

Business, Innovation and Social Networks

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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

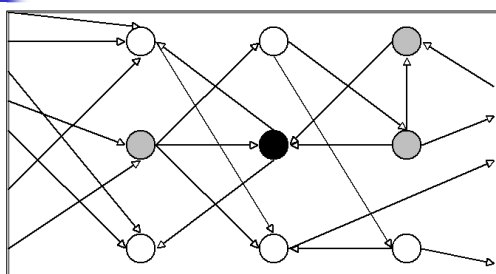
- Sales transactions are between humans
 - First time adopters do not buy a breakthrough product type without an acceptable reference
- Note: no replacements, adopt only once.*

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A network of buyers



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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:

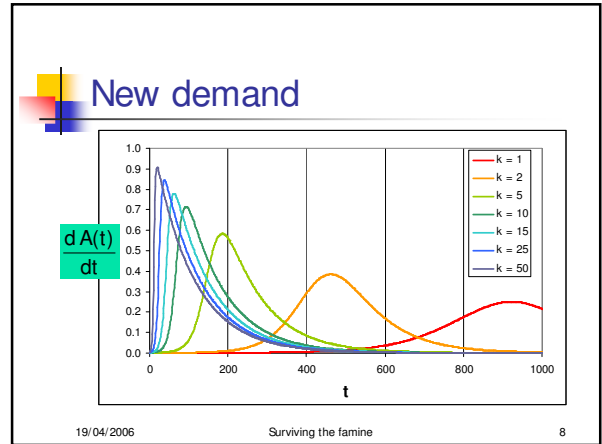
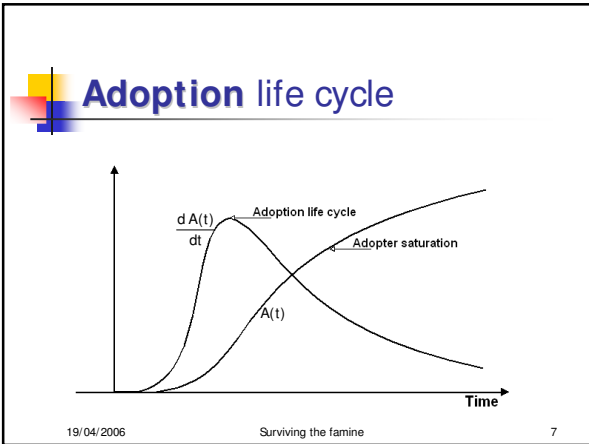
$$\therefore \frac{dv}{dt} = -bv(1 - v^k)$$

where $v = 1 - A/N$

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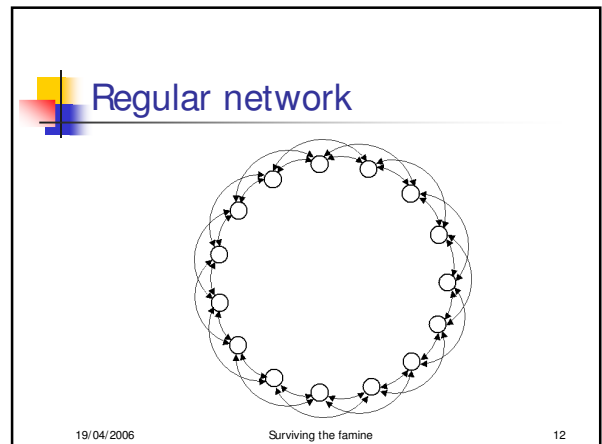
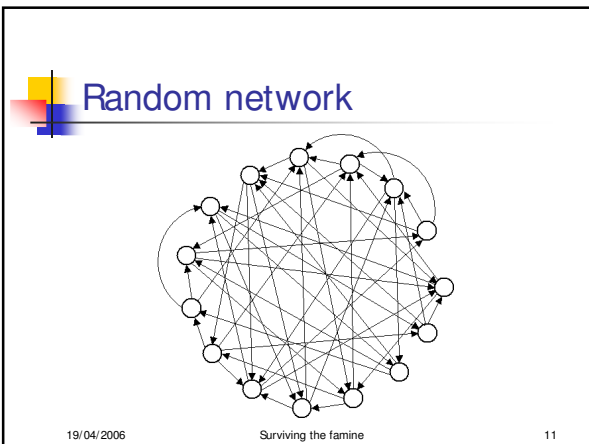
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- ### How real is the network effect?
- Hybrid corn in Iowa, Ryan + Gross, 1943
 - Boiling water in Peruvian village, 1955
 - Columbia University drug study, 1980
 - Spread of Aids in USA, 1985
 - Diffusion of the Internet, 1990
- *Diffusion of Innovations*,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

What does it look like?



