Social Network Analysis (SNA) for Modeling and Tuning an Online Social Media, Combating Terrorism Community

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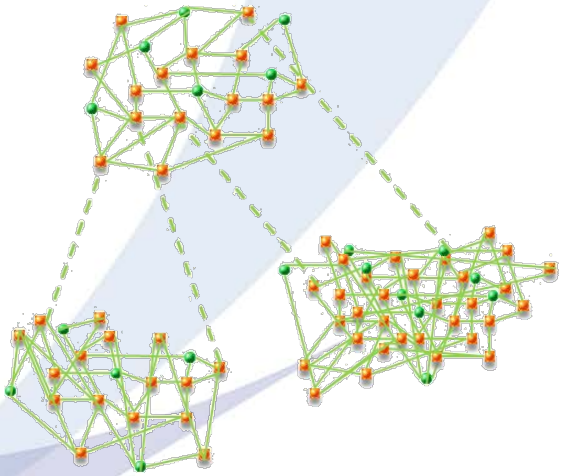
Agenda

- Introduction & Disclaimer
- Global Community of Combating Terrorism (CT) Professionals
- Social Media Websites
- Social Network Analysis (SNA) + Feedback
- The “Plan”
- Potential Outcomes

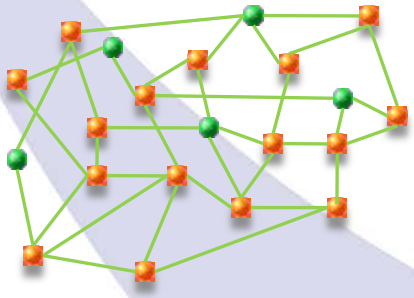
“If I had 8 hours to cut down a tree, I’d spend 6 hours sharpening my saw”
-- Abraham Lincoln



Interdisciplinary War on Terror

- Social Network Analysis: The study of network representations of social interactions

- Web 2.0, Social Media, User-generated content, Distance Learning, Virtual Classrooms, games, multi-media, …



•Establish, sustain a global network of CT experts & practitioners
• Web-delivered knowledge management and collaboration platform
• Significantly extend our reach to international communities
• Support sustained global CT partnerships

"The greatest challenge to any thinker is stating the problem in a way that will allow a solution
-- Bertrand Russell

Global Combating Terrorism (CT) Challenge

- A *Program* for Planning Future Directions for Analysis, Modeling, and Feedback, in its initial planning.
- How to foster collaborations among 'neighborhoods' of CT professionals
  - diverse international cultures and organizations.
- How to measure *cohesiveness* within the global CT community
  - from behavior on a social media website
- How to encourage formation of
  - bridging ties and tight-knit clusters

Measures of Effectiveness for CTFP* Continuing Engagement

Existing Capital Investment

~$200 Million ➔ ~20,000 Alumni
~$10 K in-class cost per Fellow
~$5 K per in-person Continuing Engagement
(for only ~ 400 Alumni/year)

Keeping Connected

Cost per interaction is dramatically reduced
e.g. If ~ 20 - 80% use CTFP-ECCO*
➔ ~ $200 - $900 per user/yr
(for ~3,000 to 13,000 Alumni *continually*)

Extending the Reach: Metrics

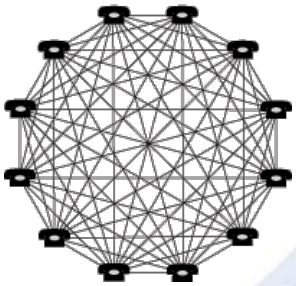
% of all CTFP graduates in our database
% of all graduates using the CTFP ECCO website
% of new graduates regularly using ECCO
% of the total set of countries using website

Number of and growth in connectivity of sub-networks of Alumni interacting on the website
Reduced numbers of disjoint networks having low connectivity
increased number of bridging links between relatively homogeneous sub-networks of users (inter-agency or inter-nation)

"Network Effect"

