Wisdom is not the product of schooling but the lifelong attempt to acquire it.
- Albert Einstein

Innovative Media in Support of Distributed Intelligence and Lifelong Learning

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Overview

- Basic Message or Basic Question
- Education in the 21st Century
- Lifelong Learning and Distributed Intelligence
- Conceptual Frameworks
- Examples of Socio-Technical Environments
- Reflections and Conclusions

Basic Message or Basic Question

♣ **WMTE**: what is the **true value added**?

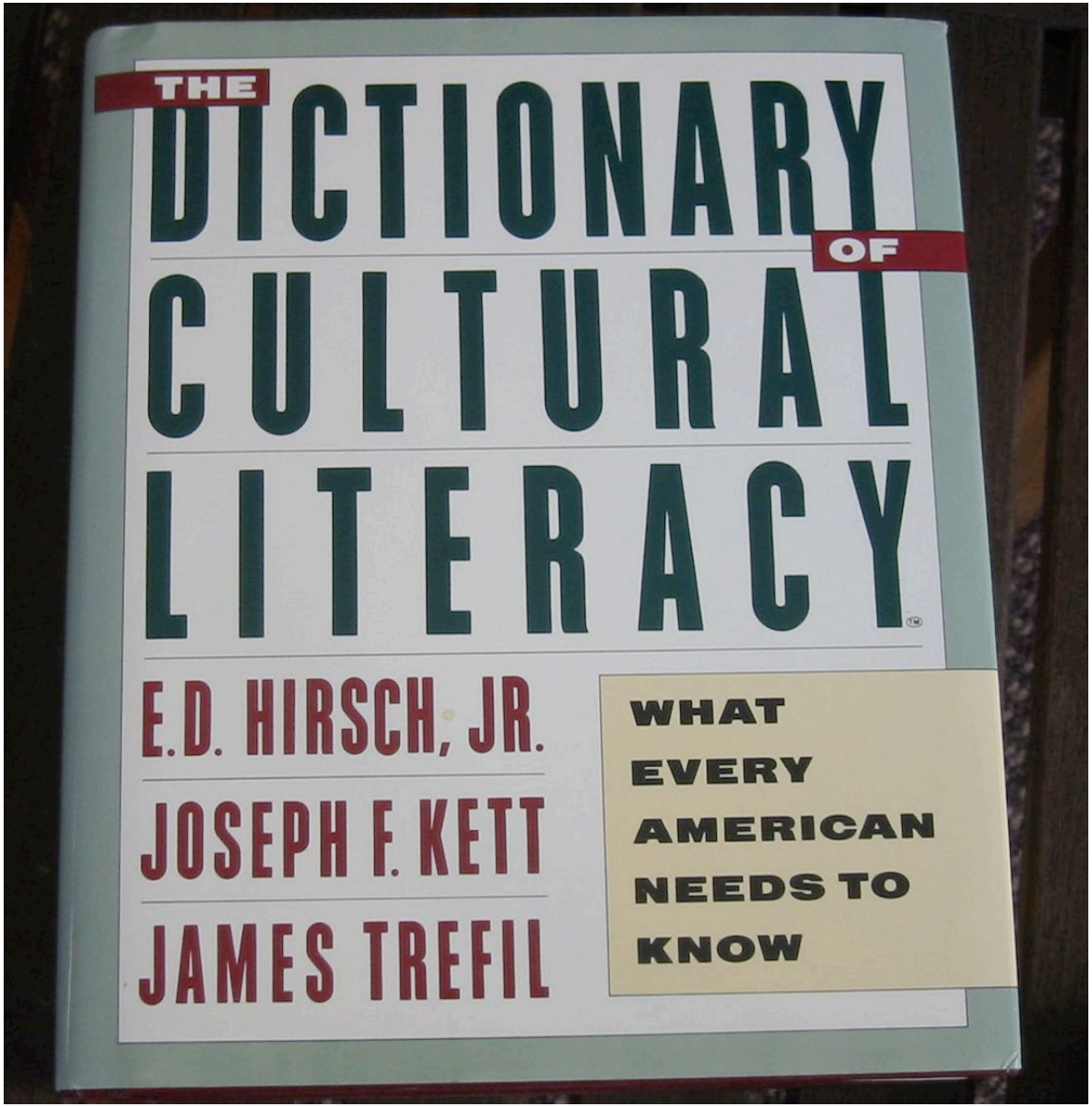
♣ **approaches:**

- **gift-wrapping:** technology as add-on to existing practices
- **techno-determinism:** technology dictates educational concerns
- **co-evolution** between education and technologies

♣ **opportunities:**

- new levels of **distributed intelligence** (knowledge in the head ⇓◊ knowledge in the world)
- **lifelong learning** (formal and informal learning; including and transcending the classroom)
- new **basic skills** in the 21st century?

Being Educated?



