Social Computing:
Innovation, Open source and the Internet

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The Dynamics of Innovation: Schumpeter I-II

I

1. Scientists and innovators create technological opportunities
2. Entrepreneurs see the profit potential of technological opportunities and grab them
3. Followers swarm in and erode profits

- In the process, investments are made in the emerging technologies, and industry and market structure change

(Theory of Economic Development, 1912)

II

- Big corporations become main investors in technology creation
- Innovation becomes mechanized and routinized in corporate R&D laboratories

(Capitalism, Socialism and Democracy, 1943)

“Schumpeter” III-IV

III

- A global sphere of financing emerges, loosely coupled to technology creation
- Venture capitalist become an important engine of re-engineering
- Investments “swarm” to fastest growing industries
- Equity-based incentives (=options) are invented
- Big corporations try to renew by acquisitions, internal venturing, and new innovation management models

IV (circa 2000)

- Internet changes the balance between labor and capital
- Mature industries live in Schumpeter II (+III)
- New businesses emerge in Schumpeter III
- Social institutions are adapted to Schumpeter II, except in Silicon Valley
- Important new technologies are created in **Schumpeter V**

“Schumpeter” V

- Collective production of technology and experience
  - open source SW, blogs, social software with images, music, games…
- Loosely coupled to economic investments and interests
- Requires broadband networks
- New rules for competition
- “Symbiotic economy”
- New “medieval villages” of the Internet

source: Tuomi, I. (2000) Evolving Networks of Innovation: Rewriting Schumpeter for the Silicon Valley. E-Commerce and the Changing Terms of Competition, Berkeley, CA, 28.-29. April 2000.

Towards the New Economy of Meaning

- The social and cultural infrastructure is becoming increasingly important
- Diversified communities interact across global networks
- Value is created by communications that produce meaningful social interactions
- The traditional epistemology of the information processing paradigm (objective, empirical, universal) will be replaced by a new epistemology
  - It will be based on theories of social construction, hermeneutic phenomenology, linguistic genres, communities of practice, situated & distributed cognition, socio-cultural activity theory…
- The design of future ICT architectures and applications will require new types of knowledge and new types of collaboration across scientific disciplines

“Thought Communities”

- Basic assumptions:
  - Knowledge is a social phenomenon, situated in a context of social practice
  - Meaningful social practice is located in a “thought community”
  - A community uses concepts and tools and reproduces the way they are used through social activity
  - A thought community has a “thought style”
  - Concepts, tools, and practices that can be easily integrated to the existing thought style are rapidly adopted by the community
  - Within a thought community, some conceptualizations and practices become amplified, others attenuated
  - There are many thought communities, and individuals can be members of several such communities
- Argument:
  - Technology develops through the evolution of an ecology of thought communities
  - The dynamic of this evolution has changed because of the Internet

Source: Tuomi, I. (2000) Internet, Innovation and Open Source, AoIR, 15 September 2000.

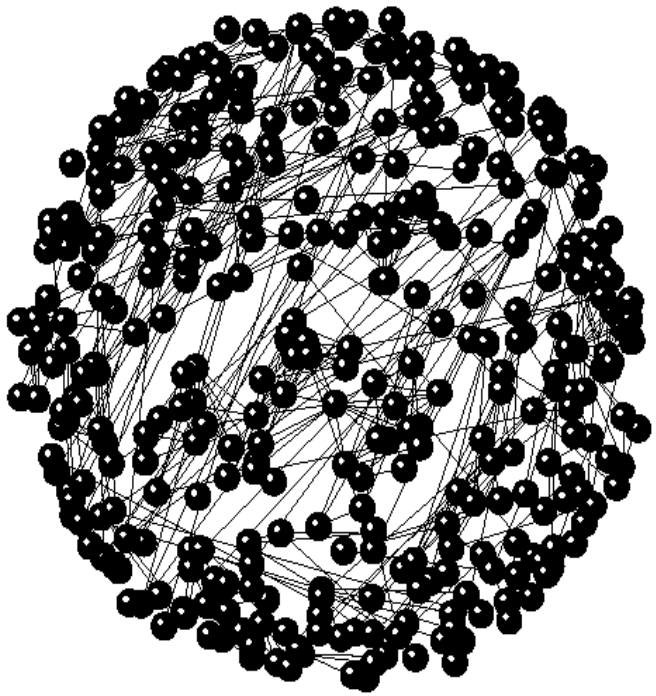
Theories of “thought communities”

- M. Bakhtin (1930’s): “genres”
- L. Fleck (1935): “thought communities”
- D. Schön (1983): “communities of reflective practitioners”
- E. Constant (1987): “communities of practice”
- Y. Engeström (1987): “activity systems”
- Lave & Wenger (1991): “communities of practice”
- Nonaka & Konno (1998): “ba”
- Brown & Duguid (1991, 2000): “communities of practice”
- Knorr-Cetina (1999): “epistemic cultures”

> The argument is that knowledge is practice-related,
> constructed in a social process,
> learned through socialization,
> reflected in the conceptual systems that are used in interpreting the world,
> embedded in material and technical artifacts,
> and often not explicitly articulated

Source: Tuomi, I. (2000) Internet, Innovation and Open Source.

Location Matters



Castilla, E.J., Hwang, H., Granovetter, E., & Granovetter, M. (2000). Social networks in Silicon Valley. In C.-M. Lee, W.F. Miller, M.G. Hancock, & H.S. Rowen (Eds.), *The Silicon Valley Edge* (pp. 218-247).

