



Center for
**LifeLong
Learning
& Design**

University of Colorado at Boulder

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

Transformative Models of Learning and Discovery by Exploiting the Long Tail

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What is Cyber-Enabled Discovery and Innovation (CDI) all About

- to produce paradigm shifts
- ambitious, transformative, multidisciplinary research proposals
- our focus area: Building Virtual Organizations: enhancing discovery and innovation by bringing people and resources together across institutional, geographical and cultural boundaries
- development of far-reaching, high-risk science and engineering research and education agendas that capitalize on innovations in, and/or innovative use of, computational thinking
- CDI projects are expected to build upon productive intellectual partnerships involving investigators from academe, industry and/or other types of organizations, including international entities
- train future generations of scientists and engineers to enhance and use cyber resource
- facilitate creative, cyber-enabled boundary-crossing collaborations, including those with industry and international dimensions,

A competitive CDI proposal will

- Describe an ambitious research and/or education agenda that, through computational thinking, promises paradigm-shifting advances in more than one field of science or engineering

- Provide a compelling rationale for how innovations in, and/or innovative use of, **computational thinking** will yield the desired project outcomes
 - computational thinking = represents a universally applicable attitude and skill set everyone, not just computer scientists, would be eager to learn and use
 - Computational thinking is defined comprehensively to encompass computational concepts, methods, models, algorithms, and tools.
 - computational thinking promises a profound impact on the Nation's ability to generate and apply new knowledge.
 - In addition, the challenge of applying computational thinking to very difficult problems in science and engineering will stimulate further advances in computational thinking.

- Draw on productive intellectual partnerships that capitalize upon knowledge and expertise synergies in multiple fields or sub-fields of science or engineering, and/or in multiple types of organizations, including academic, for-profit, and not-for-profit entities, both foreign and domestic

our focus: Virtual Organization (VO)

- VOs built upon cyberinfrastructure to link teams of people and resources distributed across institutional and geographic boundaries are increasingly essential for science and engineering discovery, learning and innovation. Accordingly, CDI investigators are encouraged to come together in the
 - design,
 - development, and
 - assessmentof VOs
- integrating different disciplinary perspectives that together advance our ability to build and leverage the computational and organizational potential of VOs as new modalities of scientific and engineering practice
- VOs are not just about cyberinfrastructure; they are also about the people, i.e., researchers, teachers, and students, using them
- Unlike traditional “bricks and mortar” research institutions, VOs provide flexible boundaries, memberships, and lifecycles, which can be tailored to particular research problems, users and learner needs or tasks of any community

VOs – Continued

- Ubiquitous remote access to experimental tools, observational instruments, simulation systems, collaborations, and globally dispersed mentors can overcome traditional institutional boundaries, thus not only blending but expanding both informal and formal research and educational opportunities and experiences.
- New definitions of presence through innovative approaches to communication, interaction, and location are needed to create VOs that facilitate discovery and innovation.
- VOs can be adapted for specific and special needs to increase the participation and collaboration of many underrepresented communities in such networks, including communities with disabilities and communities with diverse linguistic abilities.
- VOs can provide education and training for novice- to expert-level participants, reaching beyond the classroom to reach the full diversity of the potential workforce and aid its development. In addition

VOs – Continued

- VOs can offer new institutional and conceptual opportunities for formal and informal learning.
- These new environments will change how teacher and learner roles are constructed, content is delivered, knowledge is produced and performance is assessed, and how the public is engaged in learning and discovery
- CDI proposals engage junior researchers and students in the collaboration, taking advantage of cyber environments to prepare a well-grounded and globally-engaged workforce.

OUR WORK

Transformative Models of Learning and Discovery by Exploiting the Long Tail

The theory of the Long Tail <Anderson 2006>

- our culture and economy is increasingly shifting away from a focus on a relatively small number of “hits” (mainstream products and markets) at the head of the demand curve and toward a huge number of niches in the tail.
- our economy and culture is shifting from mass markets to million of niches
- chronicles the effect of the technologies that have made it easier for consumers to find and buy niche products, thanks to the “infinite shelf-space effect”—the new distribution mechanisms, from digital downloading to peer-to-peer markets, that break through the bottlenecks of broadcast and traditional bricks and mortar retail.
- without the constraints of physical shelf space and other bottlenecks of distribution, narrowly-target goods and services can be as economically attractive as mainstream fare. [Anderson, 2006]

Overview of the integration between *Conceptual Frameworks* and *Application Contexts*

	Creativity Potential of the Long Tail	Knowledge Creation, Accumulation, and Sharing	Meta- Design	Enriched Ecology of Participants and Communities
AC-1: EDC				
AC-2: Warehouses				
AC-3: Open Source				
AC-4: Zones of Learnability				

