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The Performance of Distributed Problem Solving Networks and Knowledge Ecosystems

Highlights of Findings

David Bray
Wolf Richter

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Said Business School – University of Oxford
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We have studied working examples of Distributed Problem Solving Networks solving three different types of problems

Type of problem	Case studies	What is it about?
I. What is known?	• News aggregators • Sermo • Seriosity	• Different paradigms to find, rate, and prioritize news available online • Physicians sharing medical conversations • Use of multi-player game features to help prioritize use of e-mail and attention foci
II. What will be known in the future?	• Information markets	• Aggregating judgments to predict public and private events
III. How do we find new or better solutions?	• Atlas • ASOA • Firefox development • Simple Wikipedia	• Designing and building a high energy physics (HEP) experiment • Financing and creating an Open Content Feature Film • Making an Open Source web browser “Mom-and-Dad” friendly • Improve readability of Wikipedia

Source:OII

In the case studies we have identified 7 aspects that successful DPSN organizations have addressed

The "Seven Dwarfs" We Found:

1. Define purpose of problem solving
2. Find appropriate problem and structure to solve
3. Create diversified management structures
4. Allow multiple approaches to manage participation
5. Align participation with distribution of benefits
6. Cope with loss of private, proprietary or sensitive information
7. Install checks and balances against manipulation

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Purpose of Distributed Problem Solving Networks separate two different approaches to Distributed Problem Solving

	Type I and II		Type III	
Case studies	Digg News	Information markets	Wikipedia	Atlas
	Sermo	Seriosity	Firefox	ASOA
Purpose	Leverage the power of aggregating the judgments of a large number of participants		Bring together diverse skill sets or resources to produce a solution	

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First we need to find a problem that DPSN's can help us solve

Criteria for identifying appropriate problems for DPSN's:

- Modularized or modularizable
- "Hard" to solve
- Participants need to have some useful knowledge
- Benefit from scale and multiplicity of perspectives *or*
- Require the combination of multiple skills or resources
- Participants shouldn't be able to enact the outcome they are predicting
- Socially acceptable to what you are predicting

But not all questions may be equally appropriate for DPSN's

- Markets on terrorisms produced public outcry
- There may be instances where intellectual property or secrets need to be protected
- Naïve participants may undermine the DPSN's outcomes; experience or expertise matter at times

Problem-structuring intermediaries seem to be better suited for type I and type II problems than for the exploratory type III

Type I and II		Type III	
Case	**Tools / main activities**	**Case**	**Tools**
Digg	Digg web platform: Submit articles, comment on them, and vote	Wikipedia	Wiki with independent Wiki pages
Sermo	Conversations, start a survey, participate and vote	Firefox	Bugzilla database with individual bug report
Seriosity	Virtual currency linked to email, email plug-in	Atlas	Websites, email, face-to-face meetings
Information markets	Ask a question, bet on an outcome	ASOA	Website, discussion forum

- For exploratory problems (type III), the design of the solution process is part of the problem
- Therefore dominance of “multi-purpose” tools of communication in type III DPSN’s vs. specialized platforms in type I and II

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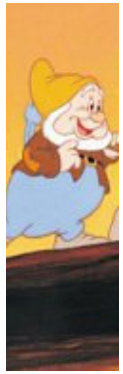
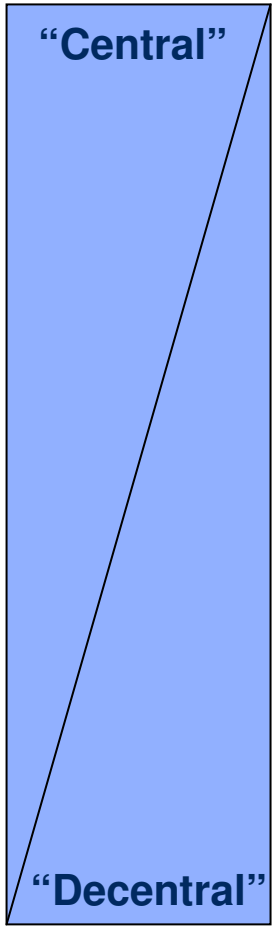


The trade-off between a decentral and central decision making models has significant impact on the DPSN's performance