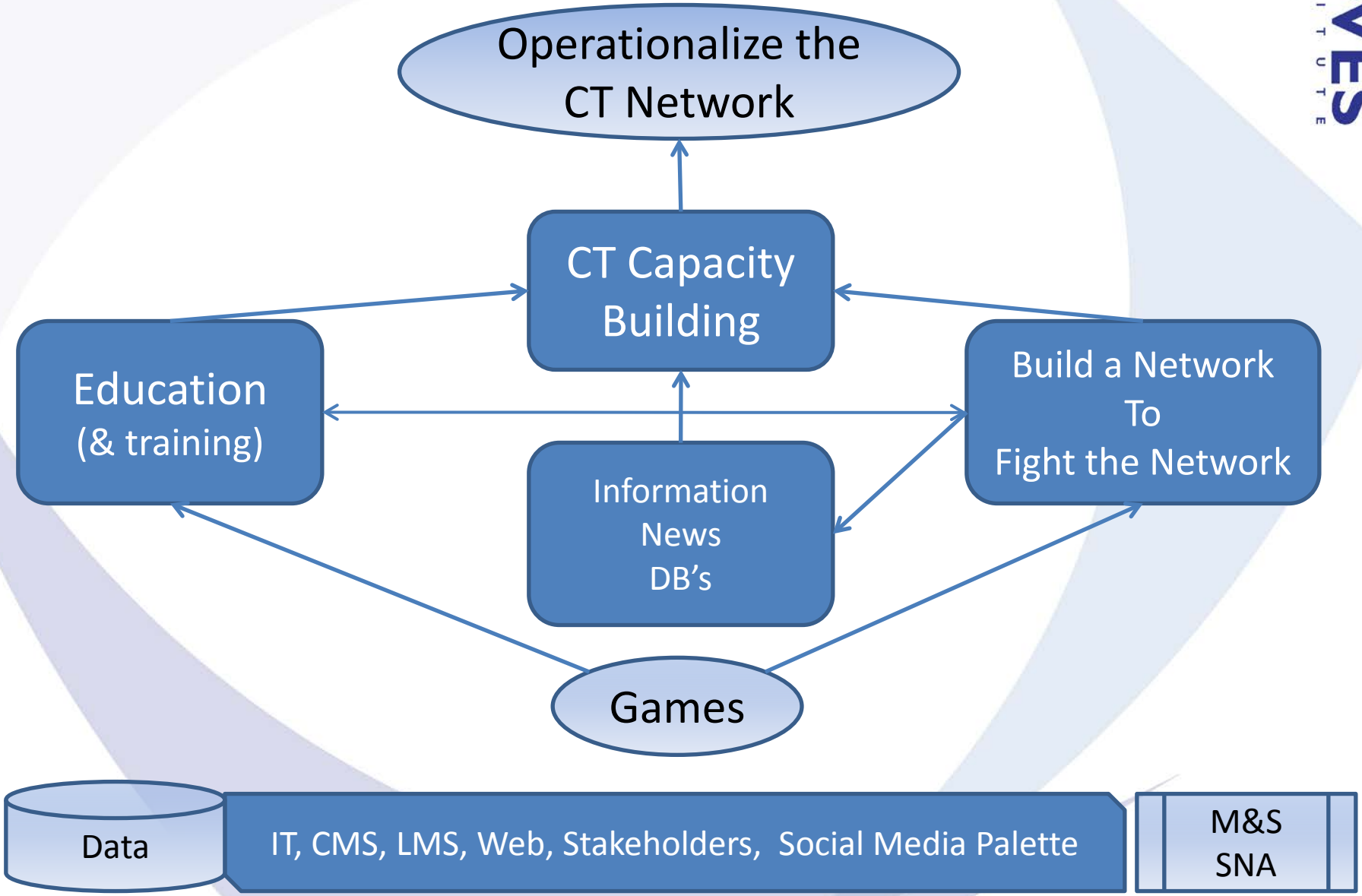
Metric: speed at which the website 'scales up' to a critical mass

Metric: Value of a network >= N^2
(but too simplistic)



* CTFP = Combating Terrorism Fellowship Program, ECCO = Education and Collaboration Community Online

