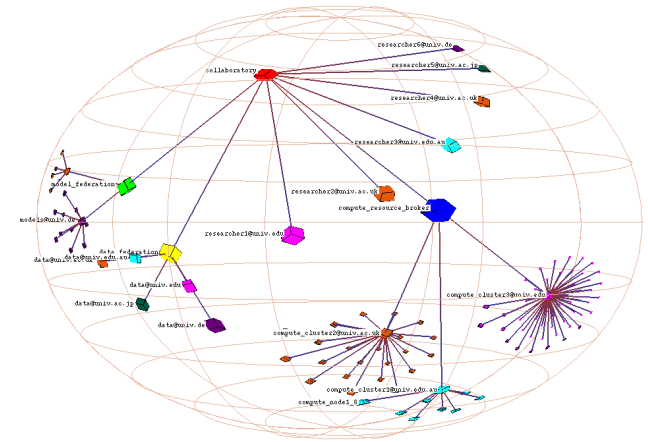
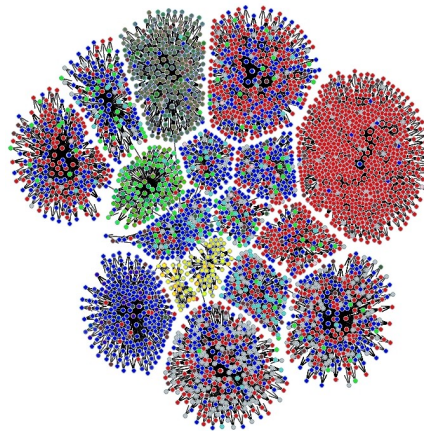
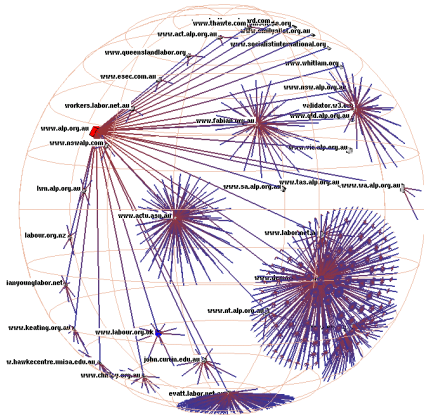


Online Social Movements

From Web 1.0 to Twitter



Presentation at “Social Media and Social Movements” workshop,
National Research University Higher School of Economics,
St Petersburg, 18-19 September 2014

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September 2014

- Introduction to VOSON Project and software
- Web 1.0 online social movements
 - Collective identity, exchange of resources via networks
 - Competition over social problems
- Online social movements in the Twitter era
- Big data and social movements research – 3 challenges



VOSON Project and software



The World Wide Web is only around 20 years old, but it has transformed the way we work, collaborate, engage in commerce, participate in politics and interact socially.

The Master of Social Research (Social Science of the Internet) was launched in 2008 and focuses on:

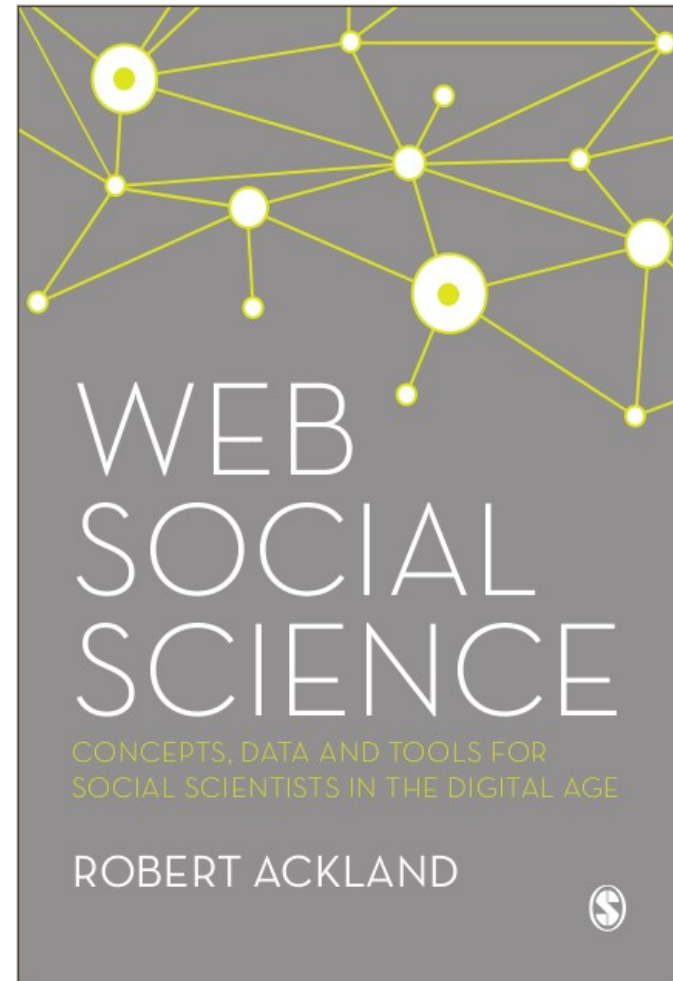
- the fundamental changes to society, politics and the economy brought about by the web
- social science concepts and methods for understanding life in the internet age
- online research methods for collecting and analysing Internet data.

The emphasis on social science (economics, political science and sociology) and quantitative research methods is what distinguishes the Master of Social Research (Social Science of the Internet); Internet studies elsewhere typically have a media and communication studies perspective, or else focus on the governance of the Internet.

The Master of Social Research (Social Science of the Internet) can be completed in one year of full-time study (part-time students are also welcome).

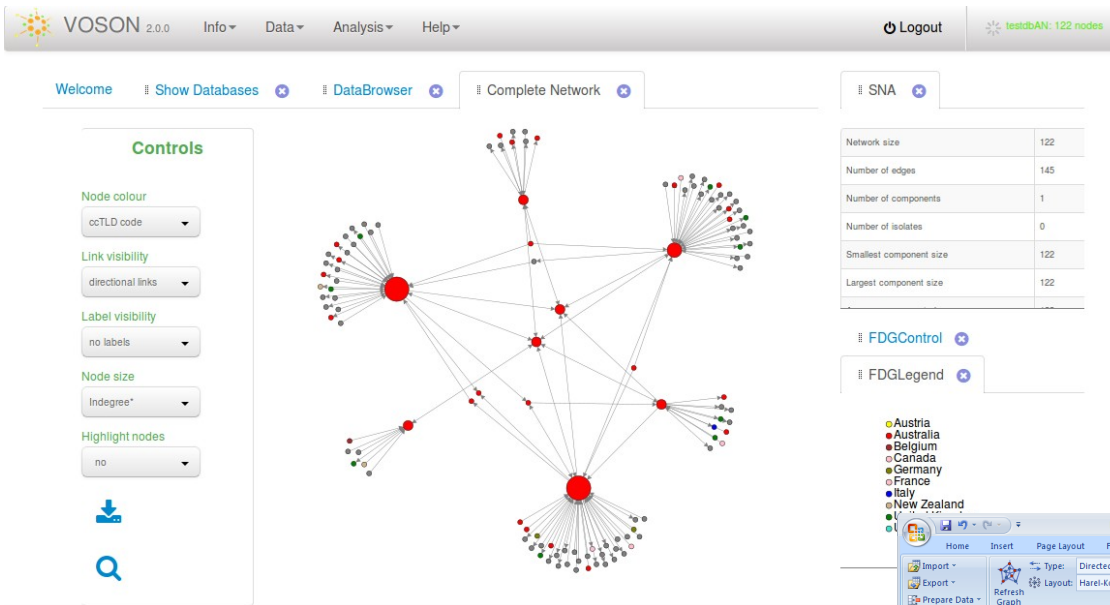
For more information contact
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ANU COLLEGE OF ARTS & SOCIAL SCIENCES



