environments is true for the majority of large organizations as a result of increasing global transactional:



- Velocity
- Volume
- Volatility
- Veracity

Turbulent Environments

With turbulent environments, traditional "top-down" approaches to management are inefficient at:

- Rapid awareness and assessment
- Rapid response to new threats or opportunities

Turbulent Environments

Perhaps the IC needs to experiment with "bottom-up" approaches to intelligence gathering and partnerships, with the goals of:

- Rapid awareness and assessment
- Rapid response to new threats or opportunities

... but first, let's return to the fundamentals

Excerpt from Merriam-Webster Online, m-w.com

Turbulent Environments

Defining (General) Intelligence:

- The ability to learn or understand
- To deal with new or trying situations
- The skilled use of reason
- The ability to apply knowledge to adapt to one's environment

Reference: Malone, Thomas. (2004) The Future of Work.

Collective Intelligence

- Group(s) of individuals doing things collectively that seem intelligent
- Groups addressing new or trying situations
- Groups applying knowledge to adapt to a changing environment

Reference: Malone, Thomas. (2004) The Future of Work.

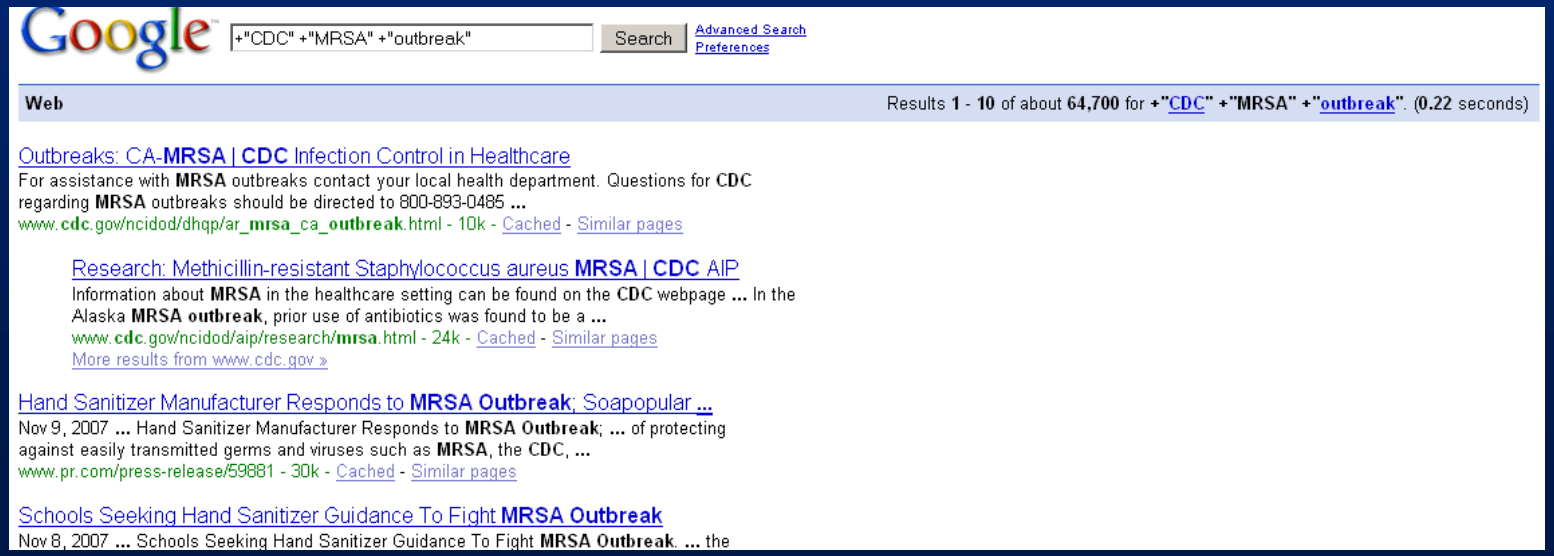
Collective Intelligence

- Old concept, since hunter-gather societies
- What's different now are web technologies

How can people and computers be connected so that <u>collectively they act more intelligently</u> than any individual, group, or computer has ever done before?

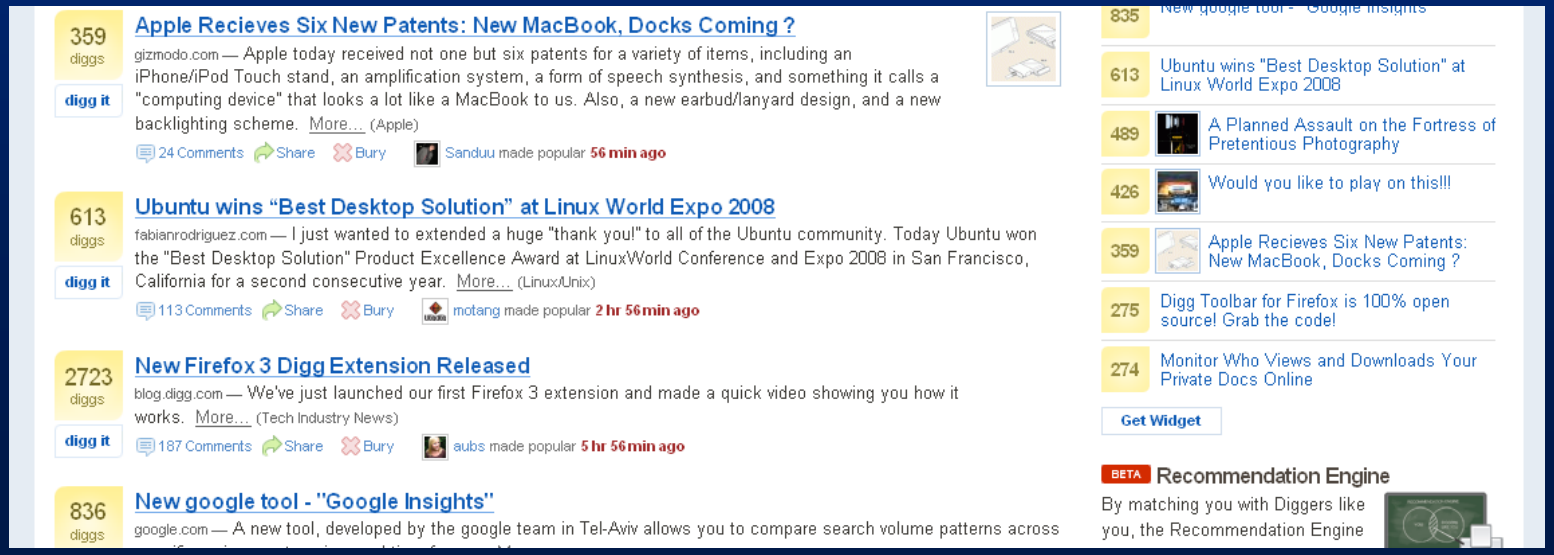
Collective Intelligence

Google: machine assisted search of the internet, using automated computer programs to comb through the millions of pages created (for the most part) by humans