Hierarchy of MOEs & MOPs



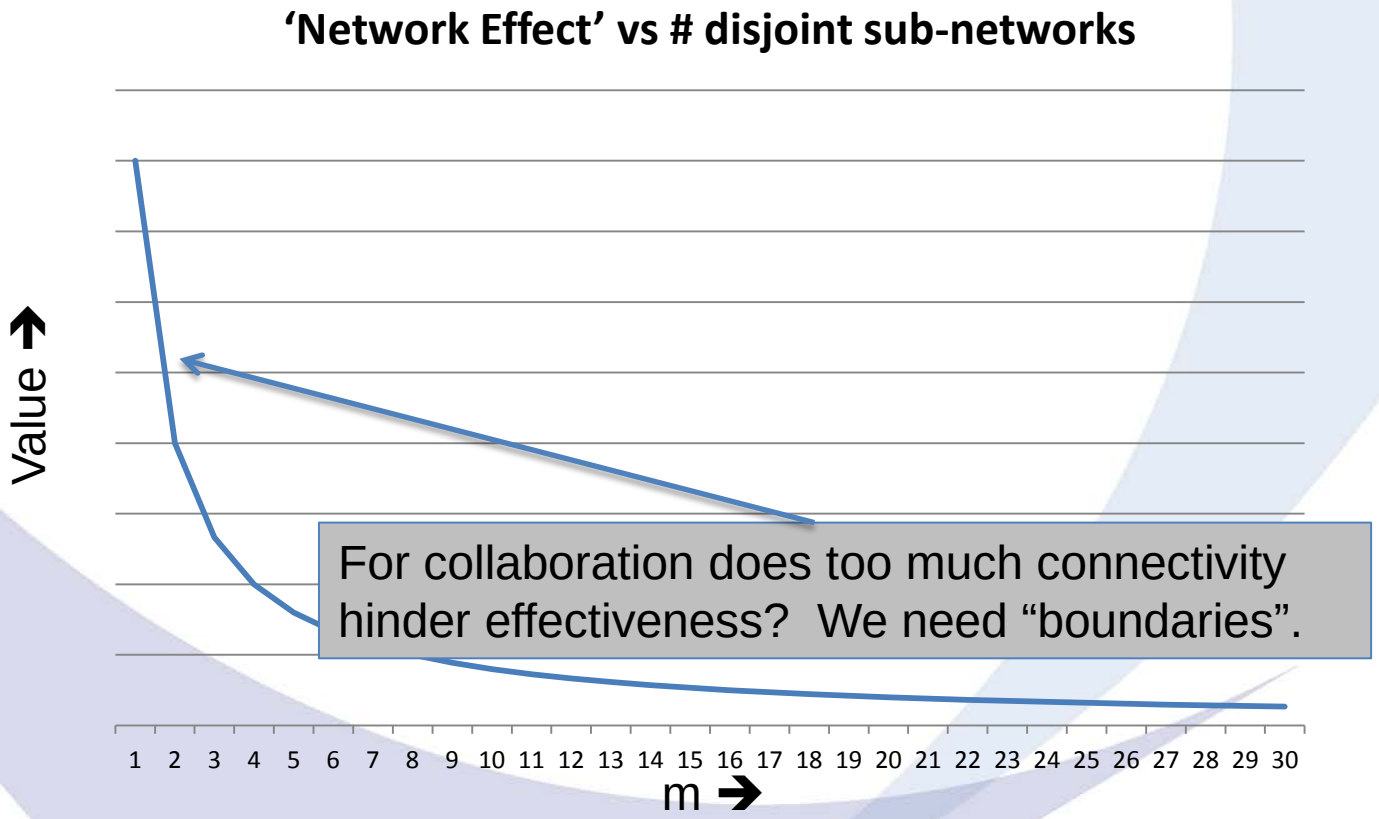
Goals

- Instantiate in-class Alumni relationships online
- How to develop, tune, and test models of online collective behavior for military and CT "capacity building".
- How to measure 'success'
  - Plethora of potential MOPs & MOEs
- How to foster 'success'
  - Survival of one community vice another!
  - Observe, analyze, and tune the website to increase important metrics

Connecting Disjoint Networks: 'N' individuals, 'm' disjoint sub-nets

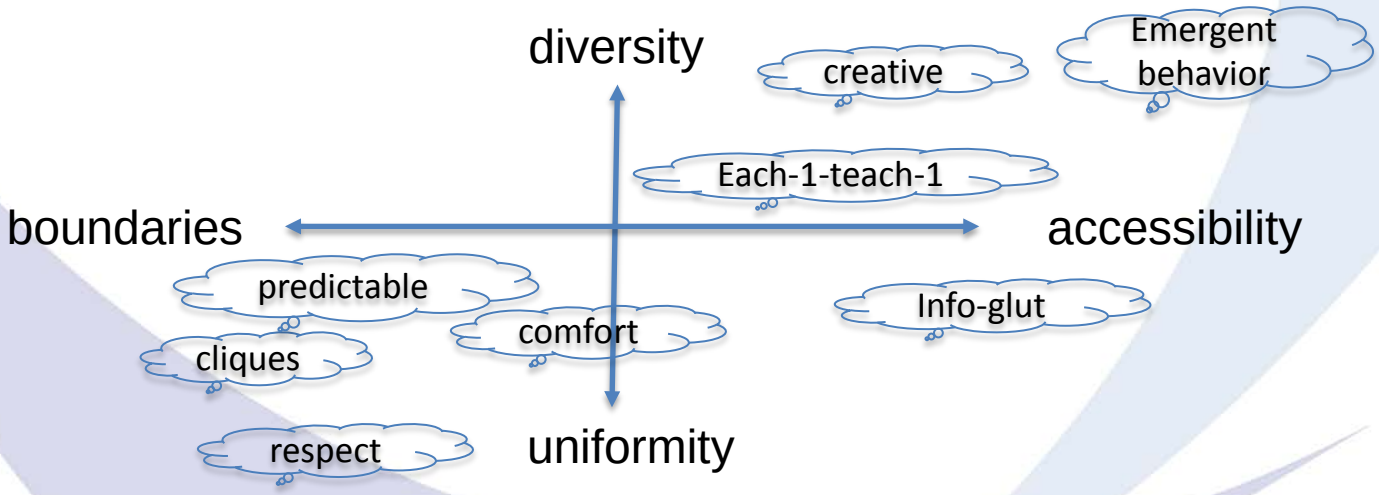
Metcalfe's Theorem Value of Network ~ N * (N-1) ~ N^2

