



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**

Transdisciplinary Graduate Education

**Gerhard Fischer and Hal Eden
Fall Semester 2007**

**Course information environment (SWIKI):
<http://swiki.cs.colorado.edu:3232/phd-intro-2007/>**

November 14, 2007

Lifelong Learning and Graduate Education

- **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 graduate education needs to prepare students for having meaningful and productive lives in such a world

- **graduate education should**

- help learners enhance their ability to learn, engage in meaningful activities, and exploit the power of media
- promote new civic discourses, since a major role for new technologies is not to deliver predigested information but to provide for social debate and discussion
- advance knowledge and mindsets about communities of diverse learners
- focus on transdisciplinarity

Transformations in Graduate Education

- **information technology** revolution
- **globalization** (e.g.: Friedman, T. L. (2005) *The World is Flat: A brief history of the twenty-first century*, Farrar, Straus and Giroux, New York.)
- increasing trends to **outsource and offshore high-level cognitive tasks** → see class meeting about “Employment in a Globalized World — A Report of the ACM Job Migration Task Force”
- **participate** effectively in diverse collaborative organizations addressing complex world problems
- **collaboration** with experts from multiple fields and interact and work with people of diverse backgrounds

Transdisciplinary

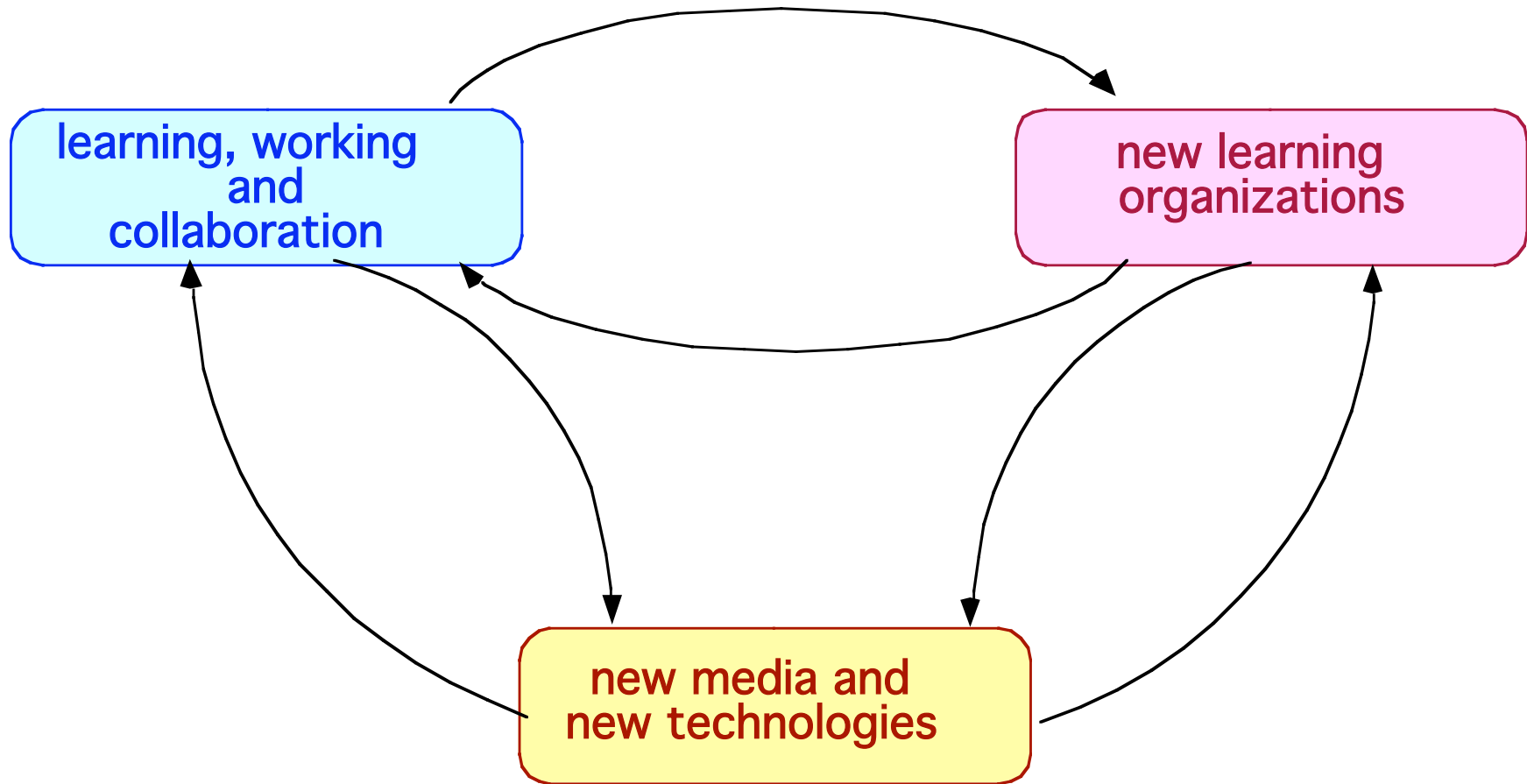
- mono, multi, and interdisciplinary approaches each generate new knowledge
- multi- and interdisciplinary approaches overflow the boundaries between distinct disciplines
- transdisciplinary takes us beyond disciplines by weaving a new kind of knowledge — engaging in transdisciplinary collaboration → not only the intersection of two existing fields is explored, but the participating fields themselves undergo changes
- transdisciplinary competencies refer to knowledge and skills required to identify, frame and address important scientific and practical problems that cut across disciplinary boundaries

