

Business, Innovation and Social Networks

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Why this topic here?

- We start with a few simple observations,
- build a model, and
- Draw some interesting conclusions.

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Context

- Focus on start-up businesses
- Entering an established market is nearly always doomed to failure
- A start-up's only chance is to innovate and thus to create a new market segment
- But diffusion of innovation is notoriously difficult...

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Diffusion of innovation

- Why is the diffusion of innovation slow?
- What can a start-up do to speed up adoption of an innovation?
- How does a start-up survive initially?

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Adoption life cycle model: Assumptions

- Sales transactions are between humans
- First time adopters do not buy a breakthrough product type without an acceptable reference

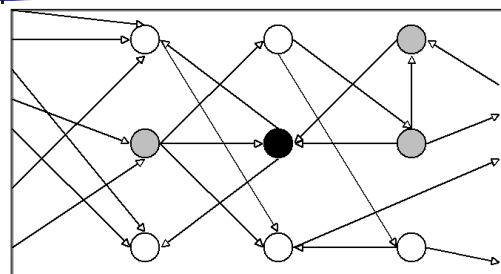
Note: no replacements, adopt only once.

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A network of adopters



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Differential equation

Differential equation:

$$\frac{dA(t)}{dt} = bN \left(1 - \frac{A(t)}{N}\right) \left(1 - \left(1 - \frac{A(t)}{N}\right)^k\right)$$

After simplification:

$$\therefore \frac{dv}{dt} = -bv(1 - v^k)$$

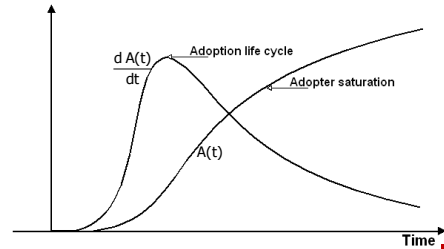
where $v = 1 - A/N$

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Adoption life cycle

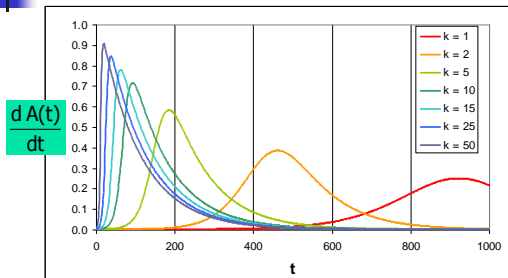


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New demand



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How real is the network effect?

- Hybrid corn in Iowa, Ryan + Gross, 1943
 - Boiling water in Peruvian village, 1955
 - Columbia University drug study, 1980
 - Spread of Aids in USA, 1985
 - Diffusion of the Internet, 1990
- *Diffusion of Innovations*, Everett M. Rogers, 1995

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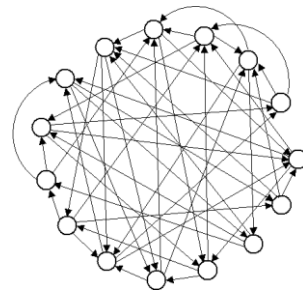
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Reference networks

What does it look like?

Random network

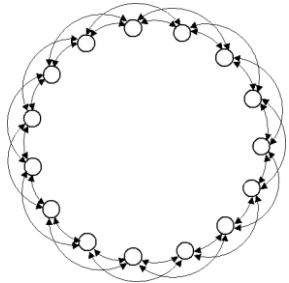


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Regular network



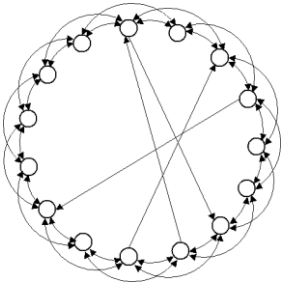
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It's a small world

- Milgram's experiment
- Six degrees of separation.

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Small-world network



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What does a reference network look like?

- A reference network is a social network
- Large-scale reference networks have not yet been studied quantitatively
- But many studies have been done on general social networks.

