Community Ecology for IT Innovation

STICK: Science & Technology Innovation Concept Knowledge-base

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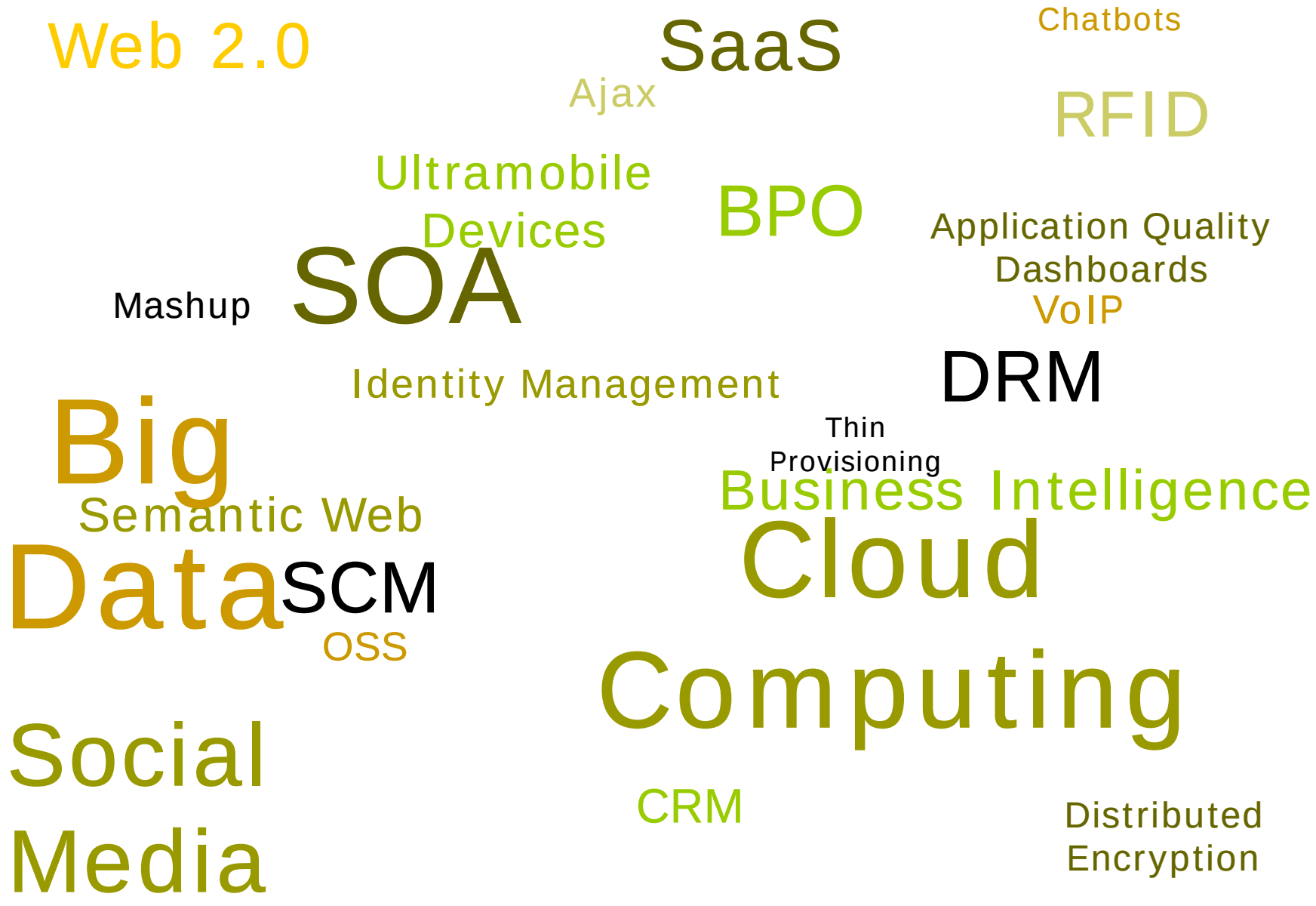
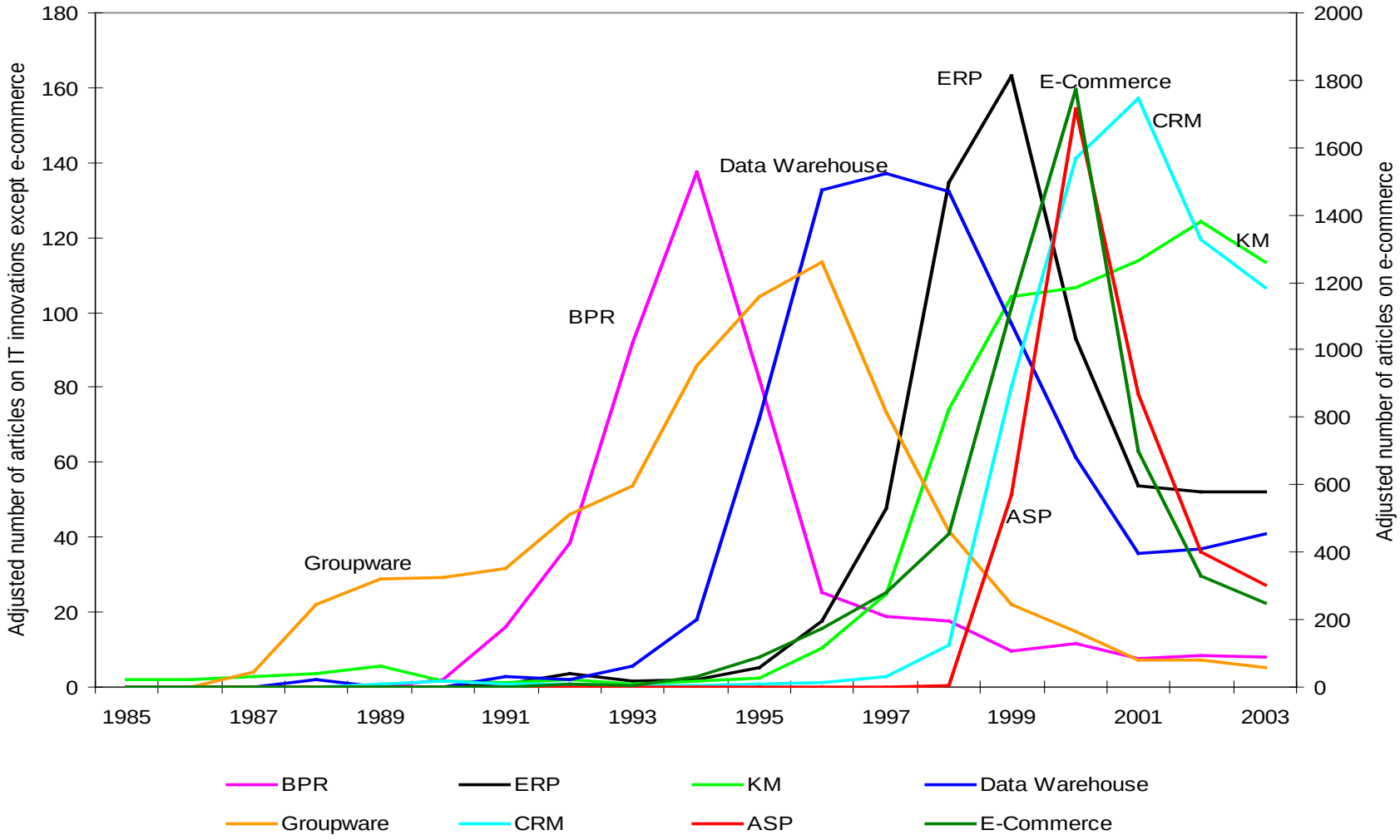