Education, Learning, Teaching and New Media

♣ education, learning and teaching = **f{media}** ◊ for this presentation: WMT

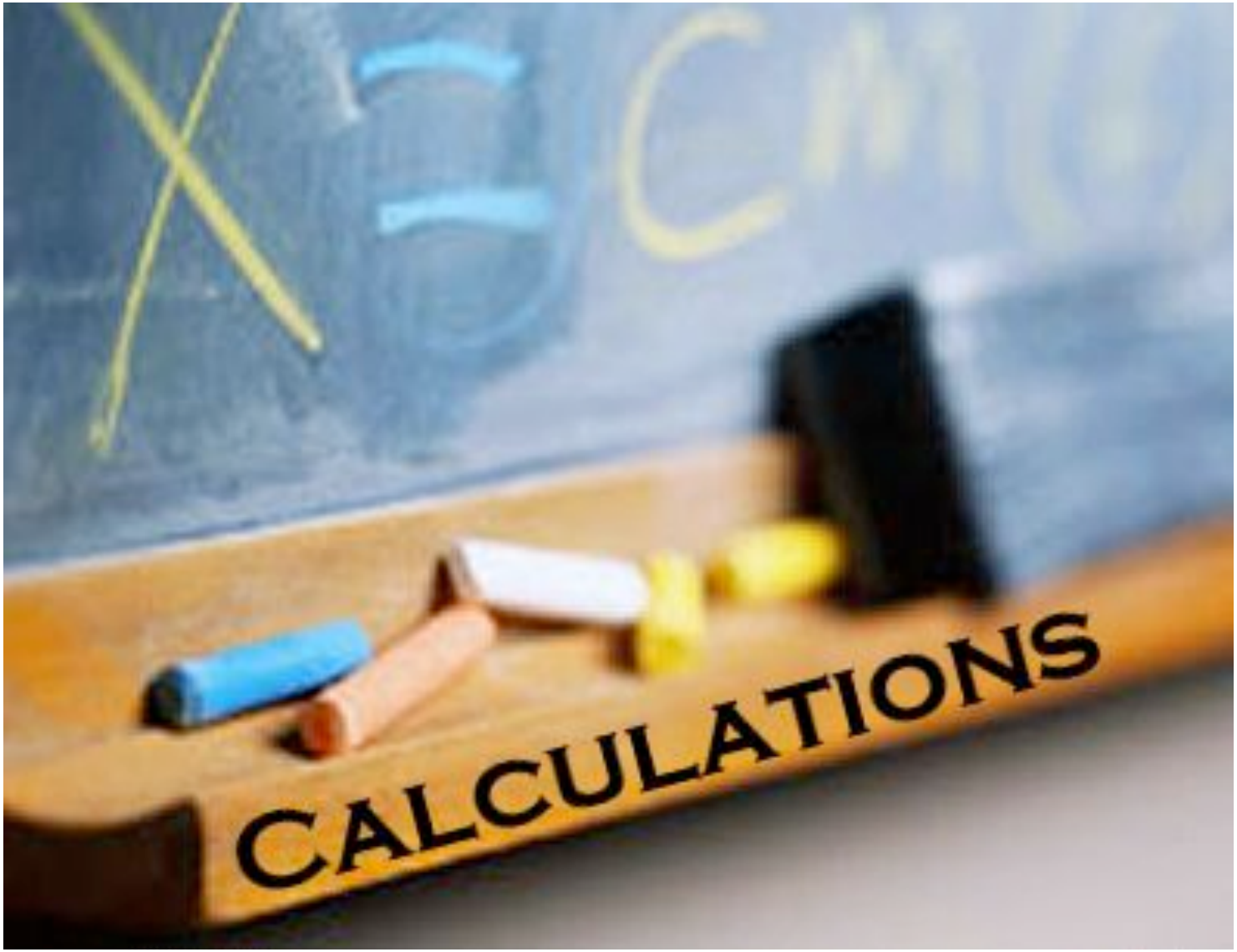
♣ **lifelong learning:**

- learning about ⇓◊ learning to be
- learning when the answer is known ⇓◊ learning when the answer is not known
- learning and teaching are not inherently linked

♣ **distributed intelligence:**

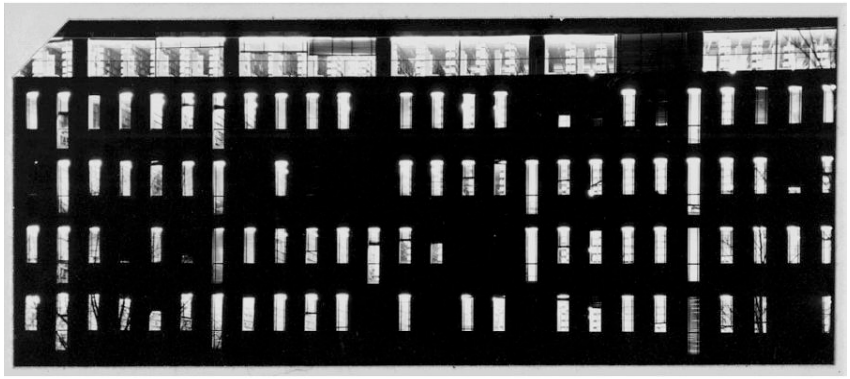
- distributed among people ◊ collaborative learning
- distributed between humans minds and artifacts
- tools for learning and tools for living

Education = f{Media} — In "Ancient" Times



Education = f{Media} — In the "Very Old" Days

Education = f{media} — In the "Old" Days



Yesterday

Today

Education ⇓◊ Technology

- claim: all important technologies are **"Faustian bargains": ** they give and take away ◊ technological change always produces winners and loosers

- while the growth of technology is certain, the **inevitability of any particular future is not** ◊ therefore: we can envision a number of different futures that might be

- the **visions** for possible futures:
  - **techno-utopians** romanticize the future ◊ things will be wonderful with new technologies, technology will liberate us
  - **techno-pessimists** glorify the past ◊ technologies will oppress us
  - **basic belief:** the deep and enduring changes of our ages are not technological but social and cultural

Education of the Future: A Lifelong Learning Perspective

- **basic assumption:** If the world of working and living relies on collaboration, creativity, definition and framing of problems, dealing with uncertainty, change, and distributed cognition — then education needs to prepare students for meaningful and productive lives in such a world

- **objective:** education from a lifelong learning perspective *should*
  - help learners enhance **their abilities to learn** and allow them to engage in **meaningful activities**
  - promote **new civic discourses** because: a major role for new technologies is not to deliver predigested information but to support social debates and discussions
  - exploit the **power of media**

Education of the Future: A Distributed Intelligence Perspective

♣ ***claim:*** *human cognition* has been seen as existing solely "inside" a person's head, and studies on cognition have often disregarded the physical and social surroundings in which cognition takes place

♣ **distribution:**

- distributed among people ◊ collaborative learning
- distributed between humans minds and artifacts
- tools for learning and tools for living

Question: Does this Statue convey the "Right" Image?

("The Thinker" by Auguste Rodin)

Elements of a Conceptual Framework

- usage and activity
- tools for learning and tools for living
- planning and situated action
- scarce resource
- gift wrapping and techno-determinism

Importance of Usage and Activity rather than Technologies

- ***Who*** **is using the computer?** — learners, teachers, skilled professionals, technically sophisticated users, domain workers

- ***What*** **are they doing?** — moving through space, accessing information, engaging in informed participation and collaborative knowledge construction, communicating with others

- ***Where*** **are they doing it?** — in classrooms, in work environments

- ***When*** **are they are able to do it?** — at any time without major preparations or setup

- ***Why*** **are they doing it?** — a self-directed and self-motivated activity, an assigned task, to obtain information

- ***How*** **are they doing it?** — in a tool-rich environment, in their heads

Tools for Learning

concepts: learning on demand, scaffolding, fading of scaffolding

Tools for Living

concepts: using on demand, distributed intelligence

Tools for Living ⇓◊ Tools for Learning

- **tools for living** (such as eyeglasses) are grounded in a distributed intelligence perspective, in which intelligence is mediated by tools for achieving activities that would be error prone, challenging, or impossible to achieve

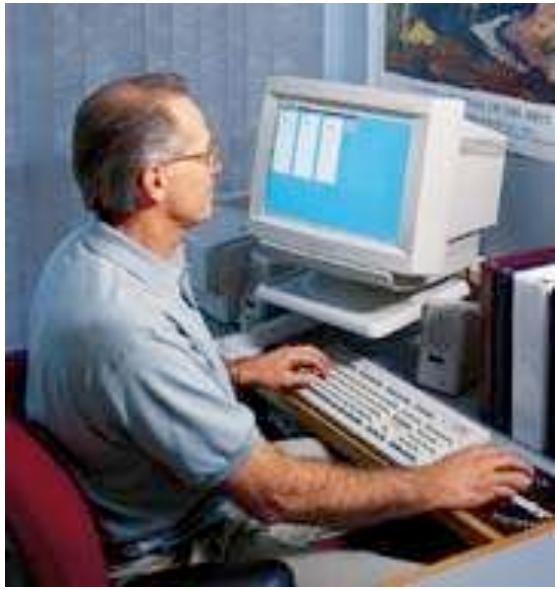
- **tools for learning** (such as training wheels) are grounded in a "scaffolding with fading" perspective in which the ultimate goal is autonomous performance by people without tools