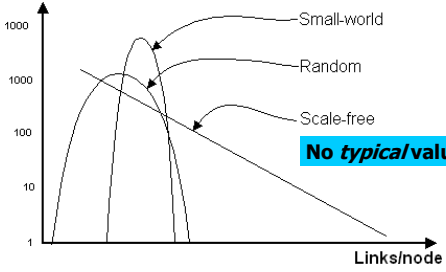
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Social networks

- Oracle of Bacon
- WWW
- Citation database
- Sexual relations in Sweden
- E-mail interchanges
- Scientific collaborations
- Business alliances in biotechnology
- Biological organisms.

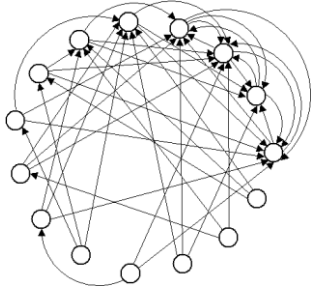
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Histogram of links per node



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Scale-free network



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Why are networks scale-free?

- Networks grow over time
- Links can only be made to existing nodes
- Older nodes tend to have more incoming links.

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Questions

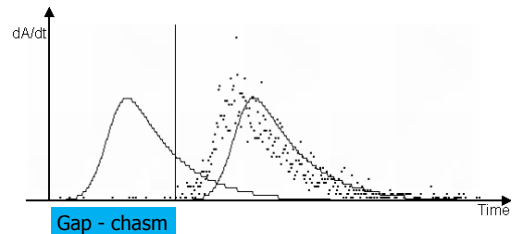
- We implied a random network in life cycle derivations
- How does it change when it is a scale-free network?

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Scale-free life cycle



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Hub adopters in scale-free reference networks

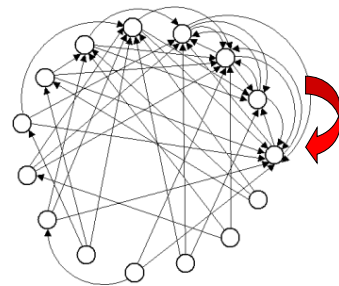
- No exponential growth **until** a hub adopts
- Guaranteed exponential growth **when** a hub adopts
- Adoption by a hub is necessary **and** sufficient for exponential growth.

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Select hub adopters



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Chicken versus egg dilemma

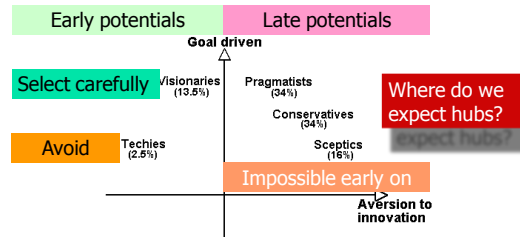
- Any adopter needs earlier adopters to kick-start adoption life cycle
- Where does the first adopter come from?

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Life cycles

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Adopter profiles



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Life cycles

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Actions during famine

- Select hub adopter(s)
- Identify their acceptable visionary reference site(s)
- Target those visionaries first
- Do not use a shotgun approach.

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Are all networks scale-free?

- Business to business reference networks typically are
- Consumer reference networks typically are not due to high attrition rate
- Consumer reference networks probably more like small-world networks.

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Consumer markets

- Frighteningly slow adoption rate
- Not practical for start-ups to enter
- Start-ups should rather aim at B2B (business-to-business) markets.

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Why is innovation adoption slow?

- Humans are inherently risk averse

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What can a start-up do to speed up adoption of an innovation?

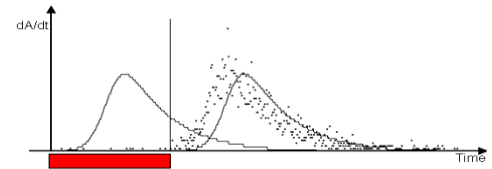
- Choose a scale-free reference network, i.e. business-to-business model
- Target a hub via visionaries.

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How does a start-up survive the famine?



- Do not accept venture capital
- Become sustainable through project income.

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