Why do some innovations become highly popular, while others do not?

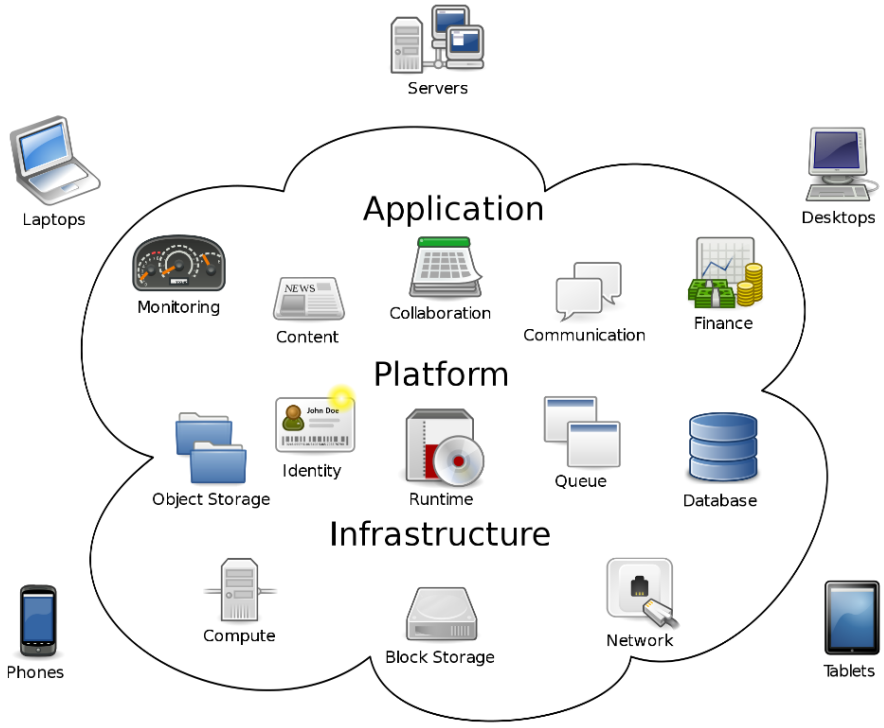
Varying Popularity, Varying Impacts



Wang 2010

Cloud Computing

A model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction



Mell and Grance 2011, U.S. NIST

Sam Johnston, Wikipedia

Innovation Community for CC

Platform Provider

App/Service Provider

Adopter

Public Investor

Private Investor

Researcher

Analyst

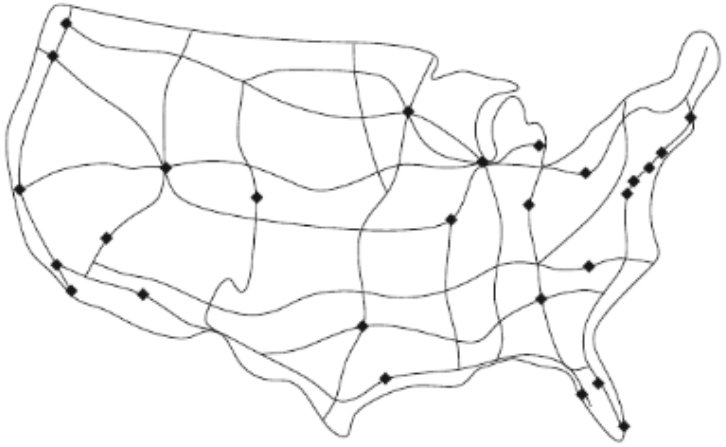
Consultant

Innovation Community Ecology

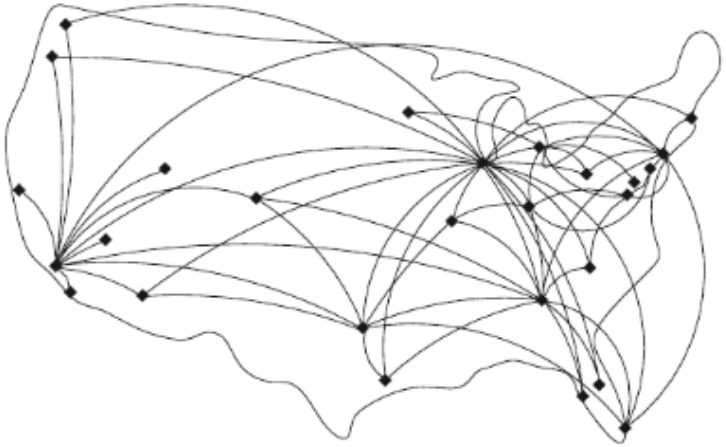
- Legitimacy of innovation determines the vitality of the innovation community.
- H1: Higher legitimacy → higher organizational entry rate
- Amount of resource is finite.
- Crowding causes competition for resource.
- H2: Higher competition → lower organizational entry rate