VOSON Project at the ANU (<http://voson.anu.edu.au>): Teaching, research and tool development in areas of computational social science, network science, web science

- VOSON Project formally commenced in 2005
- Australian Research Council grants:
 - DP0452051 "New Methods for Researching the Existence and Impact of Political Networks on the WWW" Ackland and Gibson – 2004-2006
 - SR0567298 "Virtual Observatory for the Study of Online Networks (VOSON)" - Ackland, Gibson, O'Neil, Buchhorn, Bimber, Ward – 2005
 - LP0990974 "The role of online social networks in successful ageing: benefitting from 'who you know' at older ages" - Booth, Ackland, Windsor – 2009-2012
 - DP110100446 "The institutional structure of e-government: a cross-policy, cross-country comparison" – Henman, Ackland, Margetts – 2011-2013
 - DP140103688 "Understanding online attention and user-generated content creation: An information consumption and production perspective" - Ackland – 2014-2016

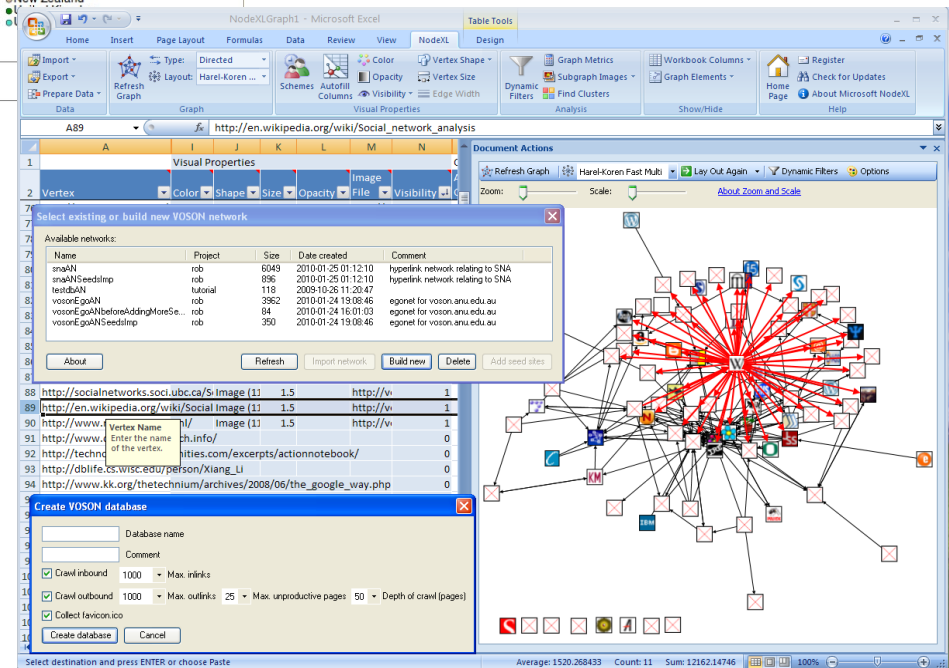


VOSON 2.0 web
interface works with
Firefox, Chrome, Safari,
iPad

VOSON+NodeXL allows
construction and import
of hyperlink networks
from within NodeXL



<http://www.uberlink.com>



Web 1.0 Online Social Movements

Collective identity, exchange of resources via networks

- Before rise of the Internet, institutional contexts in which collective identity is created were characterised as “free spaces” (Evans and Boyte, 1986), “sequestered social sites” (Scott, 1990)
 - Internet is clearly such a “protected site” and social movements swim on the Internet “like fish in water” (Castells, 2004)
- If belief systems of social movements have been institutionalised in the online environment, we should see evidence of this in digital trace data
- Hunt and Benford (2004, p. 414): social movement scholars studying collective identity typically “appear to take for granted [its] existence without offering compelling evidence that [it exists] outside the minds of the social movement analysts”

Definition of (offline) social movement

- Mario Diani – important contributor to social movement scholarship, in particular, use of social network analysis to study social movements
- Diani (2003) – social movement is grouping of actors who:
 - 1) Share a *collective identity*
 - 2) Exchange *practical* and *symbolic* resources through *informal* networks
 - 3) Engage in conflict or *competition* over a social problem

- Much of my work in this area involves collaboration with Mathieu O'Neil from University of Canberra
 - <http://www.canberra.edu.au/faculties/arts-design/communications-staff/media-and-public-affairs/oneil-mathieu>
- [Ackland, R. and O'Neil (2011): "Online collective identity: The case of the environmental movement," *Social Networks*, 33, 177-190.]
 - Adapt Diani (2003) definition of social movement to online world, focusing on (1) collective identity, (2) exchange of resources via informal networks

Collective identity

- Mutually agreed upon (and often implicit) definition of membership, boundaries, activities and norms of behavior used to characterize a grouping of actors
- Snow (2001, p. 2213): “...discussions of [collective identity] invariably suggest that its essence resides in a shared sense of 'one-ness' or 'we-ness' anchored in real or imagined shared attributes and experiences among those who comprise the collectivity and in relation or contrast to one or more actual or imagined sets of 'others'”

Collective action frames

- Concept of **frame** is central to collective identity
- Goffman (1974, p.21) defines a frame as a “schemata of interpretation” enabling individuals to “locate, perceive, identify and label” occurrences within their life and the wider world.
- By rendering events meaningful, frames function to organize experience and guide collective or individual action (Benford et al., 1986). They allow for a social problem to be legitimately identified and addressed, perhaps as the basis for future collective action.
- **Collective action frames** are intended to mobilise “potential adherents and constituents, to garner bystander support, and to demobilize antagonists” (Snow & Benford 1988:198).
- Social movements are successful when the different frames of individual SMO participants align, creating 'frame resonance' (Snow and Benford 1986; Snow et al. 1988)

Exchange of resources through informal networks

- **network:** set of nodes (vertices) and a set of ties (edges) indicating connections between nodes.
 - **directed** – e.g. person x recommends person y, but person y may not recommend person x
 - **non-directed** – if person x has a familial relationship with person y, the converse must also be true
- **resources**
 - **practical** – can be valued or measured objectively e.g. money, members
 - **symbolic** – boundaries of inclusion/exclusion (connection to collective identity)

- **organizational practical exchange network:** directed network where ties between organizations reflect exchange of practical resources
 - e.g. Hoffman and Bertels (2007) construct network of board interlocks between the NGOs – reflect access to information and funding
- **organizational symbolic exchange network:** undirected network where ties between organizations reflect mutual recognition of shared characteristics and goals
 - Diani and Bison (2004, p.298) assessed whether the voluntary organizations in their study “...feel links to their partners ...[which] imply some kind of broader and long-term mutual commitment? Do they, in other words, share a collective identity?”

from Diani and Bison (2004)