Exploiting “Long Tail” Opportunities



The Long Tail

TOTAL INVENTORY

* inventory in a typical store



Exploiting the “Long-Tail” in Learning and Discovery

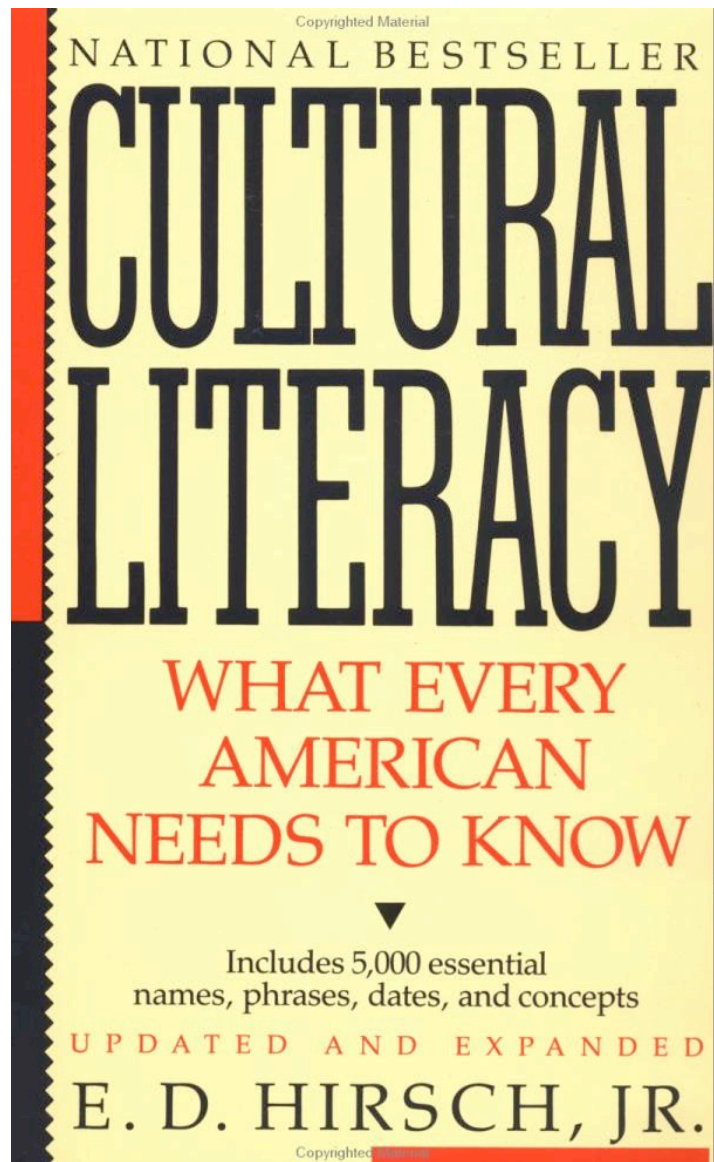
- a **new synergy and hybrid model**: integrate basic knowledge and skills (head of the long-tail) and idiosyncratic interests and passion (tail of the long-tail) → create richer learningscapes

- **basic knowledge and skills**: learning to learn, learning on demand, preparation for future learning, soft skills,

- **long-tail**:
 - interest and passion
 - self-directed learning and intrinsic motivation
 - personally meaningful problems
 - interesting example → movie: “October Sky”

- **extensive coverage** needed for supporting the infinite numbers of interesting topics — will be facilitated by a “meta-design” culture (Wikipedia)