New Media and Socio-Technical Design

- working, learning, collaborating, designing never was and never will be independent of media
- rethink the power of new media as a co-evolutionary process: beyond “**gift-wrapping**” and “**technology-driven developments**”

Co-Evolution

Beyond “Technology-Driven Developments” and “Gift-Wrapping”



From Reflective Practitioners to Reflective Communities

- supporting reflective practitioners is important, but it is **not enough** because complex design problems require more knowledge than any single person possesses and the knowledge relevant to a problem is distributed

- evidence that individual, disciplinary competence is limited:
 - “even within disciplines, disciplinary competence is not achieved in individual minds, but as a collective achievement made possible by the overlap of narrow specialties” [Campbell, 1969] ;
 - “while the Western belief in individualism romanticizes this perception of the solitary creative process, the reality is that scientific and artistic forms emerge from the joint thinking, passionate conversations, emotional connections, and shared struggles common in meaningful relationships” [John-Steiner, 2000];
 - “nobody knows who the last Renaissance man really was, but sometime after Leonardo da Vinci it became impossible to learn enough about all the arts and the sciences to be an expert in more than a small fraction of them” [Csikszentmihalyi, 1996];
 - “none of us is as smart as all of us” [Bennis & Biederman, 1997];
 - “Linux was the first project to make a conscious and successful effort to use the entire world as a talent pool” [Raymond & Young, 2001].









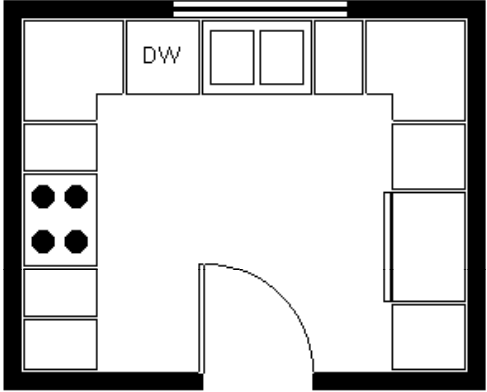
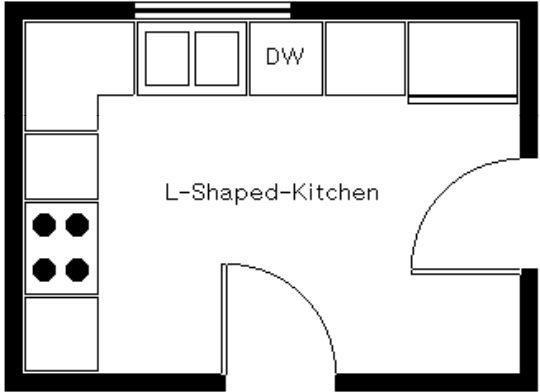

