Information Rules:
A Strategic Guide to the Network Economy

Networks and Positive Feedback
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Important Ideas
• Positive feedback
• Network effects
• Returns to scale
  – Demand side
  – Supply side

Positive Feedback
• Strong get stronger, weak get weaker
• Negative feedback: stabilizing
• Makes a market “tippy”
• Examples: VHS v. Beta, Wintel v. Apple
• “Winner take all markets”

Sources of Positive Feedback
• Supply side economies of scale
  – Declining average cost
  – Marginal cost less than average cost
  – Example: information goods
• Demand side economies of scale
  – Network effects
  – In general: fax, email, Web
  – In particular: Sony v. Beta, Wintel v. Apple

Network Effects
• Real networks
• Virtual networks
• Number of users
  – Metcalfe’s Law:
    Value of network of size n proportional to n^2
• Importance of expectations

Lock-In and Switching Costs
• Network effects lead to substantial collective switching costs
• Even worse than individual lock-in
• Due to coordination costs
• Example: QWERTY
Don’t Get Carried Away

- Network externalities don’t always apply
  - ISPs (but watch out for QoS)
  - PC production
- Likelihood of tipping
  - See next slide

Likelihood of Tipping

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<tr>
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<th>Low Scale Economies</th>
<th>High Scale Economies</th>
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<tr>
<td>Low Demand For Variety</td>
<td>Unlikely</td>
<td>High</td>
</tr>
<tr>
<td>High Demand For Variety</td>
<td>Low</td>
<td>Depends</td>
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Igniting Positive Feedback

- Evolution
  - Give up some performance to ensure compatibility, thus easing consumer adoption
- Revolution
  - Wipe the slate clean and come up with the best product possible

Evolution

- Offer a migration path
- Examples
  - Microsoft
  - Intel
  - Borland v Lotus
- Build new network by links to old one
- Problems: technical and legal

Revolution

- Groves’ law: “10X rule”
- But depends on switching costs
- Example: Nintendo

Openness v. Control

- Your reward = Total added to industry x your share
- Value added to industry
  - Depends on product and
  - Size of network
- Your share
  - Depends on how open
Openness

- Full openness
  - Anybody can make the product
  - Problem: no champion
- Alliance
  - Only members of alliance can use
  - Problem: holding alliance together

Control

- Control standard and go it alone
- If several try this strategy, may lead to standards wars

Generic Strategies

<table>
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<tr>
<th>Compatible</th>
<th>Control Migration</th>
<th>Open Migration</th>
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<tr>
<td>Incompatible</td>
<td>Performance Play</td>
<td>Discontinuity</td>
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Performance Play

- Introduce new, incompatible technology
- Examples
  - Palm Pilot
  - Iomega Zip
- Attractive if
  - Great technology
  - Outsider with no installed base

Controlled Migration

- Compatible, but proprietary
- Examples
  - Windows 98
  - Pentium
  - Upgrades

Open Migration

- Many vendors, compatible technology
- Examples
  - Fax machines
  - Some modems
Discontinuity

- Many vendors, new technology
- Examples
  - CD audio
  - 3 1/2” disks

Historical Examples of Positive Feedback

- RR gauges
- AC v. DC
- Telephone networks
- Color TV
- HD TV

RR gauges

- South used 5’ and North used 4’ 8 1/2” before Civil war
- South Secedes
- Congress decides new lines going west used 4’ 8 1/2”
- In 1866 South switched to 4’ 8 1/2”
- Incompatibility can persist for a long time!
- Networked markets tend to tip
- Withdrawal from standard setting process bad.

AC vs DC

- Edison – DC
  - First mover
- Westinghouse – AC
  - Better technology for long distance transmission
- Expectation management tactics
  - To “Westinghouse” = electrocution
- AC wins of course

Telephone Networks

- Mid 1890 Bell patents expire
- Independent non-bells have half market around 1900
- Bell Long Distance tactic
  - Open up long distance to non-affiliated companies that do not have a local bell competitor
- Tactic allows Bell System to become dominant.

Color Television

- RCA / NBC leading black and white TV maker
- CBS leading TV network
- CBS proposes new color standard
  - Accepted by FCC in 1950
  - Not backwards compatible
  - Lacks MFG to actually make TVs
- RCA comes out with backwards compatible color technology
  - FCC reverses 1950 decision in 1953
HD-TV

- Japanese develop analog system in early 80s
- US uses performance tests to settle on standard
  - All digital system proposed 1991
  - Standard adopted by FCC in 1996

Lessons

- Positive feedback means strong get stronger and weak get weaker
- Consumers value size of network
- Works for large networks, against small ones
- Consumer expectations are critical
- Fundamental tradeoff: performance and compatibility

Lessons, continued

- Fundamental tradeoff: openness and control
- Generic strategies
  - Performance play
  - Controlled Migration
  - Open Migration
  - Discontinuity
- Lessons of history