The Other End: Cultural Literacy



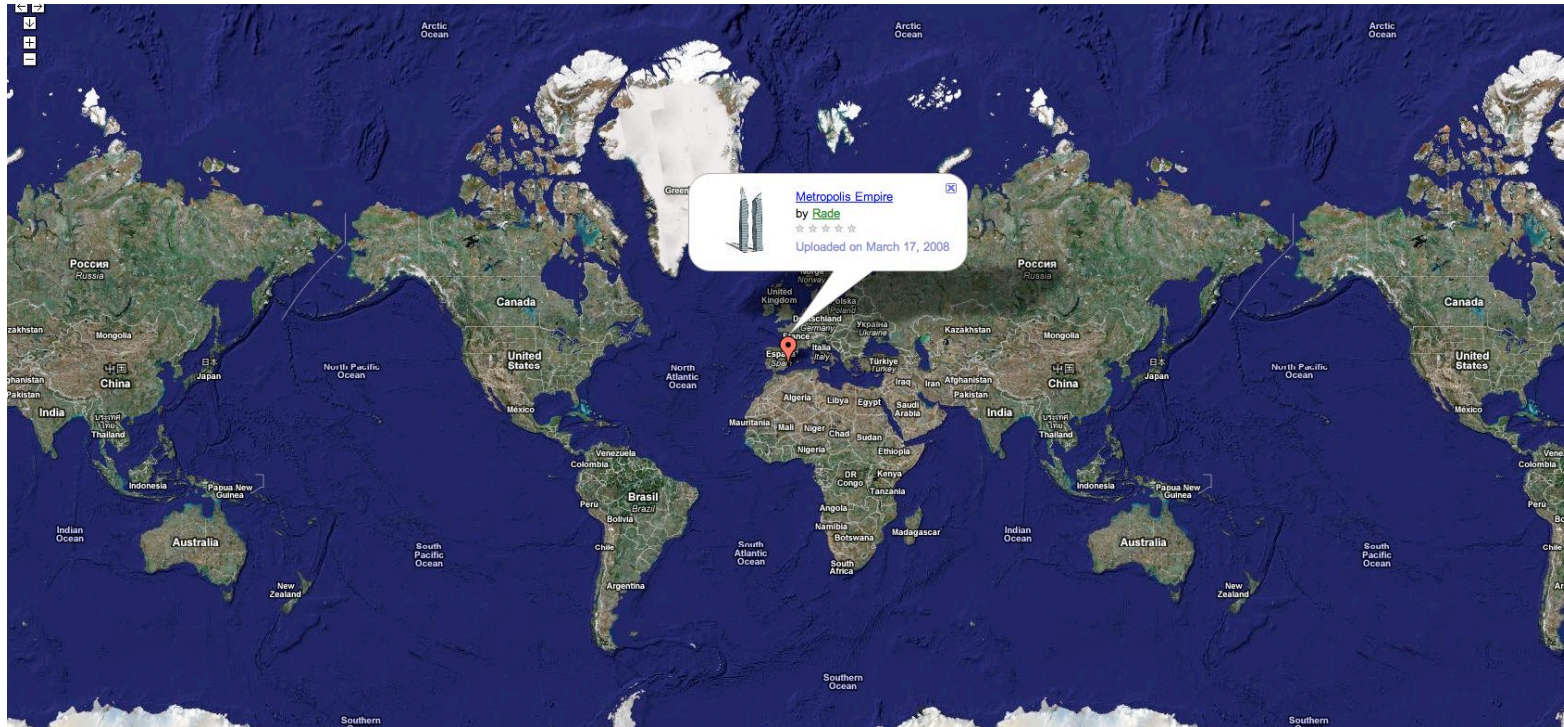
Some of our Basic “Beliefs”

- Internet / cyberinfrastructure is the Long Tail of idea spaces or cultural spaces
- most people are interested / feel passionate about something (which maybe be very idiosyncratic, locally sparse, but world-wide there maybe still some niche communities) → vignettes / examples:
 - astronomy, casino games, Viking Ships
 - urban planning, 3D models, open source
 - wines, jewelry, carpets
 - books, movies
 - Warren Miller’s ski movie ↔ my ski movie (both on YouTube)
- A3: people are re-forming into thousands of cultural tribes of interest, connected less by geographic proximity and workplace chatter than by shared interest → claim: “what we have lost in common culture, we’ve made up in our increased exposure to other people”

A reinterpretation and mapping of the “Long Tail” for Learning and Discovery

Web-Based Businesses	Learning and Discovery
unlimited shelf-space	unlimited knowledge
megahits	core curriculum
niche markets	passion for unique topics
hybrid model of distribution	hybrid model of learning and discovery
many interesting books, movies, songs will not enter the traditional market place	many interesting topics and ideas will not be taught at universities