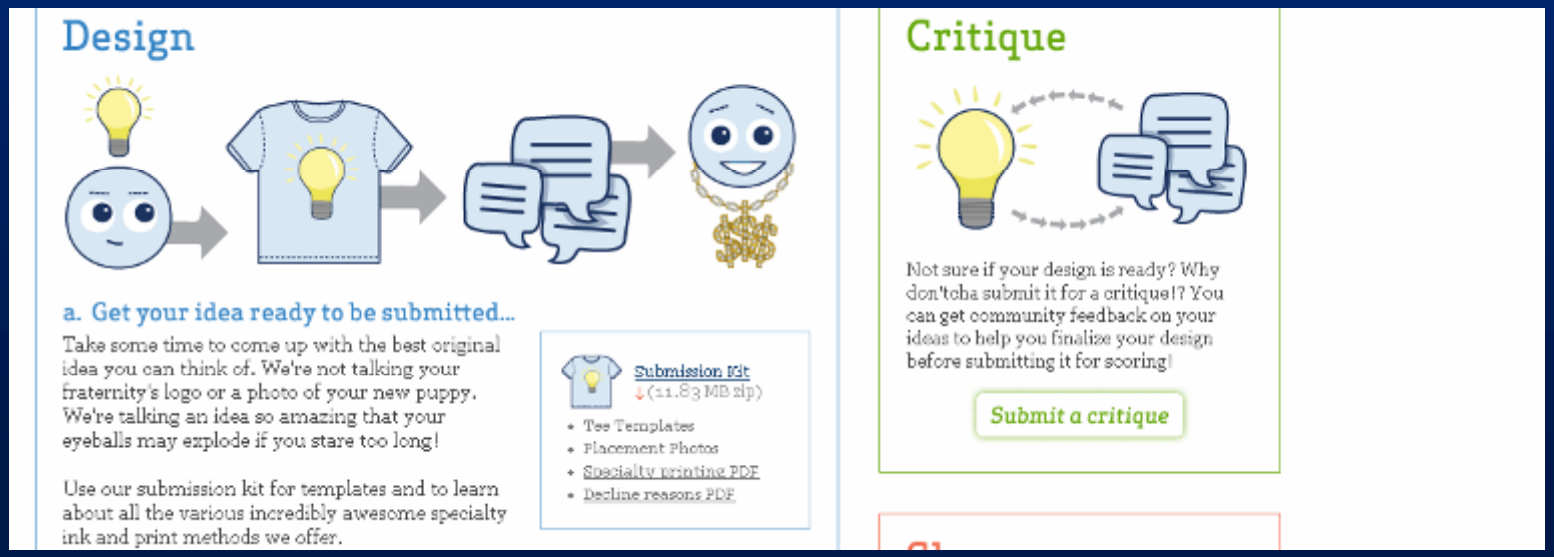
Crowdsourcing

Digg.com: registered users can upload a news story or posting, can also give thumbs-up or down to posts; all can view most "digg'ed" posts by topic by date range



Crowdsourcing

Threadless.com: registered users can upload a t-shirt design idea to the site, can also help score designs; company produces top-ranked designs with a percentage back to designer



Reference: Page, Scott. (2007) The Difference: How the Power of Diversity Creates Better Groups, Firms, Schools, and Societies.

Crowdsourcing

- Employing a combination of a large number of human nodes, combined with technology nodes, to better leverage the collective intelligence of a crowd
- Typically grassroots, “bottom-up”
- But why do we even think there might be any value to this approach?

Reference: Page, Scott. (2007) The Difference: How the Power of Diversity Creates Better Groups, Firms, Schools, and Societies.

Crowdsourcing

- Diversity Prediction Theorem

Crowd Error = Average Individual Error - Diversity Among Individuals

- Crowd Error: a sum of squares error for what the crowd predicts vs. external truth
- Averaged Individual Error: average sums of squares errors for what individuals predict vs. external truth

Reference: Page, Scott. (2007) The Difference: How the Power of Diversity Creates Better Groups, Firms, Schools, and Societies.

Crowdsourcing

- Diversity Prediction Theorem

  Crowd Error = Average Individual Error - Diversity Among Individuals

- Diversity Among Individuals: average sums of squares errors for individuals vs. the consensus of the crowd

- Let’s try an example…

Reference: Page, Scott. (2007) The Difference: How the Power of Diversity Creates Better Groups, Firms, Schools, and Societies.

Crowdsourcing

Crowd Error = Average Individual Error - Diversity Among Individuals

Predictions as to 2005 NFL Football Draft

Player	A	B	C	D	E	F	G	Crowd	Actual
Alex Smith	1	1	1	1	1	1	1	1.0	1
Ronnie Brown	2	2	4	5	2	2	2	2.7	2
Braylon Edwards	3	6	2	2	4	3	3	3.3	3
Cedric Benson	4	4	9	4	8	4	8	5.9	4
Carnell Williams	8	5	5	9	5	10	4	6.4	5
Adam Jones	13	8	6	6	6	9	9	8.1	6

Predictor	A	B	C	D	E	F	G	Crowd
Sum of Squared Error	58.0	13.0	30.0	26.0	17.0	34.0	26.0	11.1

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Predictor	A	B	C	D	E	F	G	Crowd
Sum of Squared Error	58.0	13.0	30.0	26.0	17.0	34.0	26.0	11.1
Distance From Crowd	29.7	13.8	20.2	20.8	12.7	16.5	12.5	0.0

Individual Average Error	29.1	= average of all predictors sum of squared error
Diversity Among Individuals	18.0	= average of all predictors distance from average
Crowd Error	11.1	note that the crowd error is less than any "expert" error

Reference: Hung, See and Page, Scott. (2002). Proceedings of the National Academy of Sciences.

(1) Power of Diversity

- With crowds: diversity trumps ability
- Yet clearly there are times when crowds are smart and also <u>times when crowds are dumb</u>, so why does diversity influence outcomes?
- Consider: individuals have particular perspectives on a problem, paying attention to some aspects and filtering out others

Reference: Hung, See and Page, Scott. (2002). Proceedings of the National Academy of Sciences.

(1) Power of Diversity

- Learned perspectives may limit the search space any one individual uses to reach an answer, even for “smart” individuals

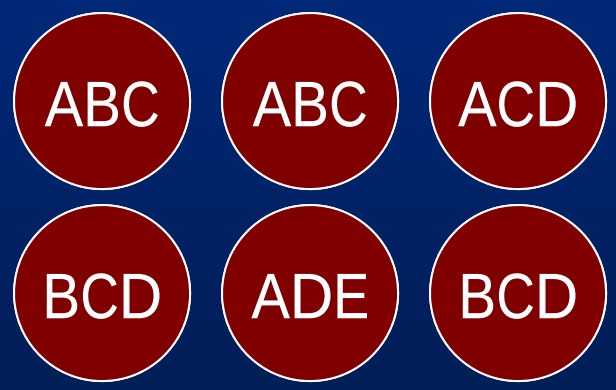
IQ view of the “Alpha” Group

IQ view of the Diverse Group

Reference: Hung, See and Page, Scott. (2002). Proceedings of the National Academy of Sciences.

(1) Power of Diversity

- Multiple individuals with varying perspectives expand the search space employed
- A diverse crowd has more “tools” to apply



Toolbox view of the “Alpha” Group

Toolbox view of the Diverse Group

Reference: Hung, See and Page, Scott. (2002). Proceedings of the National Academy of Sciences.