Value of Network ~ m * (N/m) * (N/m - 1) ~ N^2 * **1/m**



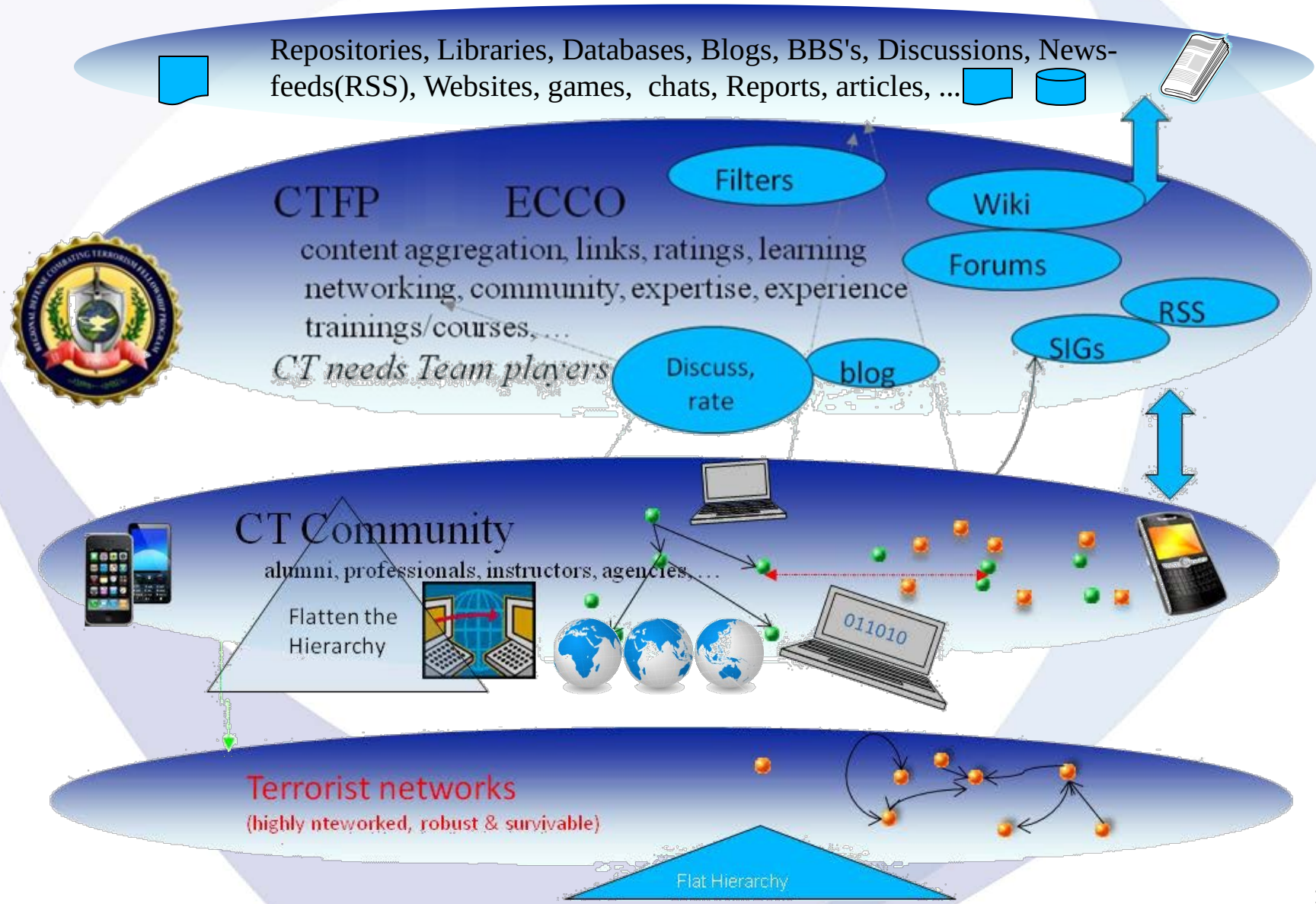
Create Searchable* Networks

- But respect boundaries, security, privacy
- "Good fences make good neighbors"
  - each Fellow controls what information they share
  - anonymity is an option



* Fellows can find & access diverse sources of data, expertise

Aggregate and add meaning and meta-data to information/news/reports, connect people to actionable information, connect people to people… foster teamwork and empowerment.



Two-Mode Affiliation Networks

Users may interact:

- Directly
  - -- contact via private messaging, comment on a blog or article authored by 2nd person. “Single-mode”, i.e. person ←→ person
  - -- connection in Social Network is stronger, more immediate
- Indirectly
  - -- comment on the same article, a 3rd person’s blog, read same RSS feed story, contribute to same wiki article, …
  - -- infer a connection, raw data is “affiliation”, person←→blog , person ←→ forum, …
  - -- Analysis yields person ←→ person & affiliation-i ←→ affiliation-j
  - -- Relationships identified among information types, sources, articles, books*, …

* e.g. Amazon book recommendations

Two-Mode ➔ One-Mode

Count of discussion	Column Labels ("Affiliations")													
People	Blog-1	Blog-2	Blog-3	Blog-4	Blog-5	Blog-6	Blog-7	Blog-8	Blog-9	Forum-1	Forum-2	Forum-3	Forum-4	Forum-
User-1		1												
User-2			1				1		1					
User-3														
User-4														
User-5														
User-6										1				
User-7														

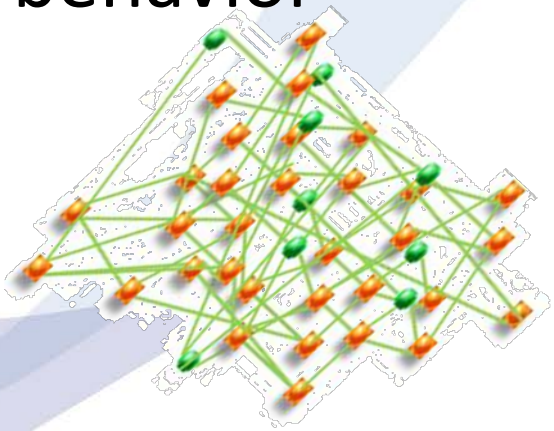
- "Affiliation", person ←→ blog , person ←→ forum, …

	Blog-1	Blog-2	Blog-3	Blog-4	Blog-5	Blog-6	Blog-7	Blog-8	Blog-9	Forum-1	Forum-2	Forum-3	Forum-4
Blog-1	3	0	0	1	0	0	0	0	0	1	0	1	0
Blog-2	0	4	0	0	0	0	0	0	0	0	0	0	0
Blog-3	0	0	4	0	0	0	1	0	1	0	0	0	0
Blog-4	1	0	0	8	0	0	0	1	0	2	0	1	0
Blog-5	0	0										0	0
Blog-6	0	0										0	1
Blog-7	0	0	1	0	0	1	23	0	1	0	0	0	0
Blog-8	0	0	0	1	0	0	0	4	0	1	0	0	0
Blog-9	0	0	1	0	0	0	1	0	10	1	0	0	0
Forum-1	1	0	0	2	0	1	0	1	1	31	0	2	1
Forum-2	0	0	0	0	0	0	0	0	0	0	1	0	0
Forum-3	1	0	0	1	0	0	0	0	0	2	0	13	0
Forum-4	0	0	0	0	0	1	0	0	0	1	0	0	4

- Visualize connections among site 'content'
- Visualize inferred connections among users

What is Optimal Connectivity?