The Open Source Model

- Key factors driving rapid growth:
  - Multi-focal user-centric innovation model

    Innovation occurs where it makes a difference

    Lack of centralized decision-making makes knowledge, innovation, and implementation local
  - Evolution instead of implementation of predetermined design

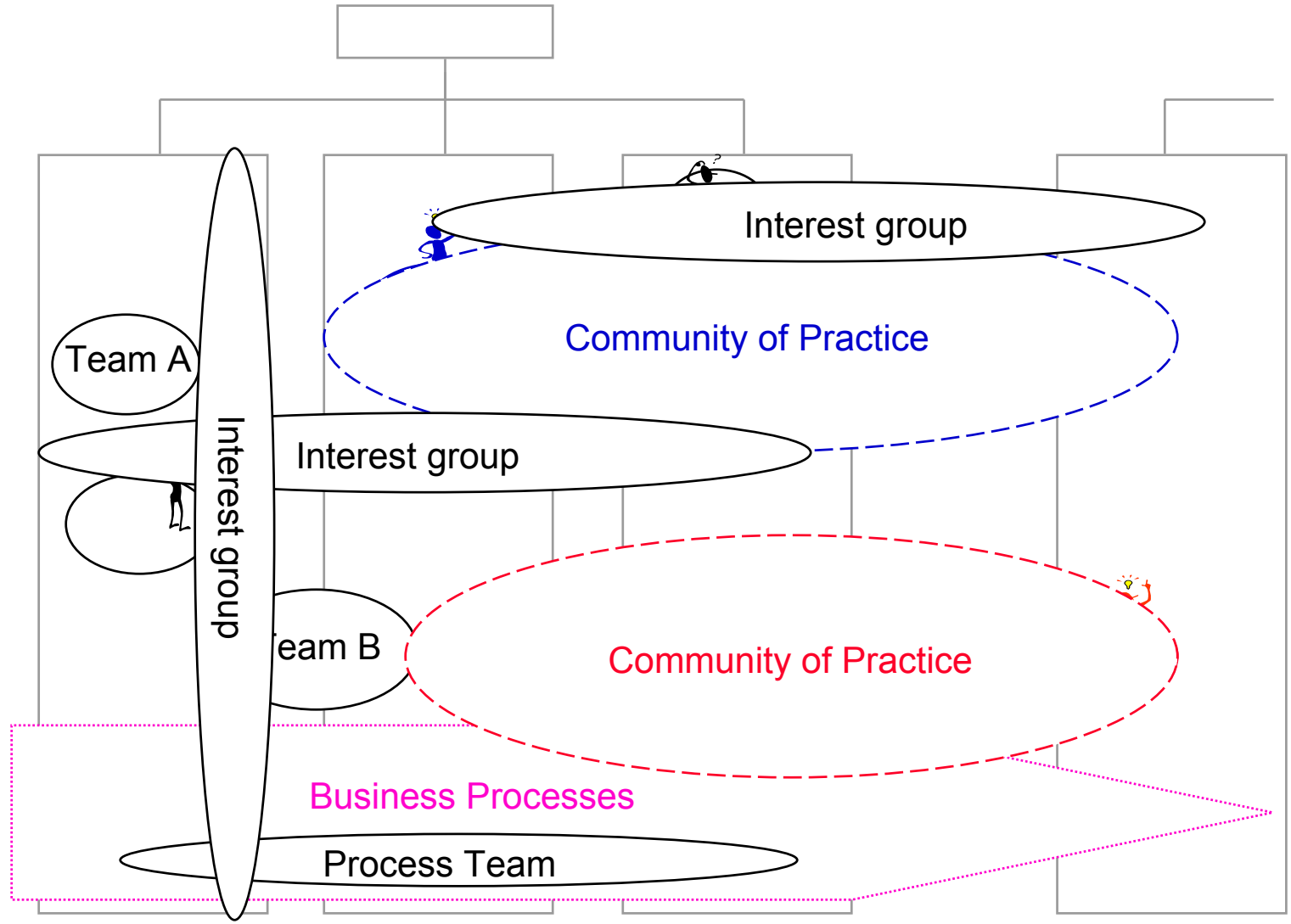
    Growth occurs where there is least resistance
  - Successful “universal” interfaces facilitate recombination of resources

    Several translations done using a single interface

    Translation is not only between two specific communities, but between any two similar communities
- Boundary conditions:
  - Tight control of core is needed to enable continuous growth in the periphery
  - Standard interfaces (technical and procedural) necessary to reduce complexity and to translate sub-networks into resources
  - Requires constraints that substitute for design (e.g. a given processor architecture)

Source: Tuomi, I. (2000) Internet, Innovation and Open Source.

Knowledge Organizations



Source: Tuomi, I. (1998) Collaborative learning as a source of corporate competence.

The Social Foundation of Knowing

Knowledge is practice-related and activity-oriented

•articulated in a social process,
•learned through socialization (and sometimes education)
•reflected in the conceptual systems that are used in interpreting the world,
•partially embedded in material and technical artifacts, and physical spaces
•and often not explicitly articulated
•and, most importantly, **the world of knowledge is not flat**: it has a social infrastructure that creates "domains of validity" and "domains of meaning"

- M. Bakhtin (1930's): linguistic "genres" and "chronotype"
- L. Fleck (1935): "thought communities"
- D. Schön (1983): "communities of reflective practitioners"
- E. Constant (1980, 1984, 1987): "communities of practice"
- Y. Engeström (1987): "activity systems"
- Lave & Wenger (1991): "communities of practice"
- Brown & Duguid (1991, 2000): "communities of practice," "networks of practice"

Three Models of Innovation

- Heroic Innovation Model
  - Thomas A. Edison, James Wa[illegible]erners-Lee,…

- Combinatorial Model, (a.k.a. the Lego model)
  - The World Wide Web (closer to the real story…)
- Organic Model
  - Linux operating system
  - Dynamic based on evolving specialization and division of labour

The Heroic Model of Innovation
An Example

- ”Tim Berners-Lee, the inventor of the World Wide Web, has been hailed by *Time* magazine as one of the 100 greatest minds of this century.