Communities of Practice and Communities of Interest

- ***Communities of Practice (CoPs)*** = groups of people who share a professional practice and a professional interest
- ***Communities of Interest (Cols)*** = groups of people (typically coming from different disciplines) who share a common interest, such as framing and solving problems and designs artifacts

CoPs: Homogenous Design Communities

- **characterization:** reflective practitioners who work as a community in a certain domain
- **examples:** kitchen designers, STEM teachers, architects, urban planners, software developers, software users,
- **learning:**
 - masters and apprentices
 - **legitimate peripheral participation (LPP)** → one accepted, well-established center and a clear path of learning towards this center
- **problems:** avoiding **group-think** (when people work together too closely in communities, they sometimes suffer illusions of righteousness and invincibility)
- **systems:** **domain-oriented design environments**

A Domain-Oriented Design Environment for Kitchen Design: Construction

<i>Janus-Construction</i>	Clear Work Area Load Catalog	Critique All Save In Catalog	Edit Global Descriptions Select Context
<p>Appliance Palette</p> <p>walls</p>  <p>doors</p>  <p>windows</p>  <p>sinks</p>   <p>stoves</p>   	<p>Work Area</p> 		
<p>Catalog</p> 	<p>Messages</p> <ul style="list-style-type: none"> • The length of the work triangle (Double-Bowl-Sink-1, Four-Element-Stove-1, Single-Door-Refrigerator-1) is greater than 23 feet.  • Single-Door-Refrigerator-1 is not near Four-Element-Stove-1. 		
	<p>Commands</p> <ul style="list-style-type: none"> ▶ Critique All ▶ ■ 		