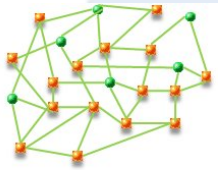
- To organize to fight a common enemy?
- Can a network be too connected
  - Or too disjoint?
- Is there an *optimal* network connectivity (i.e. not just max or min)?
- To share information (be 'searchable')
- To promote useful emergent behavior

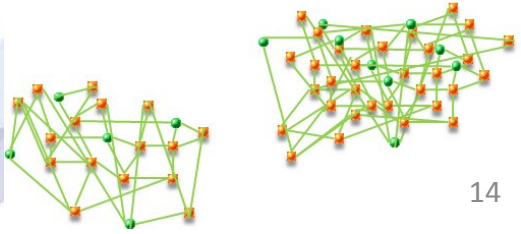


Can a "Community" be too disjoint?

- Can a group of people be too disjoint and cliquish
  - -- to heed important warnings
  - -- to enable responsive and effective emergent behavior
  - -- to self-organize against a common enemy

- An influential 1973 study* shows exactly that:
  - -- Boston's West End Community** was too cliquish, forming highly disjoint sub-networks
  - -- Failed to organize against Boston's "urban renewal"
  - ➔ was eventually destroyed



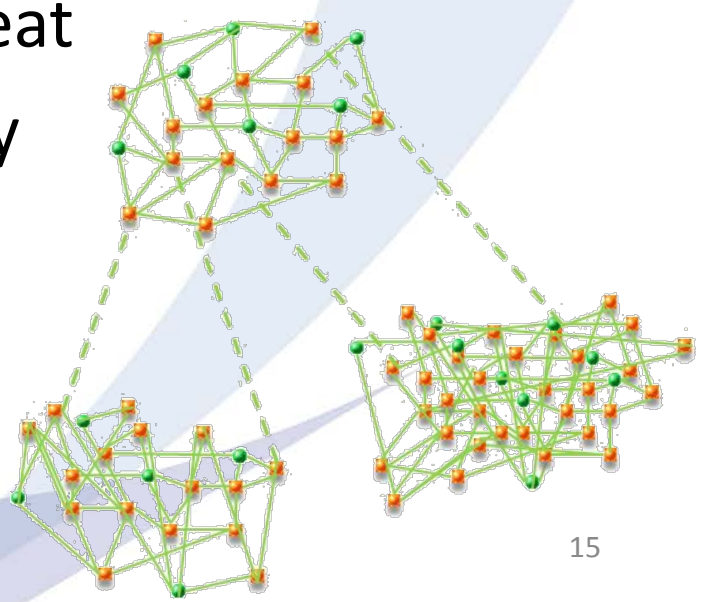


* Mark Granovetter, 1973 American Journal of Sociology

** "… widely known because a late 1950s urban renewal project razed" neighborhoods to redevelop the area." -- Wikipedia

The Strength of "Bridging Links"

- In *contrast* to the West End Community
- A neighboring Boston community:
  - Had numerous "bridging links"
  - Enabled effective organization for defense
  - Successfully withstood the threat
  - Survived as a viable community



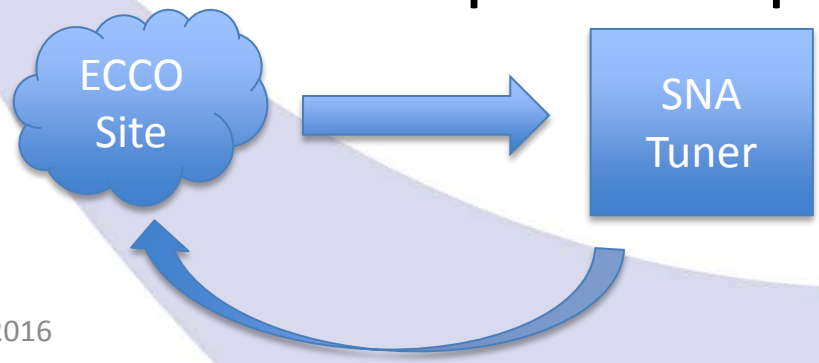
Fast-forward to the Global CT challenge of today

- Granovetter study suggests important questions
- A *global* context, with "neighborhoods" of CT professionals
  - Diverse languages, cultures, professions, talents, organizations

- How to measure current state of cohesiveness of global CT community?
- How to encourage bridging links and cohesiveness to enable effective learning & self-organization?
- ➔ thus materially increasing capacity-building CT partnerships!

Social Network Analysis

- Concepts:
  - "Centrality" (betweenness, degree, …)
  - Influence
  - Searchable networks
  - Reach
- Model site activity, Analyze & Visualize
- "feedback loop"? To optimize (what MOE's?)