"Decentral" decision making	"Central" decision making	
Atlas Decentral decision making at Atlas created more friction during the initial design phase at Atlas, but resulted in better performance when resolving issues and findings workarounds during the construction phase	*CMS* Central decision making made several project members leave (and join Atlas) after they "lost" decisions	Decentral decision making facilitates wide participation and buy-in, although it may frustrate some people for lack of progress
Mozilla Decentral development created feature-rich browser, with little attention paid on usability, Production tool that benefits the developers directly	*Firefox* Central prioritization of bug reports and design feature requests to achieve goal of building a "mom and dad" browser	Central decision power required to counter-balance self-selected attention focus of community if not totally aligned with goal of DPSN

Source:OII

DPSN are characterized by multiple points of control, therefore degree of "central" and "decentral" control difficult to generalize



Type I & II

Digg: Benevolent dictator* tried (unsuccessfully) to prevent the leak of the Blu Ray code

Digg: Posting and rating of articles totally decentralized

Type III

Firefox: Prioritization of bug reports overlooked by benevolent dictator**

Firefox: Decision to fix bugs decentralized: "Important", but "uninteresting" bugs fixed at lower speed

There is no clear connection between the type of problem solved and a particular governance model

* Kevin Rose
** Blake Ross

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Distributed Problem Solving Networks do not leverage all nodes equally

A Swarm of Angels (ASOA)

- 5% of ASOA members produce 80% of the contributions
- About 15% participate in the “polls”
- 31% have joined ASOA and have not been active ever since
- Several very active users left ASOA

Wikipedia

- “Unsimple” tag mainly given by registered administrators

Sermo

- 15% of users are posting, 40% are participating in votes

Digg News

- Top 100 power diggers contribute 62% of all front page stories

Observations

- Flexibility to shape own role and mode of contribution is attractive to many participants, BUT
- Multitude of motivations makes it difficult for community to predict level of activity of members or steer solution process
- Key challenge is to find meaningful role for occasional contributors in order not to loose their creativity

Source:OII

Exit vs. Voice framework distinguishes two approaches to managing participation

	"Exit"	"Voice"
Description	If participants are not satisfied, they leave	If participants are not satisfied, they make themselves heard
Case studies	• Sermo • Seriosity • Digg News • Google News • Information markets	• Atlas • ASOA • Wikipedia • Firefox
But…	• Some platforms have witnessed "revolutions": – Digg's users posted Blu-Ray code – Sermo users forced change in IP rules	• If the voice is not heard, there is the risk of "forking", e.g. Firefox started as a fork from Mozilla

Conclusions

- Do not underestimate the "will of the crowd"
- Also DPSN's governed as "exit" models require careful management of user participation to avoid expectation gap
- Similarly there are limits to the "voice" model if the unifying momentum is no longer strong enough to keep the community together
- Group identity matters

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Motivation to create a DPSN not only driven by private appropriation of pecuniary benefits

NON-EXHAUSTIVE

	"Pecuniary" benefits	"Non-pecuniary benefits"
"Privately appropriable benefits"	• Co-creation of a valuable product from information aggregation or prediction (Digg, Sermo, Information markets)	• Skill development (ASOA, Firefox, Atlas) • Signaling: Build reputation, expand CV, etc. (almost all) • Fun
"Social benefits"	• Satisfaction of needs that are not met by the market – Creation of a shared research facility (Atlas) – Production of an alternative web browser	• Co-creation of a peer-reviewed encyclopedia (Wikipedia)

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Are open networks good or bad?

When is having open networks *Good*?

1. When you face uncertain future events:

- Prediction Markets provide a way of gauging probable future outcomes
- Sermo can provide "early warnings" about drug reactions or emerging diseases

2. When you can motivate people to "work" for free:

- Networks are *great at distribution* of content or ideas
- For some News Aggregators, individuals post, edit, and filter stories for free
- For Google News, every mouse click "informs" Google's computers

When Are Open Networks *Bad*?