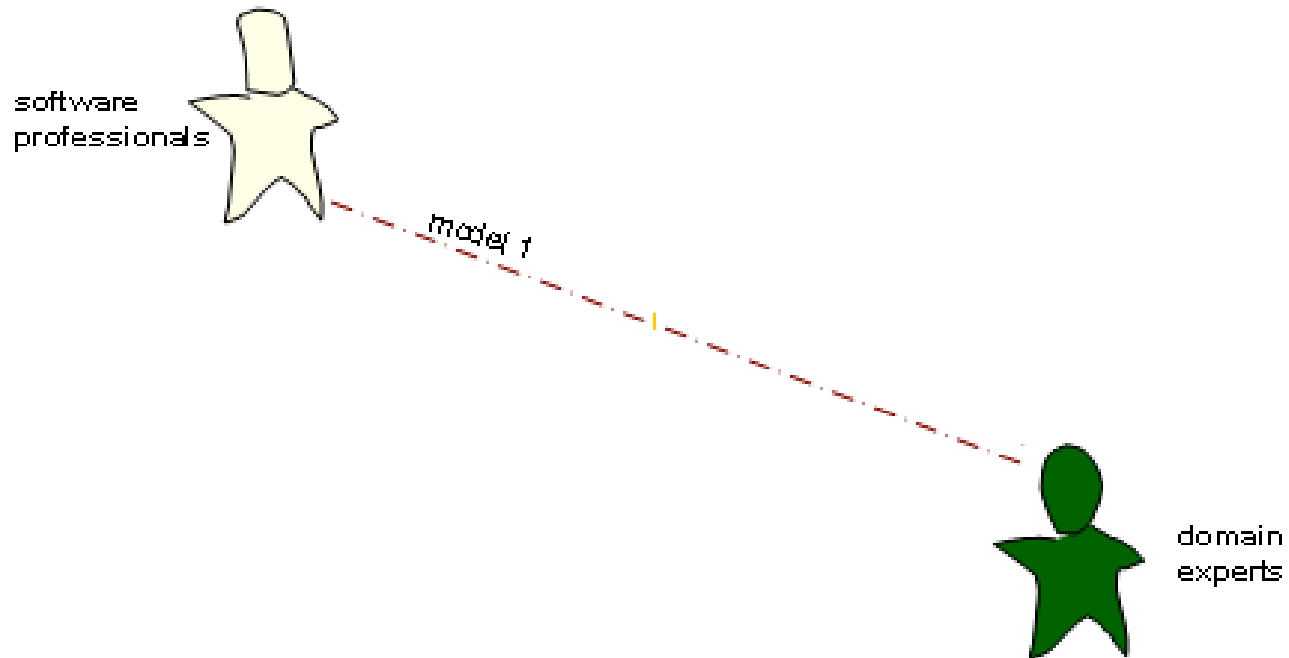
Cols: Heterogeneous Design Communities

- **characterization** = bring different CoPs together based on a shared interest in the framing and resolution of a major design problem
- **examples:** large scale software developments projects, transportation planning, digital fluency, reinventing universities as learning organizations, improving the life of people with disabilities
- **learning:**
 - exploiting the symmetry of ignorance
 - building bridges between diverse cultures
 - transdisciplinary education
- **problems and challenges:** establishing common ground, creating boundary objects, mutual appreciation
- **systems:** **Envisionment and Discovery Collaboratory**

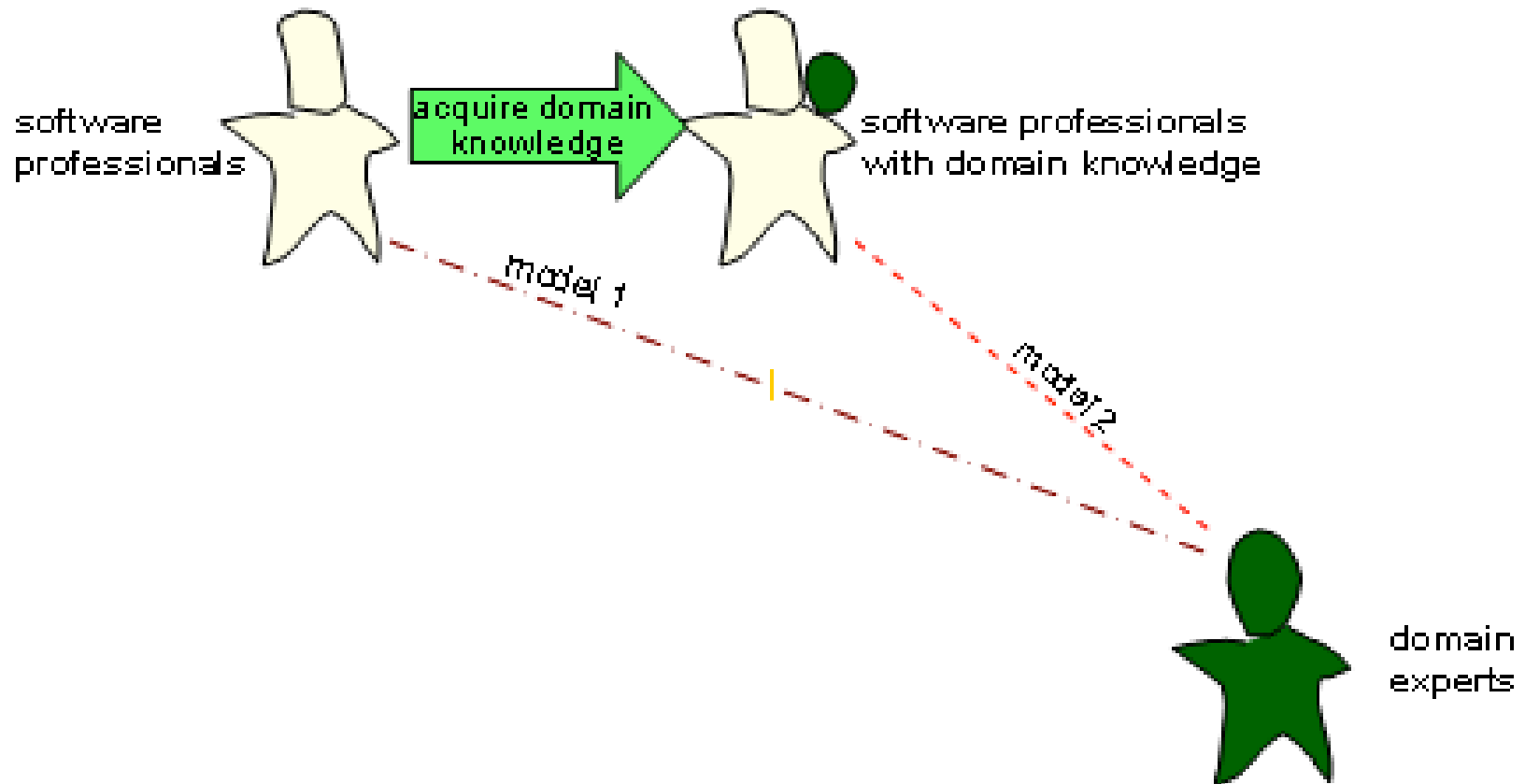
The Envisionment and Discovery Collaboratory