- **a possibility provided by WMT:** tools for living rely on the presence of the tools at all times, and WMTs can therefore make them more relevant because we can rely on them at all times

Planning and Situated Action

---learning about future situations --------- learning/using in context ----◊

time



- ♣ world-as-imagined
- ♣ prediction
- ♣ planning
- ♣ process
- ♣ classroom

world-as-experienced
reality
situated action
practice
authentic environments

The Scarce Resource: Human Attention, not Information

- **claim:** a design representation suitable to a world in which the scarce factor is information may be exactly the wrong one for a world in which the scarce factor is attention

- **Herbert Simon:** *"What information consumes is rather obvious: it consumes the attention of its recipients. Hence a wealth of information creates a poverty of attention, and a need to allocate efficiently among the overabundance of information sources that might consume it."*

- always on ⇓----------◊ Rodin's Thinker

Beyond Anywhere, Anytime, Anyone

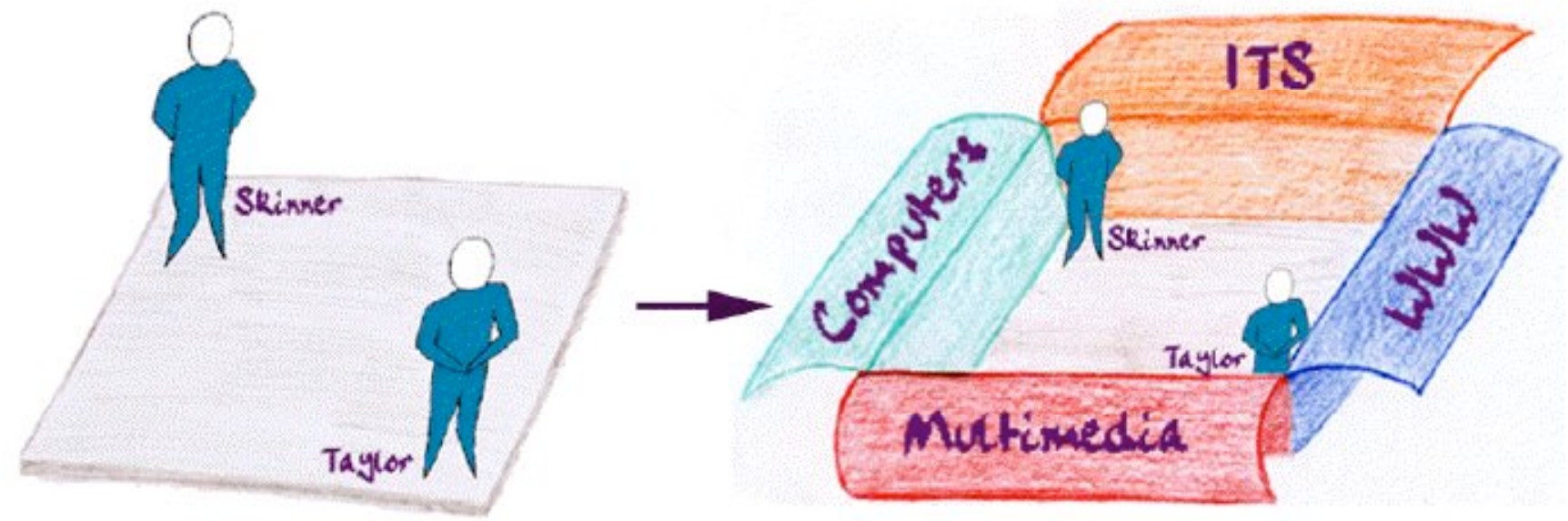
◊

The 'Right' Information at the 'Right' Time, in the 'Right Place', in the 'Right Way', to the 'Right' Person

- **'right' information:** relevant to the task at hand ◊ task modeling
- **'right' time**: intrusiveness (pull versus push), interruptions
- **'right' place:** location-aware cell phone (noisy environment versus movie theatre), smart tour guides
- **'right' way:** multimodal presentation (textual, visual, auditory, tactile)
- **'right' person:** taking background knowledge and interests of specific users into account ◊ user modeling, "who do I ask and who do I tell"
- **Faustian Bargain: privacy**

Gift-Wrapping: Adding Technology to Existing Practice

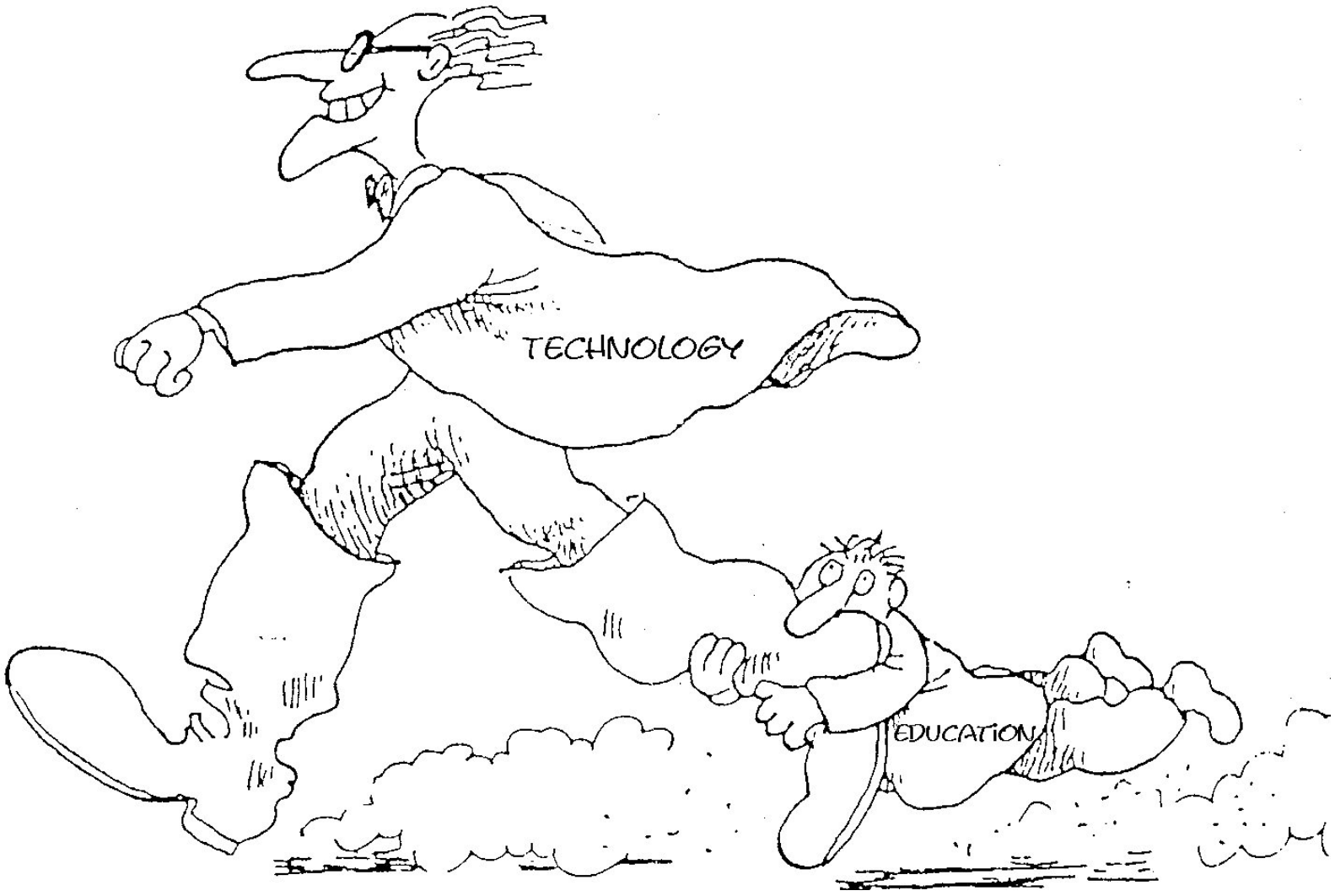
"There is nothing so useless as doing efficiently that which should not be done at all." — **Peter Drucker**