(1) Power of Diversity

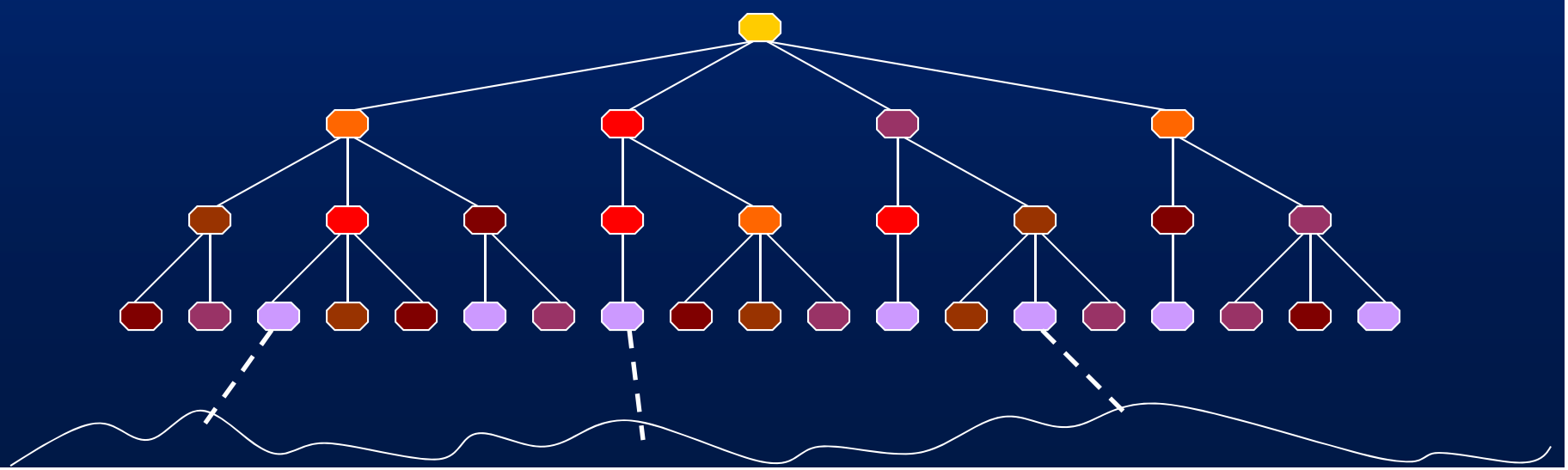
Potential drawbacks:

- Diversity works if everyone has same goal of getting the answer right, and values this goal
- If goal-related values of different groups are not shared, crowd may splinter into factions

Reference: Bray, David and Prietula, Michael. (2007). International Conference on Information Systems. Best Paper KM Track.

(2) Power of the Edge

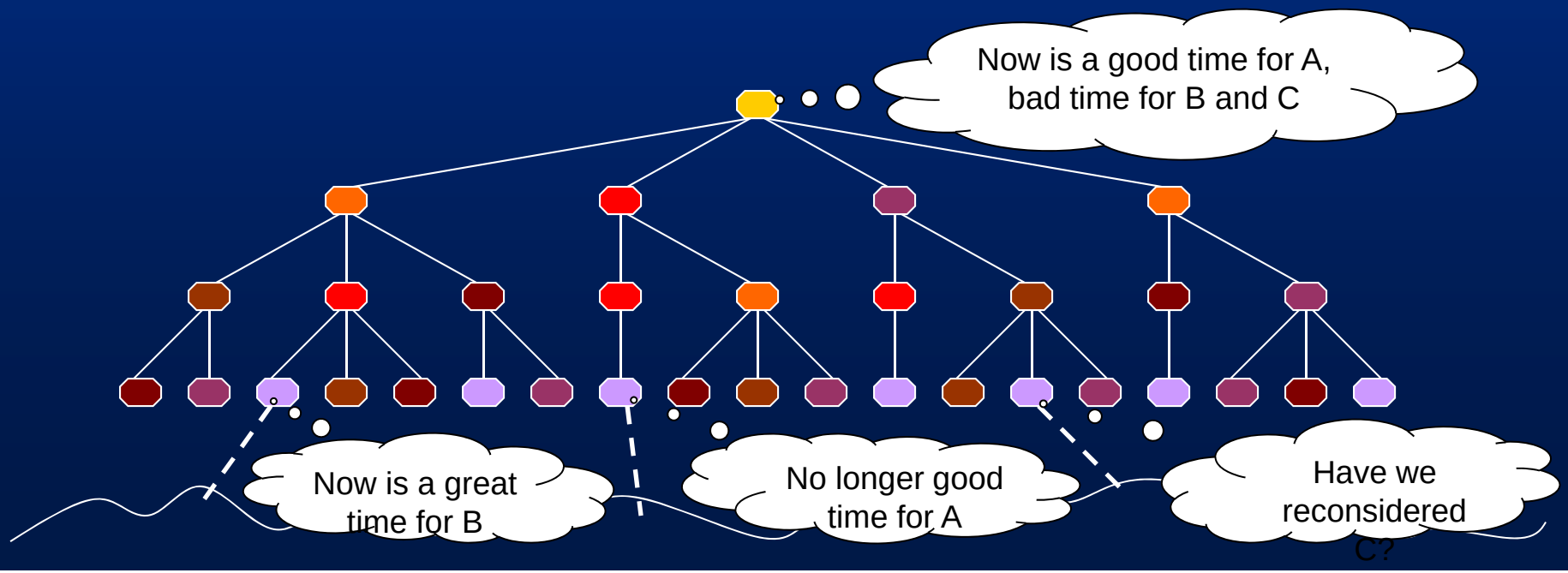
- Traditional organizations exist to harness worker output, usually a top-down approach
- Yet top-down hierarchies <u>restrict opportunities</u> for bottom-up information flow; also introduce information flow <u>delays</u>



Reference: Bray, David and Prietula, Michael. (2007). International Conference on Information Systems. Best Paper KM Track.

(2) Power of the Edge

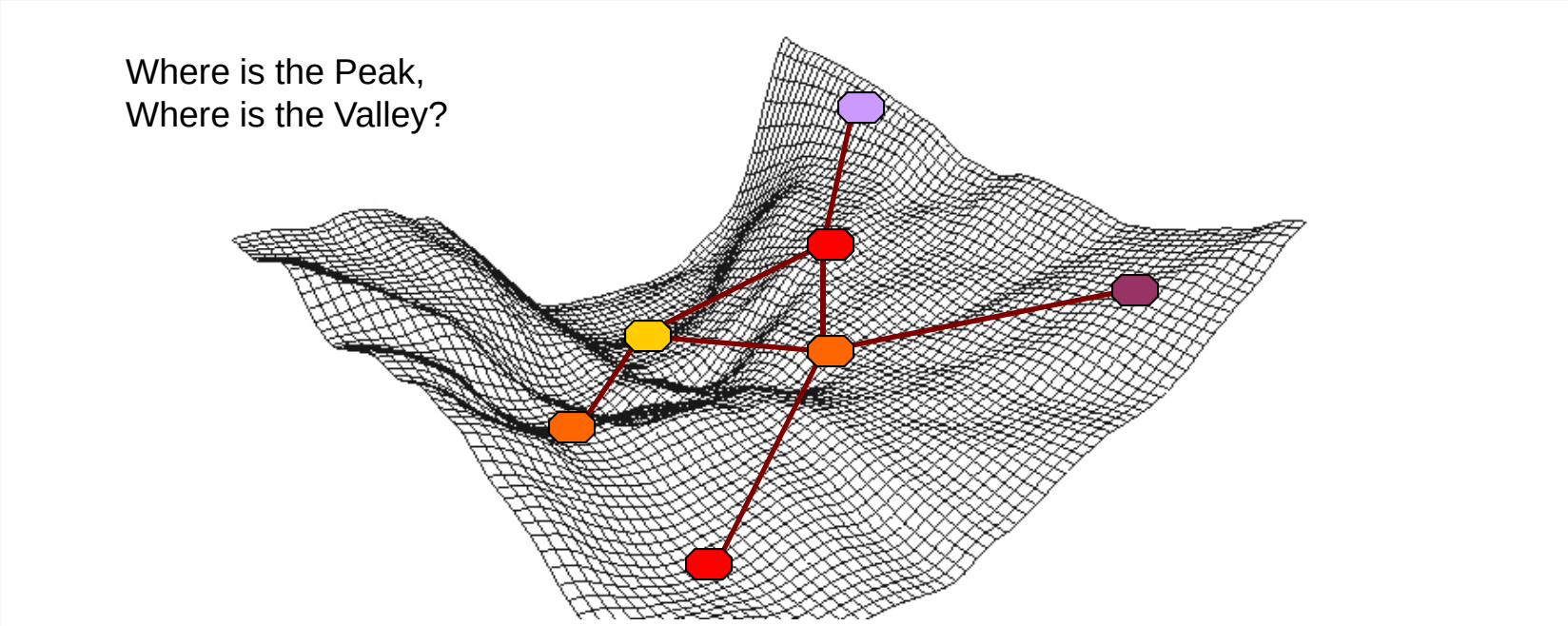
- If the organization doesn't encourage bottom-up percolation of these insights to a changing environment, highly probable that the the top could lose relevancy despite larger scope