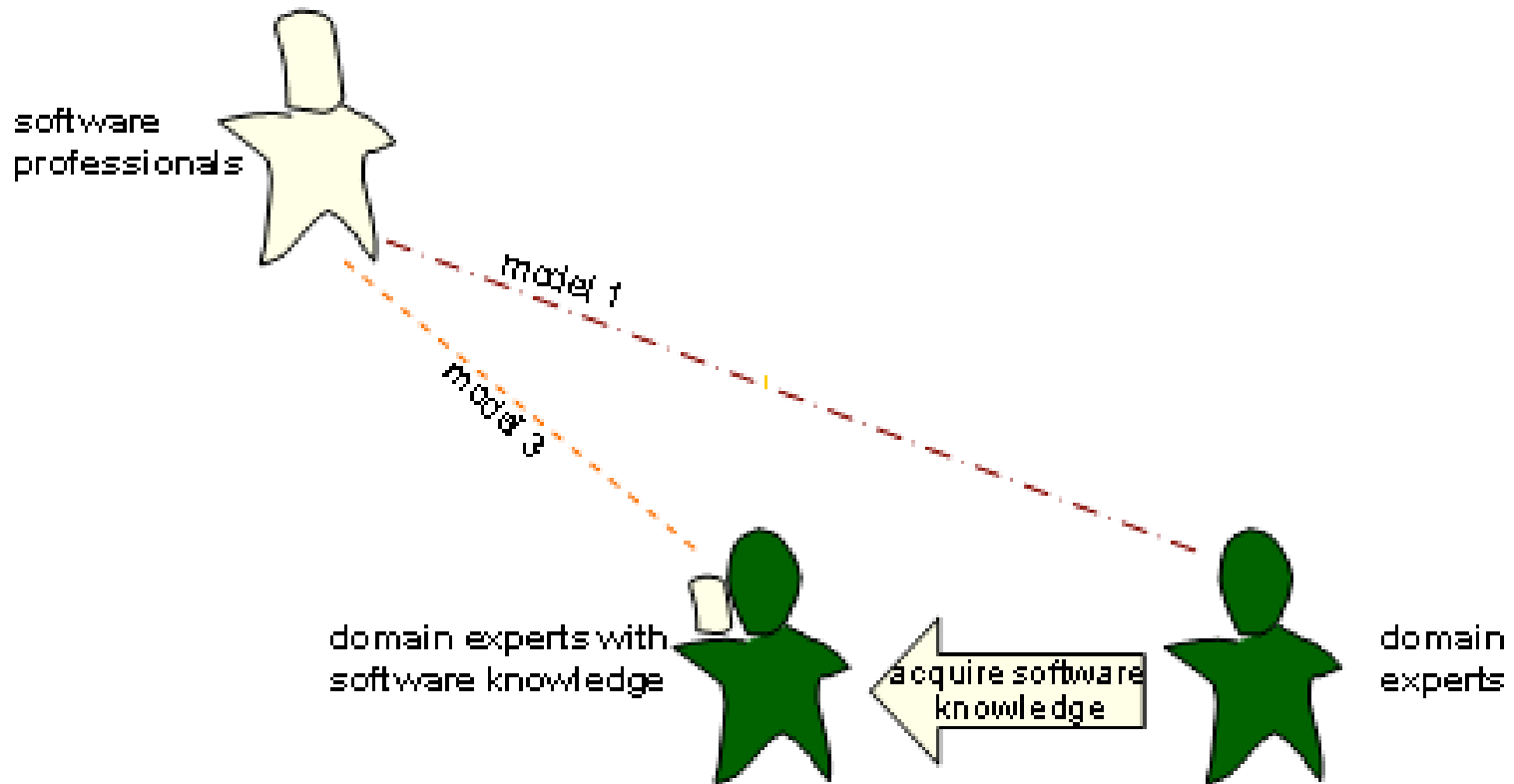
Large Conceptual Distance – Limited Common Ground