Hannan and Freeman 1977; Hannan et al. 1995

Innovation Community Structure



Random



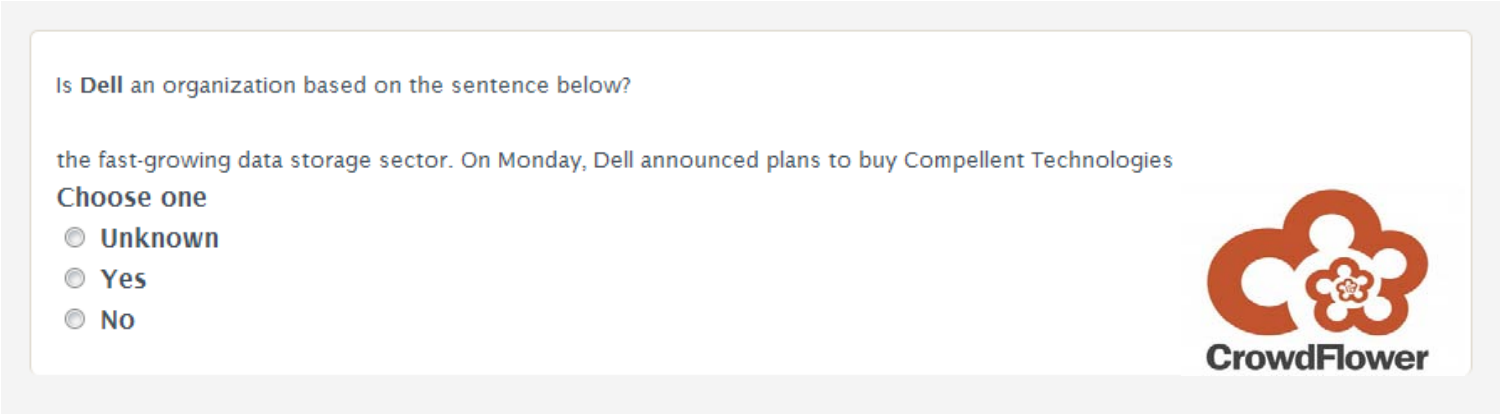
Scale-Free

- Scale-free network has a few highly connected nodes.
- Scale-free networks are efficient in diffusing information, rumors, and viruses.
- H3: Higher scale-free community → higher organizational entry rate