  His creation has already changed the way people do business, entertain themselves, exchange ideas, and socialize with one another.

  With new online businesses and communities forming every day, the full impact of Berners-Lee’s grand scheme has yet to be fully known.”

From the cover of Berners-Lee & Fischetti (1999) *Weaving the Web: The Original Design and Ultimate Destiny of the World Wide Web by Its Inventor*.

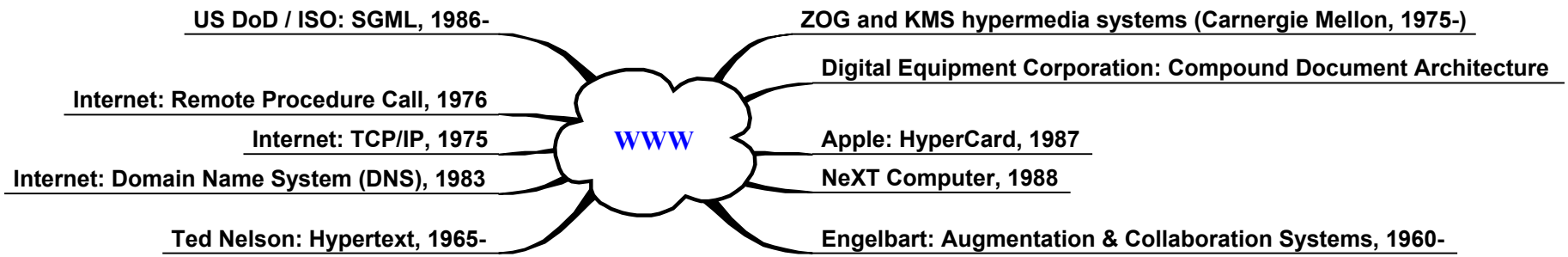
The Origin of the Heroic Model

Genesis

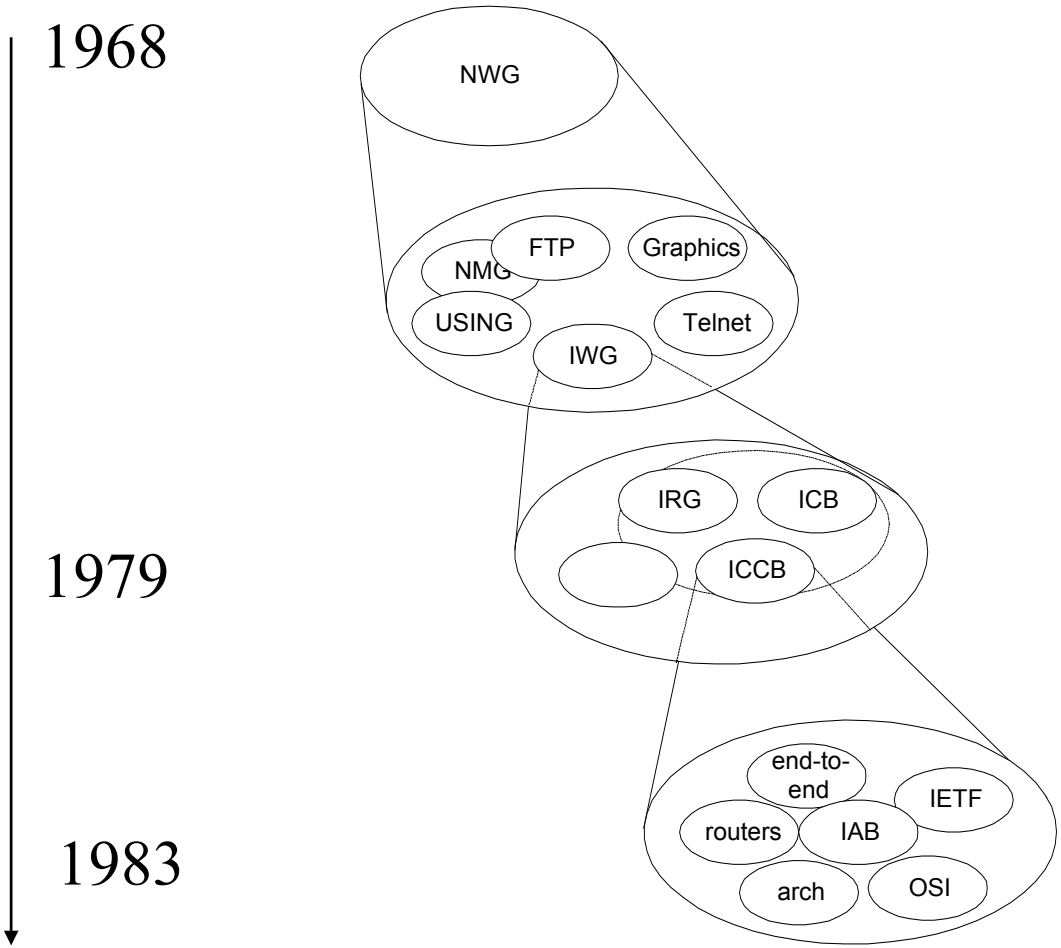
- **1:24 And God said, Let the earth bring forth the living creature after his kind, cattle, and creeping thing, and beast of the earth after his kind: and it was so.**
- **1:25 And God made the beast of the earth after his kind, and cattle after their kind, and every thing that creepeth upon the earth after his kind: and God saw that it was good.**

