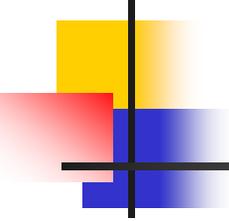


Views of Technology Futures

An Internet Perspective

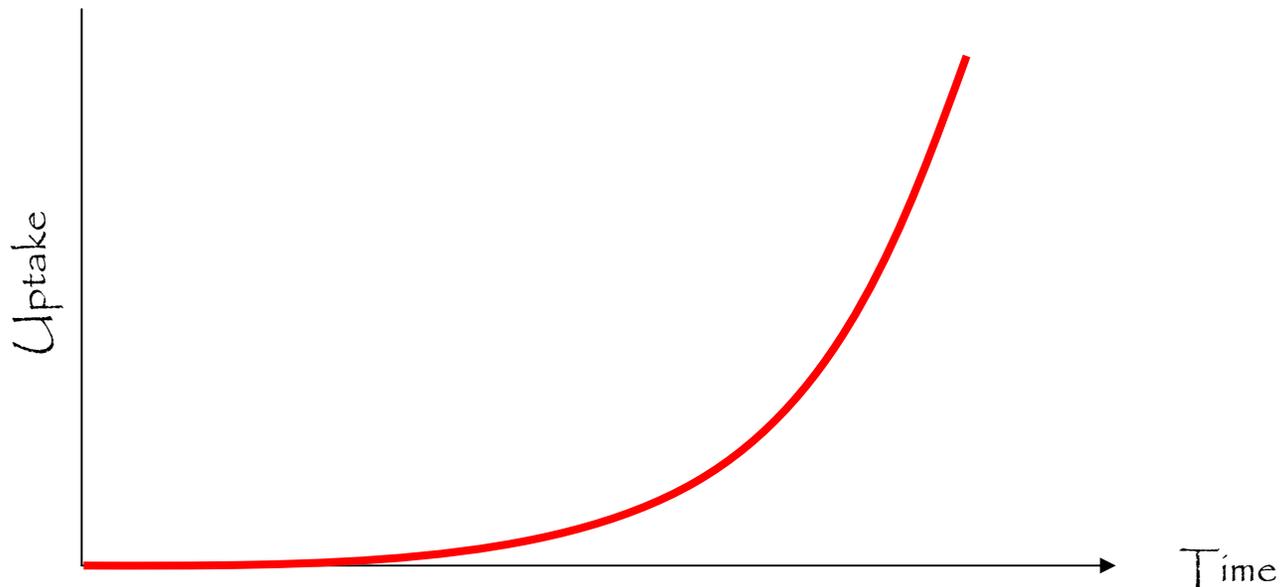
Geoff Huston
Internet Society
October 2000