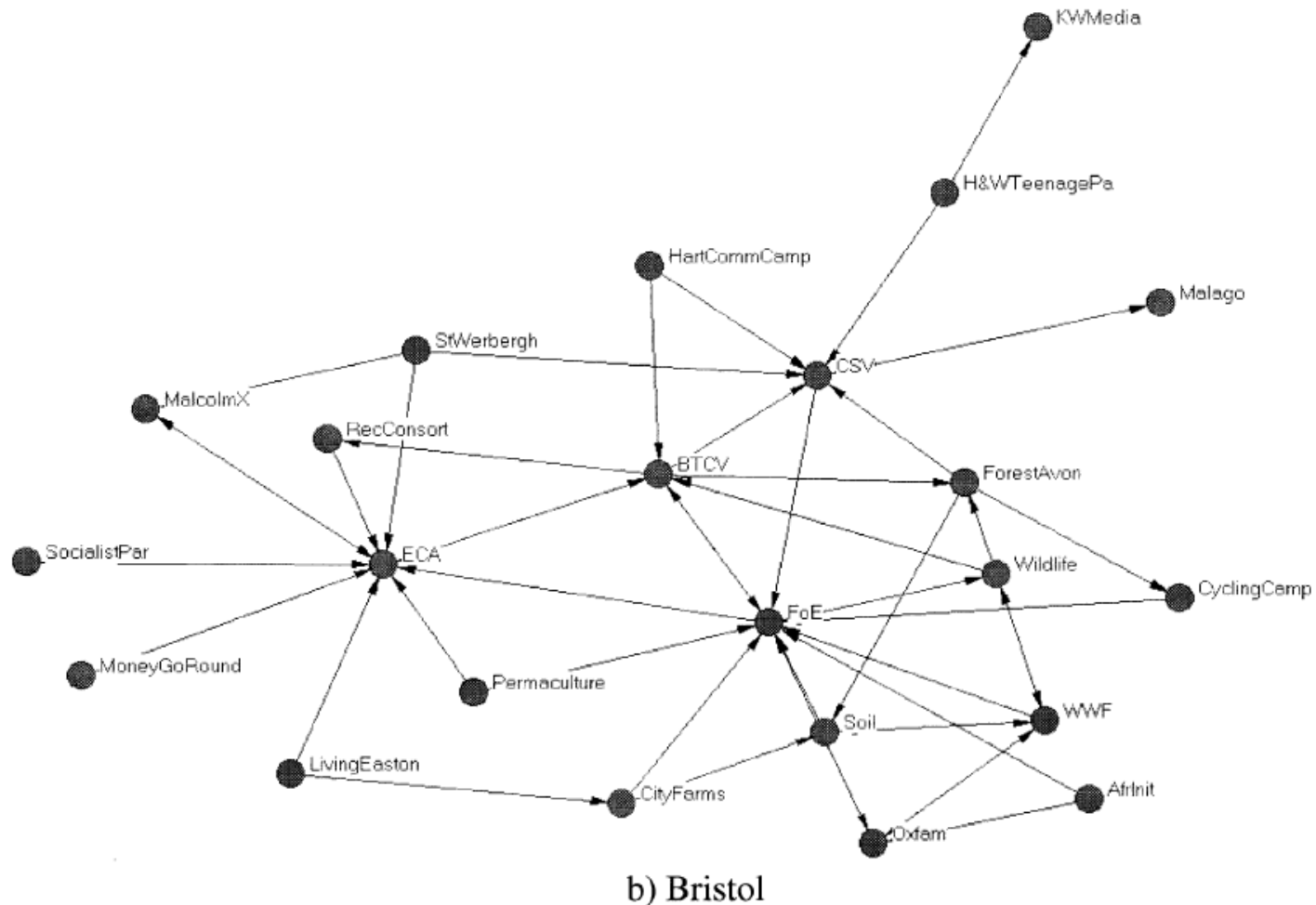


Figure 1. Inter-organizational alliances in block 3 in the Glasgow and Bristol civic networks.

- What are the characteristics of an **“informal network”**?
 - evidence that network ties are easily reconfigured
 - network is fairly “horizontal” (not too centralized)
 - significant evidence of “informal” or endogenous network tie formation (e.g. reciprocity, triadic closure), as identified using Exponential Random Graph Modeling (ERGM)

Definition of online social movement (Ackland and O'Neil 2011)

- Set of websites of organisations who:
 - share a collective identity
 - exchange practical and symbolic resources via **hyperlink networks**
 - exchange symbolic resources via **online frame networks**
 - engage in competition over a social problem
- Key differences with model of offline social movement (e.g. Diani):
 - hyperlink and online frame networks (see below)
 - presence/absence of collective identity specifically tied to *structural signatures* of hyperlink and online frame networks

- Used VOSON software to collect data from 161 environmental activist websites in March 2006.
 - websites (“seed sites”) identified using combination of search techniques proposed for researching “issue networks” (Rogers and Zelman, 2002).
- Automatically collected data:
 - Hyperlink data - web crawler used to find hyperlinks between seed sites
 - Text data - collected meta keywords from homepages of seed sites
 - data preparation: synonyms, capitalization, stemming

• Manual coding of site attributes

- Hypothesised sub-movements: “Globals” - climate change, forest/wildlife preservation, nuclear weapons, sustainable trade (89 sites); “Toxics” - pollutants, environmental justice (26 sites); “Bios” - genetic engineering, organic farming, patenting issues (46 sites)
- Country of origin: US-based (72), UK (2), rest from 24 other countries
- Geo-political north/south classification (e.g. Shumate and Dewitt 2008)