The Origin of the Heroic Model

The Lego-World of WWW

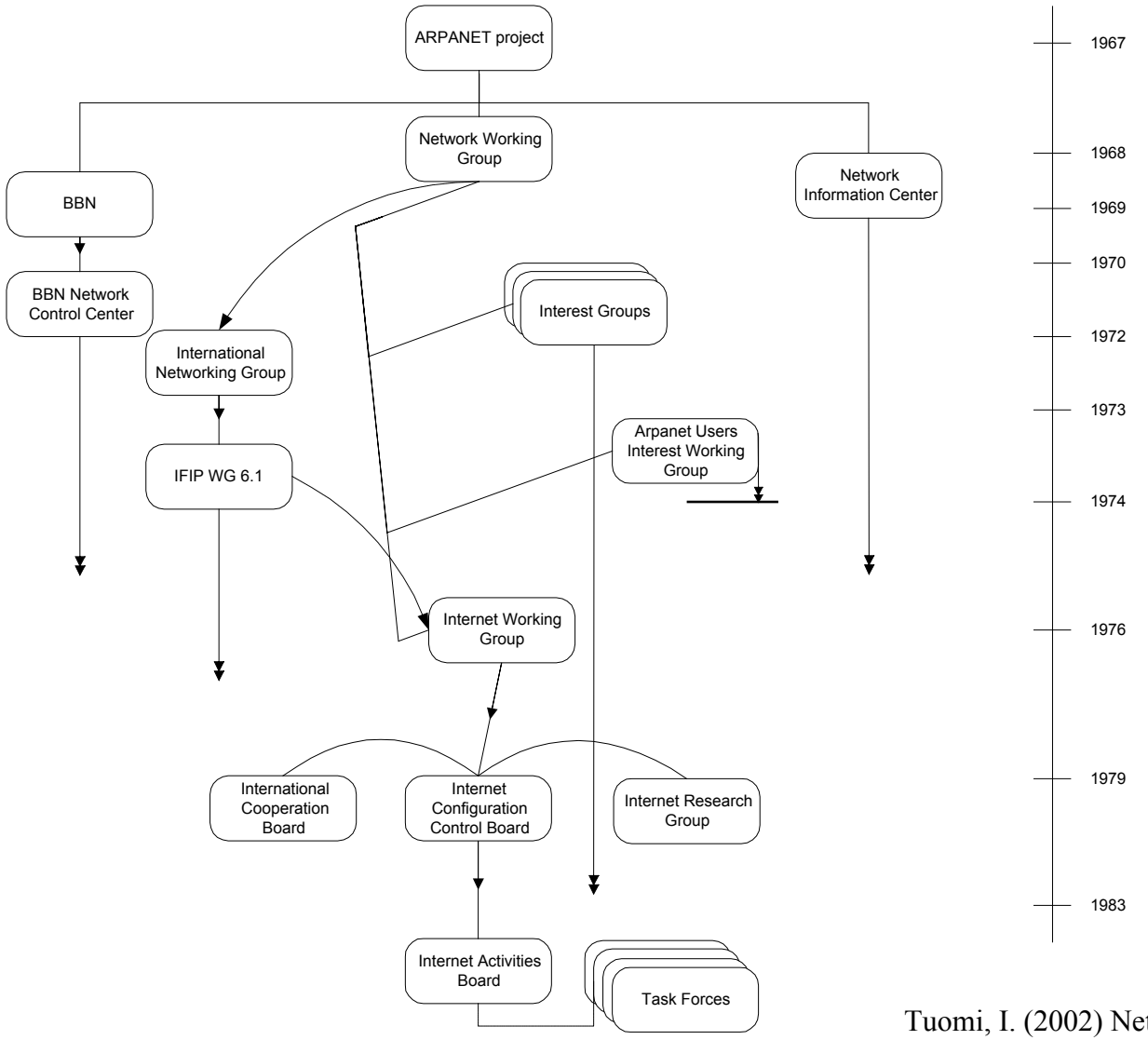


The Organic Innovation Model
Internet Communities 1968-1983



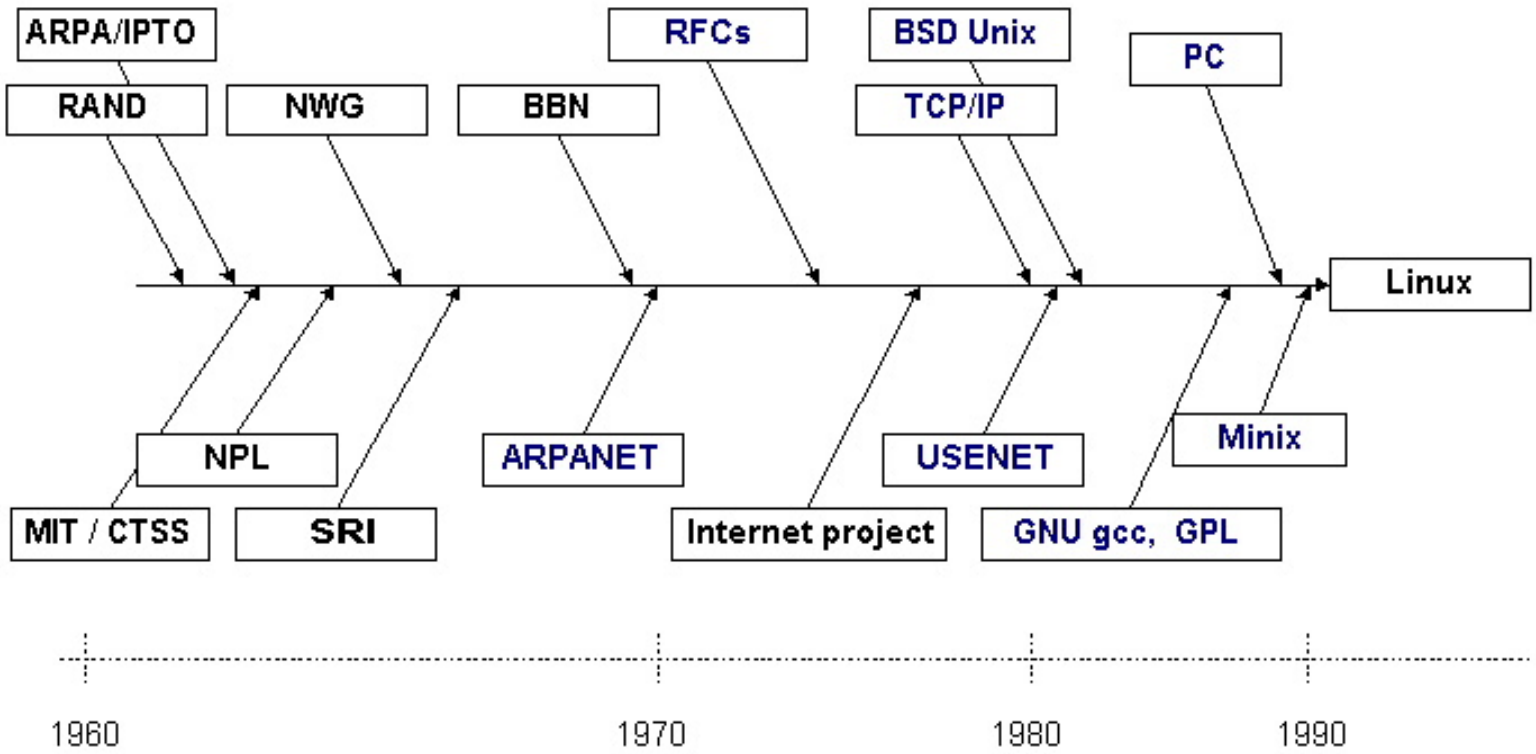