Reference: March, James. (1993) Exploration and Exploitation in Organizational Learning. Organization Science.

(3) Power of an Ecosystem

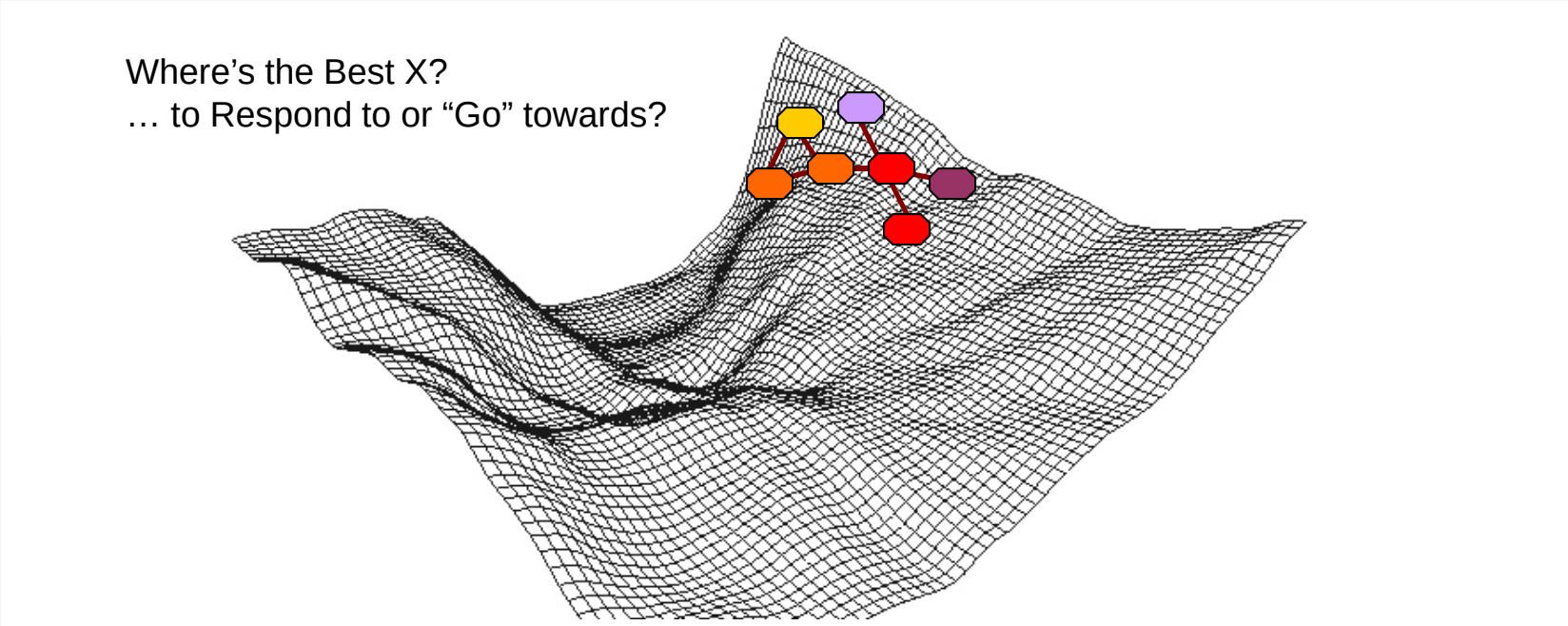
- Where any one individual (or team) is looking may no longer be relevant; whereas different views can better scan the environment



Reference: Bray, David (2008). Knowledge Ecosystems: Technology, Motivations, Processes, and Performance.

(3) Power of an Ecosystem

- Through chatter and conversation, new threats or opportunities can be addressed through swarming around interesting features



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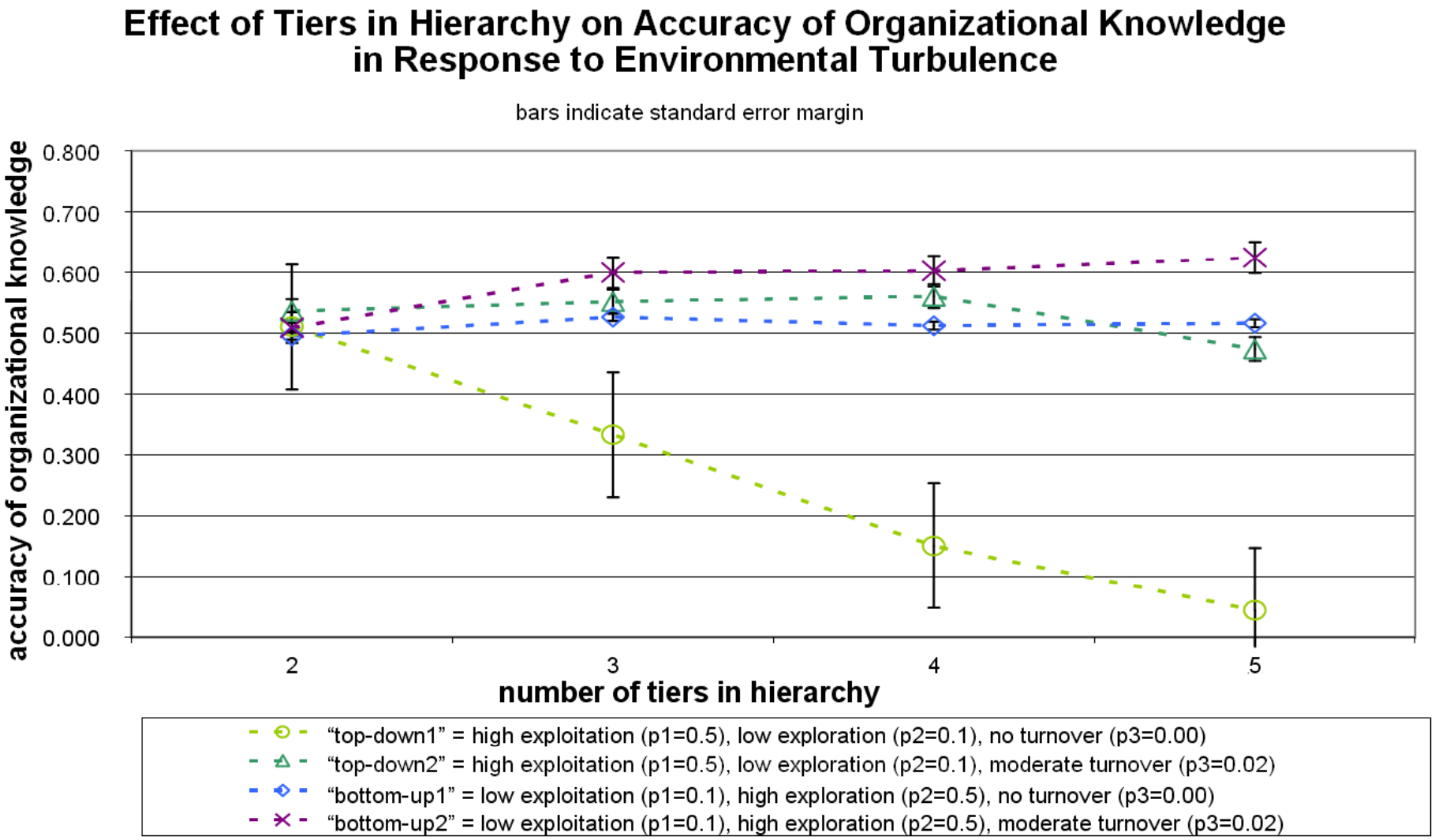
Findings - Empirical Support