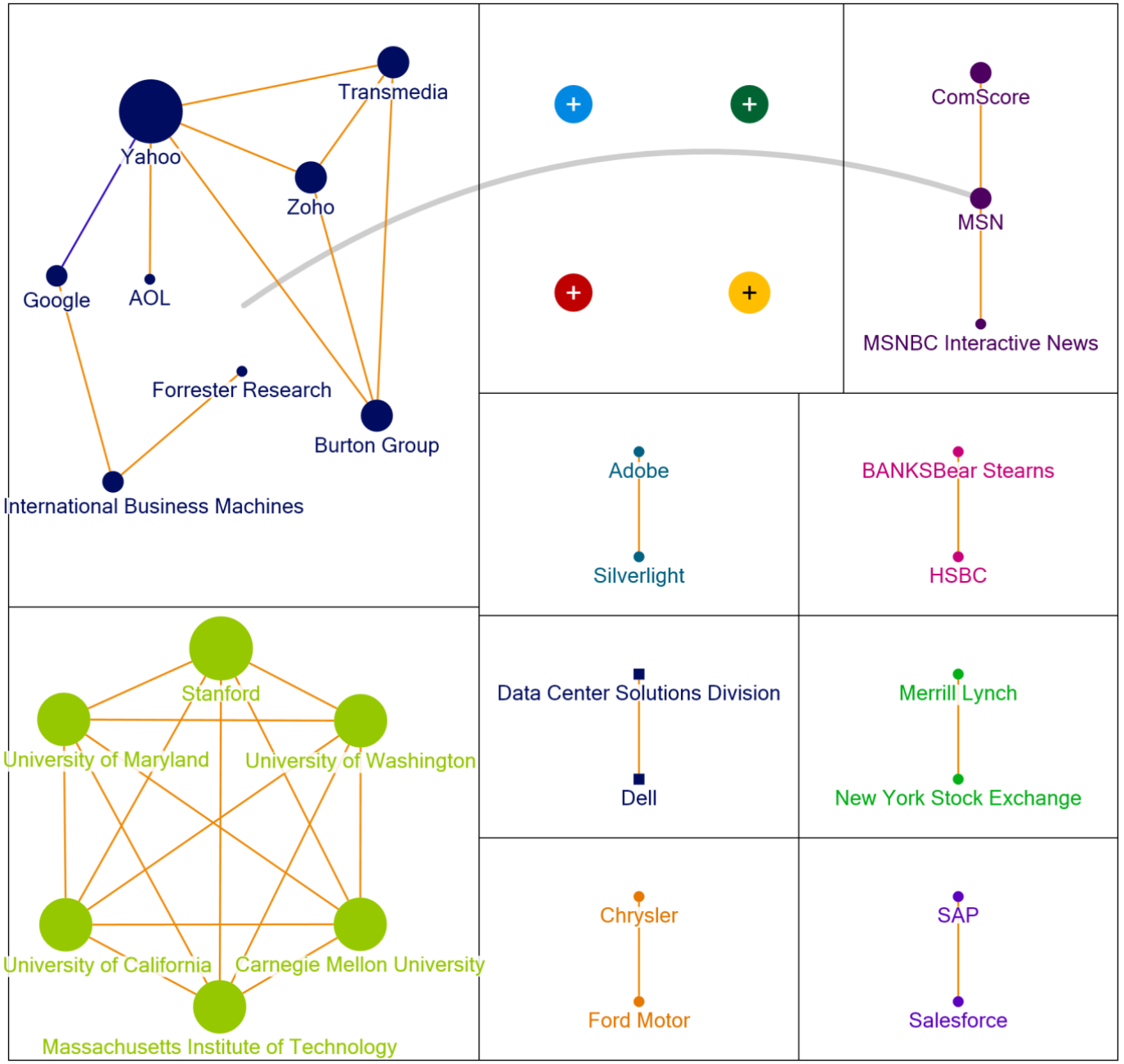
Barabási 2003

Data Collection and Processing

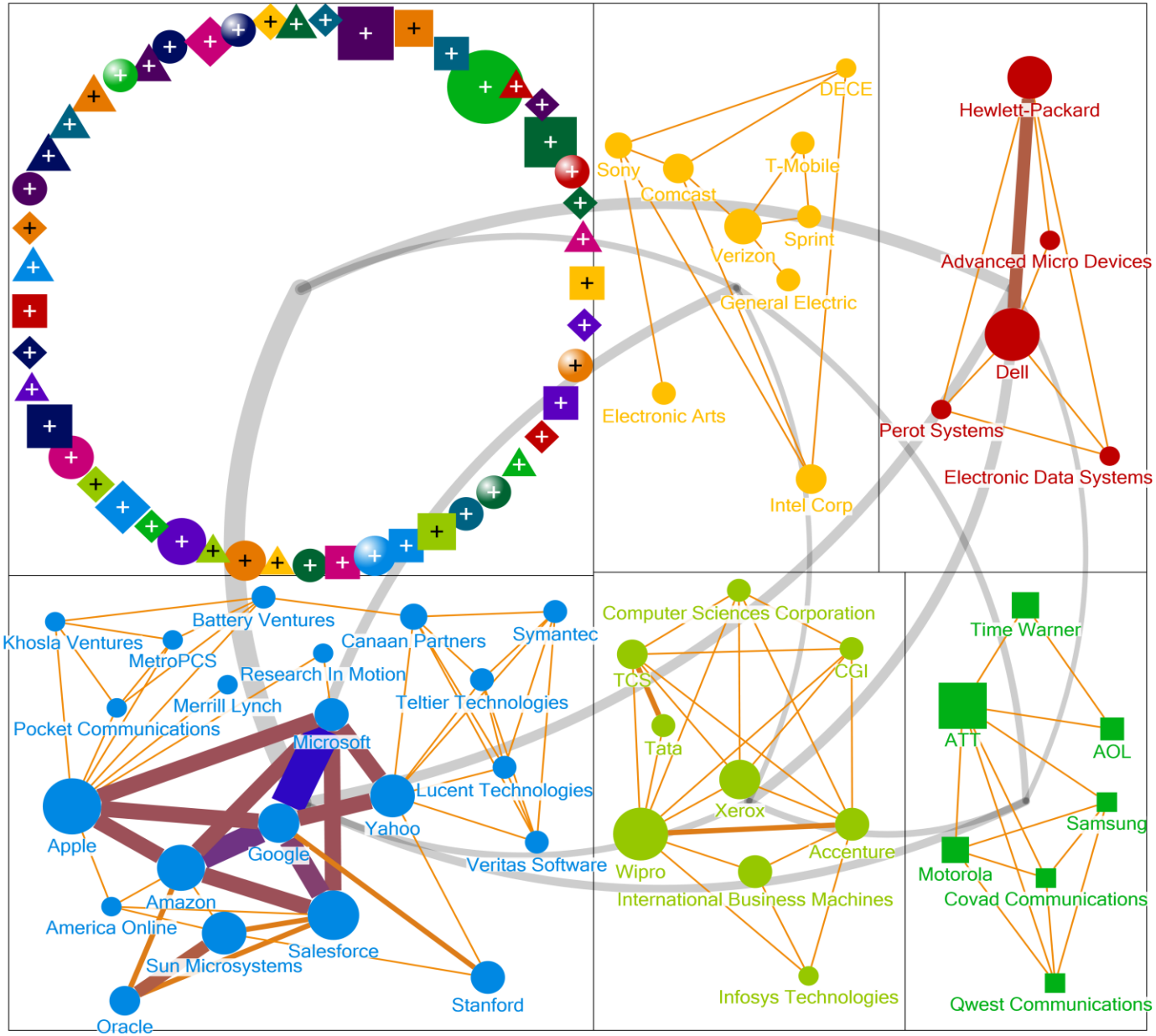
- News articles about CC (2007-2011)
- Identified organizations with Stanford NER
- Cleaned results with CrowdFlower