Tuomi, I. (2002) Networks of Innovation. Oxford University Press, p. 151.

The Combinatorial Innovation Model



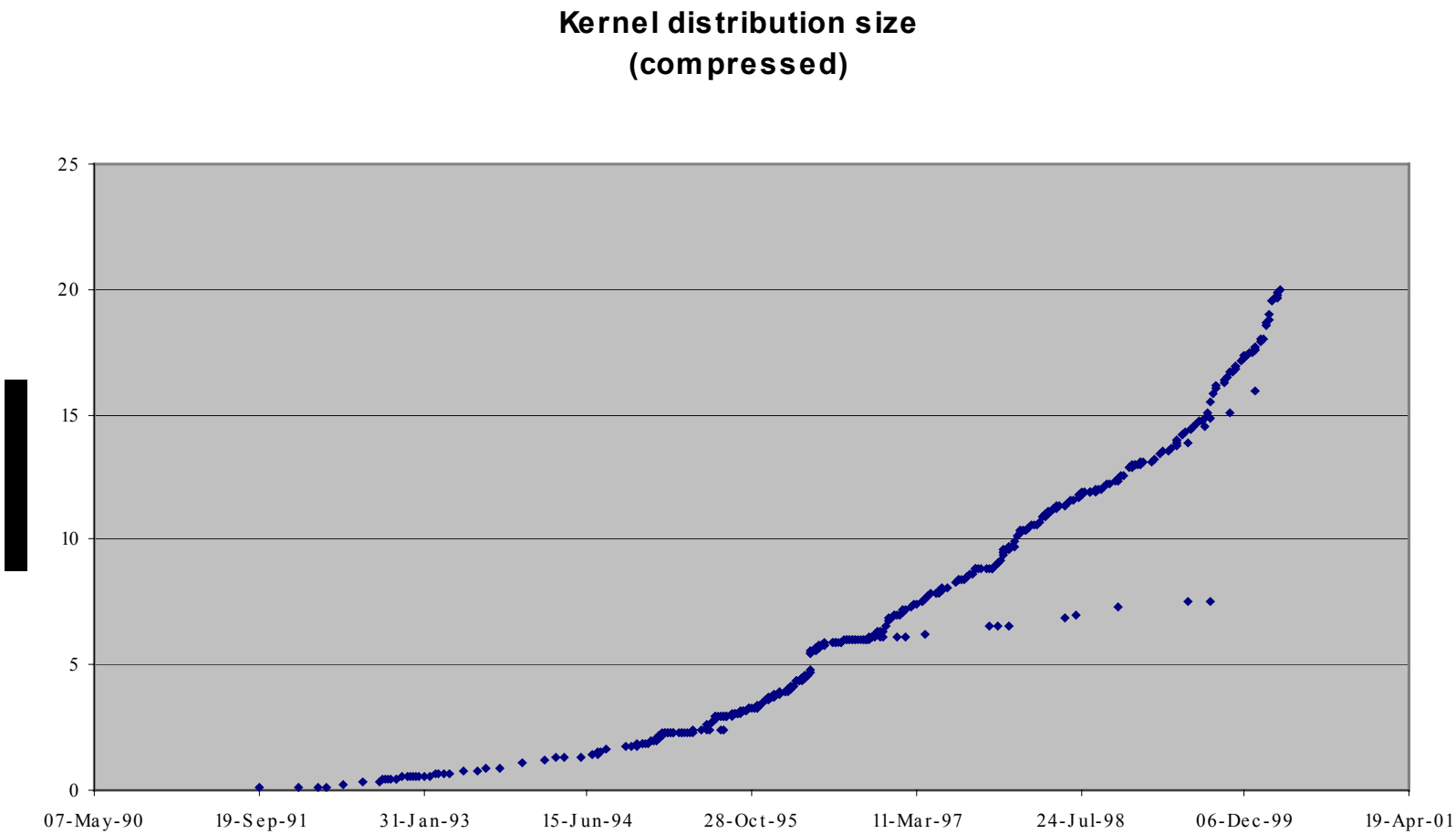
Tuomi, I. (2002) Networks of Innovation. Oxford University Press, p. 149.