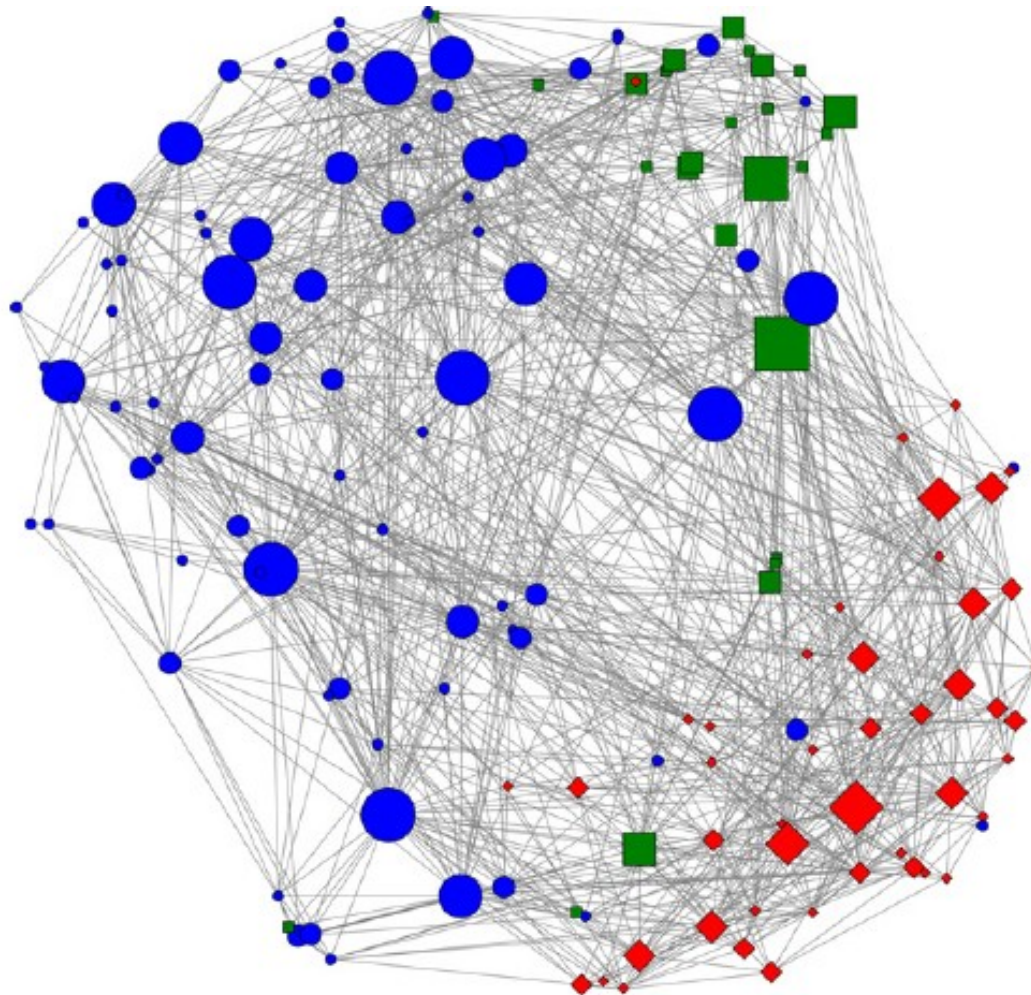


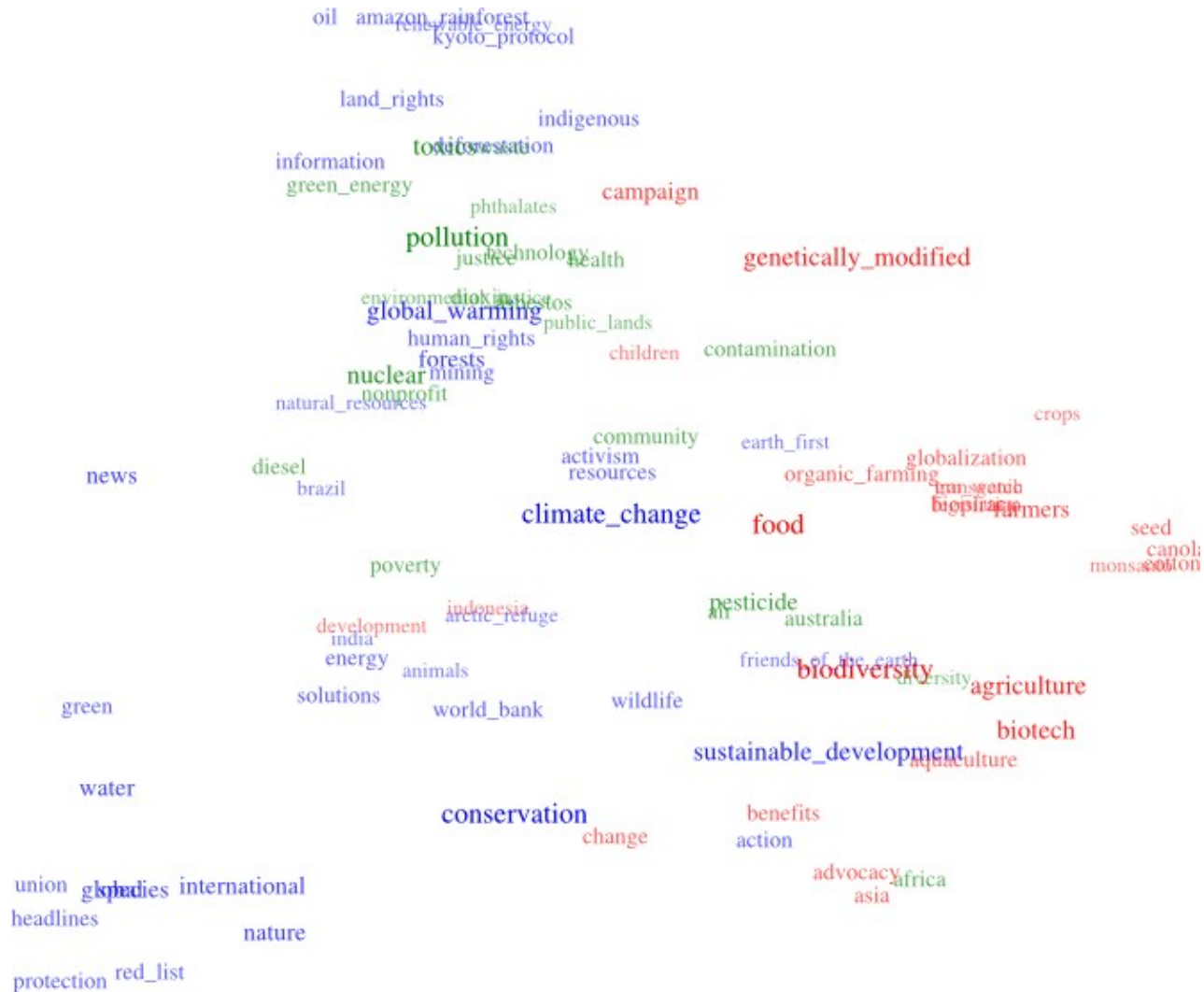
Fig. 1. Hyperlink network FDG map – node color reflecting sub-movements. *Note:* Bios (red diamond), Globals (blue circle), and Toxics (green square). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of the article.)

Table 1

Meta keywords used by sub-movements.