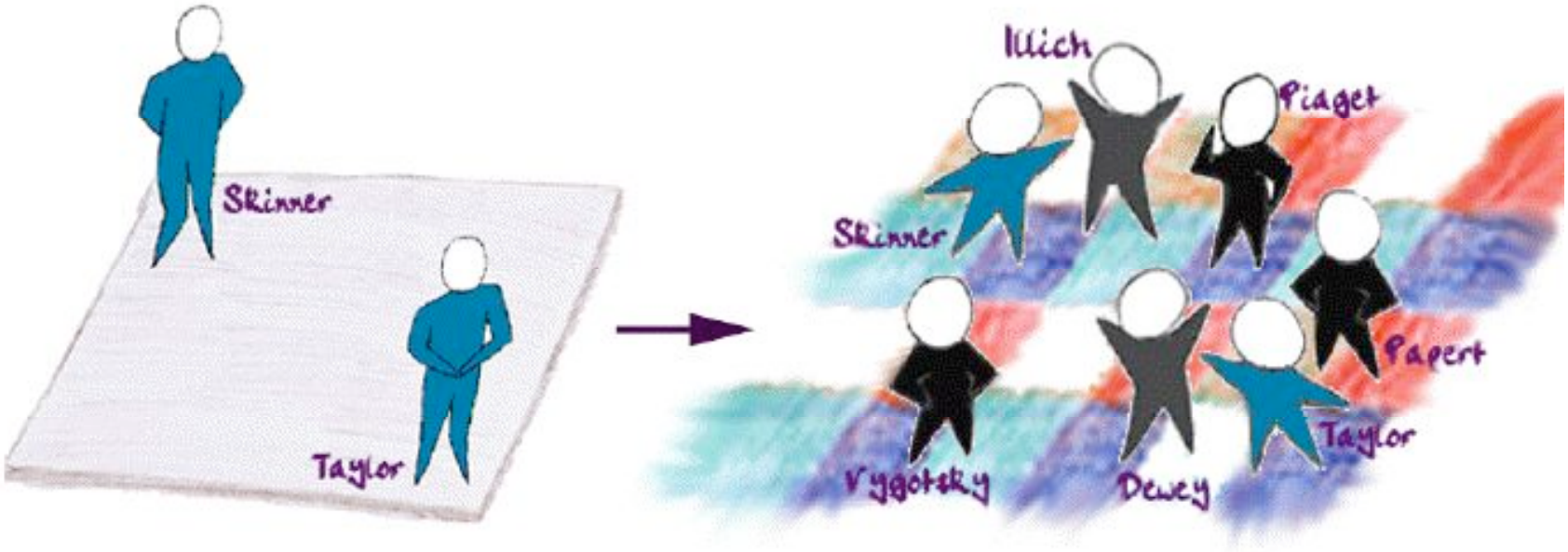
current practice (e.g., education)

current practice wrapped in technology

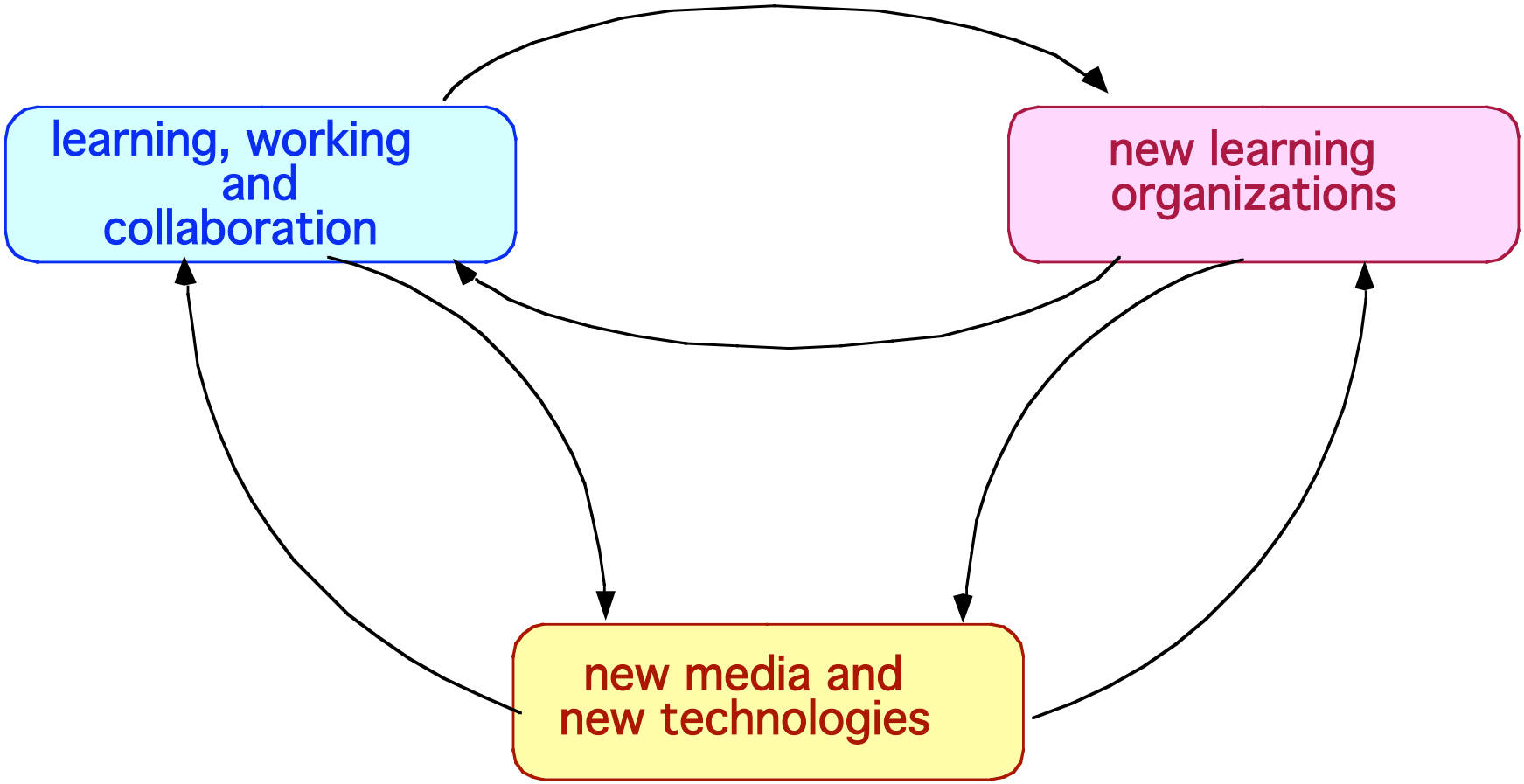
Techno-Determinism



A Richer Understanding of Learning and Education



Co-Evolution: Beyond "Technology-Driven Developments" and "Gift-Wrapping"



