

Collective Action in Virtual Organizations

Networks of Collaboration in an Online Scientific Community

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Motivation

How do virtual organizations enable collaborative work?

Do traditional notions of *collective action theory* provide a basis for understanding collaboration in virtual orgs?

Or are there other mechanisms at work?



Our Study



Examination of collaboration in a online scientific community

- Patterns of and motivations for contributing to online knowledge systems
- Tagging as a contribution to online knowledge systems



Collective Action & Public Goods



- Collective action is the "mutual interest and the possibility of benefits from coordinated action" (Marwell & Oliver, p. 2)
- Public goods theory is the most used in organizational communication research (Monge & Contractor, 2003, p.159)
- Public goods are characterized by:
 - Jointness of supply
 - Impossibility of exclusion
- Nonexclusivity generates a free-rider problem (Kollock, 1998)

Collective Action & Public Goods



- Most observed collective action characterized by decreasing marginal returns
 - Possibility that virtual public goods might instead be characterized by increasing marginal returns
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Hypotheses



H1: Virtual networks will demonstrate increasing participation over time

H2: The increase in participation in virtual networks will accelerate over time.

On Selective Incentives



Originally Stated:

"Only a *separate and selective incentive* will stimulate a rational individual in a latent group to act in a group-oriented way..."
(Olson, 1965; p. 51, emphasis original).

Recent Work:

- Selective incentives can be used to spur innovation by targeting "key innovators" (Von Hippel & von Krogh, 2006)
- Selective incentives can be used to encourage the creation of trust amongst community participants - and in turn will drive contribution (Feiock et. al., 2010)

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Incentives



- Points/Rewards (direct incentives)
- Visibility (indirect incentives)



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Hypotheses



H3: The introduction of a point system to incentivize participation in a virtual network will increase contributions to the public good

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Tagging & Collaboration



- Tags are a medium for social collaboration and interaction (Cattuto et. al., 2007; Golder and Huberman, 2006)
 - Tagging occurs more frequently when users have multiple motivations (gain knowledge, promote certain perspectives, etc.) (Ames and Naaman, 2007)
 - As the number of users stabilizes, tagging systems tend towards an equilibrium point (stability) (Golder and Huberman, 2006; Halpin et. al., 2007)
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Hypotheses



H4: Users are likely to tag at an increasing rate (tagging leads to more tagging) during initial periods

H5: The amount of incremental tagging will stabilize following initial periods

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Data



- Data collected from nanoHUB.org
 - Online community for research collaboration - focused on nanotechnology research
 - More than 100,000 users (students, professors, practitioners)
- Users are able to create groups, add resources, add simulations, tag content, rate content, etc.

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The screenshot shows the nanoHUB.org website interface. At the top, the logo 'nanoHUB.org' is displayed with the tagline 'ONLINE SIMULATION AND MORE FOR NANOTECHNOLOGY'. Below the logo is a navigation menu with links for Home, My HUB, Resources, Members, Explore, About, and Support. A search bar and 'Login'/'Register' buttons are also visible. The main content area features a resource titled 'Crystal Viewer Demonstration: Various Crystal Systems' by Gerhard Klimeck and Benjamin P. Haley from Purdue University. The resource description states: 'This video shows the use of the Crystal Viewer Tool to visualize several crystal systems, including Si, GaAs, C60 Buckyball, and a carbon nanotube. Crystal systems are rotated in 3D, zoomed in and out, and the lattice style changes from sticks and ...'. A 'View Presentation (pdf)' button is prominently displayed. To the right, there is a '5.0 RANKING' section with '0 review(s) (Review this)' and '0 Chat(s)'. Below the main text, there are tabs for 'About', 'Reviews', and 'Supporting Docs'. An 'Abstract' section repeats the resource description. A 'SEE ALSO' section lists 'Crystal Viewer Page' and 'PCPPT Page'. At the bottom right, there is a 'RECOMMENDATIONS' section.

Data



- Resources data
 - 2569 resources created
 - November 2005 – June 2009
- Questions and answers data
 - 319 questions asked and 294 answers given
 - June 2007 - June 2009
 - Incentive point system added end of March 2008

Data



- Tagging network data
 - 248 unique users
 - 1970 unique resources
 - 8457 tags
 - September 2006 - June 2009