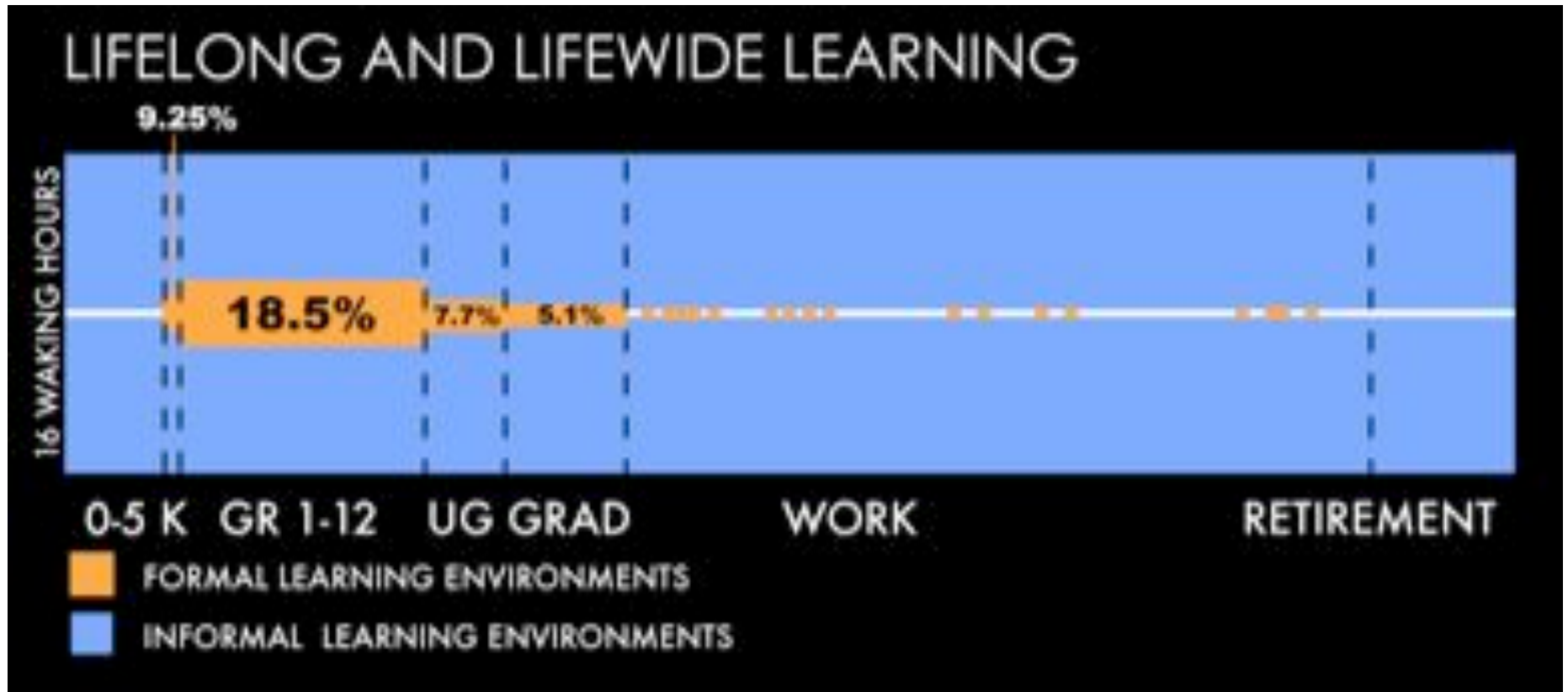
A Small Percentage of a Large Population Base is still a substantial community