1. When vetted experts matter:

- Sometimes you need a minimum level of competency to trust someone's views
- Sermo works because its physicians talking about healthcare, not the public

2. When intellectual property or privacy matters:

- Networks are *bad at protection* of content or ideas
- An "open source" model means that anyone can copy or modify an asset
- For Sermo, if the public had immediate access, physicians might be less open

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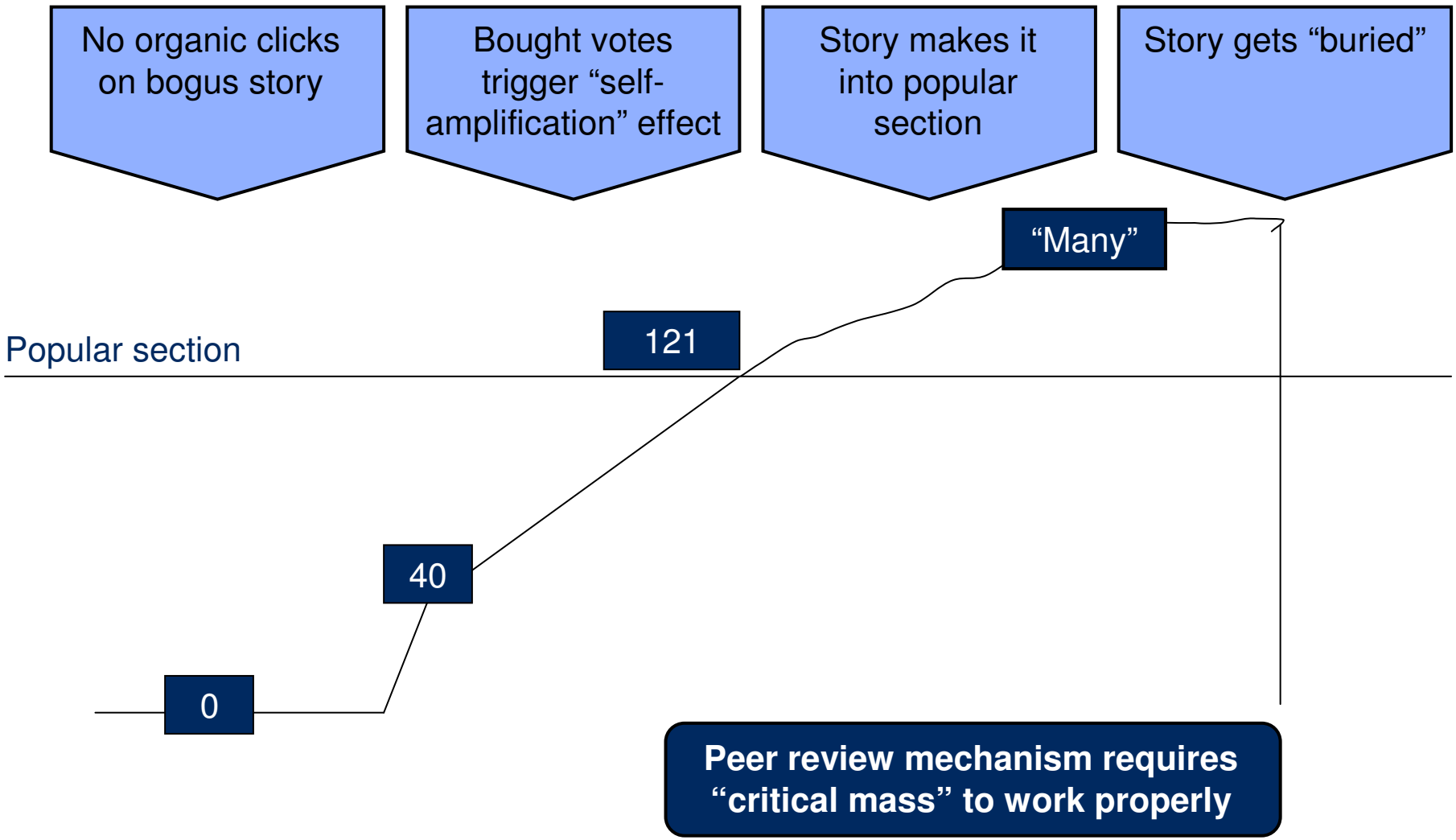
Solution created by DPSN's may not always be correct in the short run – but self-correction has found to work in the long run for popular items

Example Digg News



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"… it's off to work we go …"