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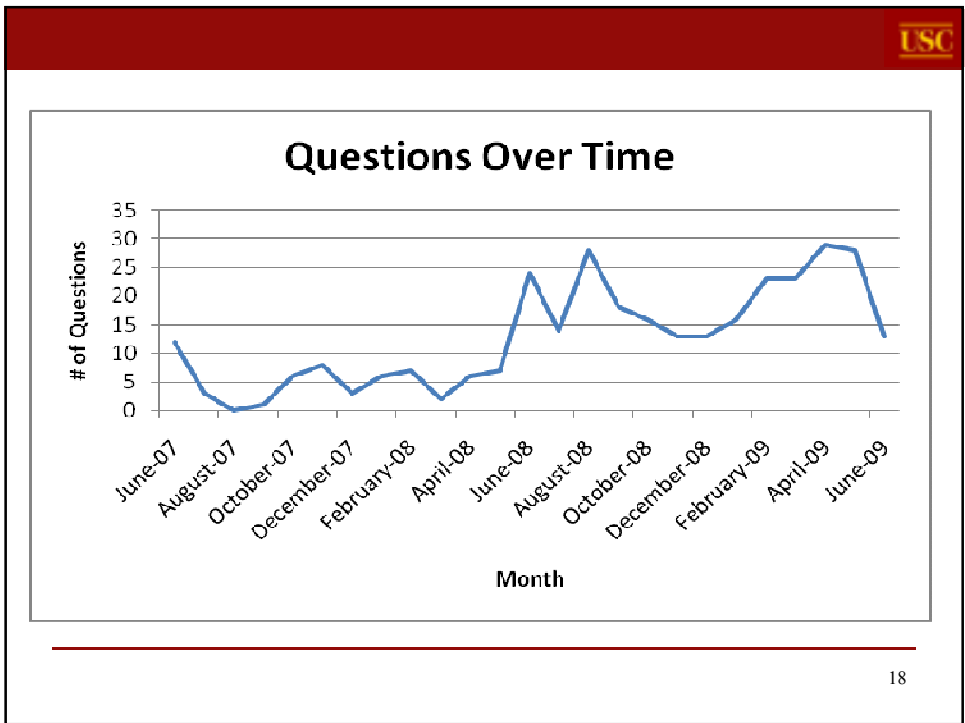
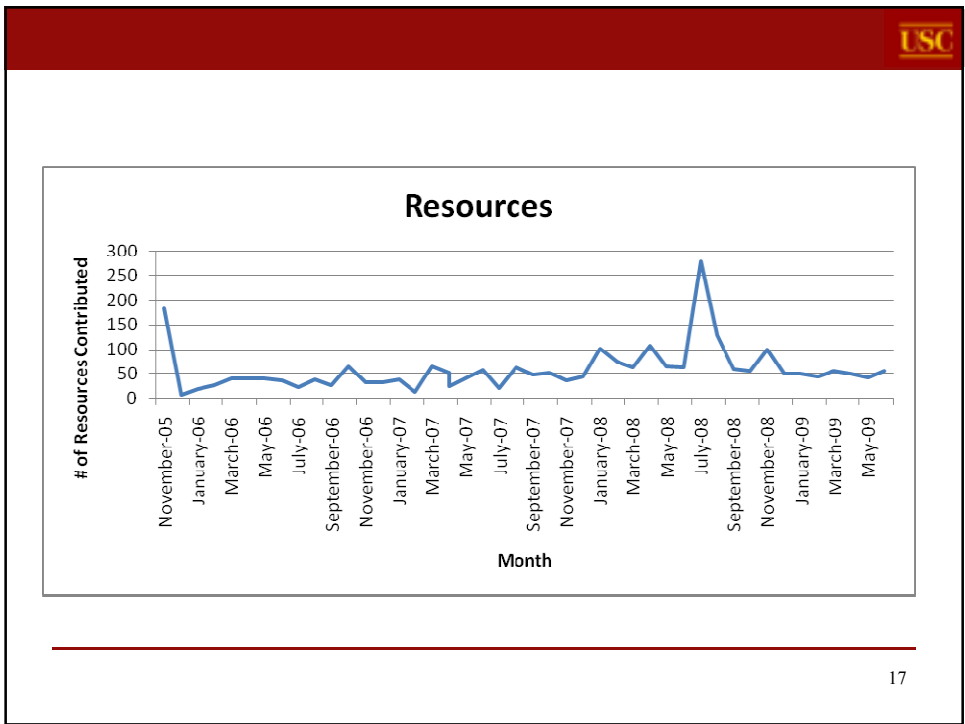
Methods