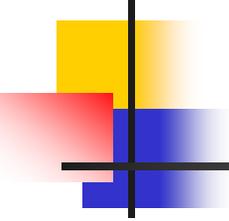


The Phases of Technology Adoption

1 - The Shock of the New

- Escalating uptake
- Disruptive impact on existing services

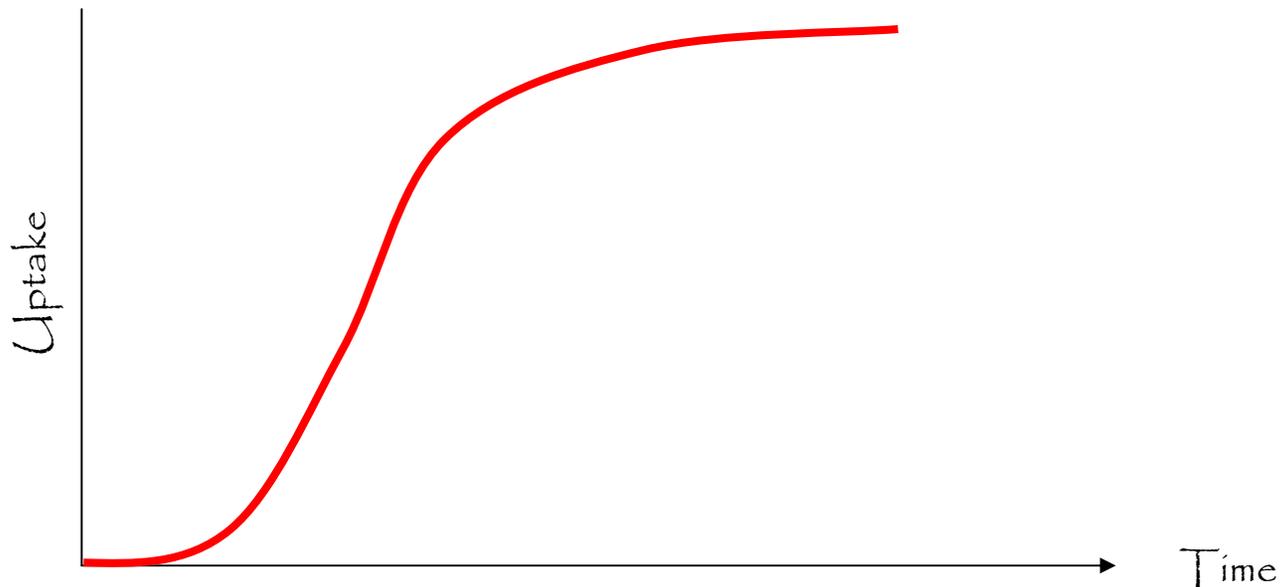




The Phases of Technology Adoption

2 - Market Saturation

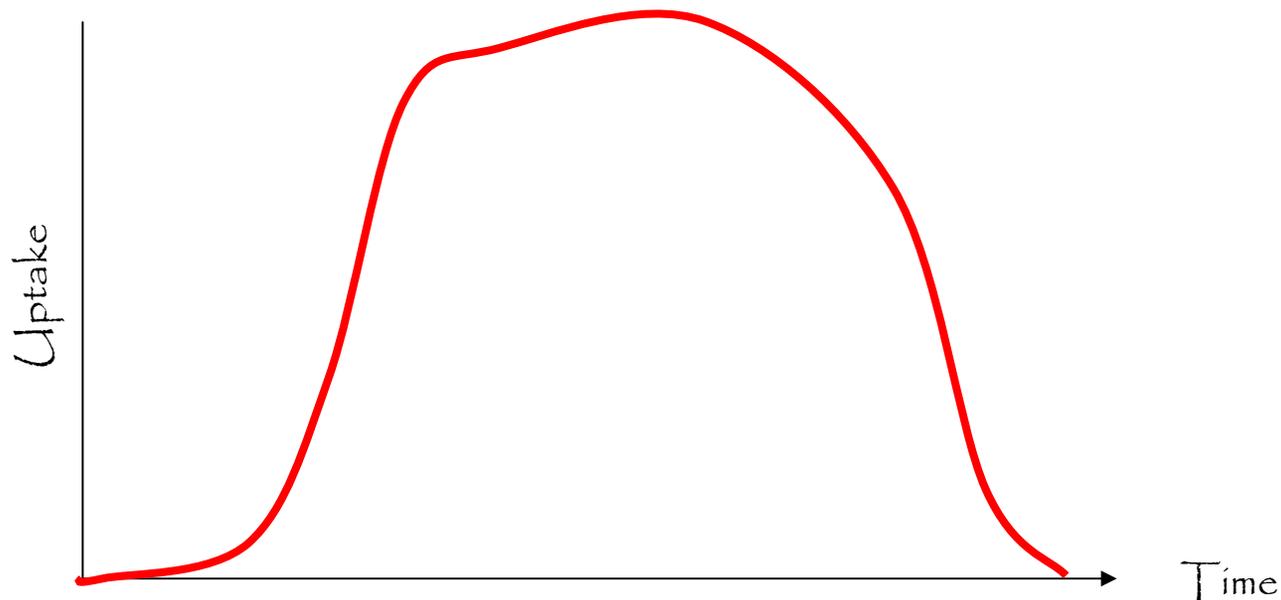
- Uptake level slows as it maps changes population and relative wealth