Examples of Socio-Technical Environments

♣ **brief description of three examples:**

- going **small**
- going **large**
- going **everywhere**

♣ **other developments at L3D / CU:**

- SmartTiles (paper by Elumeze and Eisenberg)
- QuiltSnaps (poster by: Buechley et al)

Going Small

Human-Centered Public Transportation Systems

- Mobility-for-All
- Memory Aiding Prompting Systems (MAPS)
- LifeLine — integrating the technical and human system
- explored in the context of:

	**"CLever:** Cognitive Levers — Helping People Help Themselves"

- supported by the Coleman Institute, August 2000 – July 2006
- http://l3d.cs.colorado.edu/clever/index.html

The Story Shown in the Multi-Media Presentation

- **specific**: a woman with cognitive disabilities (memory problems, no capacity for planning and remembering) and her mother

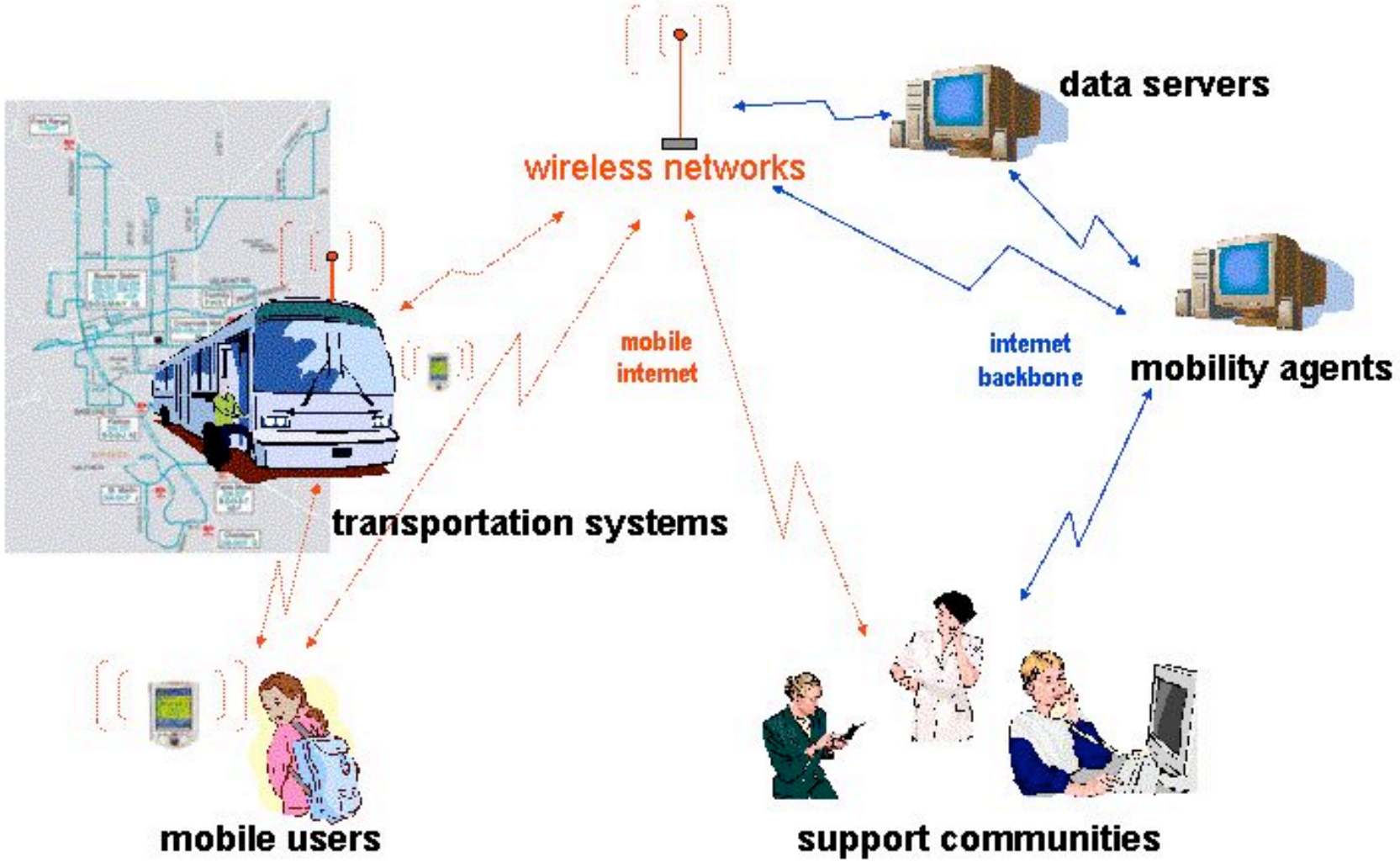
- **general**: the scenario shows socio-technical environments to help people with
  - cognitive disabilities and elderly people (e.g., with Alzheimer)
  - out-of-town visitors, foreigners, **everyone**

- innovative technologies to **simplify the use and increase the usefulness** of complex environments
  - personal device (PDAs, mobile phones)
  - global positioning systems (GPS)
  - web-based collaboration tools

Specific Projects

- **Web2gether: Online Community Environment** — supporting the members of a community (not only information management)
- **TEA: The Evaluation Assistant** — matching the needs of individuals to specific technologies
- **MAPS: Memory Aiding Prompting Systems** — creating new *scripts* by end-users who have no interest or technical knowledge
- **Mobility-for-All: Human Centered Public Transportation Systems** exploiting the power of wireless and mobile technologies
- **Lifeline: Remote Monitoring** — reuse of the technological infrastructure for a different purpose