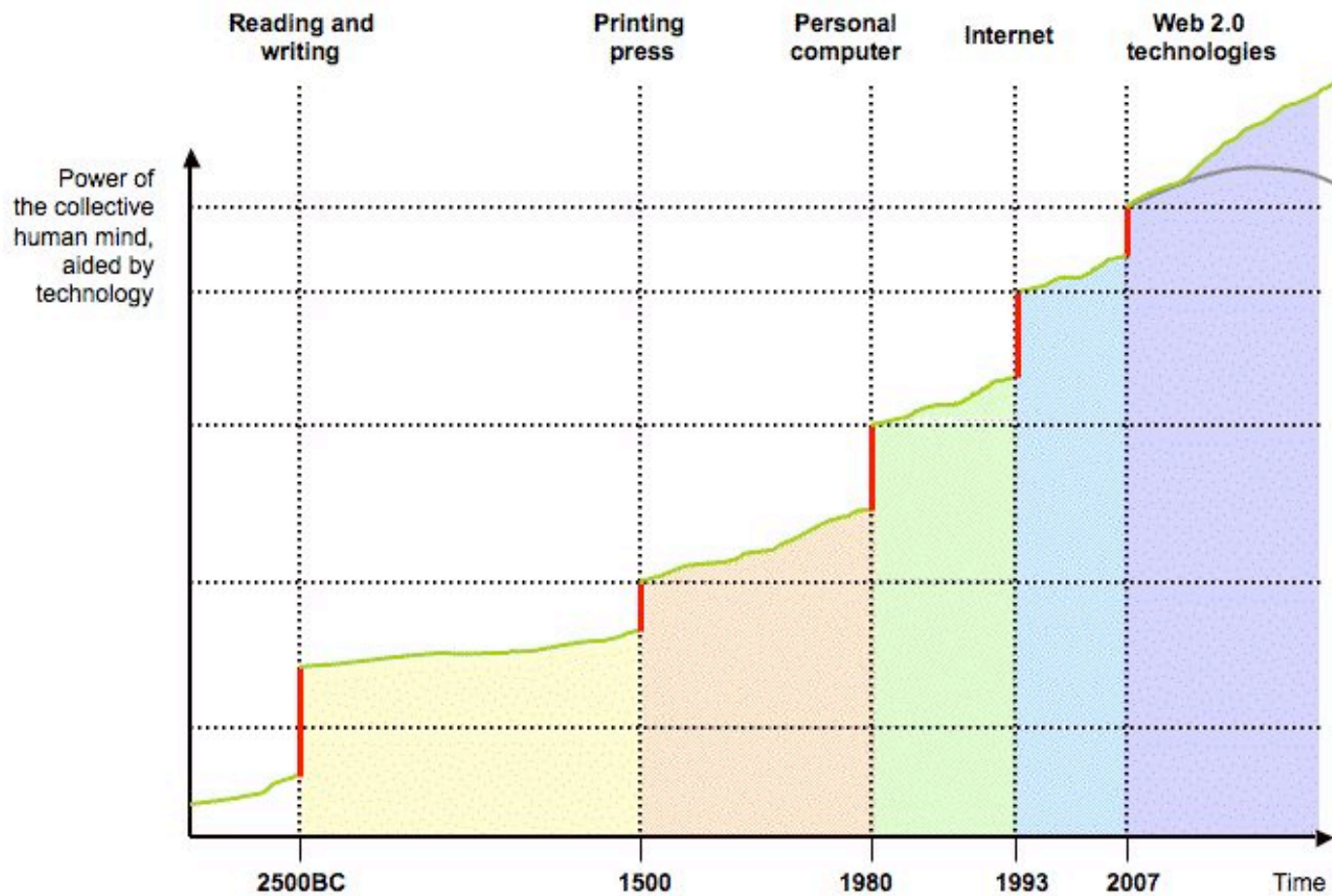
A Transformational Framework

- | | | |
|-------------------------------------|---|--|
| ▪ established frameworks | → | frameworks for the future |
| ▪ school learning | → | lifelong learning |
| ▪ unaided individual human mind | → | distributed intelligence |
| ▪ consumers | → | active contributors (meta-design) |
| ▪ learning when the answer is known | → | learning when no one knows the answer (social creativity) |
-

Lifelong Learning: Identifying and Exploring New Synergies between Formal and Informal Learning



Beyond the Unaided, Individual Human Mind



Research Challenge

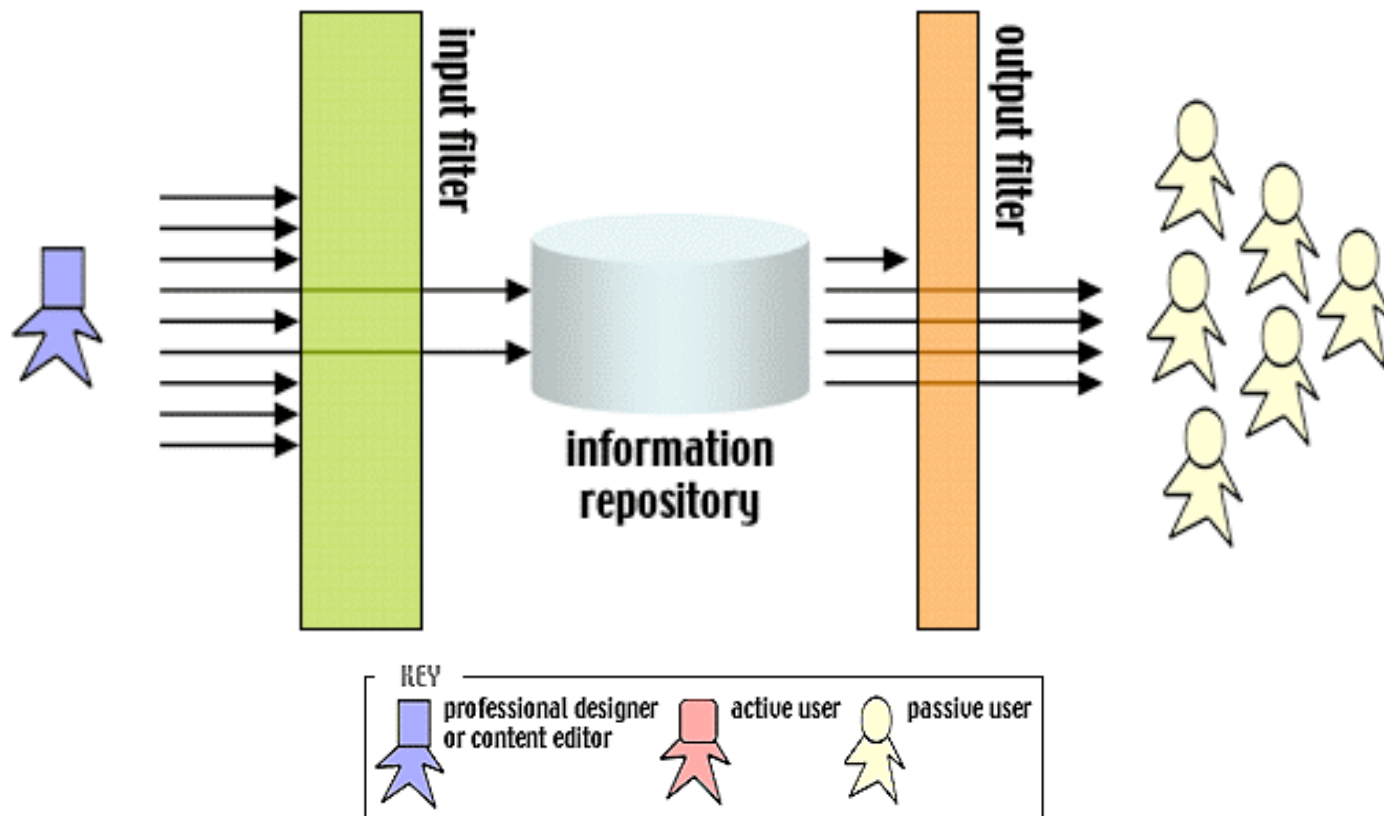
Understanding New Relations between Consumers and Producers