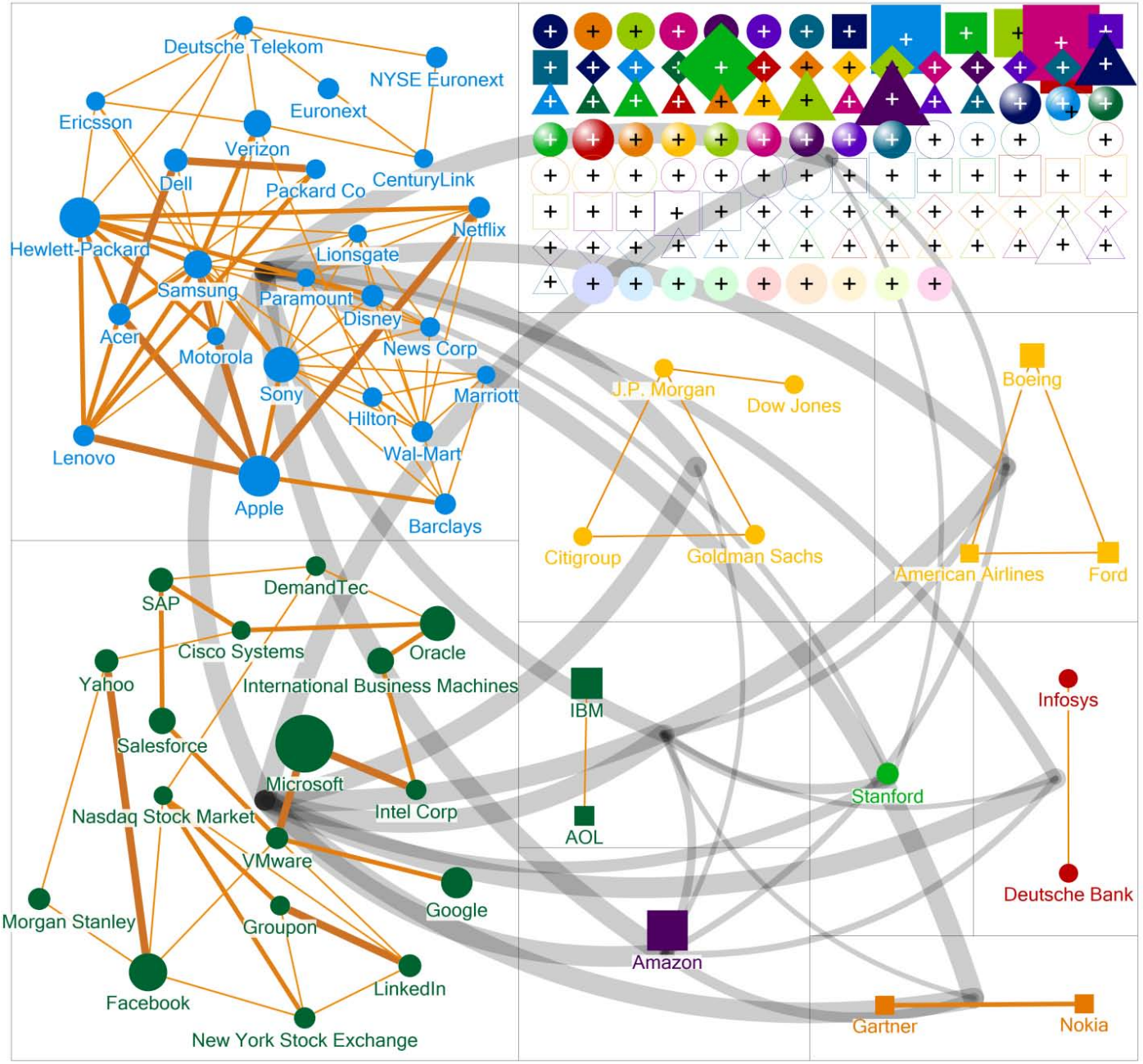
- Network of co-occurring organizations
- Visualized networks with NodeXL



Cloud Computing Community in 2007



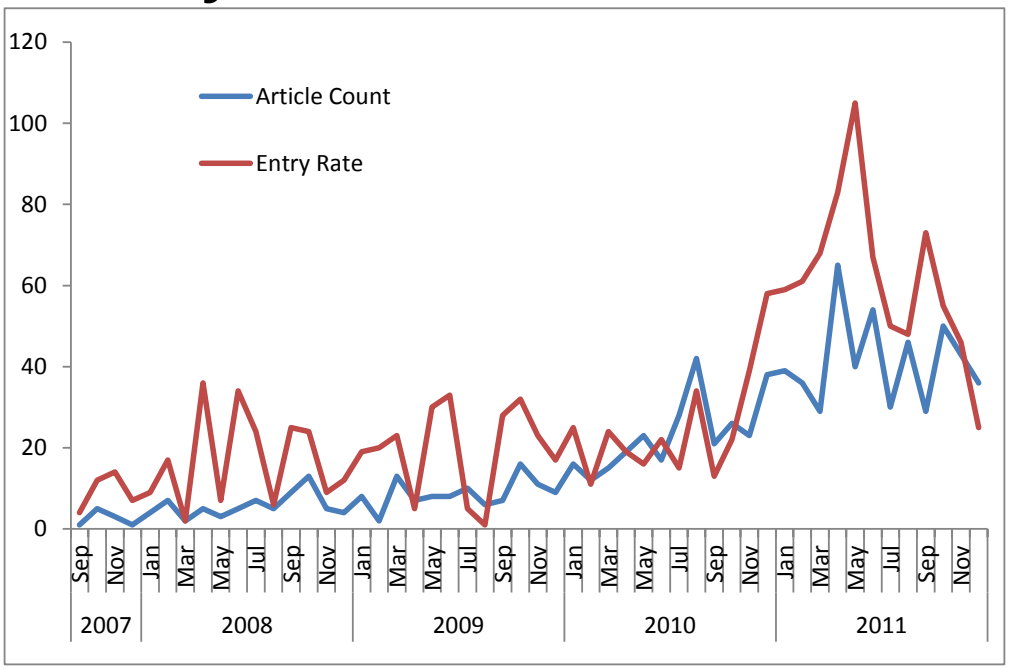
Cloud Computing Community in 2009



Cloud Computing Community in 2011

Data Analysis

- DV: Organizational Entry Rate
- IV-Legitimacy: Density
- IV-Competition: Density^2
- IV-Scale-freeness
- Control:
  - Prior entry rate
  - Prior entry rate^2
  - Year dummies



Regression on Org. Entry Rate

- Legitimacy increases entry rate.
- Competition hinders entry.
- Scale-freeness positively affects entry rate.
- Model explains ~73% variance.

