Social Capital Accumulation Strategies in Anti-Nanotech Online Networks

Mathieu O’Neil and Robert Ackland
ACSPRI Centre for Social Research
Research School of Social Sciences
The Australian National University
http://voson.anu.edu.au

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Power on the net: capacity to influence others

In the case of online communities domination can be analysed in terms of:
- central position (authority)
- success in controlling terms of debate (diffusion)

How can this be empirically measured? Convergence of social science (organisation and social movement theory, social network analysis) and information science approaches (web metrics).
Social capital

- Influence: possession of resource [interdisciplinary term]
  - Social capital [SK]: resource available through network.
  - Hyperlink capital [HLK]: ties become a resource.

- Retrievability online is absolute; visibility is relative (Hindman et al 2003).

- Actors (websites) engage in competition for eyeballs -> supporters -> contributions and / or engagement.

- Mechanisms for generation HLK: how actors gain legitimacy / authority; how themes diffuse successfully?
Activist networks online: ideology and practice.

Working hypothesis: the online environmental network is structured as a field where new entrants seek to assert the legitimacy of their prognostic frames over that of incumbents. See reform ecology 1970s, deep ecology 1980s, eco-feminism / eco-spirituality 1990s.

Nanotechnology: cornucopia or dystopia?
Virtual Observatory for Study of Online Networks. http://voson.anu.edu.au

Creation of seed set (search engines, media stories, directories). Content and hyperlink harvesting by web crawler.

Creation of “Activist Connectivity Database”. Aggregation into page-groups (org-level analysis): 161 groups.

LGL / FDG mapping of hyperlinks.

Automatic classification of groups (ccTLD, generic TLD).
Manual classifications of 161 groups

- Frame: globals (89), bios (46), toxics (26)
- Years in network: 1-2 years (12), 3-6 years (82), 7+ years (55)
- Organisational type: advocacy (71), coalition (70), grassroots (20)
- Nanotech content: none (125), some (22), substantial (12)

Analytical approaches

- Text analysis of co-locations parsed from homepages.
- Cross-tabulations of automatic / manual categories.
- Social Network Analysis (SNA) - node and graph metrics.
[text analysis: prognostic frames]

- **globals**: climate/change (22) public/health (5) natural/resources (4) ancient/forests (4) air/quality (3) extinction/hotspots (3) oil/addiction (5) greenhouse/emissions (4) fossil/fuels (3) human/activities (4) major/companies (4).

- **bios**: trade/dispute(s) (5), trade/war(s) (5) multinational/corporations (4) corporate/power (3) global/system (3) patent(s)/law(s) (4) misleading/claims (3) field/trials (6) engineered/crops (6) modified/organisms (5) animal/feed (4) engineered/food (3) food/security (5) food/safety (4)

- **toxics**: toxic/chemicals (6) environmental/health (4) chemical/burden (4) waste/sent (3) being/dumped (3) community/groups (4)
## [hyperlink counts]

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>total-outbound</th>
<th>total-inbound</th>
<th>site / outbound</th>
<th>site / inbound</th>
<th>ratio in / out</th>
</tr>
</thead>
<tbody>
<tr>
<td>bios</td>
<td>46</td>
<td>6458</td>
<td>2219</td>
<td>140.3</td>
<td>48.2</td>
<td>0.34</td>
</tr>
<tr>
<td>toxis</td>
<td>26</td>
<td>3812</td>
<td>1724</td>
<td>146.6</td>
<td>66.3</td>
<td>0.45</td>
</tr>
<tr>
<td>globals</td>
<td>89</td>
<td>16129</td>
<td>7755</td>
<td>181.2</td>
<td>87.1</td>
<td>0.48</td>
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<tr>
<td>all</td>
<td>161</td>
<td>26399</td>
<td>11698</td>
<td>163.9</td>
<td>72.6</td>
<td>0.44</td>
</tr>
</tbody>
</table>
## Cross-tabulation: Frame / Age