- Consumer Culture (“Access”) and Design Culture (“Participation”)

- Exploiting “Long Tail” Opportunities

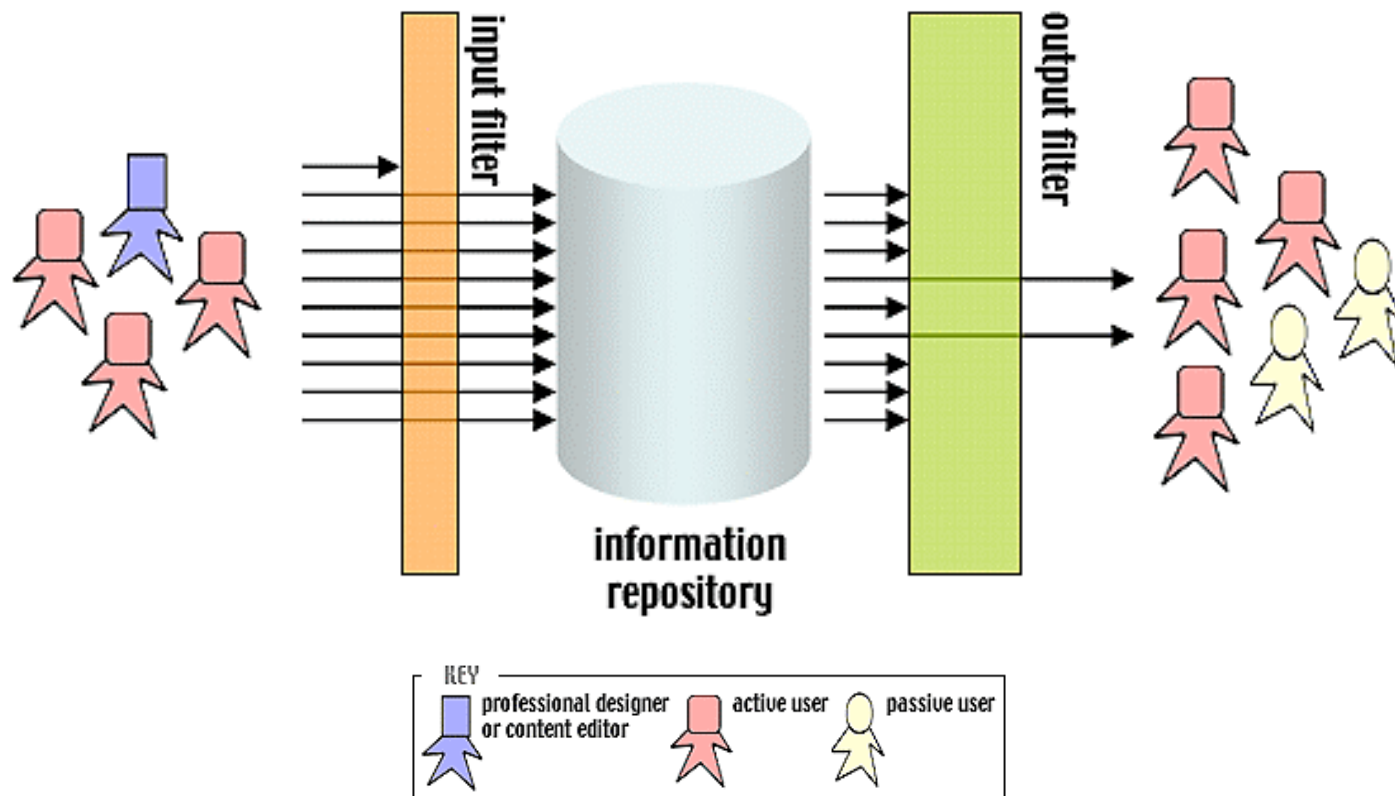
Producer/Consumer Models in a **Consumer Culture**

- Strong Input Filters, Small Information Repositories, Weak Output Filters
- Limitation: Making All Voices Heard



Producer/Consumer Models in a **Design Culture**

- Weak Input Filters, Large Information Repositories, Strong Output Filters
- Limitation: Trust and Reliability of Information