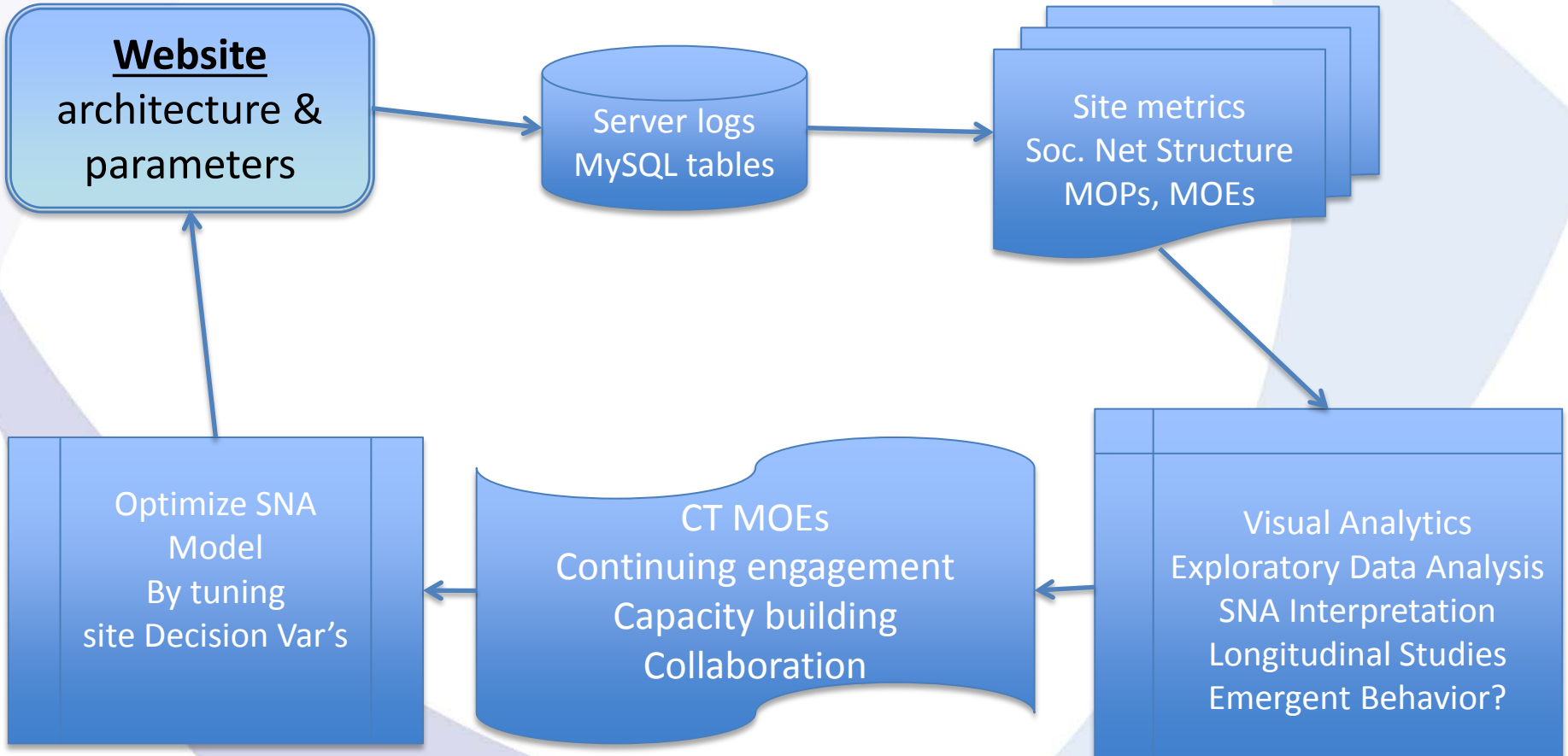


Social Media Websites

- Goals
  - Not optimizing page views
  - Not “monetizing” traffic, nor selling Google Ads!
  - MOE’s
    - Usability
    - Site engagement, stickiness, page views,
    - Interactions among nations, organizations, individuals, races, cultures, …