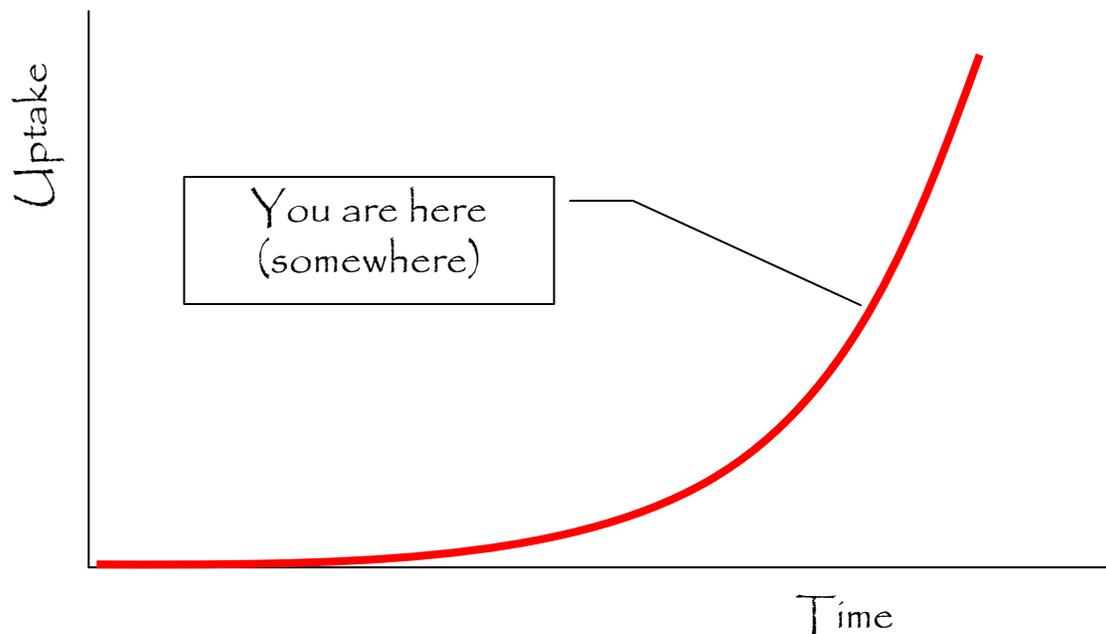
The Phases of Technology Adoption

3 – Obsolescence

Technology is displaced by alternative offerings



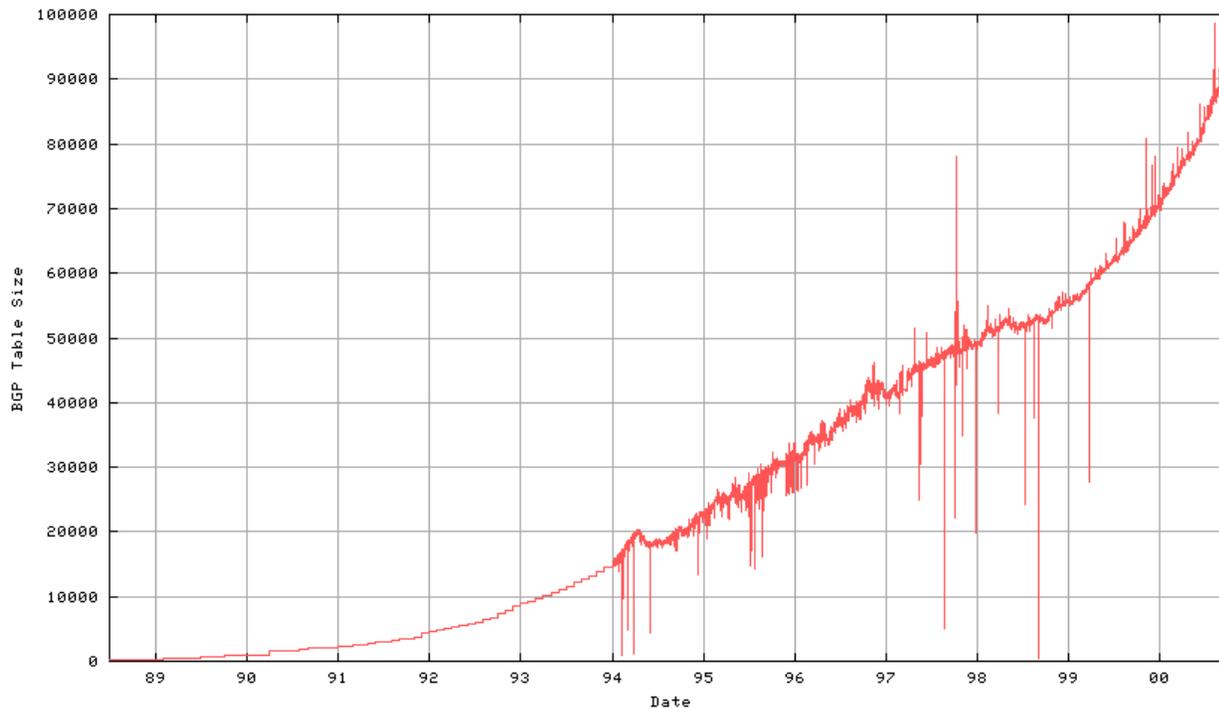
The Internet Today

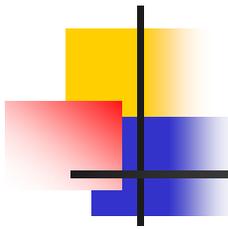


- Still in the mode of rapid uptake with disruptive external effects on related activities
- No visible sign of market saturation
- Continual expansion into new services and markets
- No fixed service model
- Changing supply models and supplier industries

The Internet Today

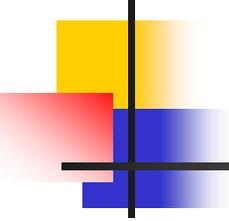
- No visible signs of demand saturation
- Current growth levels have been sustained for over two decades





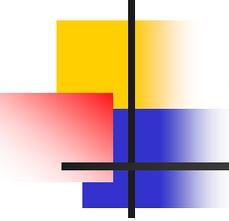
WHY the Internet?

- A new network model: Dumb Network – Smart Devices
- The Internet is simply a collection of packet switches linked together by transmission elements:
 - Packets can be queued
 - Packets can be lost
 - There is no end-to-end time coupling and there is no end-to-end reliability coupling.
- This allows an Internet network to use basic and cheap transmission elements and basic and cheap packet switches.