	Coef.	S. E.
Density	.198*	.077
Density^2	-.104*	.036
Scale-free	191.351*	96.131
Prior entry	-.160	.302
Prior entry^2	3.362	2.961
Year 2008	15.302	12.596
Year 2009	6.737	17.459
Year 2010	2.292	21.893
Year 2011	28.269	26.952
Multiple R^2		.727
F (df)		11.86 (40)

* $p<0.05$ (one-tailed test)

Takeaways

- Community ecology
  - Innovation community consists of multiple industries and ecology theory is applicable to multi-industry community.
- Computational discourse analysis
  - Discourse analysis captures attention flowing across industries and computational approach scales up analysis for research and practice.
- New ground for science of innovation
  - More innovation communities, data sources, periods, network structural metrics…

Thanks and Contact Information

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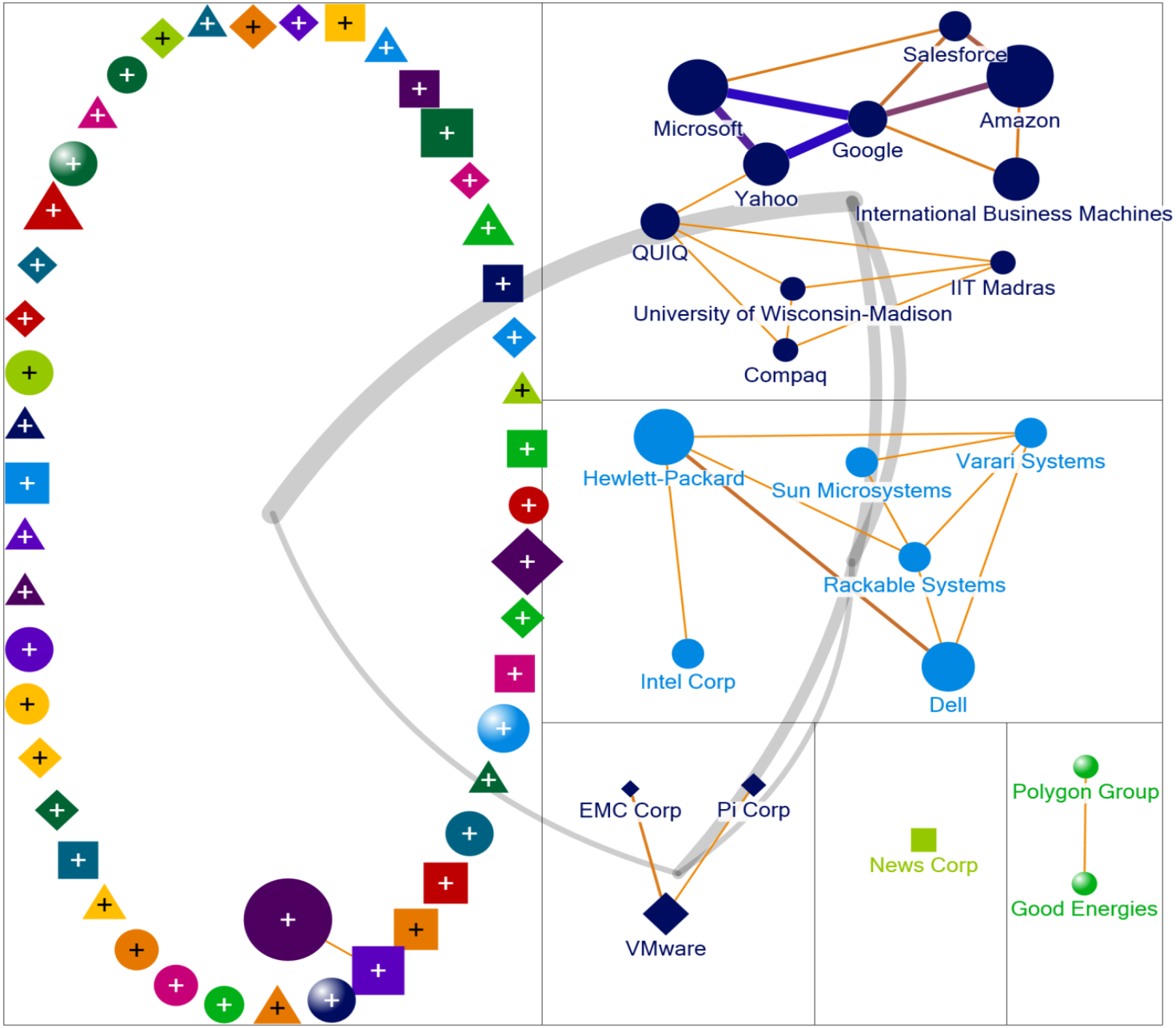
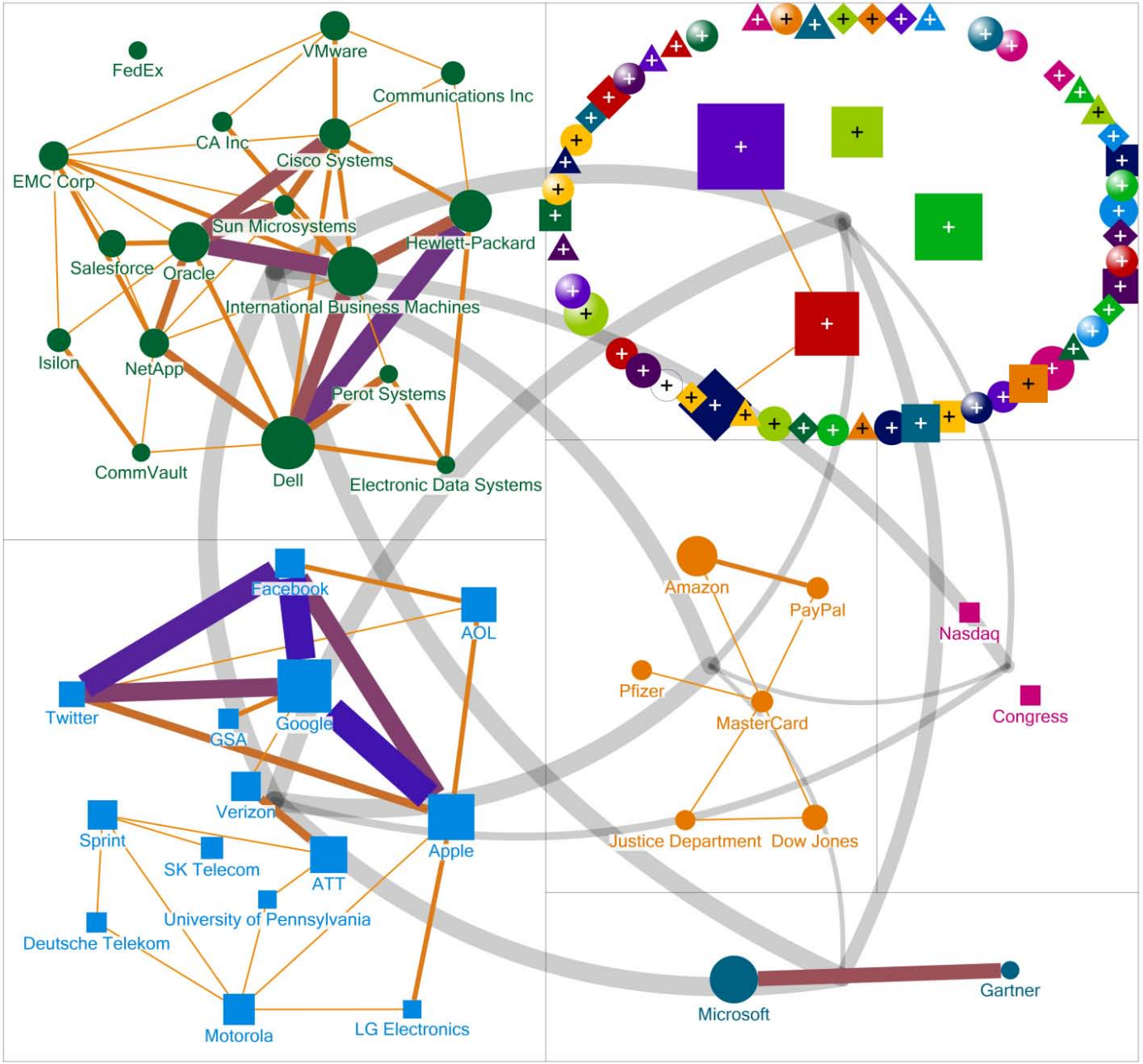
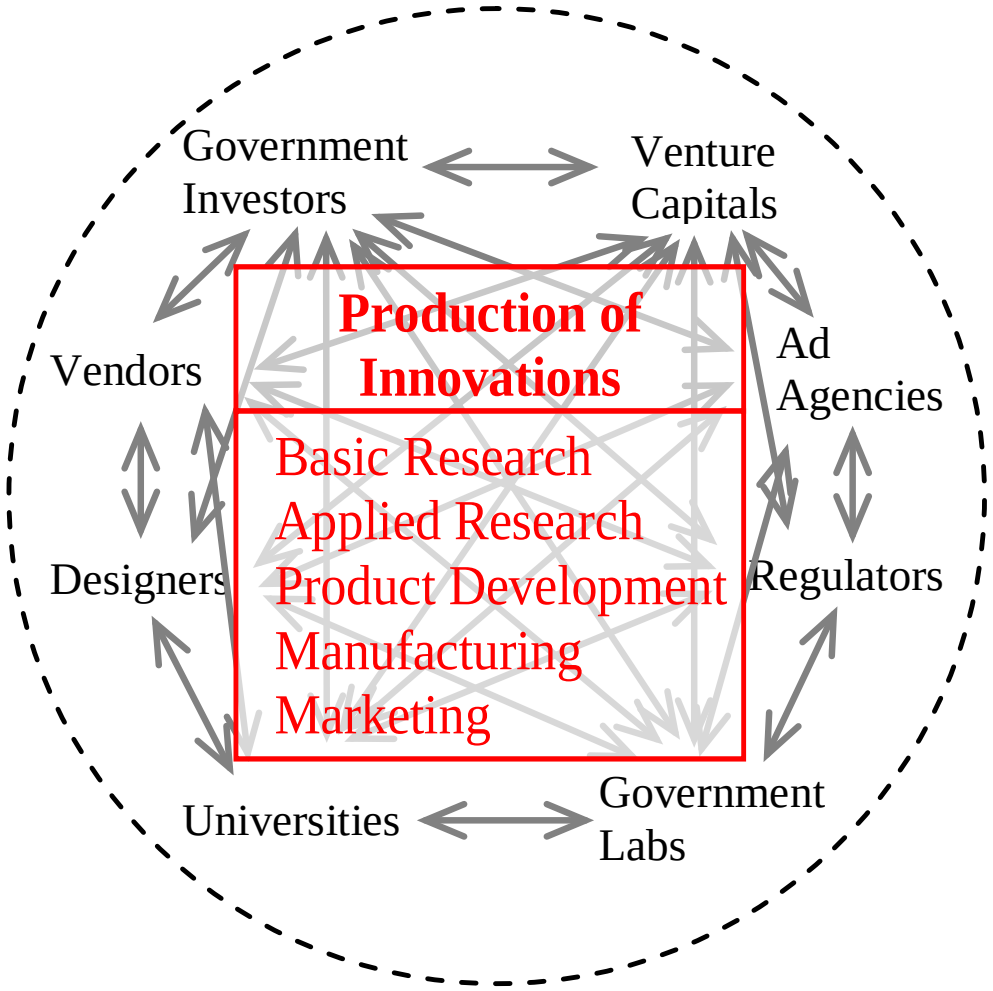