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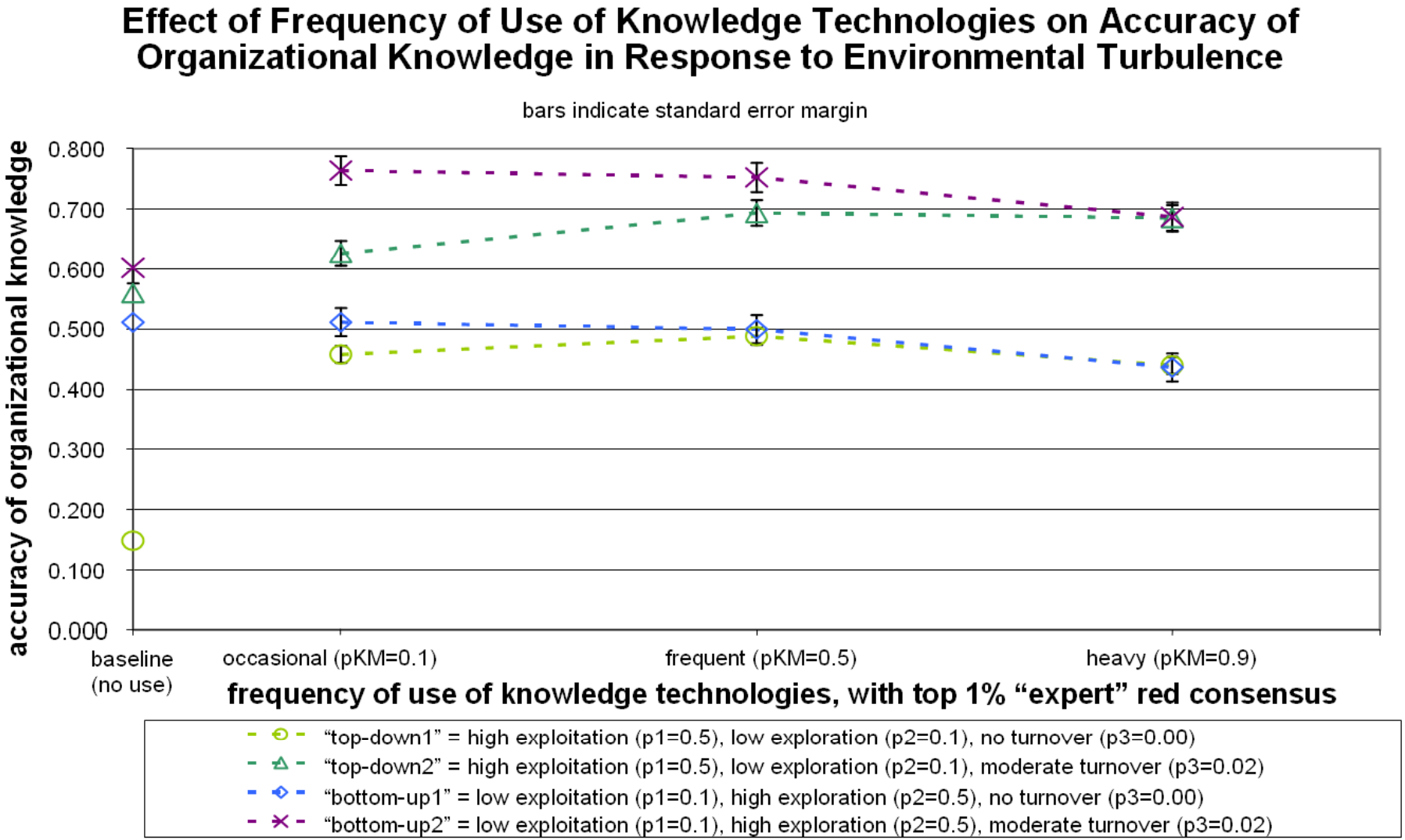


Reference: Bray, David (2008). Knowledge Ecosystems: Technology, Motivations, Processes, and Performance.