<table>
<thead>
<tr>
<th></th>
<th>1-2 years</th>
<th>3-6 years</th>
<th>7+ years</th>
<th>Unknown</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>bios</strong></td>
<td>6.5</td>
<td>67</td>
<td>17</td>
<td>8.5</td>
<td>100</td>
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<tr>
<td><strong>toxics</strong></td>
<td>2</td>
<td>57</td>
<td>30.5</td>
<td>7.5</td>
<td>100</td>
</tr>
<tr>
<td><strong>globals</strong></td>
<td>9</td>
<td>40.5</td>
<td>44</td>
<td>6.5</td>
<td>100</td>
</tr>
<tr>
<td><strong>all</strong></td>
<td>7.5</td>
<td>50</td>
<td>34</td>
<td>19.5</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>none</td>
<td>some</td>
<td>substantial</td>
<td>unknown</td>
<td>total</td>
</tr>
<tr>
<td>----------</td>
<td>------</td>
<td>------</td>
<td>-------------</td>
<td>---------</td>
<td>-------</td>
</tr>
<tr>
<td>bios</td>
<td>63</td>
<td>21</td>
<td>13</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>toxics</td>
<td>84.5</td>
<td>11.5</td>
<td>4</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>globals</td>
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<td>10</td>
<td>5.5</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>all</td>
<td>77.5</td>
<td>13.5</td>
<td>7.5</td>
<td>1</td>
<td>100</td>
</tr>
</tbody>
</table>
In terms of indegree the most successful groups are the globals.

Apparent confirmation of the preferential attachment model; bios lack “stickyness”.

The contestation of nanotechnology (new stake) is primarily championed by bios (newest entrants); toxics least interested.
LinLogLayout FDG of 355 nodes (node repulsion version, minimum degree: 10)

blue: globals
red: bios
green: toxics
## SNA: nanotech content

<table>
<thead>
<tr>
<th></th>
<th>some / substantial nano content</th>
<th>no nano content</th>
</tr>
</thead>
<tbody>
<tr>
<td>network size</td>
<td>34</td>
<td>125</td>
</tr>
<tr>
<td>network density</td>
<td>0.108734</td>
<td>0.0429032</td>
</tr>
<tr>
<td>dyadic reciprocity</td>
<td>0.344262</td>
<td>0.285714</td>
</tr>
<tr>
<td>centralisation (degree, normalised)</td>
<td>0.190341</td>
<td>0.202269</td>
</tr>
</tbody>
</table>
## SNA: frame

<table>
<thead>
<tr>
<th></th>
<th>globals</th>
<th>bios</th>
<th>toxics</th>
</tr>
</thead>
<tbody>
<tr>
<td>network size</td>
<td>89</td>
<td>46</td>
<td>26</td>
</tr>
<tr>
<td>network density</td>
<td>0.0764811</td>
<td>0.106763</td>
<td>0.146154</td>
</tr>
<tr>
<td>dyadic reciprocity</td>
<td>0.0250255</td>
<td>0.0289855</td>
<td>0.0369231</td>
</tr>
<tr>
<td>centralisation</td>
<td>0.218195</td>
<td>0.167122</td>
<td>0.34</td>
</tr>
</tbody>
</table>
Centralisation highest for oldest challengers (toxics), dominant group (globals).

Contradiction with?...

Density and dyadic reciprocity higher for oldest challengers (toxics) and actors promoting new stake (some & substantial nano).

- Consistent with study of online extremists such as far-right networks (Burris et al. 2000). Provides sense of critical mass lacking in real world (Park et al. 2005).
- Indicates that efforts to spread new stake have limited success (consistent with our dialect diffusion analysis).
[dialect diffusion: results]

- Leadership role taken by two globals: Environmental Defense (US): “green nano”; Greenpeace UK. [FoEA not included].

- Most influential on activist field has been ETC Group (bio-advocacy group; sixth highest indegree overall). Risk / danger frame: “atomtech”, “nanotoxicity”. [Emulate “frankenfood”?]

- No occurrence on sample homepages of these terms. For internal complex contagions to spread many sources are needed (Centola and Macy 2006); no “critical mass”.
LinLogLayout
FDG of 66 nodes
(node repulsion version)

red: bios
green: toxics

According to McAdam (2003) more success for spread through brokerage than internal diffusion.

If Pesticide Action Network fulfills its role as a broker – anti-nano frame may spread from bio subgroup to toxics subgroup.

But why “structural hole” between these two groups?
Frames serve to link the everyday to broader issues of equality, solidarity and injustice: what is the everyday?

Risk: affects a stigmatized minority (toxics frame) or affects everyone (bios frame)?

These divisions have a class basis (Lichterman 1996). Yet it is precisely the environmental movement’s diversity which has allowed it to survive.

New stakes (re) generate divisions, thereby contributing to network resilience.