History Makes Heroes:
Inventing Linux



Tuomi, I. (2000) Internet, Innovation and Open Source: Actors in the Network. First Monday 6(1).

Rapid Growth is Possible in the Organic Model



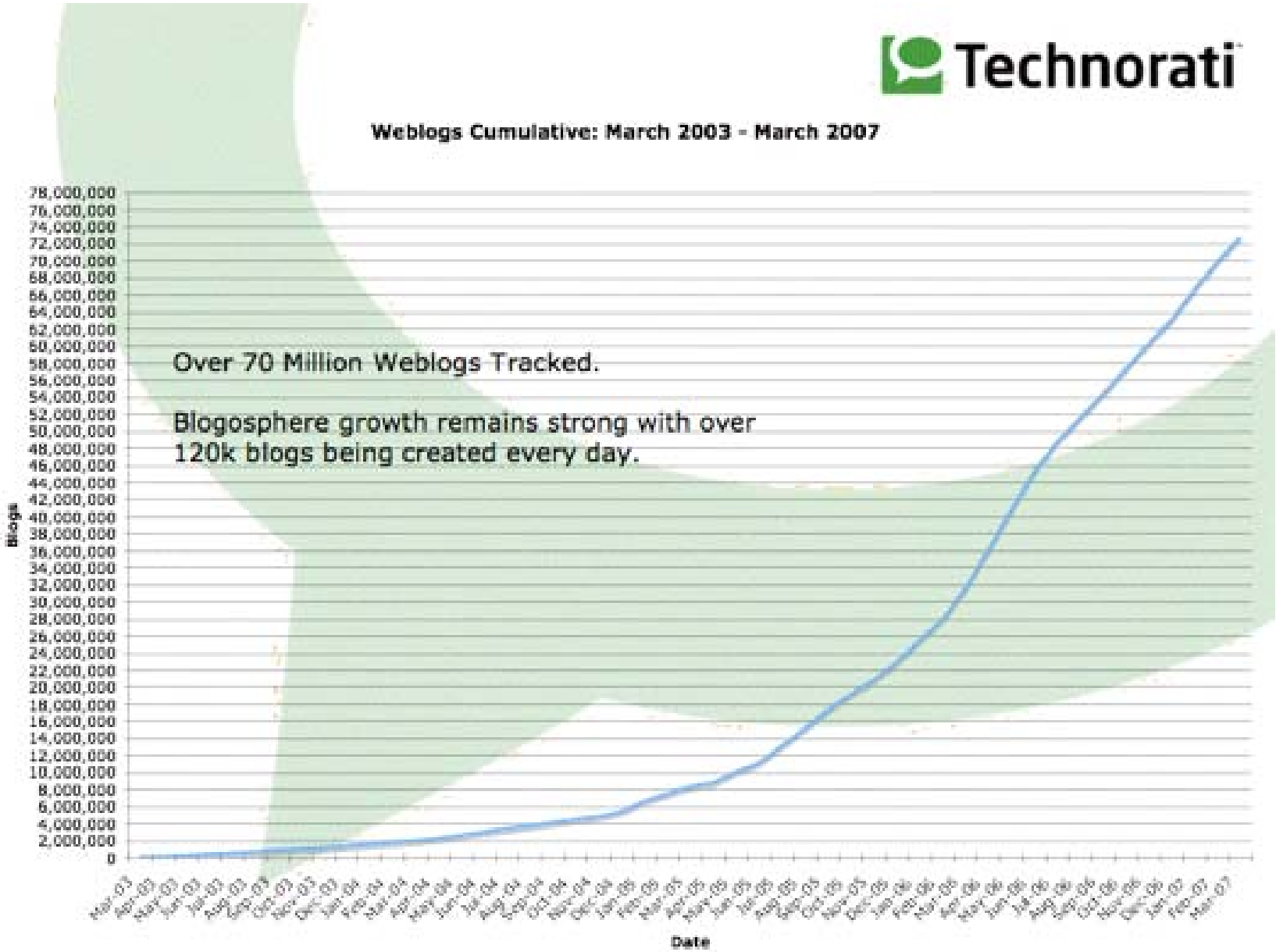
Combinatorial and Organic Models

- In the combinatorial model, several independent technologies and user / developer groups are brought together.
  - No shared language, multiple meanings of the same concepts.
  - Innovation dynamics based on ”mobilizing” and ”recruiting” existing resources.