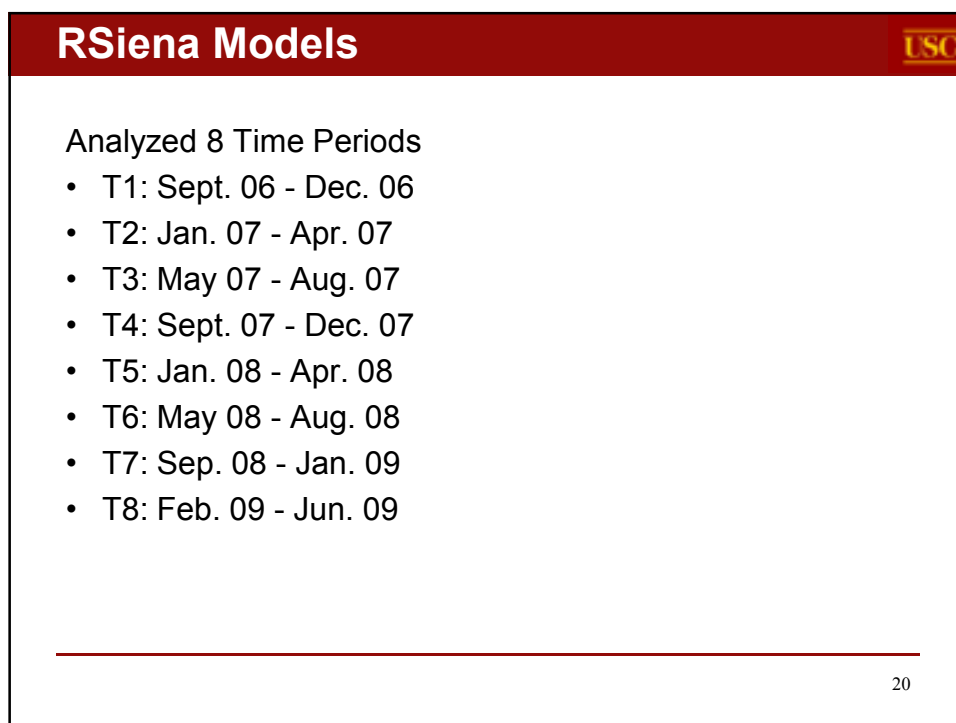
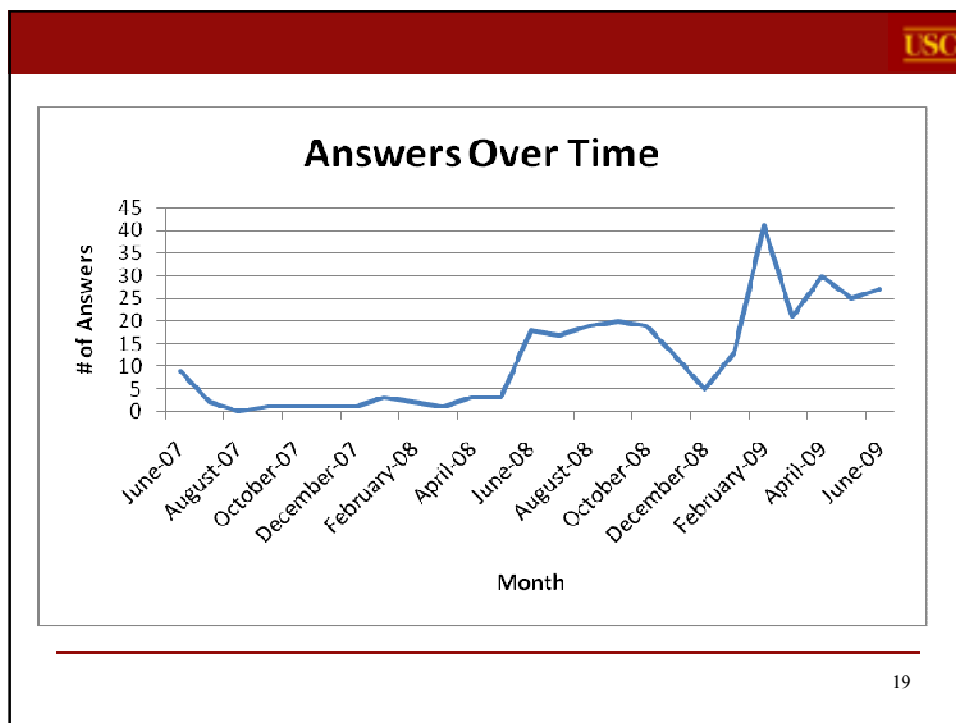


Three methods were used for analysis:

- Curve fitting (H1 and H2)
- Time series intervention analysis (H3)
- RSiena - longitudinal network analysis (H4)

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RSiena Model



- Actors seek to optimize their tagging; generally choosing to tag, rather than not to tag
 - Model the existing tags in each period (non-cumulative)
 - Avoids issues of “non-deletion”
 - Modeled as an affiliation matrix - allows modeling of growth of tagging
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RSiena Model



RSiena - Model Results

Parameter	Value	SE	t-Value
Rate T1 - T2	0.23	0.08	2.88
Rate T2 - T3	0.43	0.21	2.05
Rate T3 - T4	0.60	0.32	1.88
Rate T4 - T5	1.10	0.72	1.53
Rate T5 - T6	1.23	0.77	1.60
Rate T6 - T7	3.40	0.93	3.67
Rate T7 - T8	3.32	0.94	3.53
Outdegree (Density)	-4.53	0.45	10.07
Reciprocity	2.34	0.84	2.79

Conclusions



- Although contributions generally increased over time, they did not do so at an accelerating rate.
- For this virtual space, incentives did not significantly increase contributions.
- Initial tagging prompts later tagging
- Initial taggers are community founders

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Future Work



- Working to address longitudinal analysis issues associated with networks featuring non-deletion of ties
 - Moving away from use of affiliation matrix to a 2-mode network

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Further Information:
ascnetworksnetwork.org

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