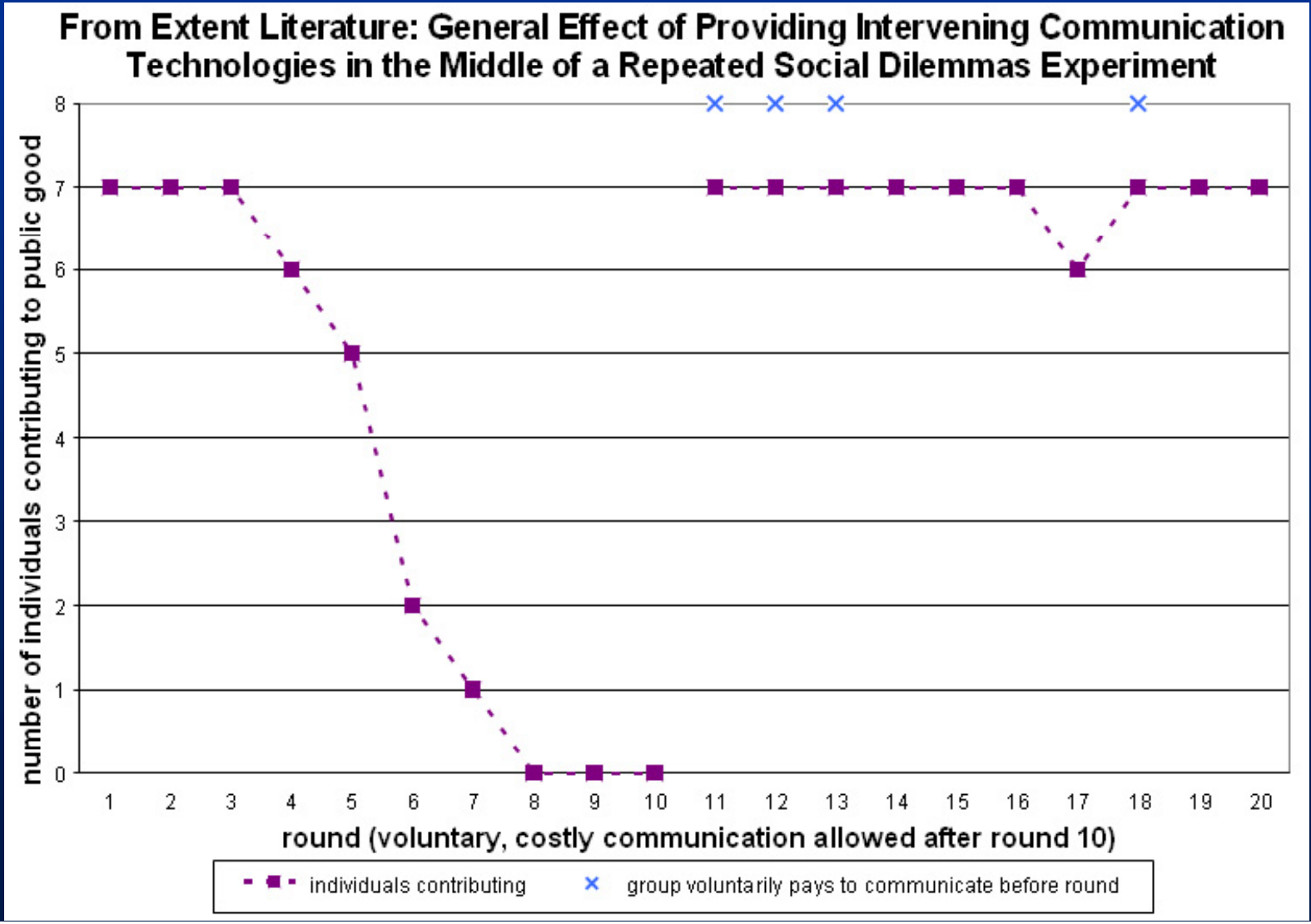
Research - Sharing vs. Protection

In 2006, conducted a field survey at a large U.S. federal gov't agency involved with emergency response and national security

- Found negative incentives to collaborate
- Gov't workers <u>less likely</u> to leverage lessons learned in the organization vs. outside
- Significant difference in the reported <u>value of sharing knowledge</u> for FTE's vs. contractors

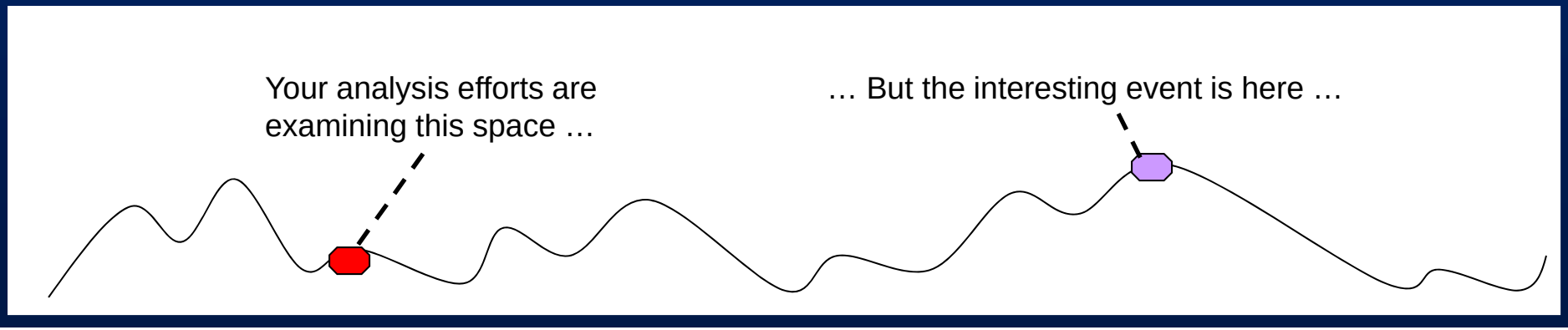
Reference: Bray, David (2008). Knowledge Ecosystems: Technology, Motivations, Processes, and Performance.

Research - Sharing vs. Protection



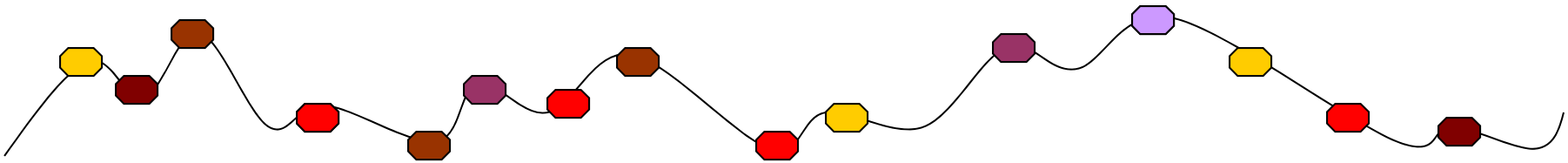
Applying this to the IC

- What happens if what your organization should to focus on is dramatically different from what is expected?
- Traditional analysis and data-mining can limit diversity and top-down approaches limit organizational responsiveness