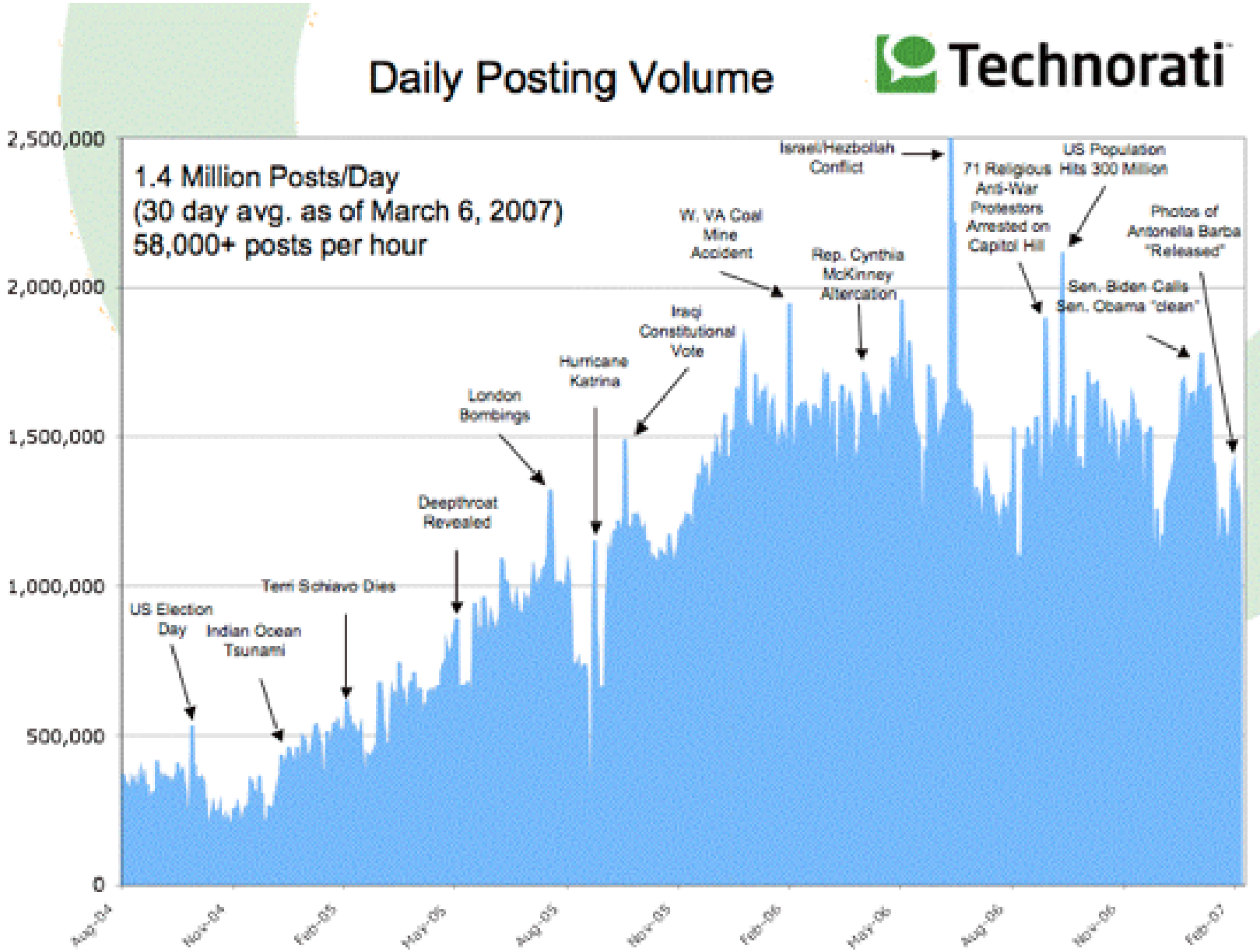
- In the organic model, several specialized communities ”spin-off” from a common ancestor group.
  - Multiple ”dialects,” based on the same shared language.
  - Dynamics based on evolving division of labor (functional differentiation and specialization).