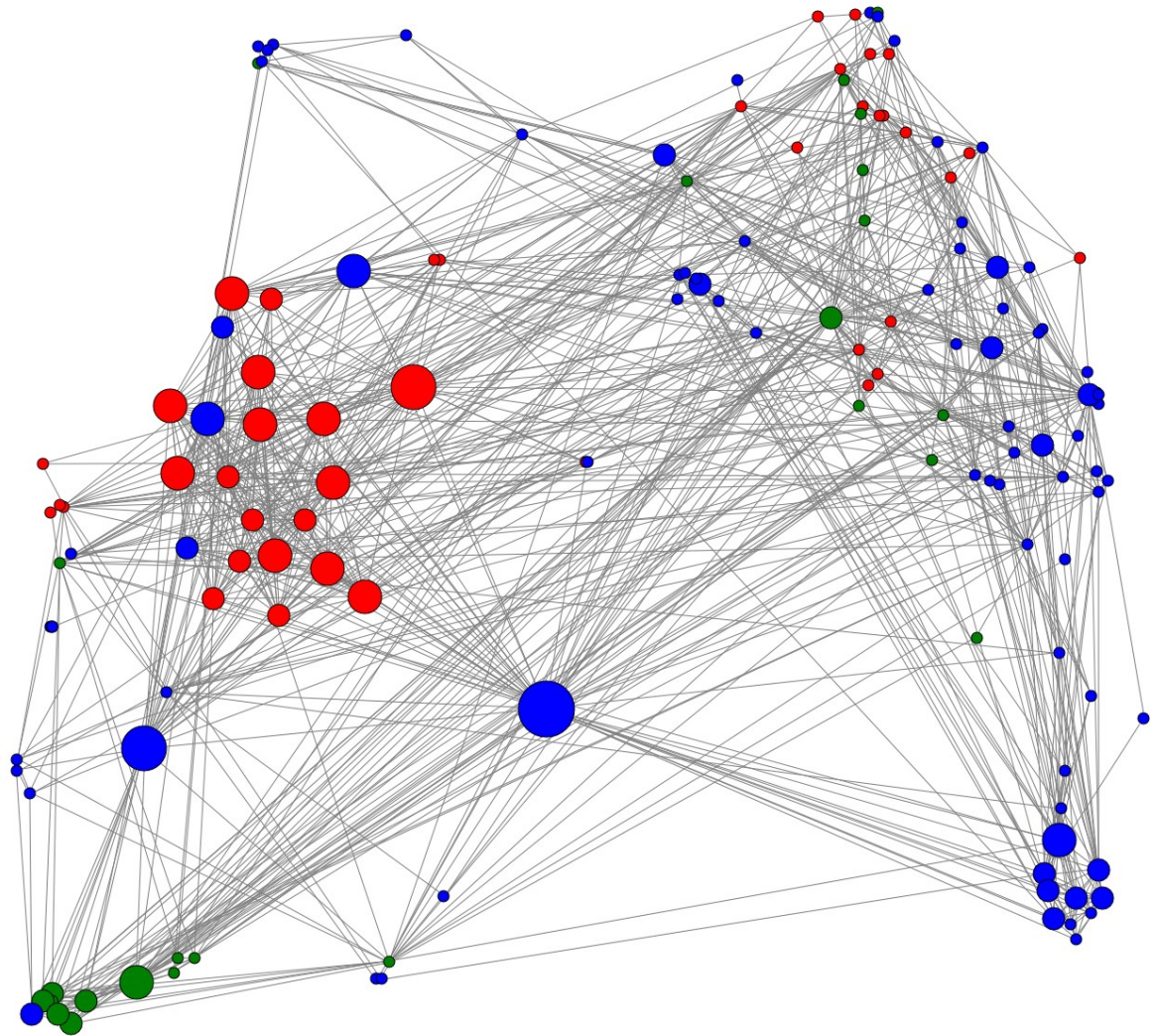
Bios	genetically_modified:67, biotech:15, food:14, farmers:9, environment:9, agriculture:7, biodiversity:6, organic_farming:6, sustainable_development:4, biopiracy:4, seed:2, health:2, globalization:2, transgenic:2, canola:2, world_trade_organization:2, monsanto:2, crops:2, legislation:2, cotton:2, campaign:2, starlink:2, family_farms:2, uk:2
Globals	environment:42, climate_change:14, conservation:11, sustainable_development:10, nuclear:10, global_warming:8, pollution:7, genetically_modified:7, forests:6, news:6, activism:6, green:5, biodiversity:4, globalization:4, nature:4, wildlife:4, species:4, food:4, resources:3, kyoto_protocol:3, energy:3, headlines:3, human_rights:3, global:3, water:3, international:3, indigenous:3, dam:3, natural_resources:3, world_bank:3, technology:2, mining:2, wild:2, take_action:2, windows:2, red_list:2, green_energy:2, deforestation:2, software:2, india:2, environmental_organizations:2, agriculture:2, protection:2, brazil:2, new:2, amazon_rainforest:2, river:2, animals:2, waste:2, toxics:2, oil:2, arctic_refuge:2, campaign:2, union:2, renewable_energy:2, community:2, solutions:2, land_rights:2, information:2, action:2
Toxics	pesticide:16, environment:15, pollution:11, toxics:10, nuclear:5, nonprofit:3, biotech:3, africa:2, justice:2, afrique:2, community:2, dioxin:2, climate_change:2, phthalates:2

Concept map



- **online frame network:** undirected network where the nodes represent organisations and ties represent mutual use of a particular “frame component” (word or term that is part of a frame)
 - e.g if organization x and organization y both use the frame component “frankenfood” on their website then there will exist an (undirected) tie between the two organizations in the online frame network.
 - Uses concept of 'semantic network' from organisational science: shows organizational linkages based on shared interpretations (Monge and Eisenberg, 1987; Stohl, 1993)
- frame components detected using machine learning technique (support vector machine)

- Online frame network
FDG map
- node colour
corresponds to sub
movements: red –
Bios, green – Toxics,
blue – Globals
- Frame components:
genetically modified,
toxics, food,
pesticide,
conservation



Web 1.0 Online Social Movements

Competition over social problems

- Relevant papers:
 - O'Neil and Ackland (2006), "The Structural Role of Nanotechnology-Opposition in Online Environmental-Activist Networks," paper presented at 26th International Sunbelt Social Network Conference, 24-30 April, Vancouver.
 - O'Neil and Ackland (2014): "Competition in an Online Social Movement Field", manuscript submitted.
- Klandermans (1992): multi-organizational field is "total possible number of organizations with which the [social] movement organization might establish specific links"
- O'Neil and Ackland model competitive behaviour among SMOs
 - response of environmental SMOs to emergent risk issue
 - We hypothesise that one of the "rules of the game" in this field is that new entrants to the field are more likely to adopt new causes (frames) as a way of challenging the issues that the incumbents regard as legitimate

Strategic Action Fields

- [Fligstein, N. and McAdam, D. (2011): “Toward a General Theory of Strategic Action Fields,” *Sociological Theory*, 29 (1)]:
 - Proposition 11: SAFs destabilised by **external shocks** (originating from other SAFs, other groups, actions of the state, or large-scale crises e.g. wars or depressions)
 - Proposition 12: SAFs with more **connections** to other SAFs have greater **stability** (similarly, new SAFs or those with a few connections will be unstable)
 - Proposition 15: A **new or emergent frame** is likely to come from invader or challenger groups (new cultural frame are used to reorganise interests and identities)

Networks and fields

- [Fligstein, N. (2013): “Understanding stability and change in fields,” *Research in Organizational Behavior*, 33, 39–51]
 - Is it valid to represent field as a network (e.g. DiMaggio and Powell 1983, Powell et al. 2005)?
 - Networks themselves do not represent what a field is
 - Networks by themselves do not constitute all there is to a field
- O'Neil and Ackland (2014) - above argument does not take into account the specificity of Internet sociality...online interactions are extraordinarily more visible than their offline counterparts...in this example hyperlinks constitute main form of connection and affiliation available to online actors, and hence hyperlink networks can be equated to fields.

- O'Neil & Ackland (2014) assess how structural position and time in the field affect the adoption of a new risk issue
- Also investigate the roles of actor identity and the nature of the new risk issue
 - likelihood of an actor adopting a new issue will be affected by how relevant the issue is to the actor's portfolio of concerns.

A new risk issue: nanotechnology

- We focus on nanotechnology (science of technology development at the atomic level) as an emergent risk issue
 - A “textbook illustration” of an emergent technology positioned as economically and strategically necessary, by government, business and scientific actors and as fraught with risk and danger by protest actors.

- Proponents emphasised scientific/commercial opportunities (increased food yields, improved energy production and novel consumer goods), yet some acknowledge substantial uncertainties about unexpected consequences.
- Critics emphasised the risks, such as the unknown long-term health and environmental effects of nano-particles on living organisms, and surveillance and privacy issues
- Significant funding in the US to study the social impacts of nanotechnology: Centers for Nanotechnology and Society established at Arizona State University and at UC Santa Barbara.
- During 2000s, stage was set for nanotechnology risk issue to appear in the activist field.