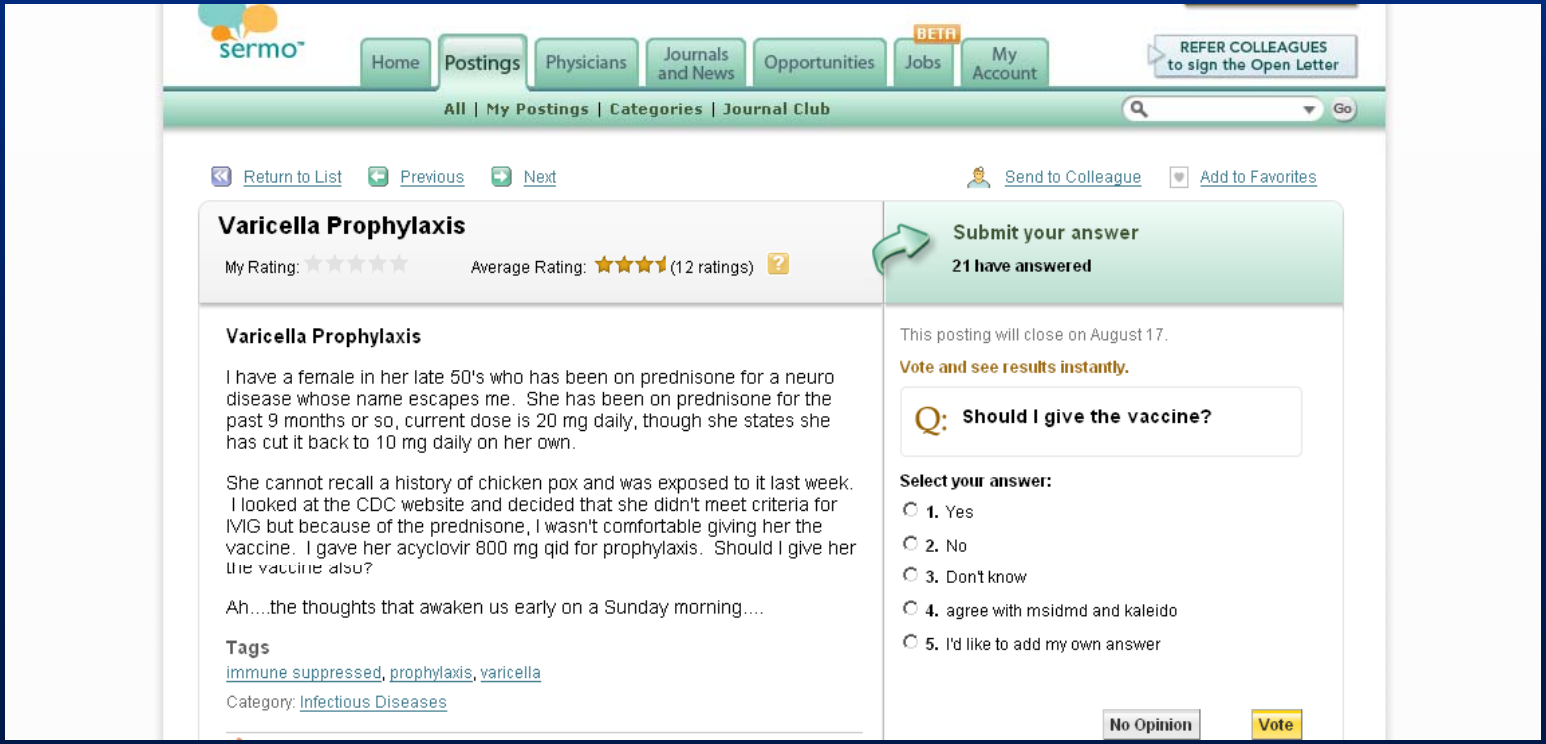
Applying this to the IC

- Leverage the crowd
- The crowd can be a closed “bottom-up” community of intelligence professionals
- The crowd can be partnerships with local, state, and federal agencies
- The crowd can include public input potentially



Early Examples Exist Already

Sermo.com: closed community of health professionals (71,000+ U.S. physicians)



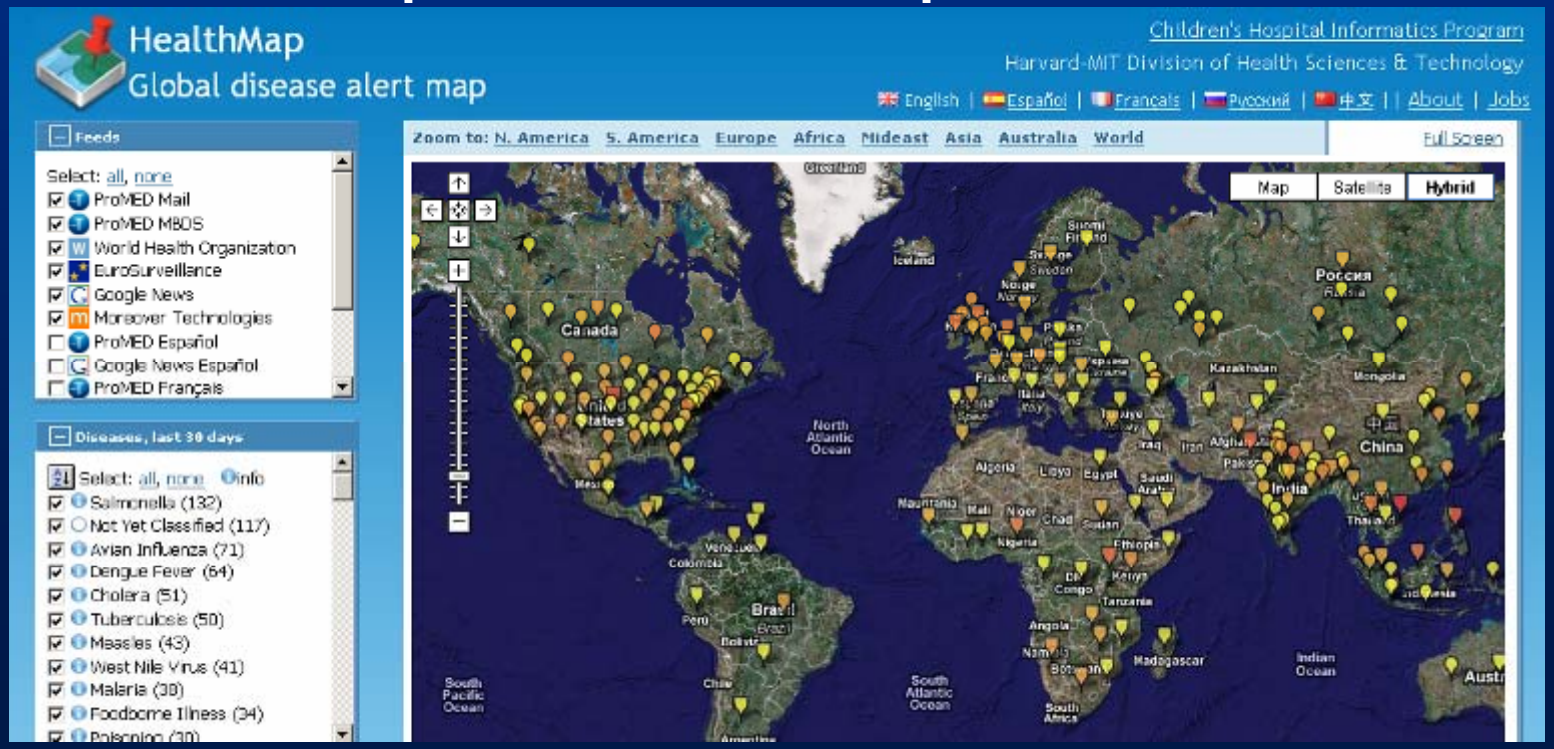
Early Examples Exist Already

Sermo.com: individuals vetted as real physicians before gaining access; once online, operate via a pseudonym

- Can ask any question to the community and answer any question; community of peers rank value of questions and answers
- Sermo also provides incentives to post; several say they participate for fun or to learn

Early Examples Exist Already

Healthmap.org: a Harvard-MIT initiative using automated computer programs to scan news articles and produce a map of disease alerts



