Building Internet Systems of Lasting Value

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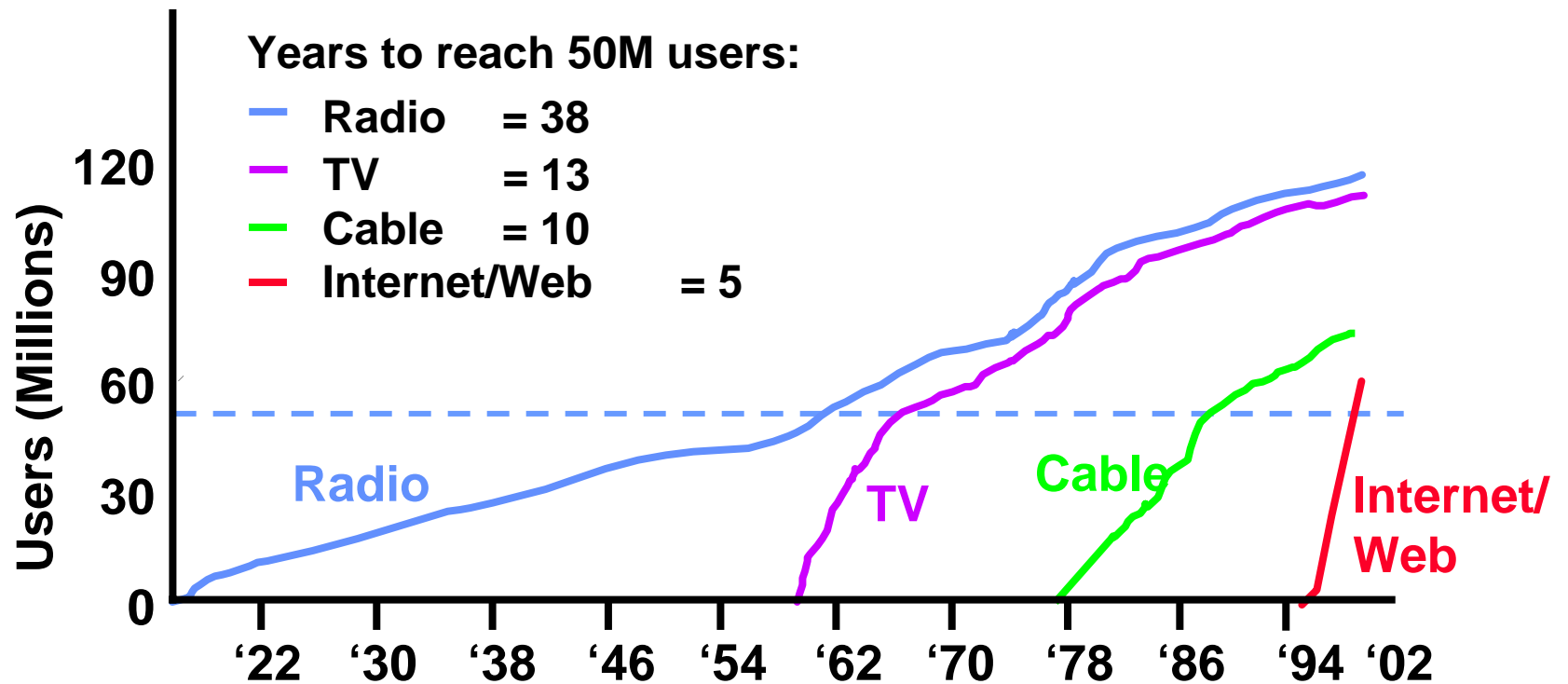
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Creating Lasting Value

- Technology changes accelerate
  - increasing rate of change
  - the problem of obsolescence
- Three rules for a happy life
  planning for Y2010
  - some guidelines
  - a few motivating examples
  - technology directions that can help

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Web and Speed

Years to reach 50M users:

- — **Radio** = 38
- — **TV** = 13
- — **Cable** = 10
- — **Internet/Web** = 5

Users (Millions)

120

90

60

30

0

Radio

TV

Cable

Internet/Web

'22 '30 '38 '46 '54 '62 '70 '78 '86 '94 '02

- 70 New users every minute (Source: New York Times)

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The Massless Economy

"America's output, measured in tons, is barely any heavier now than it was 100 years ago. In the same period, real GDP, by value, has increased 20 times." - (Alan Greenspan, chair, Federal Reserve Board, USA)

More than half of the total GDP in 1996 in the rich countries was knowledge-based.

Accelerating Trends

- Rise of Services over Products
- New information-based intermediaries
- Services are distributed over the network
- "Universal Service" includes Internet Service
- But…new technologies displace old slowly

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Three Rules for Lasting Value

- Device independence
- Capture & preserve
- The system is not the system

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Rule 1: Device Independence

- "The browser on the PC"
  will not be the primary access device
- New kinds of devices
  - Handheld, Embedded
  - Audio/Voice
  - Paper Interfaces
- Universal access to those with disabilities