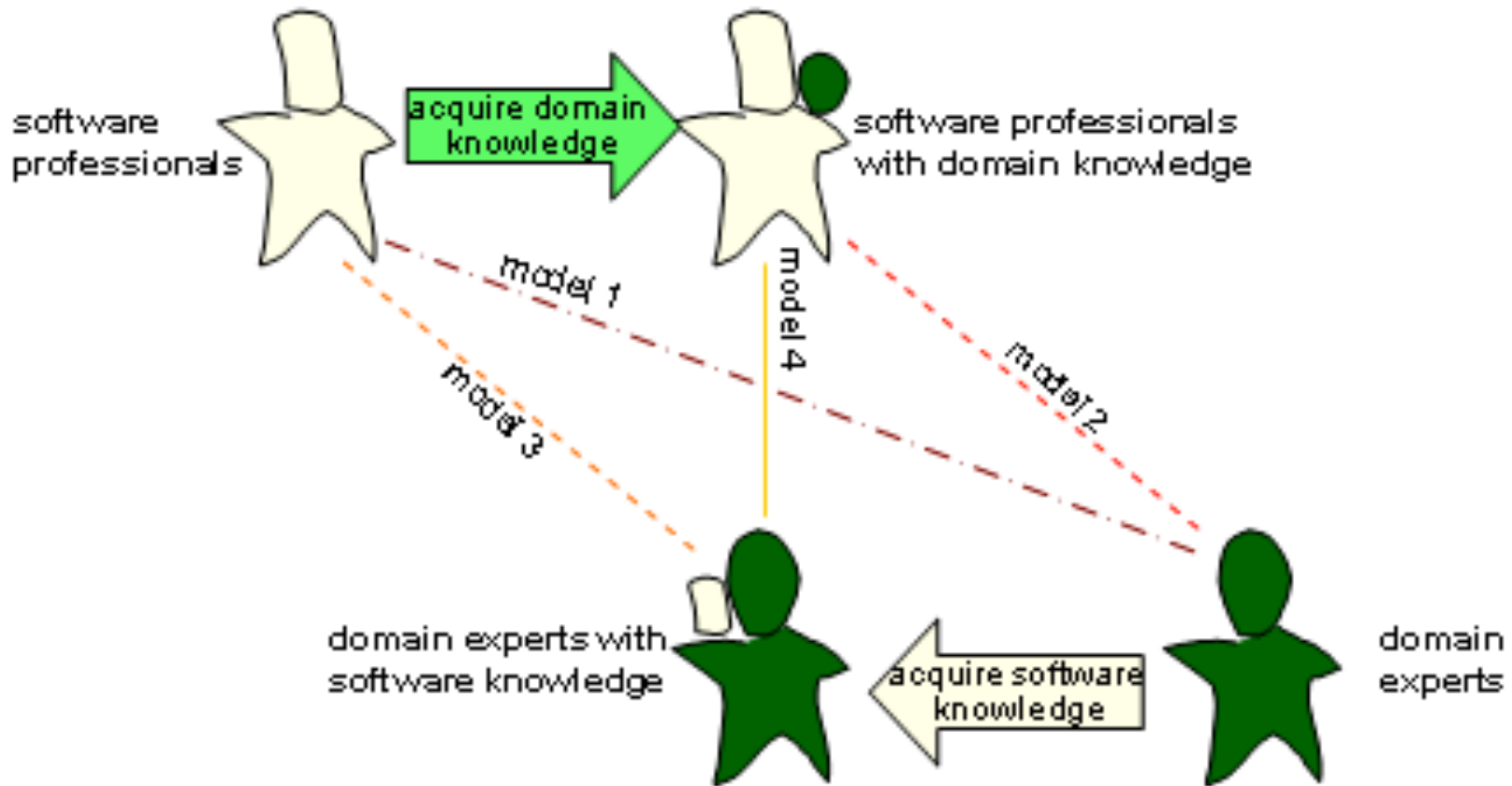
Software Professionals Acquiring Domain Knowledge