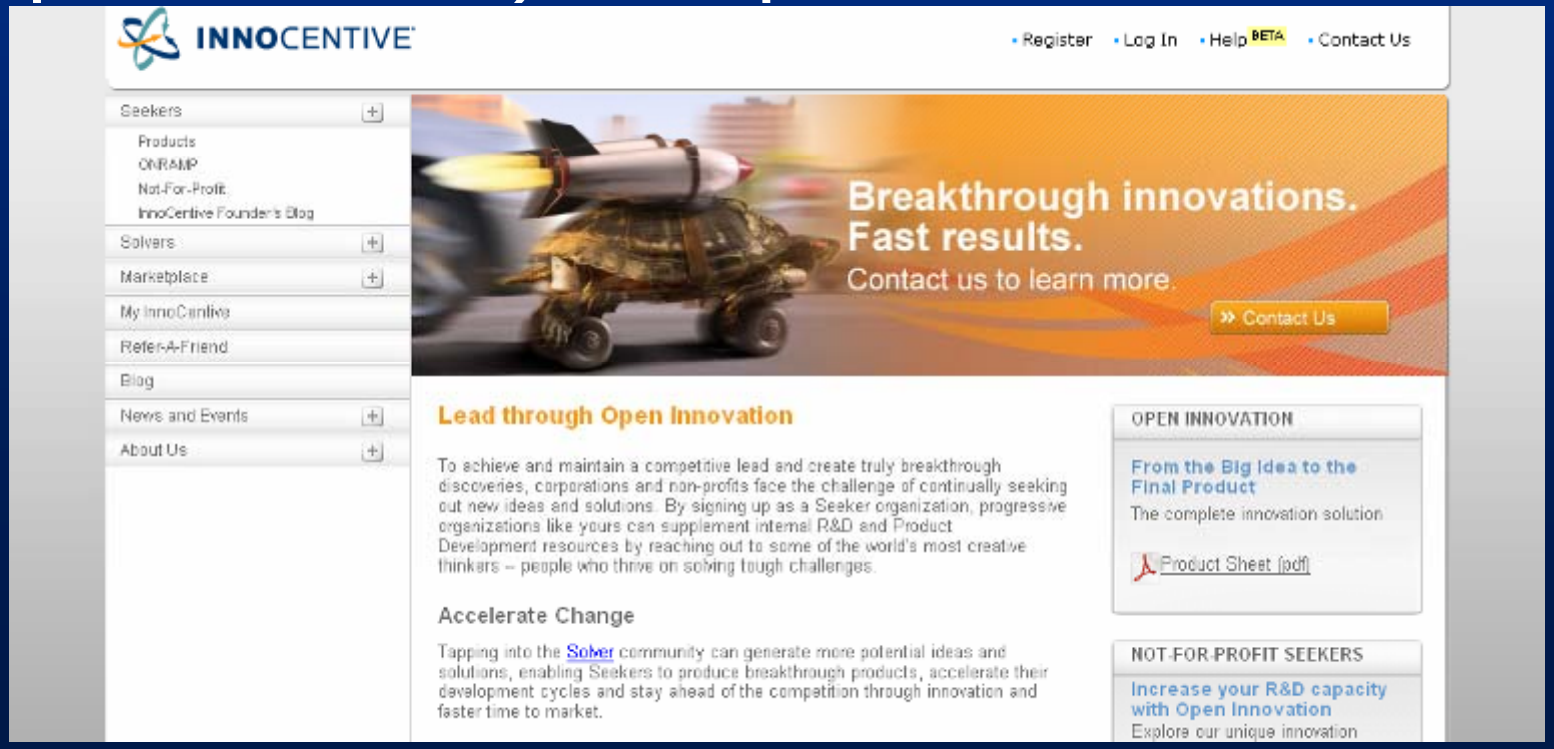
Early Examples Exist Already

Healthmap.org: sources of disease alerts include ProMED, World Health Organization, Google News

- Anyone can zoom in with the map to view specific areas, or opt to view disease alerts by category or by date
- May not be perfect as it depends on automated indexing of news, but a great start

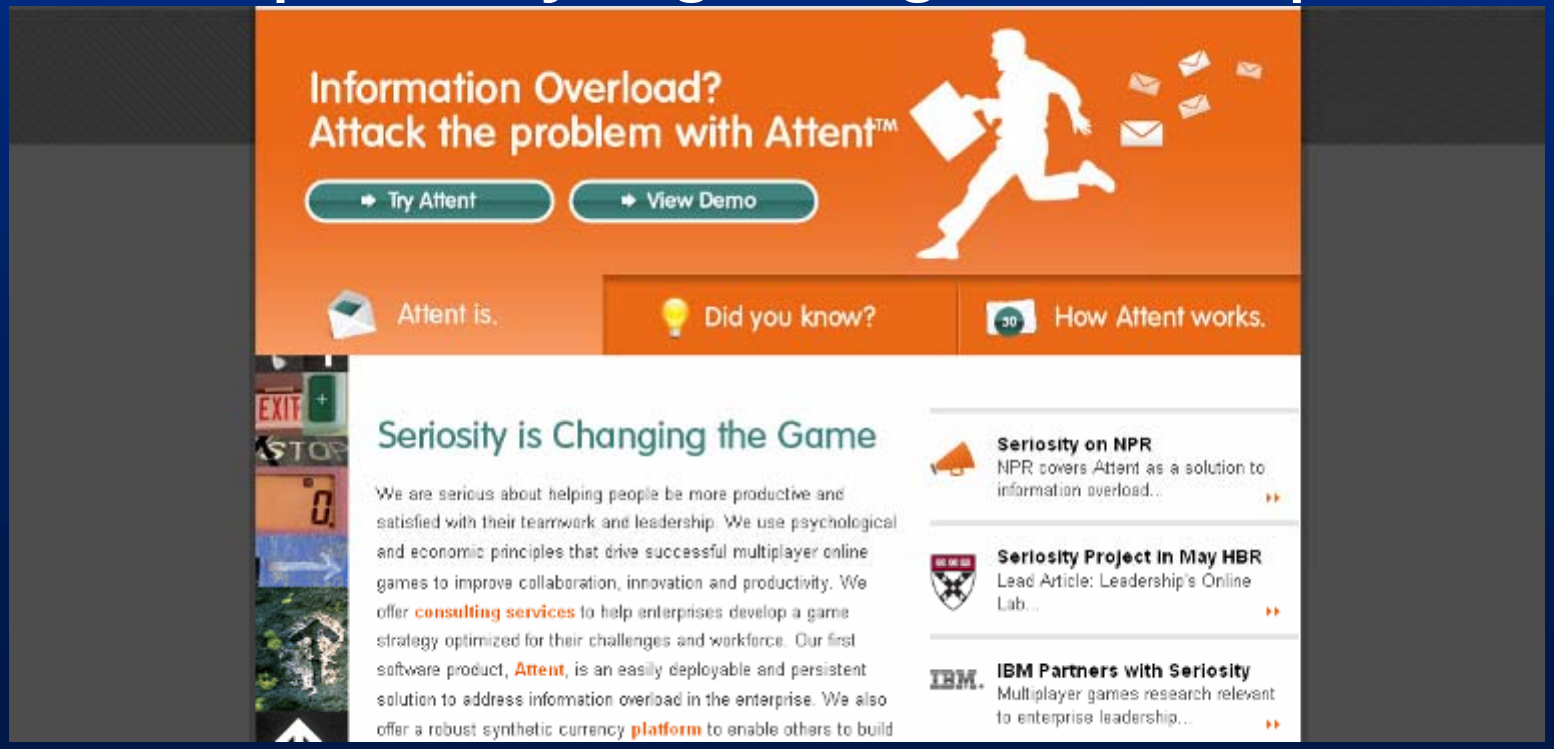
Extending Existing Examples

- How about an “InnoCentive” for the IC, connecting problem solvers (tagged by expertise areas) with problem holders?



Extending Existing Examples

- Might linking a finite “virtual currency” to email help manage information overload in the workplace by signaling email importance?



Concluding Thoughts

- Collective intelligence is not a new idea; what's different now are web technologies
- How can people and computers be connected so that collectively they act more intelligently?

"No matter who you are, most of the smartest people work for someone else..."

~ Bill Joy, co-founder Sun Microsystems

- Think: (1) diversity (2) edge (3) ecosystem

Concluding Thoughts

- Traditional top-down structure → Bottom-up
  Balance knowledge sharing and protection
- Roles of managers → Cultivators
  Position and reward boundary spanners

"No matter who you are, most of the smartest people work for someone else..."

~ Bill Joy, co-founder Sun Microsystems

- Questions? (david.a.bray@ugov.gov)