Meta-Design = Design for Designers

- **meta-design explores:**
 - a culture in which participants can **express themselves** and engage in personally meaningful activities

- **meta-design requires**
 - designers giving up some **control** at design time
 - **active contributors** (and not just passive consumers) at use time

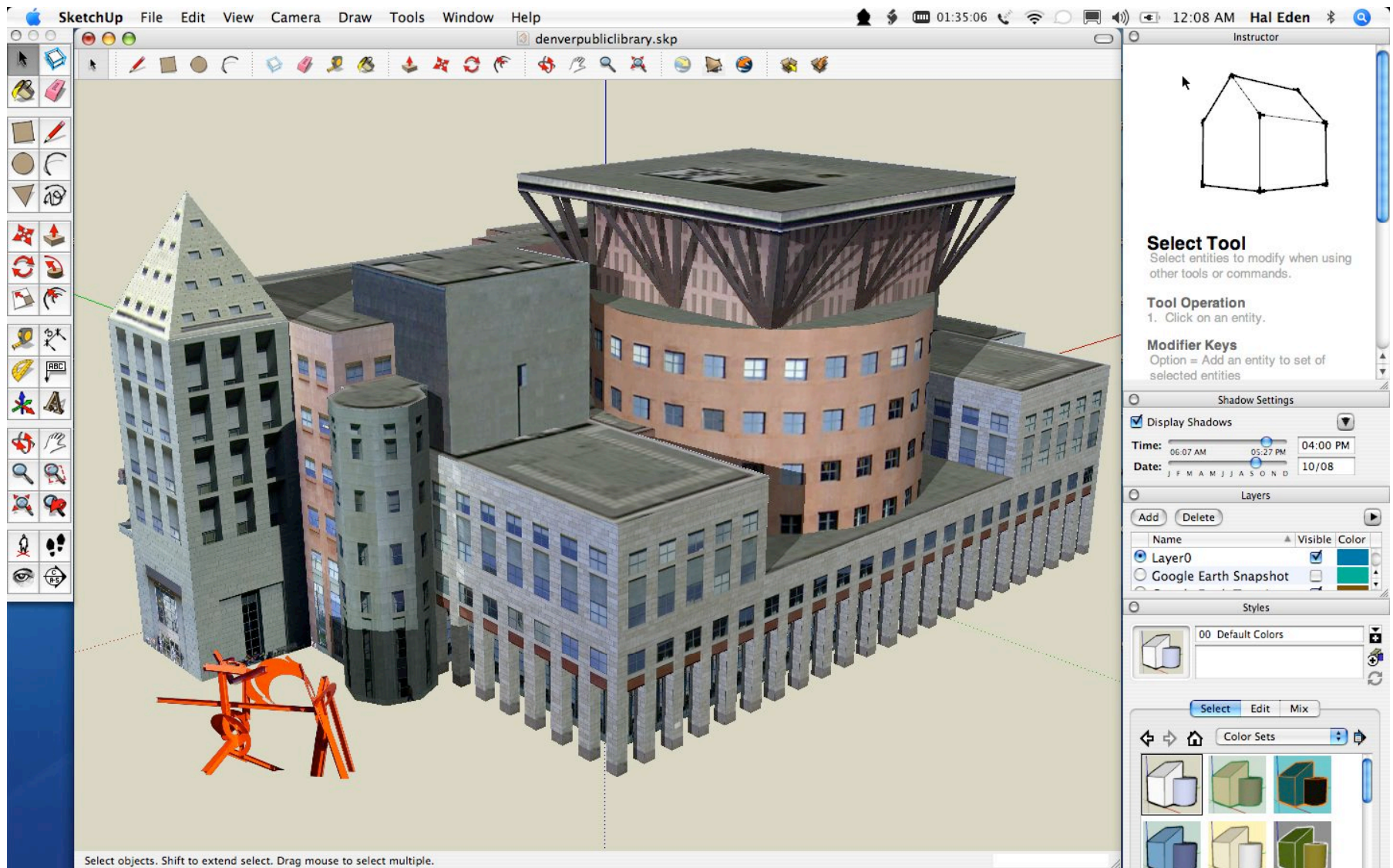
- **meta-design raises research problems of fundamental importance** including
 - new **design methodologies**
 - a new understanding of **collaboration, motivation, and creativity**

- **meta-design** provides a theoretical framework for **Web 2.0 technologies**

What Do Meta-Designers Do?