- A central characteristic of fields is the division of actors into influential actors (“dominants”) and non-influential actors (“challengers”)
- To study the environmental social movement as a strategic action field we need to identify influential actors and the strategies enabling actors to gain influence

- We use a network-theoretic conceptualisation of a social movement field
- We have two proxies of influence/power in the field.
- Proxy 1: Centrality in networks of exchange of practical or symbolic resources between social movement actors
 - SNA has long held that actor centrality in a network is strongly associated with leadership and power
 - Dominants and challengers in a social movement field can be identified using the network position of these actors
- Proxy 2: Length of time that an actor has been operating in the network
 - Preferential attachment/cumulative advantage
 - Dominants are “incumbents”, challengers are “new entrants”

- Hypothesis 1 (Network influence and participation in framing a new risk issue): The greater the influence of an actor in an online social movement field, the smaller the probability of adopting a new online frame
 - We test hypothesis 1 using three different (but related) measures of network influence:
 - Indegree centrality in the hyperlink network
 - Ratio of indegree to outdegree in the hyperlink network
 - Time in the hyperlink network.

- Hypothesis 2 (Sub-movement identity and participation in framing a new risk issue):
An online social movement organization will be more likely to adopt a new online frame, the greater the relevance of the new risk issue to issues already focused on by that organization.

- Same dataset of 161 environmental activist websites as in Ackland & O'Neil (2011)
- Length of time that each organization has maintained a web presence was estimated using the Network Solutions *whois* service (shows when domains were first registered)
 - For our sample of 161 websites, the average age (in 2006) was 6.8 years with a minimum of 0.2 and a maximum of 12.7 years.

Analysis of frame adoption - 2006 data

- Logistic regression was used to test hypotheses regarding the adoption of the nano-risk frame.
- Binary dependent variable is whether the site contains nano content on its homepage.
- All models contain dummy variables indicating sub-movement affiliation (Globals are the control group). Additionally:
 - Model 1 contains hyperlink indegree centrality (our first proxy of influence in the online social movement)
 - Model 2 includes indegree/outdegree ratio (our second proxy of influence)
 - Model 3 contains time in the network, entered as a quadratic term (our third proxy of influence)

Table 4: Logistic regression for presence of nano-related content

	(1)	(2)	(3)
Intercept	-2.560*** (0.449)	-1.570*** (0.320)	-1.314 (0.879)
Bio	1.360*** (0.465)	1.064* (0.428)	1.543*** (0.502)
Toxic	0.218 (0.647)	-0.050 (0.618)	0.233 (0.645)
Indegree	0.077*** (0.023)		
Indegree/Outdegree		-0.040 (0.070)	
Age			-0.421 (0.270)
Age ²			0.041* (0.020)
R ²	0.166	0.069	0.123
N	158	158	158

Standard errors in brackets. Significance levels are indicated by: *** < 0.1%, ** < 1%, * < 5%.

- Model 1 shows significant **positive** relationship between indegree centrality and adoption of the nano-risk frame - each additional inbound hyperlink associated with approx. 8 percent increase in the odds of having nano-related content on the homepage.
- Model 2 shows **no significant relationship** between indegree/outdegree ratio and the likelihood of adopting the nano-risk frame.
- Model 3 indicates a **statistically significant** impact of time in the network on the probability of adoption of the nano-risk frame, with the coefficient on age-squared suggesting a **U-shaped relationship**
 - Global site that has just entered the network has a 21.2% chance of having nano content, after 1 year the probability has dropped to 15.5% and it declines until it reaches a minimum of 8.4% after 5 years and then starts to increase.

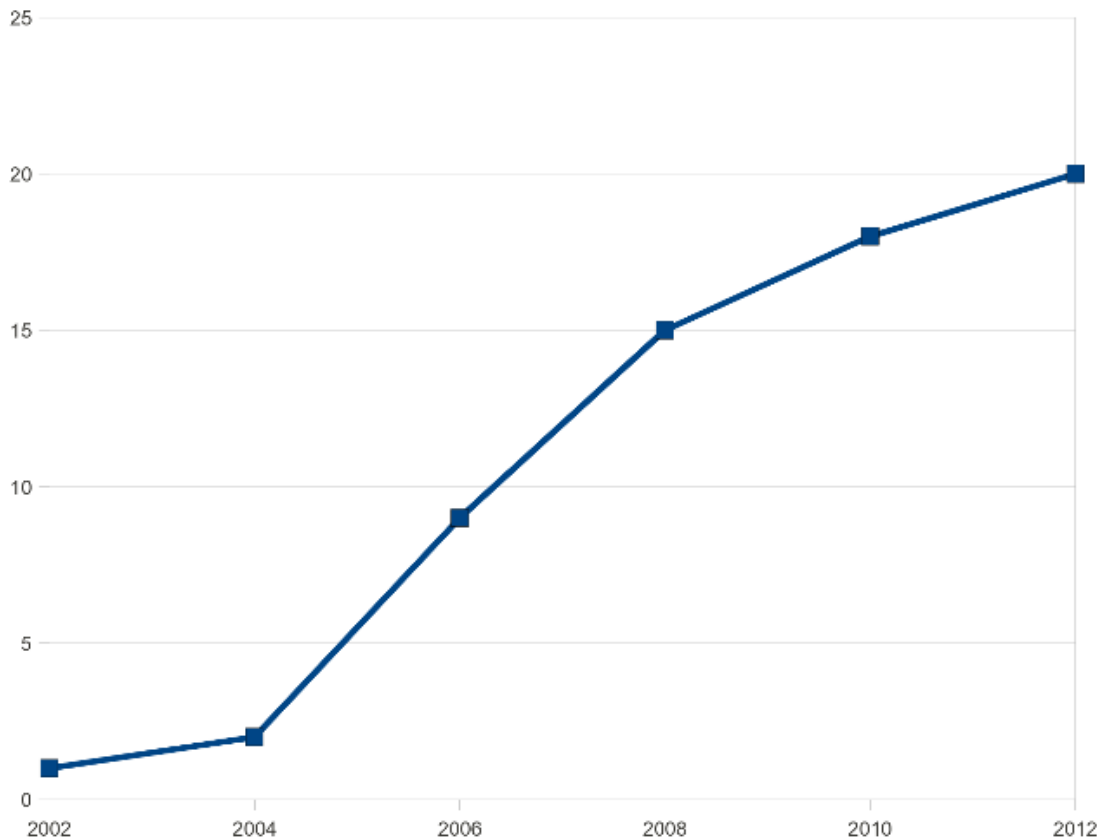
- **So, not a lot of empirical support for hypothesis 1**
 - Rather than rejecting new frames, perhaps certain dominant actors are embracing these frames in order to co-opt them.
 - In the UK, Greenpeace became involved in the biotechnology issue as a response to the “intensity of a wider public unease being expressed through the emergence of spontaneous networks and initiatives” (Kearnes et al. 2006: 300).

- All three models show that the Bios are significantly more likely to have nano content: odds of a Bio site having nano content between 2 and 5 times higher than that of a Global site.
- Strong support to hypothesis 2: SMO more likely to participate in frame development relating to a new risk issue if new issue connects with or complements the organisation's existing identity.
- There are similarities between the portrayal of biotech as likely to cause irreversible and unpredictable damage, the resistance to becoming dependent upon multinational companies, and the calls for a moratorium which anti-biotech activists have historically put forward (Levidow 2000) on the one hand, and activist discourse on nanotechnology (e.g., ETC 2003) on the other.