Mobile architecture



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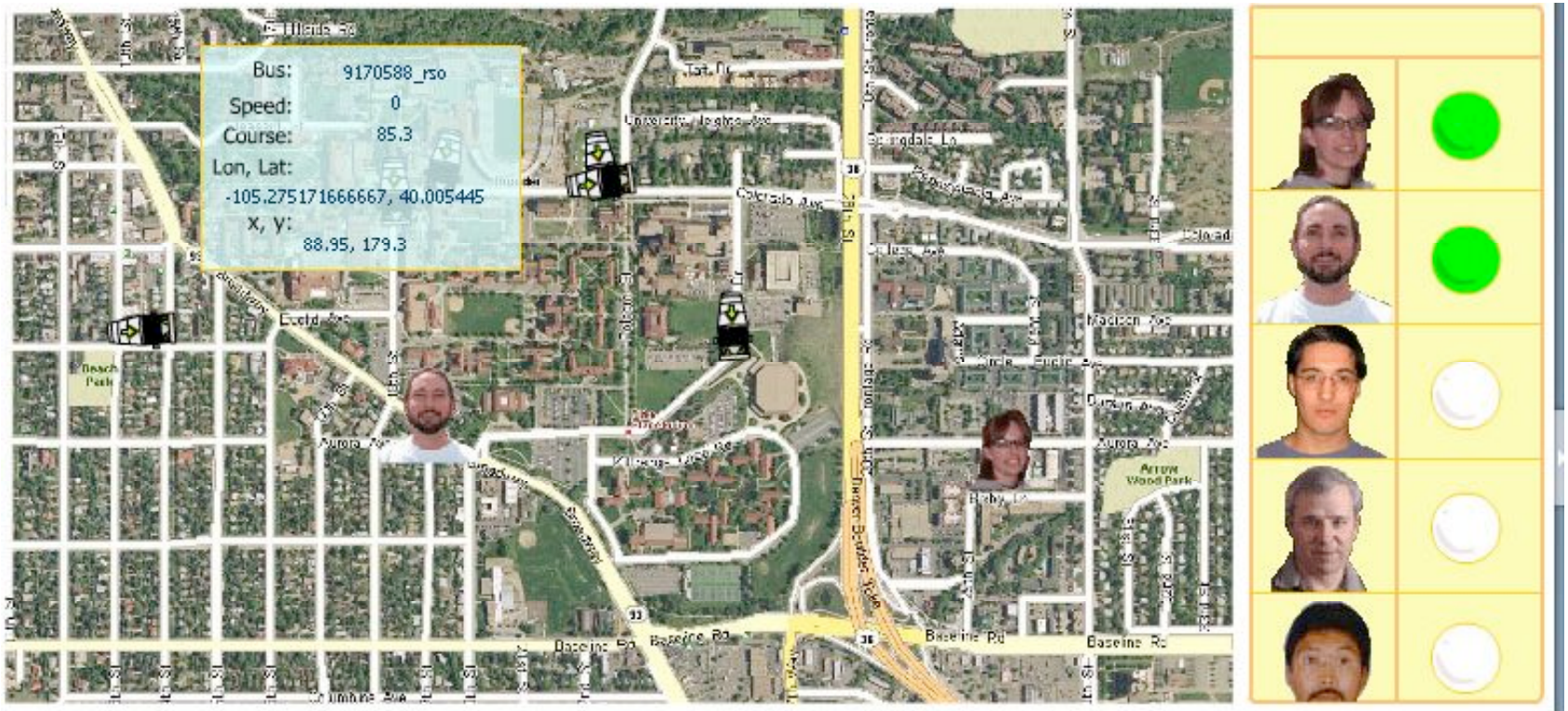
MAPS Script Editor

MAPS Handheld Prompter

LifeLine



bus	time	lon	lat	x	y	speed	course
9170588_rso	5:01:32 PM	-105.275171666	40.005445	88.95	179.3	0	85.3
9170588_rso	5:01:30 PM	-105.275171666	40.005445	88.95	179.3	0	85.3
9170588_rso	5:01:28 PM	-105.27517	40.005445	89	179.3	0	85.3
9170588_rso	5:01:26 PM	-105.27517	40.005445	89	179.3	0	85.3

Going Large

Envisionment and Discovery Collaboratory (EDC)

- **the EDC supports:**
  - collaborative design
  - integration of problem framing and problem solving
  - social creativity
  - meta-design

- **the EDC is based on:**
  - reflection-in-action
  - creating shared understanding in communities of interest

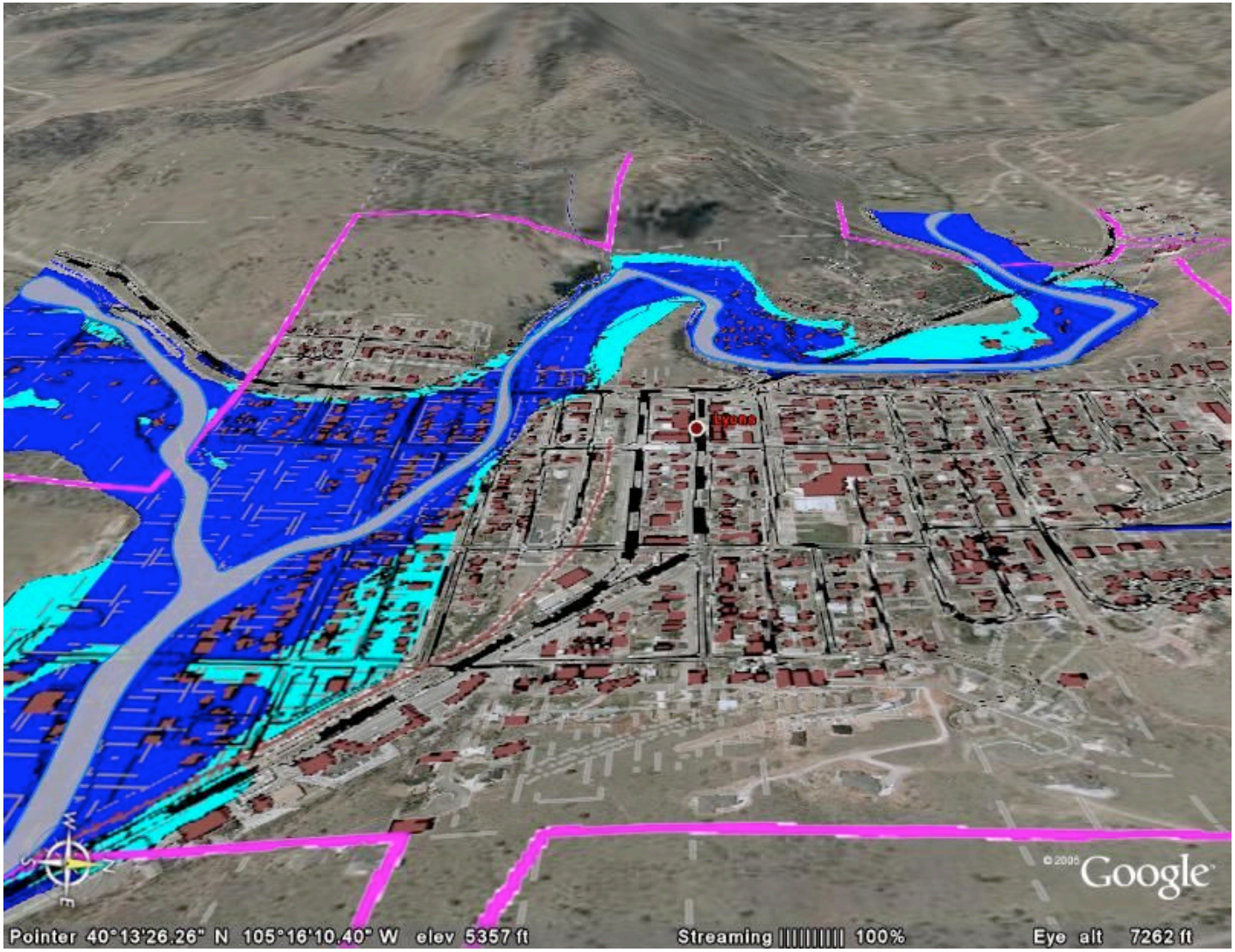
- **the EDC has been applied to:**
  - urban planning
  - emergency management