- they use their own creativity to create socio-technical environments in which **other people can be creative**
 - by creating **contexts** and **content creation** tools rather than content
 - by creating **technical** and **social** conditions for broad participation in design activities
 - by supporting '**hackability**' and '**remixability**'
- **meta-design examples:** Web 2.0 Technologies supporting user-generated content
 - Wikis (Wikipedia)
 - **Google-SketchUp + 3D Warehouse + Google Earth**
 - Second Life
 - Open Source

SketchUp – a high-functionality 3D Modeling Environment



3D Warehouse: a Web 2.0 Environment

<http://sketchup.google.com/3dwarehouse/>

▪ features:

- search, share, and store 3D models created in SketchUp
- models include: buildings, houses, bridges, sculptures, cars, people, pets, ...
- download the 3D models to be modified in SketchUp
- if the model has a location on earth → download it and view it in Google Earth
- share 3D models by uploading them from SketchUp

▪ challenges:

- what will **motivate** people to participate?
- participation requires acquiring skills in using SketchUp → create **learning environments** for SketchUp

3D Warehouse



[Tsim Sha Tsui Clock Tower](#)

by [Google](#)

★★★★☆ (1 rating)

Tsim Sha Tsui Clock Tower,...

[View in Google Earth](#)



[Figueroa at Wilshire](#)

by [Google](#)

Albert C. Martin and...

[View in Google Earth](#)



[1500 Walnut Street](#)

by [Google](#)

This building located at 1500...

[View in Google Earth](#)



[CPL Harold Washington Library Center](#)

by [Google](#)

★★★★★ (6 ratings)

This monumental building,...

[View in Google Earth](#)



[Marriott Marquis](#)

by [Google](#)

This Hotel in Atlanta rises...

[View in Google Earth](#)



[Hearst Residence \(Hearst Castle\)](#)

by [Google](#)

★★★★★ (2 ratings)

San Francisco architect Julia...

[View in Google Earth](#)



[Milwaukee Art Museum](#)

by [Google](#)

★★★★★ (6 ratings)

The history of the Milwaukee...

[View in Google Earth](#)



[CitySpire Center](#)

by [Google](#)

★★★★★ (2 ratings)

Designed by Murphy/Jahn, Inc....

[View in Google Earth](#)

CU Boulder in 3D



Downtown Denver in 3D



Motivational Aspects and Meta-Design

- **what will make humans want to become designers/active contributors over time?**
 - serious working and learning does not have to be unpleasant but can be personally meaningful, empowering, engaging, and fun

- **what will make humans want to share? → requires:**
 - cultural change
 - gift cultures
 - social capital
 - reputation economy

Utility = Value / Effort

- **increase in value:** motivation and rewards for being a designer
 - feeling in control
 - being able to solve or contribute to the solution of a problem
 - mastering a tool in greater depth
 - making an ego-satisfying contribution to a group
 - enjoying the feeling of good citizenship to a community (“social capital”)
- **decrease in effort:**
 - creating support for learning to become an active contributor (= learning SketchUp)
 - extending meta-design to design for design communities
 - exploit automatically collected information sources (e.g.: collaborative filtering = “customers who bought this book also bought”)

Boulder City Council and University of Colorado Regents



Assessment

- **explore / pay attention to the negative impacts associated with our approach**
 - we create a modern “tower of Babel”
 - people do not learn “basic skills”

- **Massification / Demassification**
 - head → identification of “basic skills / core concepts / cultural literacy”: serve as a common cultures in which narrowly specialized knowledge communities can develop
 - the Long Tail is nothing more than infinite choice → infinite choice equals ultimate fragmentation
 - “the same Long Tail forces and technologies that are leading to an explosion of variety and abundant choice in the content we consume are also tending to lead us into tribal eddies” → from mass culture to large numbers of microcultures which coexist and interact in a baffling array of ways
 - “is a fragmented culture a better or worse culture? Many believe that mass culture serves as a sort of social glue, keeping society together. But if we’re now all doing our own thing, is there still a common culture”?

Assessment — Walter Kintsch: The Long-Tail is not the same in business and education (education or (lifelong) learning?)

Business: what produces the LT distribution? We can think of it as a probability distribution generated by a Poisson-like sampling process, with certain biases based on the genetic and cultural dispositions of the buying public. Independent sampling generates the LT distribution. The main point is that the success or failure of an item in the tail does not depend on which items are in the head. Except for the vagaries of random sampling and the biases inherent in the sampling process, the item in the tail could have become an item in the head.

- **Education:** The LT distribution is not generated by random sampling, but there are dependencies among the items. Certain items must be in the head before others can get into the tail. Thus, some items in the tail of the distribution cannot be sampled unless the head contains the ability to read or to do basic math, for example. Items in the head and in the tail do not come from the same population, statistically speaking.
- The process that generates the LT distribution in the two cases is quite different, it is the same distribution, but what is in the business case the result of a independent sampling process involves complex interdependencies in the case of education.
- Therefore, supporting tail activities requires attention to what is in the head, and what should be in the head (now “in the head” has not just a metaphorical but a very literal meaning). It’s our old problem, and I see no principled solution to it.