Analysis of frame adoption - historical data (2002-2012)

- In June 2014 we used the Internet Archive's Wayback Machine to collect historical web page content
- For each website, we collected the data every two years between 2002-2012 (collected data around the middle of a given year)
- For each site in each year, we collected the homepage and other pages that presented the mission, activities and campaigns of the organisation. Also attempted to collect any pages containing links to other websites.
- Our aim was to track the adoption of the nano-risk frame over the period 2002-2012. Hence, we only collected the historical web data for those sites that were active and archived by the Internet Archive during the entire period.
- For this reason we were able to collect historical web data for only around half (88) of the 161 seed sites.

Figure 1: Number of sites that had adopted nano-risk frame, 2002-2012



- 2006 was the year the nanotechnology issue “took off” among the sites in our sample
- We therefore have some confidence that in our statistical analysis (using 2006 data), we are studying the behaviour of social movement organizations who were amongst the first wave of actors responding to an emergent risk issue.

- The historical data allows us to understand more about what types of organizations were adopting the nano-risk frame at different points along the familiar S-curve of diffusion
- Two Bio sites pioneered the use of nano-related content in 2002 and 2004 respectively. These sites were relatively young, with an average age (in 2006) of just under 6 years.
- Of the seven sites that adopted the nano-risk frame in 2006, five were Globals, one Bio and one Toxic, and these sites had an average age (in 2006) of over 9 years.
- This gives some support to our above findings that new entrants to the field play the role of innovators by inaugurating new issues. Incumbents then adopt the issue in order to expand their frame repertoire and remain current.

Online Social Movements in the Twitter Era

- In studying social movements on social media (e.g. Web 2.0), can we use (or adapt) the above conceptual framework and methods used for studying social movements using Web 1.0 data?

Networked individualism

- Barry Wellman's (2001) concept of “networked individualism” (NI) - empowerment of the individual to bring about societal change - is increasingly relevant as:
 - Membership of organisations (e.g. unions, social movement organisations declines) – see, e.g., Putnam's *Bowling Alone* thesis
 - Social media allows people to become networked more easily

Occupy Wall Street



- September 17, 2011: in Zuccotti Park, located in New York City's Wall Street financial district
- Inspired by (among other) the protests in Egypt and Indignados in Spain.
- Grew to be a global movement: Occupy and Occupy Everywhere
- The protests emerged without the structure of formal organizations (SMOs)
- Large numbers of people were recruited and mobilized in a decentralized, horizontal way.
- See, e.g. González-Bailón et al. 2011

Bennett and Segerberg (2012)

- Computer mediated communication has allowed social movements to shift from **collective action frames** (where individuals to 'toe the party line' and unite under one slogan), to **personal action frames** that are easily adaptable to the individual, and can be expressed as a personal story and spread via social media.
- Classic theories of collective action emphasise the role of Social Movement Organisations (SMOs)
- In contrast, individualized action frames shift the focus away from the SMO and onto the networked individual.

On-going research...

- Robert Ackland, Mathieu O'Neil, Cecilie Einarson Pérez
- Using Twitter data, investigate whether and how pre-Internet theories of collective action can be adapted to understanding dynamics of protest in social media era
- Since this is on-going research, I do not have findings to present but here is some progress...

Microblog hashtags (#)

- Hashtags are used to categorise a message (tweet) on the microblog site Twitter.
 - e.g., adding #ows to a tweet categorises the message as having something to do with the topic Occupy Wall Street (OWS).
- Various interpretations of meaning/purpose of hashtags:
 - labels for contextualizing statements. Hashtags tells the recipient, (the individual who must decode the message) in what context the message should be read.
 - objects for bookmarking
 - channels for sharing information
 - “virtual sites” for communities (Yang et al 2012, Lin et al 2013)
- The potential role of community building is what sets hashtags apart from tags in other other social tagging systems (e.g. del.icio.us, flickr)

Some research questions...

- RQ 1: Can hashtags be used to demarcate the boundaries to fields?
 - Do actors in a hashtag-demarcated field exhibit similar behaviour to that observed in offline fields of protest (or Web 1.0 fields, for that matter)?
 - For example, are new actors more likely to promote emergent frames, compared with incumbents?
 - Response to exogenous shocks
- RQ 2: Can some Twitter hashtags meaningfully be considered as collective action frames?

Data

- Use data from Netbadges.com for various hashtags associated with protest/politics:
 - #ows, #occupywallstreet
 - #fracking
 - #auspol, #ausvotes
- Between Oct 2011 and Jun 2013 Netbadges collected (every several days)
 - Tweets containing these hashtags
 - Twitter profile data for these users
 - Social graph (follower network) of these users



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Latest Netbadges



In "cosmology" Twitter user [BlackPhysicists](#) awarded a Silver Netbadge



In "cosmology" Twitter user [Asher_Wolf](#) awarded a Bronze Netbadge



In "cosmology" Twitter user [IMEgdall](#) awarded a Gold Netbadge



In "nijntje" Twitter user [Justiin_JS](#) awarded a Silver Netbadge

Keywords with recent Netbadges

hci

Updated: 1 min 46 sec ago

Human_Capital: Learn proven strategies to help supercharge engagement pract...(Mon, 2013-05-20 19:41 UTC)

ftl

Updated: 1 min 49 sec ago

tmj_NAS_nursing: #Plainview , NY #Nursing #Job: Primary Nurse Case Manager ll...(Mon, 2013-05-20 21:40 UTC)