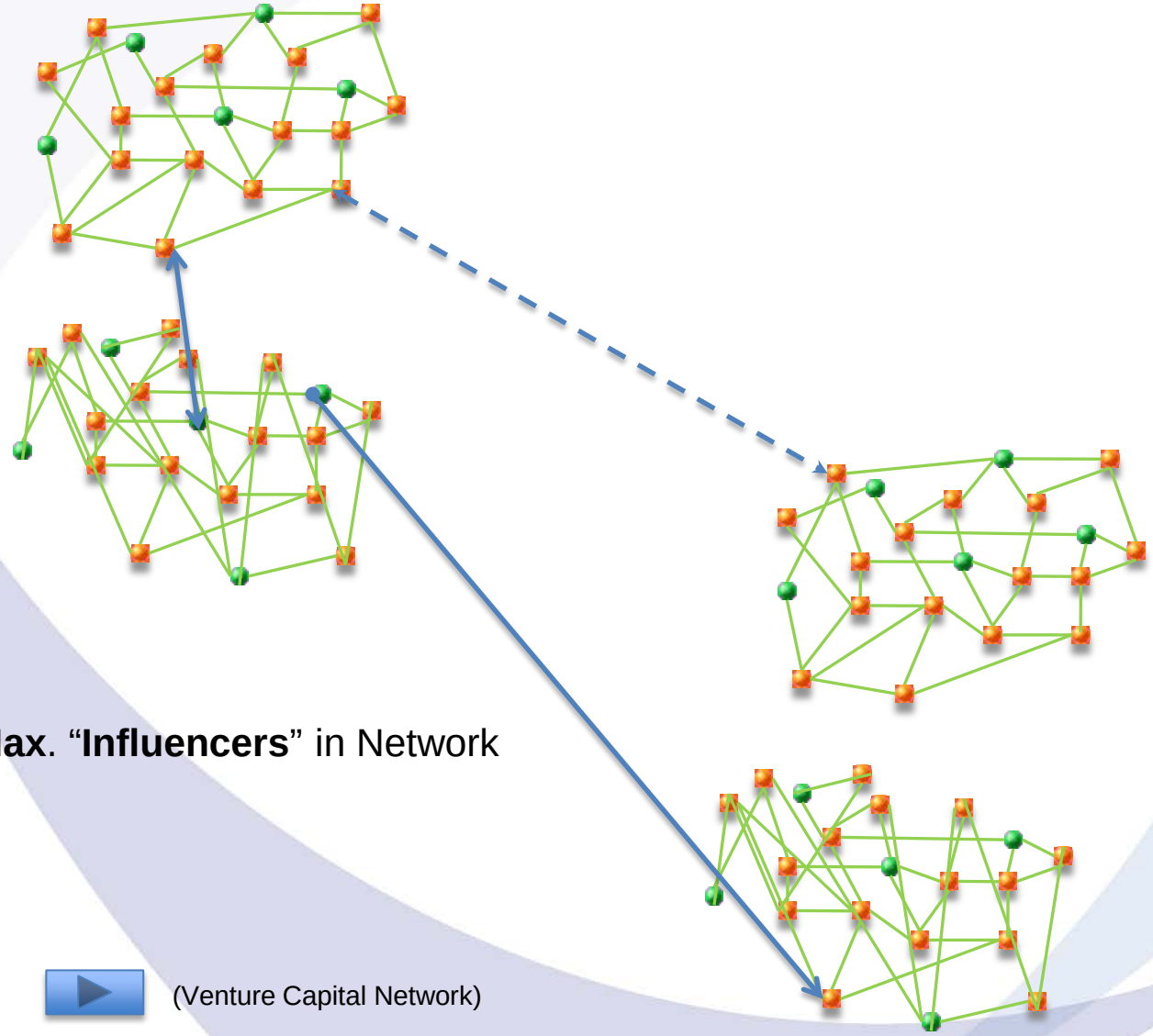
- Techniques
  - ‘Social Equity’, reputation, recognition
  - Users contribute content
  - Users interact directly & indirectly

Closing the SNA Loop



Tune the website, spiral development

In-class Networks ➔ Online (& bridges)



Max. "**Influencers**" in Network

(Venture Capital Network)

Number of Bridges

Edge betweenness

Network Searchability

Thank You!

Questions?

Comments?

"Judge a man by his questions rather than by his answers"
-- Voltaire

Backup slides, materials

- Longitudinal Study of Venture Capital Network

Longitudinal Studies

- Time evolution of networks
- Feedback to site architecture
- “time scales”
  - For on-site networks to evolve
  - For feeding back onsite behavior/analyses to site architecture
  - For users to respond to changes
  - Identify “emergent behavior”
- Overall MOE’s for “continuing engagement”…

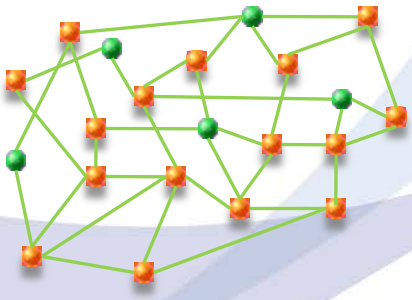
CTFP: Combating Terrorism Fellowship Program

Short- and long-term Combating Terrorism programs for international students at 5 schoolhouses and 6 regional centers around the world.

What kinds of usage data?

- **Build**:
  - ❑ effective collaboration,
  - ❑ knowledge & data -filtering, -ranking, and -fusion.
  - ❑ supportive professional learning networks
  - ❑ social structures (nets) through computer-mediated interactions?

- **Website features:**
  - ❑ wiki, messaging, user-ratings, and Forums, personalization
  - ❑ generate that data help us learn how to foster effective CT collaboration and learning community online.



CTFP ECCO Project

Needs, Gaps, Solutions

Needs

Build and strengthen a global network of CT experts and practitioners committed to supporting US efforts against terrorists and their organizations

"The worldwide CT network does exist! And all this thanks to you!"
--CISA Romanian Alumnus

Gaps

Limited reach to international CT experts and practitioners, and

Limited, short-term and intermittent meaningful contact and collaboration using traditional means

Solutions

Establish and sustain a global network of CT experts and practitioners using a web-delivered knowledge management and collaboration platform that will significantly extend our reach to international communities and support sustained global CT partnerships

Create the networks that fight the networks

CTFP Education, Collaboration Community Online Project

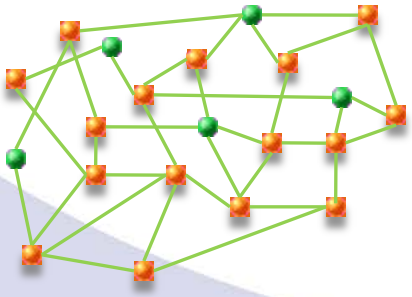
Addressing the Gaps

Extending the Reach

We can reach any CT practitioner with an internet connection, anywhere in the world

Keeping Connected

Global on-demand, long-term and sustained meaningful contact using social media web tools through online knowledge sharing, collaboration, training and education



Legitimate Environment

CTFP has created a legitimate environment for international CT collaboration with courses and outreach