It's a small world

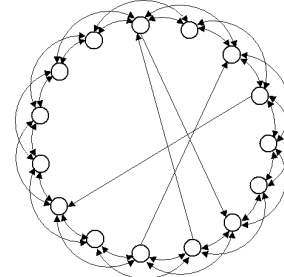
- Milgram's experiment
- Six degrees of separation.

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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

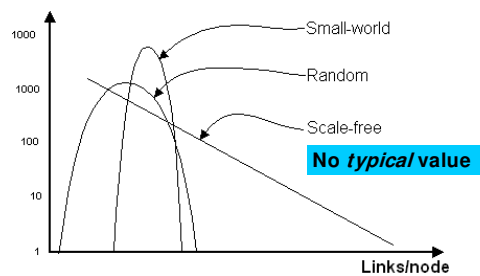
- Oracle of Bacon
- WWW
- Citation database
- Sexual relations in Sweden
- E-mail interchanges
- Scientific collaborations
- Business alliances in biotechnology
- Biological organisms.

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Histogram of links per node

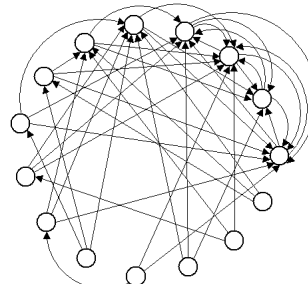


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Scale-free network



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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

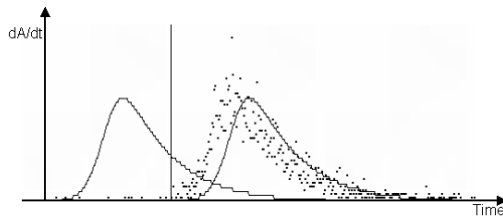
- We implied a random network in life cycle derivations
- How does it change when it is a scale-free network?

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Scale-free life cycle



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Hub adopters in scale-free reference networks

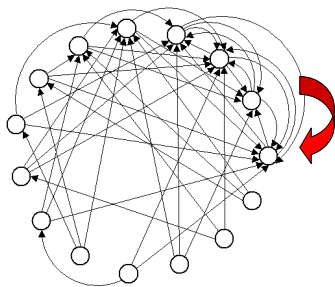
- No exponential growth **until** a hub adopts
- Guaranteed exponential growth **when** a hub adopts
- Adoption by a hub is necessary **and** sufficient for exponential growth.

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Select hub adopters



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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?

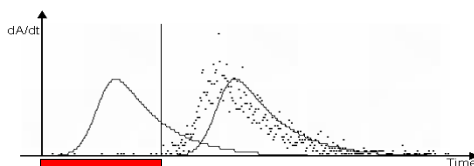
- Choose a scale-free reference network, i.e. business-to-business model
- Target a hub via visionaries.

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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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Market segments

Questions

- What is a market segment?
- How does a start-up discover promising market segments without a massive market research effort?

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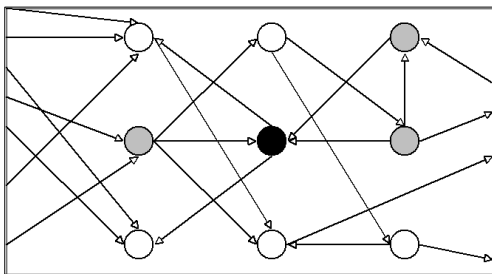
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A market is the combined behaviour of thousands of people responding to information, misinformation and whim.