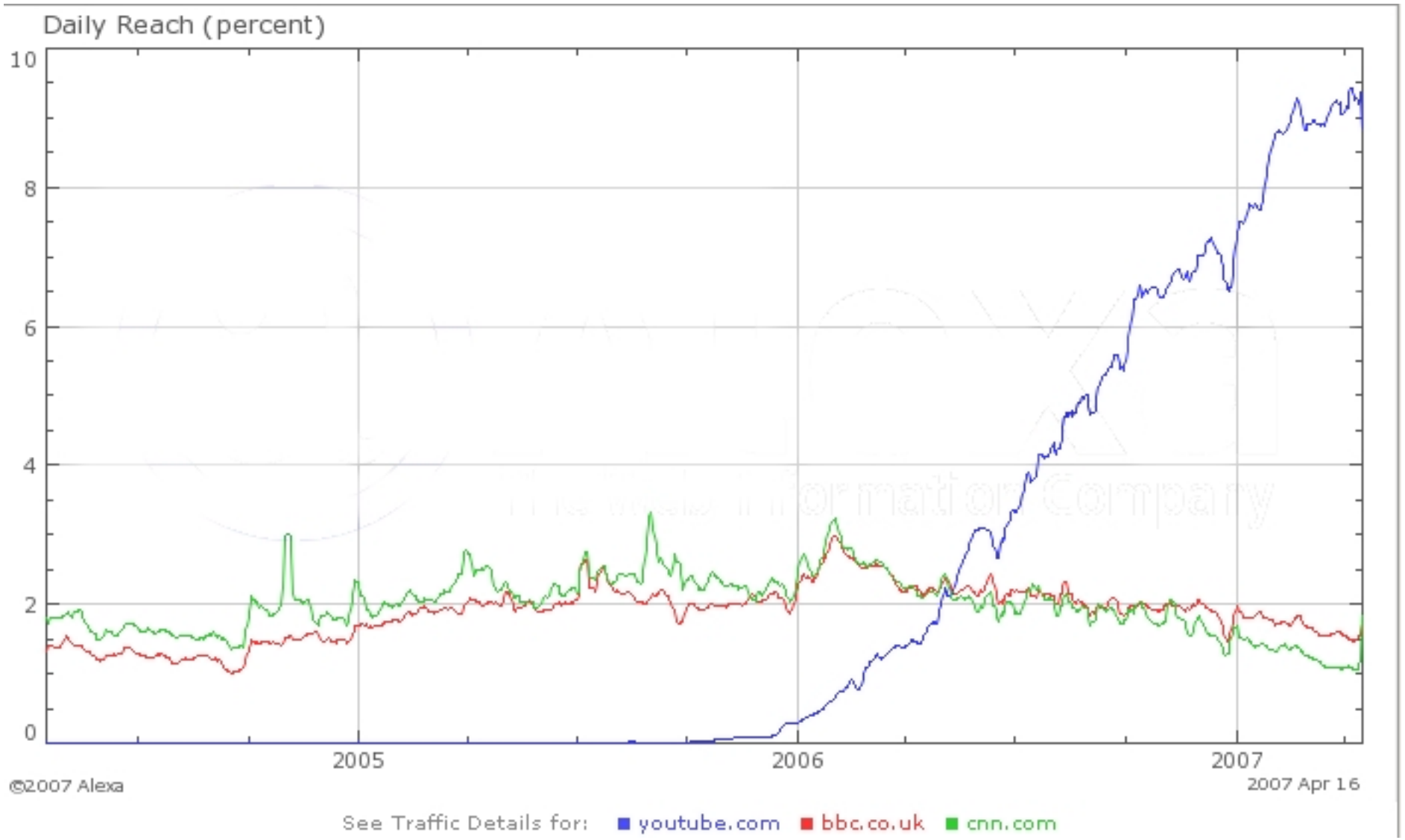
And now the Internet enables simultaneous combinatorial and organic growth...

Blogosphere



User created content




Daily Reach (percent)
10
8
6
4
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0
2005
2006
2007
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2007 Apr 16
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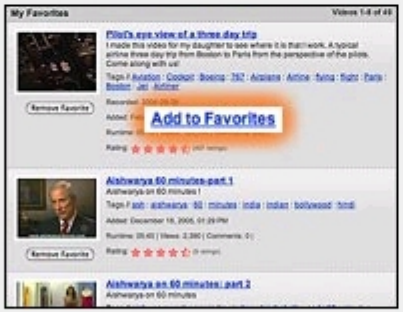
- Start a Favorites list
- Categorize favorites with Playlists
- Browse Categories to find new and interesting uploads



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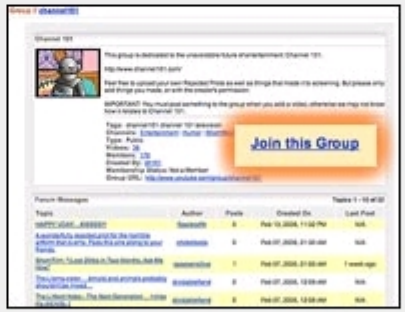
Commune

Interact and share with other users:

- Join Groups with common interests
- Comment on and rate videos
- Send messages
- Share private videos with friends and family

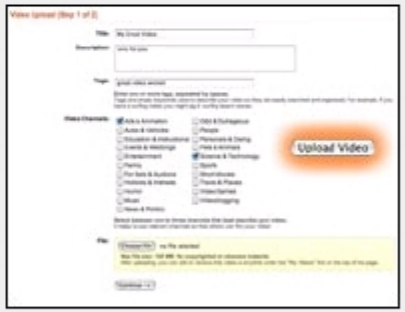


Show me more

Create

Broadcast your videos worldwide:

- Upload and tag your creations
- Email them to friends
- Link to your video from any website
- Embed your video in selected websites



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A Rough "State of the Art"

- Chesbrough; "Open Innovation"
  - (about "Schumpeter IV")
- Von Hippel: "Innovation Democracy"
  - (about "Schumpeter V")
- Zysman: "Algorithmic revolution"
  - (about "real-time global production")

- My own "work in progress"
  - "The third globalization"
  - Social practice as the infrastructure of innovation
  - "Extreme innovation"

    ("Schumpeter VI," the impact of new innovation dynamics on business, product, and policy development)

Current Challenges

- Intellectual property rights and responsibilities
  - (cost of innovation boundaries, rights of user-created innovations, responsibilities of intellectual property owners)
- Impact on knowledge creation and learning
- New policies for innovation, education, enterprises, job creation
- New dynamics of meaning economy
  - e.g.“natural disasters” of extreme innovation and Schumpeter VI