Handheld, Portable

- Handheld computers
- Cell phones
- Portable, wireless
- Small screen
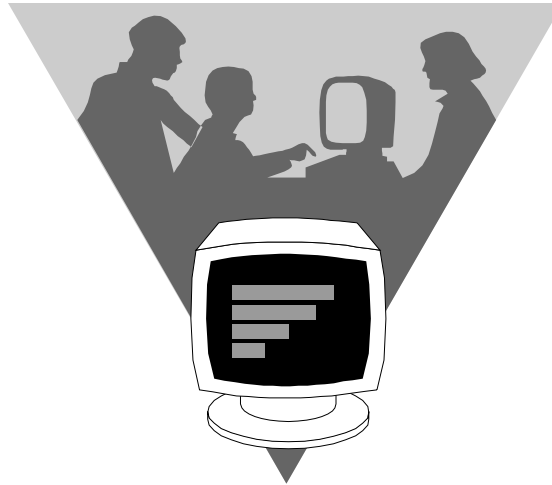- Simpler interaction methods

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Embedded in Devices

- Convergence of TV (WebTV)
- Embedded in appliances
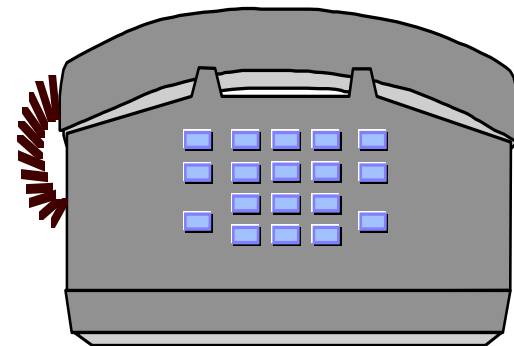- Phone, refrigerator, microwave

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Audio

- Access to information through
  - dial-up touch-tone response
  - audio response system
- Screen reader for blind
- Audio response in car

Paper Forms for Interaction

P

	John Q. Smith
History Test 2	October 24, 1998

1. Who killed Abraham Lincoln?
☐ George Washington
☐ John Wilkes Booth
☐ Aaron Burr
☐ James Garfield

2. When was the war of 1812 fought?
☐ In the 18th century
☐ 1776
☐ 1812
☐ 1998

3. Who said "Give me liberty or give me death"?
☐ Martin Luther
☐ Martin Luther King
☐ Benjamin Franklin
☐ Patrick Henry

Checked boxes will be identified when form is scanned

Data glyphs containing application-specific information

Registration mark for scanning

Data glyphs uniquely identifying this page

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Tools for Device Independence

- Author content and purpose
  - what you're saying or asking
- Transform to presentation and interaction
  - how to display or ask for it
- W3C WAI: Web Accessibility Initiative of World Wide Web Consortium
  - guidelines for content and interaction
- HTML (HyperText Markup Language)
  - XHTML; XML plus style

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Rule 2: Capture and Preserve

- Budget for preservation and conversion
  - The value of access is ephemeral

- Archiving changes culture
  - Preserve information, not conversation

- Access control allows trust
  - preservation without access control introduces risk of release

- Plan for media refresh
  - preservation of data in perpetuity

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Web In a Box

- **In 1999, the entire collection of text from the entire WWW:**
  - less than 500 gigabytes
  - fits on 1 machine.

- **Total in all of existence** (from Lesk)

  ~10 terabytes of text

  ~100 petabytes, including video, audio

  ~12000 petabytes of everything

Disk & tape production will soon exceed this

Problems with preservation

- Media refresh
- Organization
- Trust & warrantee
- Copyright & usage rights
- Replication, redundancy

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Tools for Preservation

- Standards for document formats
- Remembering metadata:
  - RDF: Resource Definition Format
    - structure for saving metadata
  - Dublin Core: standards for metadata
- Technologies of trust:
  - digital signatures, copyright
  - authentication, access control, accounting
- Global persistent naming

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Rule 3:The System is not the System

- The value of organizational change outlasts the technology used to introduce it
- Technology changes organizations
- Improving process creates value
- Building knowledge as capital

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Tapping The Social Mind

Knowledge

Learning

Information

Data

# Tools for Process Improvement

- The Internet community is building technology for "e-commerce", in the broadest sense of commerce:
  - communication
  - collaboration
  - negotiation
- XML descriptions of business processes, industry elements, commercial
- Public sector analogues build long-term value

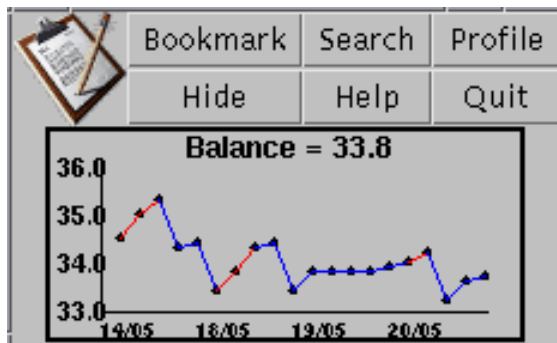Xerox Palo Alto Research Center
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Tools for Building Knowledge

Warranty

Quality

Trust

Access
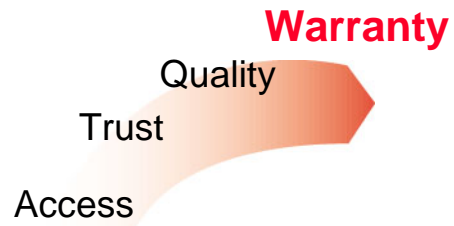
Tapping the Social Mind:

Recommendations

Communities

Incentives

Markets

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Where is the Life we have lost in living?

Where is the Wisdom we have lost in Knowledge?

Where is the Knowledge we have lost in Information?

T. S. Eliot

Provide access to all

Preserved information

Build knowledge

Develop understanding

Aspire to wisdom