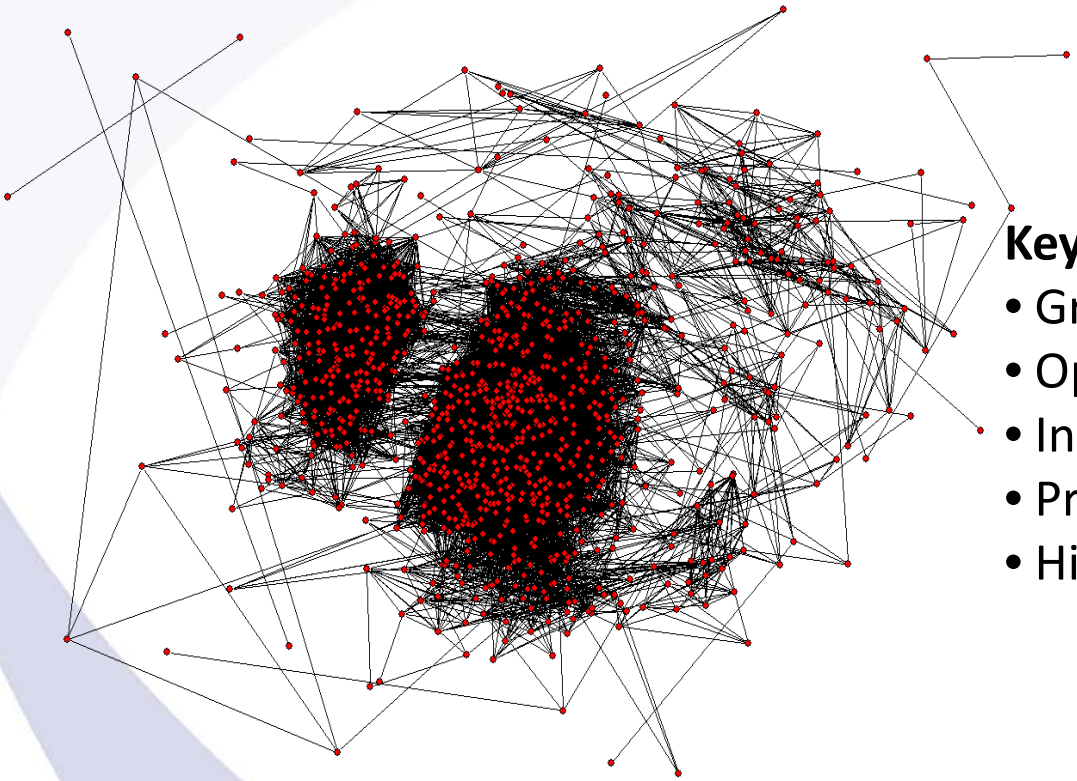
We extend this environment where international exchange can take place without raising red flags

Proven Technologies

Accepted, established and matured in large private corporations and government agencies (e.g., State Department, WhiteHouse.gov)

Social media web technologies are high leverage force multiplier tools for global connectivity

Dynamic Network Processes



Key Analysis Data:

- Group formation and dissolution
- Opinion consolidation, polarization
- In-group vs. inter-group connectivity
- Presence of *bridging* ties and groups
- Hierarchy vs. global reachability

Foster efficient teamwork, information sharing and knowledge fusion, link together individuals, groups with interests, expertise, information:

➔ effectively solve shared problems.

Visualization of large interaction network in Pajek

Talking Points for MOEs

Talking Points: Measures of Effectiveness (MOE's) & Measures of Performance (MOP's)

Ed Rockower February 28, 2010 **DRAFT for discussion**

MOE: "a quantitative measure of how well a System is accomplishing what our customer needs to accomplish"
MOP: "a quantitative measure of how well individual sub-systems, components, or processes are performing, as needed for the successful functioning of the System being developed and deployed"
Metrics: MOE's, MOP's, Figures of Merit (FOM's), Measures of Outcome (MOO's), ...
"Technical Performance Measures" (**TPM's**): the important metrics with high visibility being measured, recorded and reported to the customer on a regular basis
==========

CTFP Alumni:

1. % of *all* CTFP graduates with which we've established contact, i.e. are in our database with at least contact information, current job function
2. % of *all* graduates who regularly use the CTFP Virtual University/Community website
3. % of new graduates introduced to, and regularly using our website
4. % of the total set of countries with which we've established contact and introduced to the website
5. Satisfaction ratings of users of our website
6. Number of and growth in connectivity of sub-networks of Alumni interacting on the website
    a. "6 degrees of separation" effect (cf measures LinkedIn uses for "your network")
7. Number of Alumn's participating in the yearly meeting in Germany, etc.
8. Number and usage of refresher courses created and deployed specifically for the website
9. ...

CT Taxonomy of Expertise and Experience

1. measure completeness of taxonomy, and % of users who've identified their expertise
2. usage of the taxonomy data for individuals for team-formation, recruiting, and other collaborative teams with appropriate expertise and diversity
3. reduced numbers of disjoint networks having low diversity according to measures from the Taxonomy
4. increased number of bridging links between relatively homogeneous sub-networks of users
5. reduced number of disjoint networks
6.

Information and Traffic

1. Measures of the 'age' of information in the website (timeliness and currency of information)
2. Measures of number of users active in managing their own RSS feeds.
3. Numbers of messages posted and numbers of blogs, chats, and other synchronous and asynchronous interactions among users.

Venture Capital Network