cosmology

Updated: 5 min 46 sec ago

IMEgdall: Cool article on #timetravel: <http://t.co>



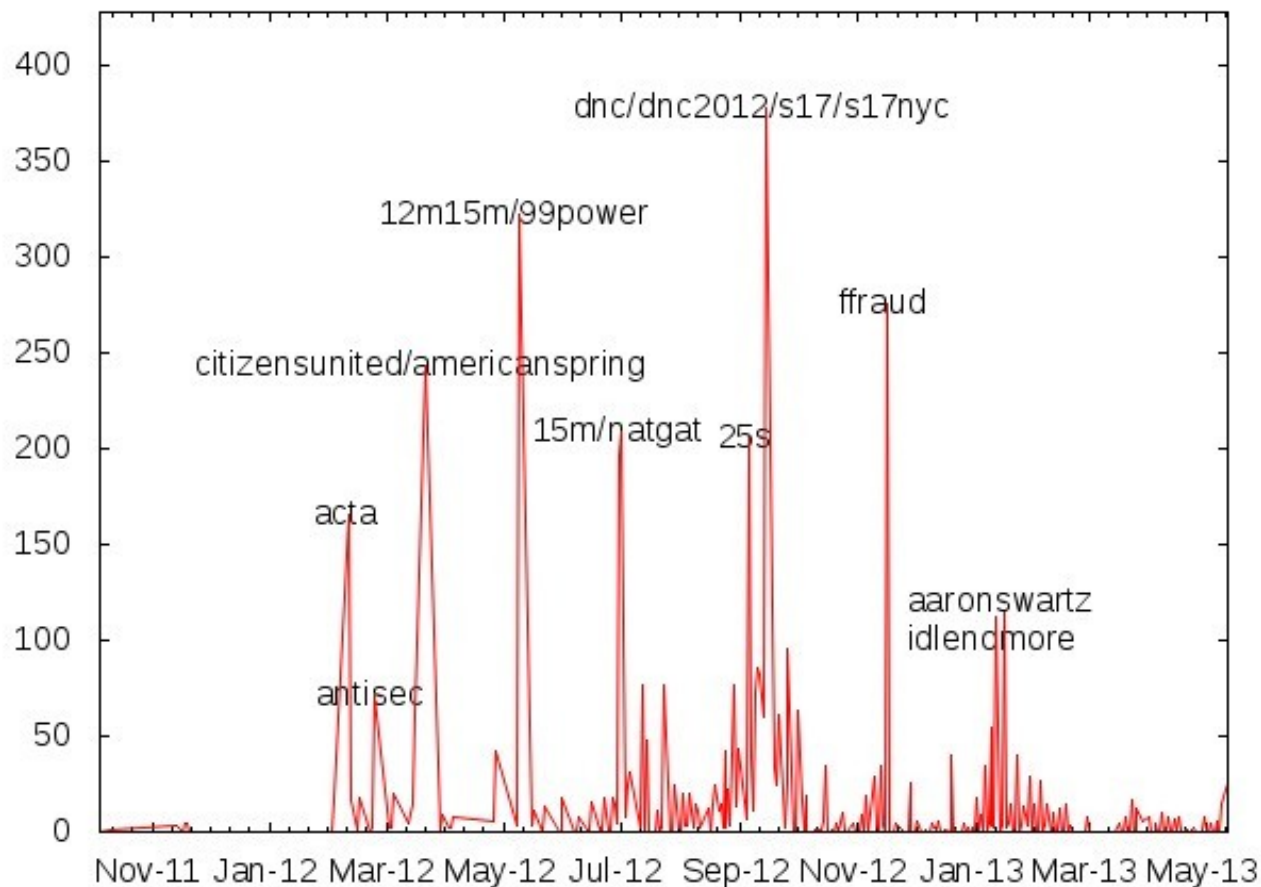
Gold Award Ranking

No.1		HuffingtonPost	731 times
No.2		jeffbullas	636 times
No.3		TechCrunch	519 times
No.4		BloombergNews	479 times

- Have constructed networks of Twitter users who tweeted particular hashtags:
 - **OWS** (#ows or #occupywallstreet and one of following):
 - 12m15m, 15m, 25s, 99power, aaronswartz, acta, americanspring, antisecc, citizensunited, dnc, dnc2012, ffraud, idlenomore, natgat, s17, s17nyc
 - **Australian politics** (#ausvotes, #auspol and one of following):
 - asylum, asylumseekers, marriageequality, refugees
 - **Fracking** (#fracking and one of following):
 - dnc2012, dontfrackme, dontfrackny, earthquake, gasland, ncga, ncpol, nogas, nokxl
- Hashtags chosen:
 - Either reflects exogenous shock (reflected in trajectory of hashtag)
 - Hashtag emerged during the data collection period (so can track uptake of “emergent frame”)

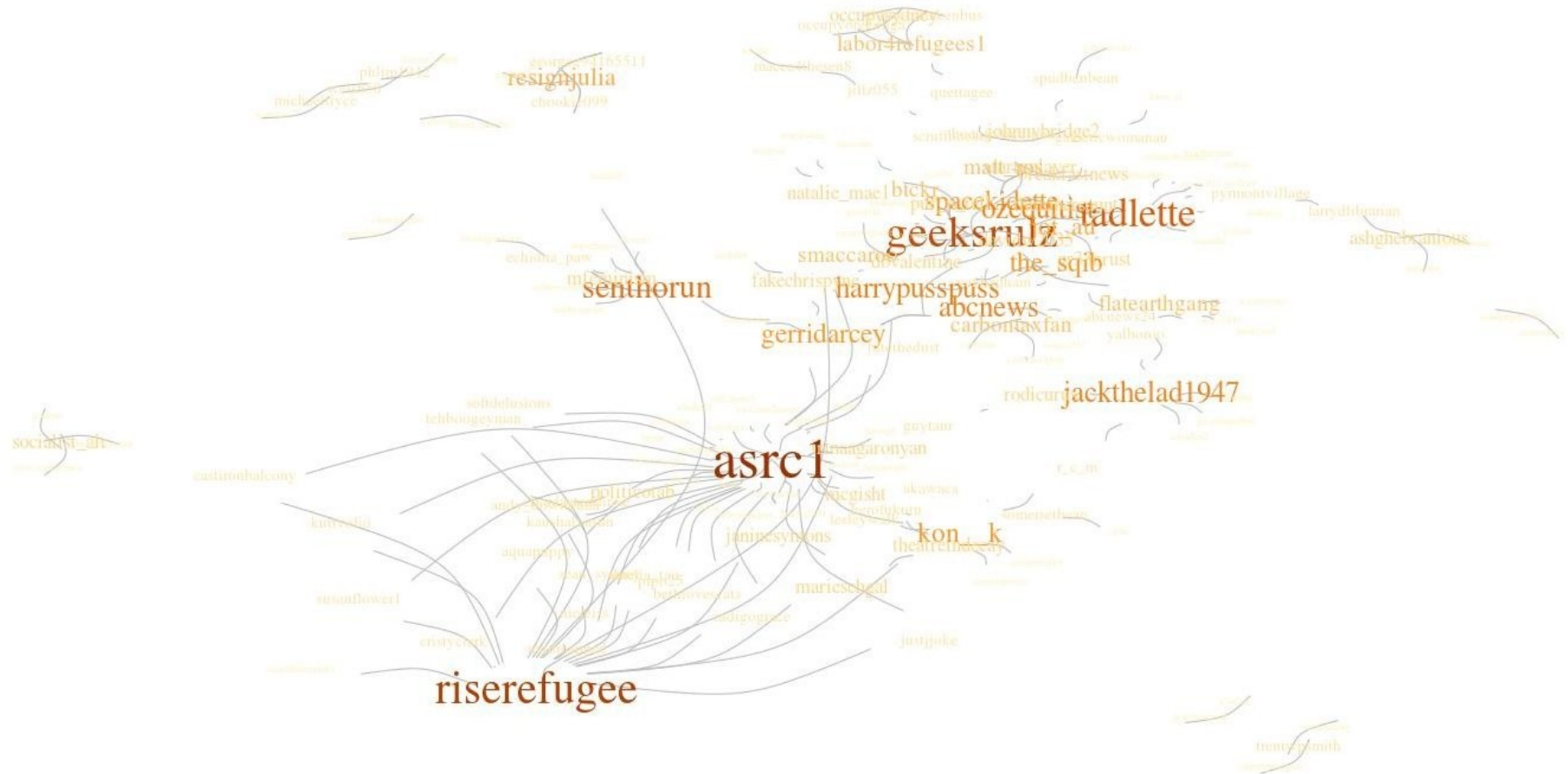
Hashtag use on the “OWS Field”

|99power|aaronswartz|acta|americanspring|antiseccitizensunited|dnc|dnc2012|ffraud|idler



Dynamic networks

- Directed network: edge between i and j because there exists either a retweet, @mention or @reply
- Networks exhibit tie decay: if tie between i and j is not “renewed” before 90 days, then it is deleted



Types of analysis we are conducting

- Logistic regression to identify factors associated with adoption of emergent hashtag (frame)
 - As per O'Neil & Ackland (2014), are new entrants/challengers more likely to adopt emergent frame? See Cecilie Einarson Pérez presentation at this workshop...
- Field dynamics: can we detect change in structure/composition of the field in response to exogenous shocks?
- Trajectories:
 - Time path of issue through social space
 - Time path of actors through issue space

Big data and social movements research

Three core challenges that underlie network research into social movements using Web 1.0 data are still present in the Twitter era:

- how to deal with large-scale digital trace data
- how to collect and analyse longitudinal/historical data
- how to interpret existence (or non-existence) of online ties between social movement actors.