Cloud Computing Community in 2008



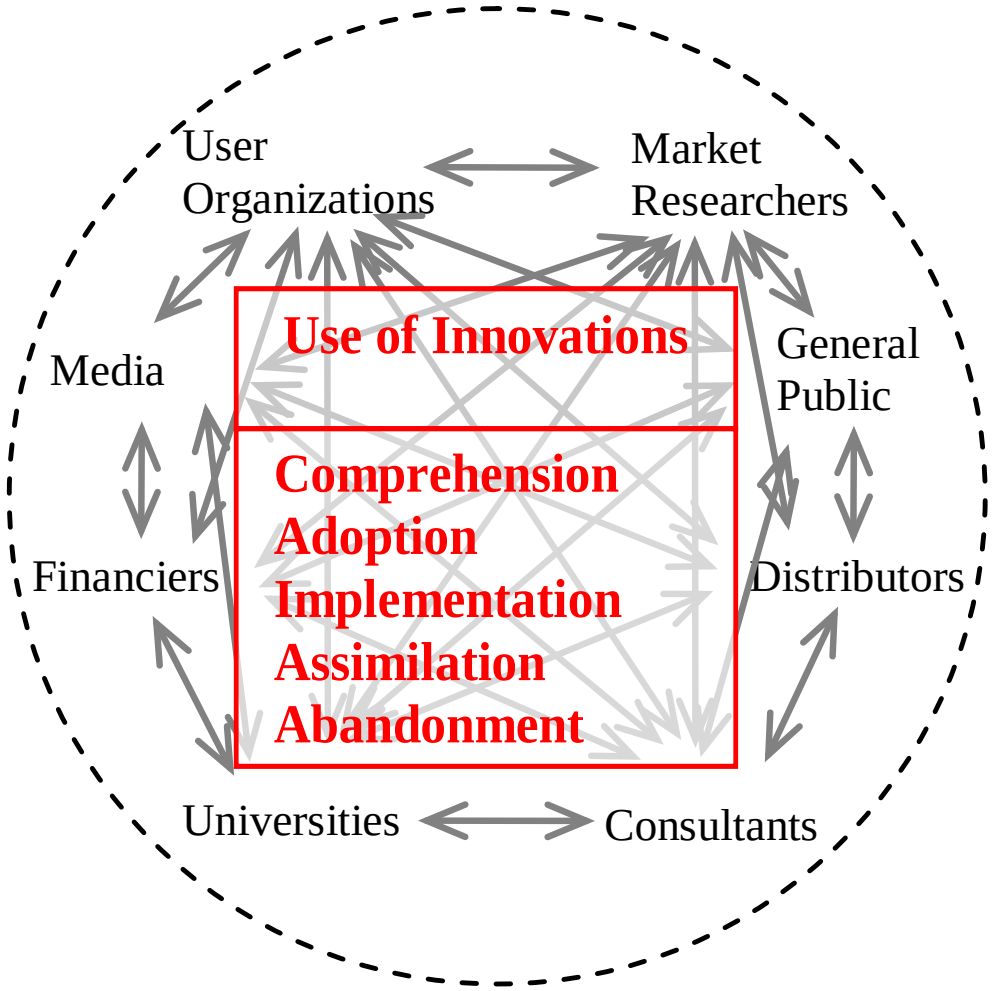
Cloud Computing Community in 2010

Production of Innovations



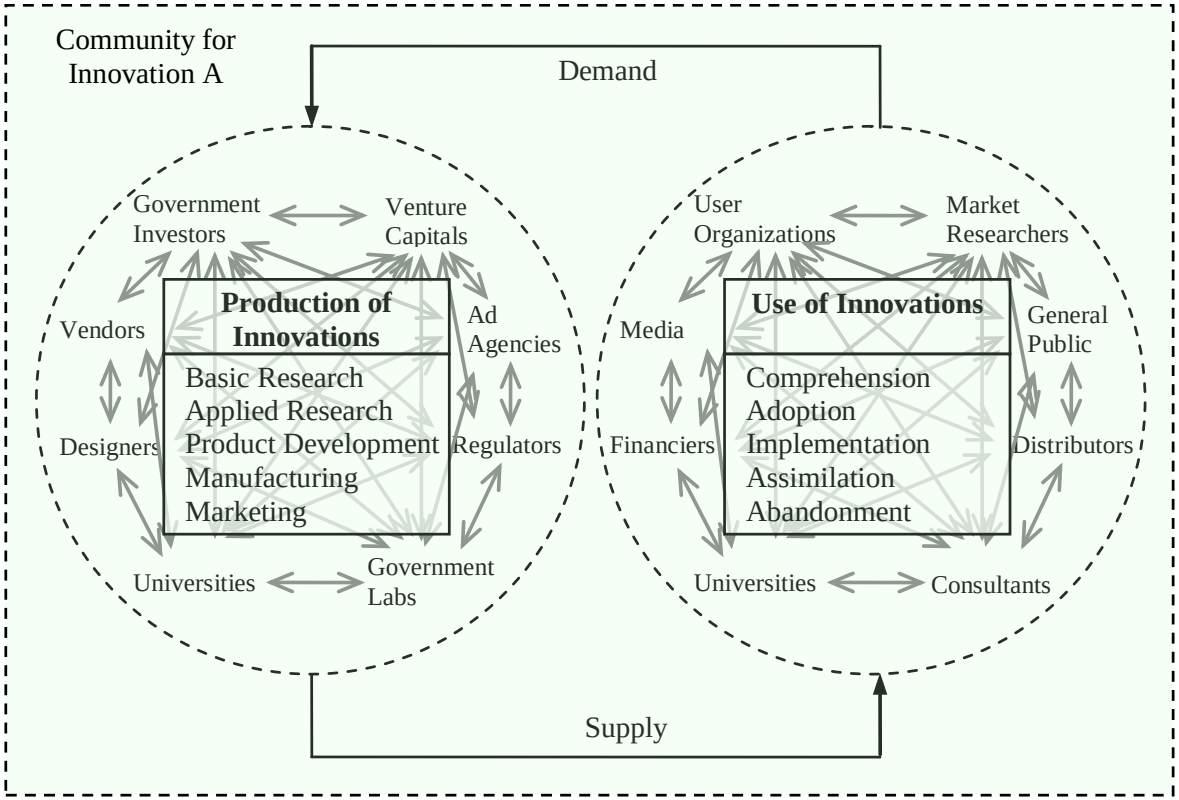
Hage & Hollingsworth 2000

Use of Innovations



Swanson & Ramiller 2004

Innovation Community



Innovation Ecosystem