The Envisionment and Discovery Collaboratory (EDC)

Boulder City Council and University of Colorado Regents

Application Context — Emergency Management: Fires

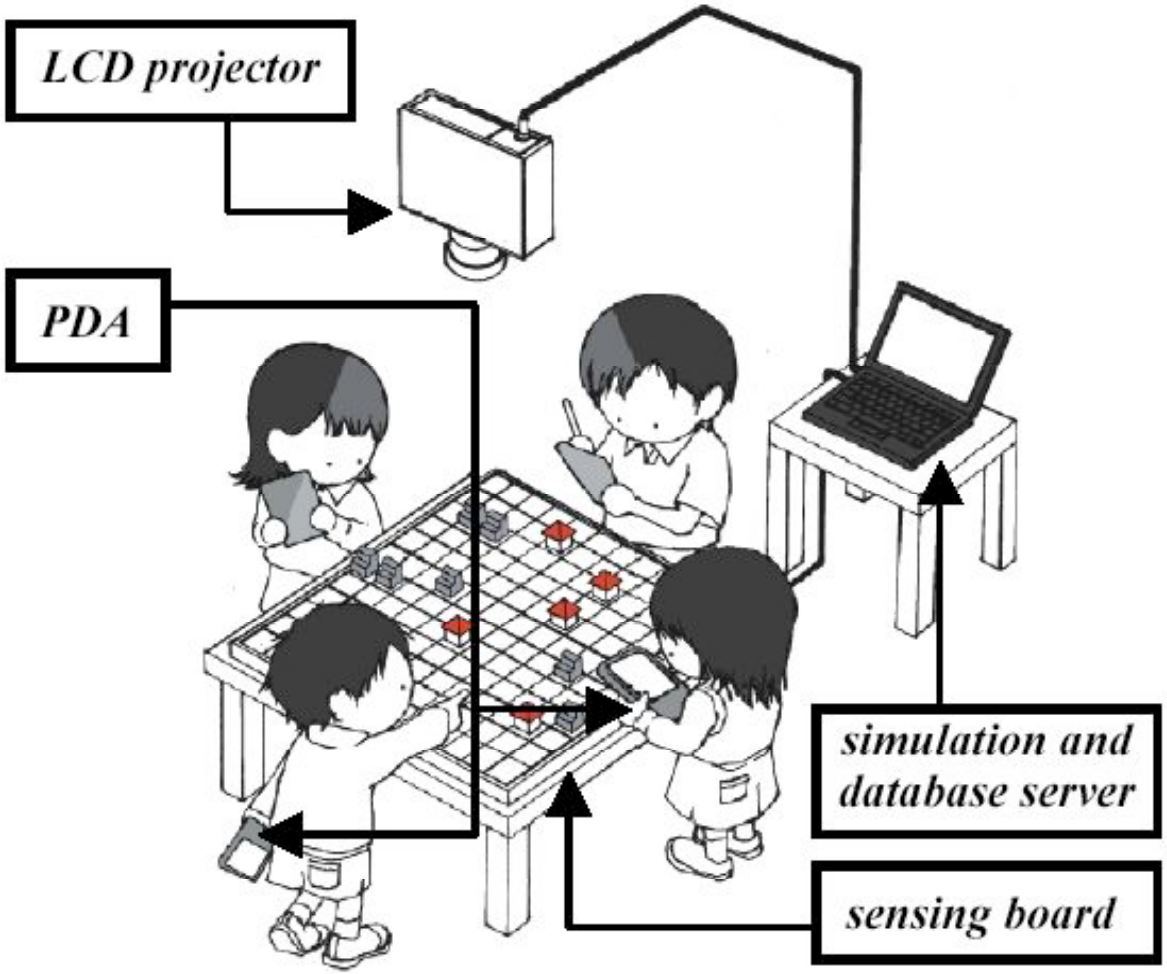
Application Context —Emergency Management: Flooding



Buildings Sketched into a Google-Earth Client

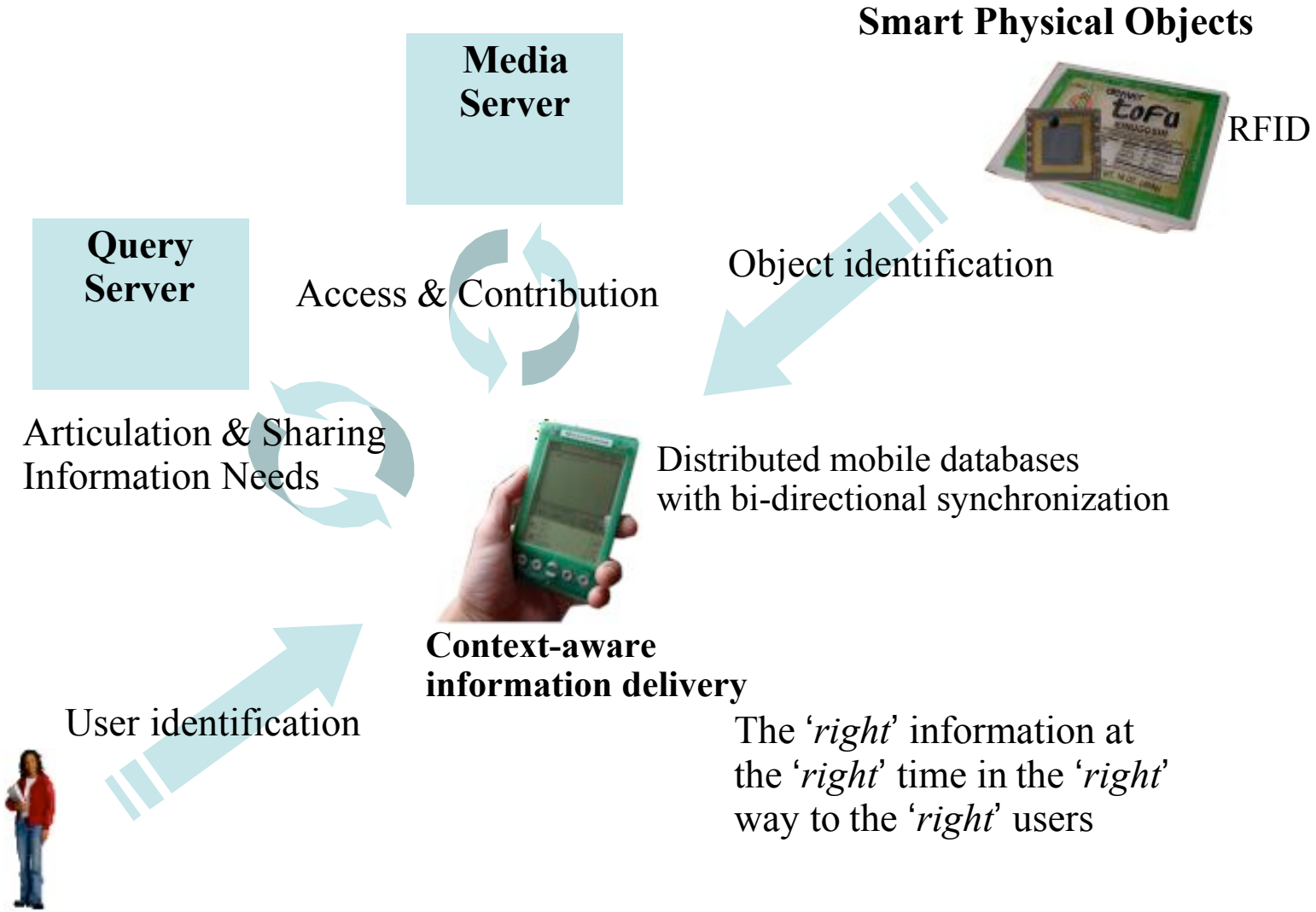
Integrating Individual and Social Creativity: Caretta