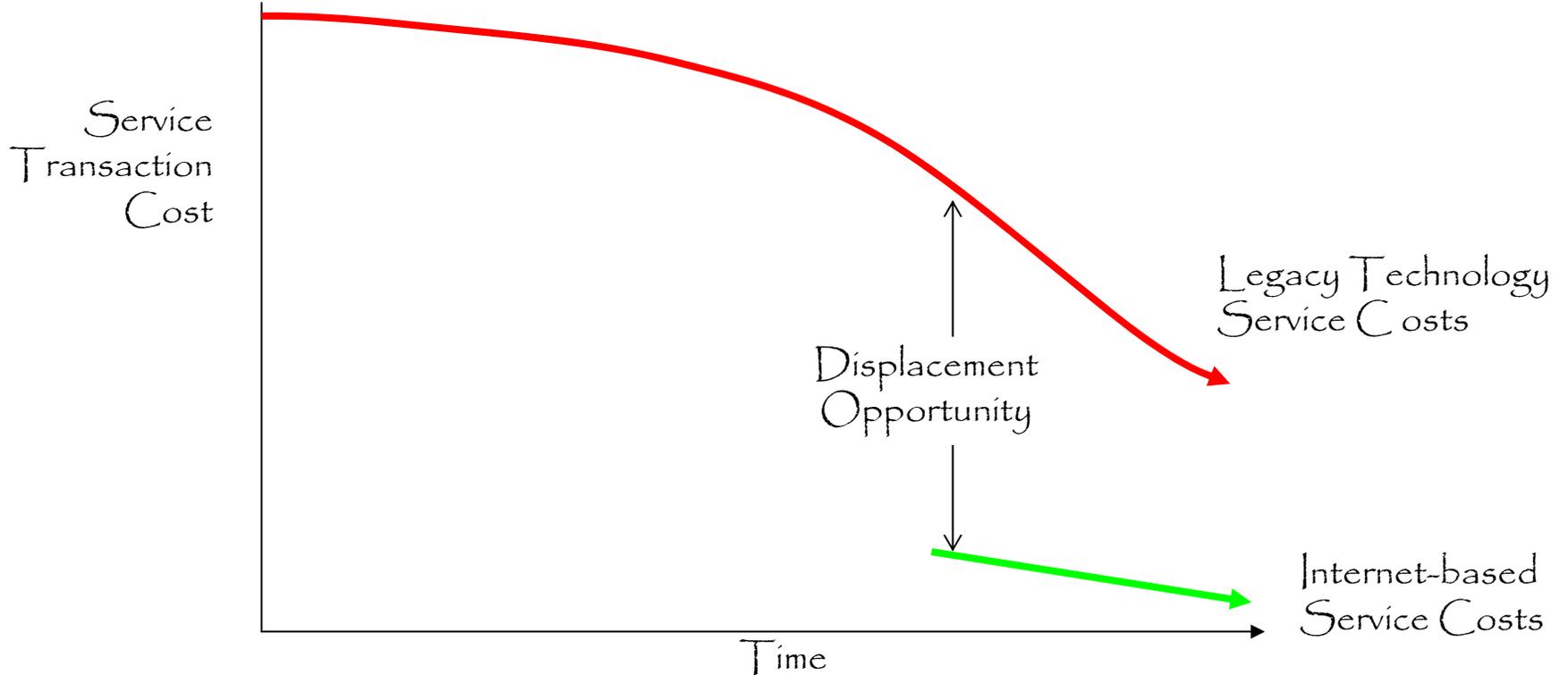


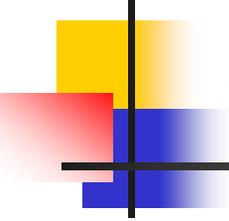
WHY the Internet?

- **Cheap** to access and exploit
- **Adequate** service model



The Disruptive View of the Internet





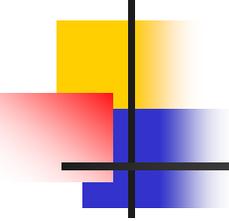
The Disruptive View of the Internet

- **Adaptable services** quickly migrate to use a cheaper cost base
 - Personal and Group Messages
 - Data transfer
 - Information Services
- **Other services** migrate based on exposure of opportunity
 - Commerce transactions (X.25)
 - VOIP (PSTN)
 - Music distribution (media distribution)
 - Video distribution (media distribution)
- Continually decreasing unit costs and increasing penetration of access devices work together to continually expose new applications and new markets for the Internet

Internet Drivers

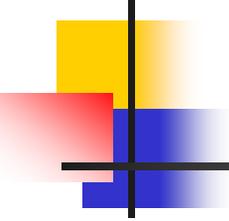
- Expansion is continuing at an exponential growth rate.
- Growth of access channels:
 - Desktop services
 - Personal services – Laptops and PDAs
 - Mobile communications services
 - Appliances
- Use Drivers
 - Information
 - Commerce
 - Entertainment





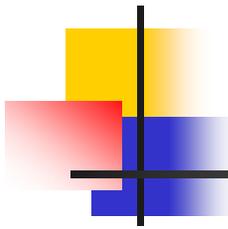
Futures for the Internet

- Same basic model:
 - dumb network, smart devices
 - Packet-based model of network sharing
 - Packet reordering, loss and jitter to remain
- Same drivers:
 - Continued growth in users
 - Continued broadening of the utility model through growth in overlay applications
 - Continued unit price drop in service costs for Internet-based services