Kenneth Chang

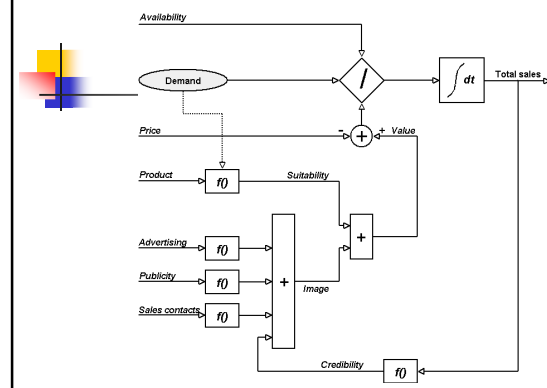
The market as a network



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Suitability and Image

- Suitability is what a prospective user can ascertain independently
- Image is what other people are saying about the product.

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Product suitability

- A potential user knows the most important factors
- These factors are known as the user needs
- To be successful, we need to address these key success factors (KSFs).

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KSFs

- KSF - key success factor
- Important factor influencing success
- Closely related to user need.

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Rating by users

- Users rate offerings in terms of KSFs
- We need an **objective** scale
- Excellent (E),
Good (G),
Acceptable (A),
Barely acceptable (B),
Unacceptable (U).

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Objective rating scale

- E = 90% - excellent
- G = 70% - good
- A = 50% - acceptable
- B = 30% - barely acceptable
- U = 0% - unacceptable

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Competitive table

Factors	Weights	Offering 1	Offering 2
Price	20%	90% (E)	30% (B)
Reliability	30%	70% (G)	90% (E)
Service	10%	70% (G)	90% (E)
Ease of use	25%	70% (G)	70% (G)
Image	15%	50% (A)	90% (E)
Score		71%	73%

$$r_x = r_{\text{price}} \cdot W_{\text{price}} + r_{\text{product}} \cdot W_{\text{product}} + r_{\text{image}} \cdot W_{\text{image}}$$

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Market segment - classical

- A market segment is a group of users with the same needs

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Market segment – our definition

- A group of users with the same KSFs
- Similar weights attached to each KSF
- Part of the same reference network.

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Finding segments – brute force

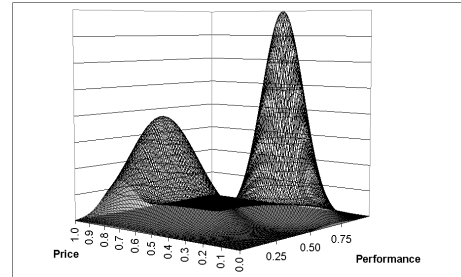
- Determine KSFs
- Interview lots and lots of users
- Measure KSF weights for each user
- Use multidimensional statistics to find clusters with similar KSF weights.

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Histogram: KSF weights



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Problems with brute force

- Expensive
- Garbage in, garbage out.

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Segments - shortcut

- Rank KSFs in all possible combinations
- Plot KSF ranking trees
- Map combinations to actual segments
- Any combination has only 2 or 3 KSFs with significant weightings
- Known as **defining KSFs**.

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Unsatisfied segments

KSFs	Offering 1	Offering 2
Price	30% (B)	0% (U)
Reliability	50% (A)	90% (E)
Service	70% (G)	0% (U)
Ease of use	70% (G)	70% (G)
Image	50% (A)	90% (E)

Only market segment with **price** KSF is still unsatisfied.

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Questions

- What is a market segment?
Users with same KSFs and similar weights attached to these KSFs **within the same reference network**
- How does a start-up discover promising market segments without a massive market research effort?
KSF grouping used with common sense.

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Concept

A rock pile ceases to be a rock pile the moment a single man contemplates it, bearing within him the image of a cathedral.

-- [Antoine de Saint-Exupéry \(1900-44\)](#)

Developing a concept

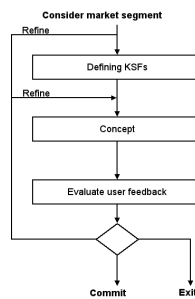
- The concept that provides the most acceptable solution in a segment
- Strongly related to the defining KSFs
- If successful, becomes the **dominant design**.

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Developing the concept



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Appropriate early process

- The concept is very unpredictable
- User needs are unpredictable
- User response is unpredictable
- We need a highly adaptive development process
- Agile Process most appropriate.

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