(Masanori Sugimoto, University of Tokyo)



Going Everywhere: Query Lens System

(Shin'ichi Konomi — focus on RFID technologies)



Looking 10 Years in the Future

♣ **1995** ⇓----------◊ **2005**

technical:

WWW becomes available

lots of contents, digital libraries, powerful search engines

social:

learning facts

Business, Education, Collaboration have fundamentally changed

♣ **2005** ⇓----------◊ **2015**

technical:

WMTE technologies become widely available

more bandwidth and coverage
more application software
smart objects
geo-referencing (“Google Earth”)

social:

access to information anywhere and anytime

G1:1
??????????????????????????

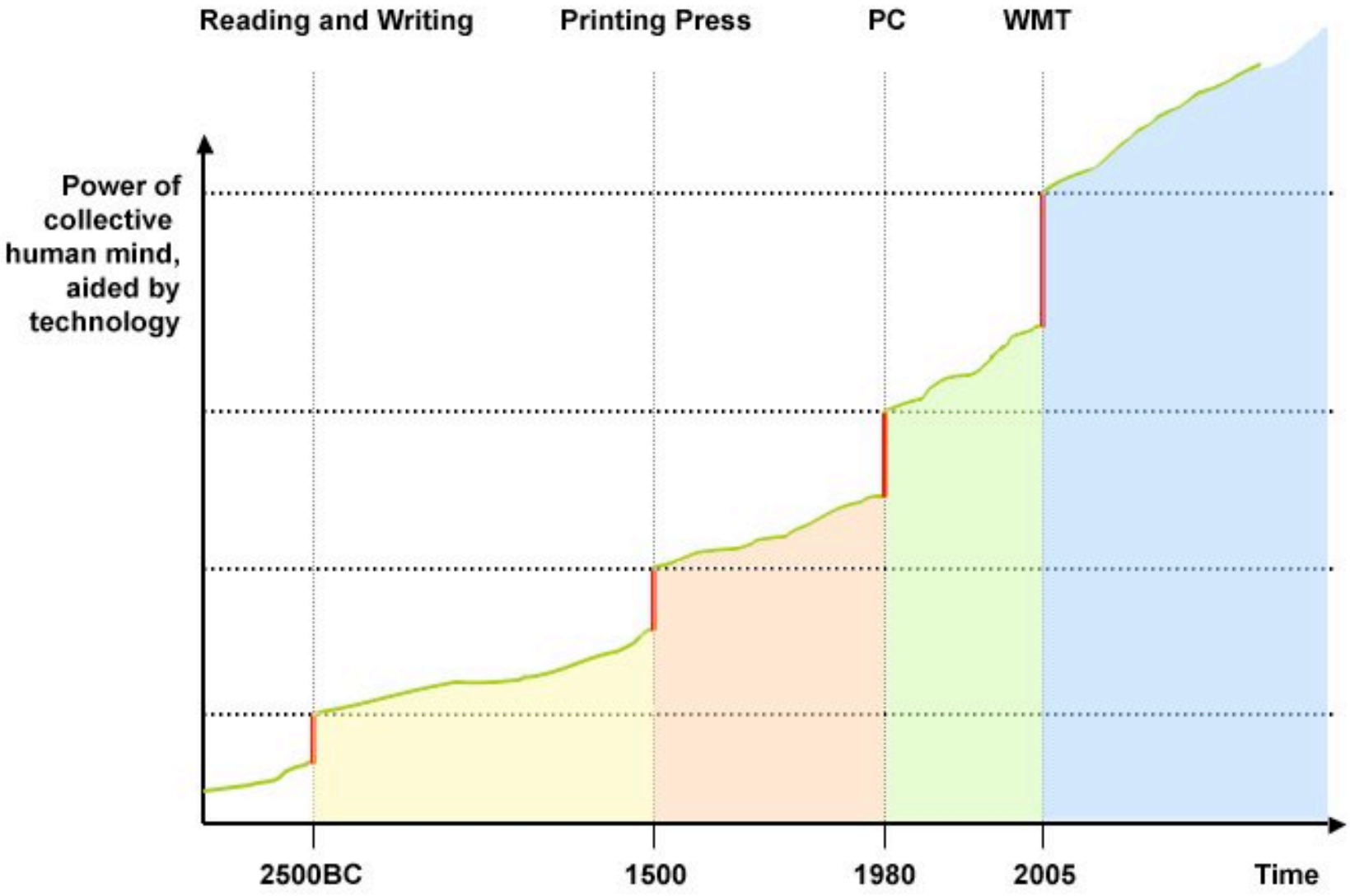
Questions and Challenges for WMTE

- ♣ what is the **magnitude of a change**? ◊ oral to literal society, printing press, digital media, World Wide Web (WWW), **WMT**

- ♣ will WMT be a **fundamental innovation** ◊ something that actually changes social practices: the way we live, work, and learn (beyond "gift-wrapping")

- ♣ **shift the discourse:** from a concern about who has access to new information technologies ◊ who will have the knowledge to design, create, invent, and use the technologies enhancing human lives

Beyond the Unaided, Individual Human Mind



Conclusions

♣ WMTE: **not simply a technology challenge**

♣ the biggest problem in the field of WMTE is an **imagination crisis** of exciting things to do and of understanding trade-offs such as:

- deskilling ⇓◊ empowering
- tools for learning ⇓◊ tools for living
- more information ⇓◊ more meaningful life

♣ the future is not out there to be "discovered" — it has to be **invented and designed not only**

- by info-enthusiasts, based on techno-determinism
- by limiting ourselves to gift-wrapping
- by the WMTE community

♣ looking ahead: **predicting the future**

"This is not the end. It is not even the beginning of the end. But it is, perhaps, the end of the beginning." —Winston Churchill