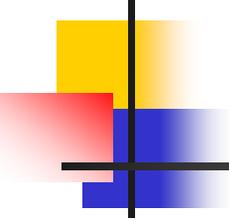
Futures for the Internet - Transmission

- Megabit Wireless Bandwidth
 - 802.11 wireless networks are gaining market share as a flexible solution for office and access
- Megabit Mobility
 - 3G wireless efforts gathering momentum as a wide area mobility solution for PDA devices
- Gigabit Fixed Bandwidth
 - Moving to a trunk and access architecture of packets placed directly into the optical plane



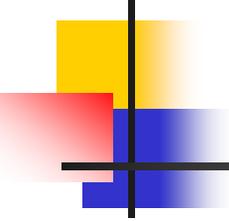
Futures for the Internet – Coping with Scale

- Billions of addressable devices
- Either: back to the multi-protocol world:
 - ‘Walled garden’ domains of rich functionality
 - Inter-domain basic functions undertaken with application-level boundary gateways
- Or: we get serious about coherency of communications
 - Adoption of IPv6-based architectures
 - Reduction of use of network boundary-ware in favour of end-to-end architectures



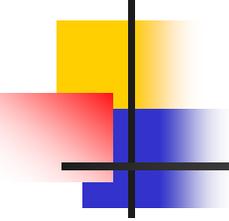
Futures: The Content Model

- Finding information is not the problem
 - Finding too much information of dubious relevance and dubious authority is the continuing problem
- An environment of **Content Abundance**



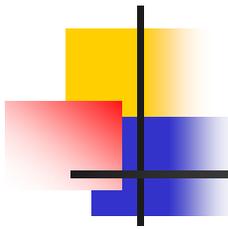
Futures: The Content Model

- Internet Content Abundance
 - Information publication will continue to be driven into cheaper and easier to use models
 - Single point content publication architectures will fade to be replaced by reference-driven distributed cache models
 - A content URL becomes in effect an index used to query a cache, not a lookup performed at a nominated unique location
 - This has implications for the DNS as know it today



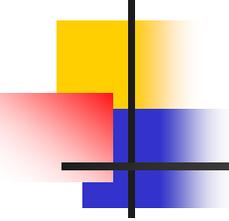
Futures: The Content Model

- The issues:
 - Generating **information navigation models** that have tight focus properties in terms of relevance of outcomes
 - Generating **mutual trust models** that can be used to create information filters that generate trustworthy outcomes
 - Adopting a **content economy** that funds quality of content
- Lets look quickly at these three issues:...



Futures: Information Navigation

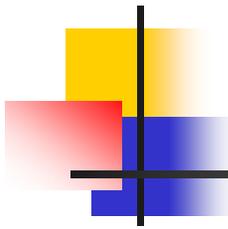
- Currently in the early stages in combining formal systems with natural language interpreters and generators and flexible format interfaces
- Will the storage structure of information need to change to aid effective content navigation?
 - Is XML a productive direction to make implicit structure of information explicit to the navigation system?
 - Are there other approaches with greater promise?



Futures: Trust Models

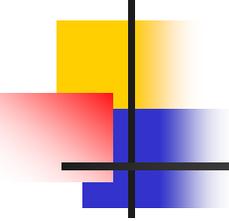
- What is the trust model of the Internet?
- What do end-consumers want the trust model of the Internet to be?
- What do media providers and media intermediaries want the trust model of the Internet to be?
- Are these three views consistent?

Trust is difficult to impose and difficult to sustain. If you want a peer-to-peer content publication model then it has to be accompanied with a peer-to-peer trust model to sustain trust in content



Futures: Content Economy

- What does a robust content economy look like?
 - Pay-per view?
 - Free – content provider funded?
 - Free - third party funded?
 - Bundled – access provider bundles content provision?
 - How do cache intermediaries fit into the model?



Thank You

- Questions?