Domain Experts Acquiring Media Knowledge

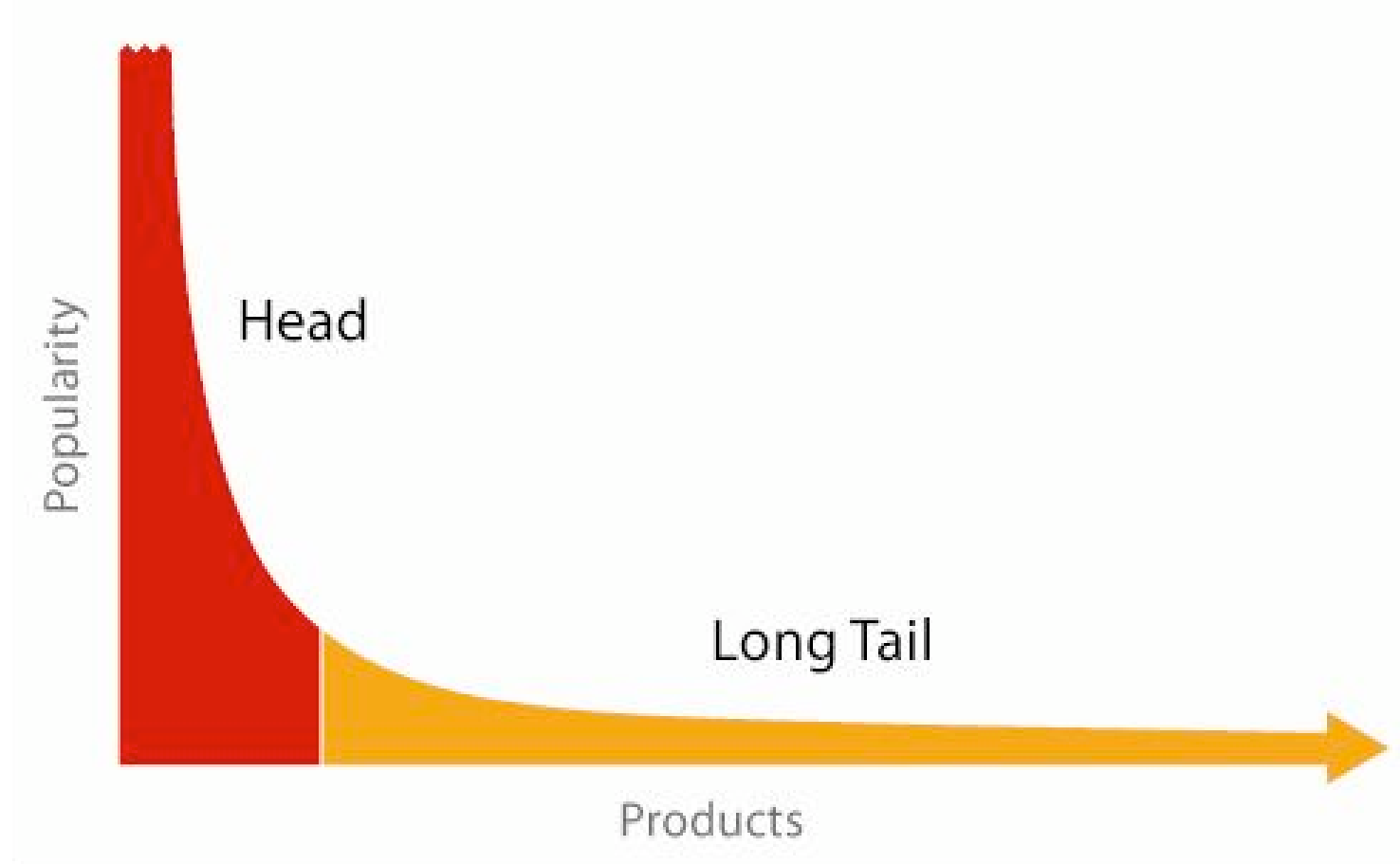


Reflective Communities and Transdisciplinary Graduate Education



Exploiting “Long Tail” Opportunities

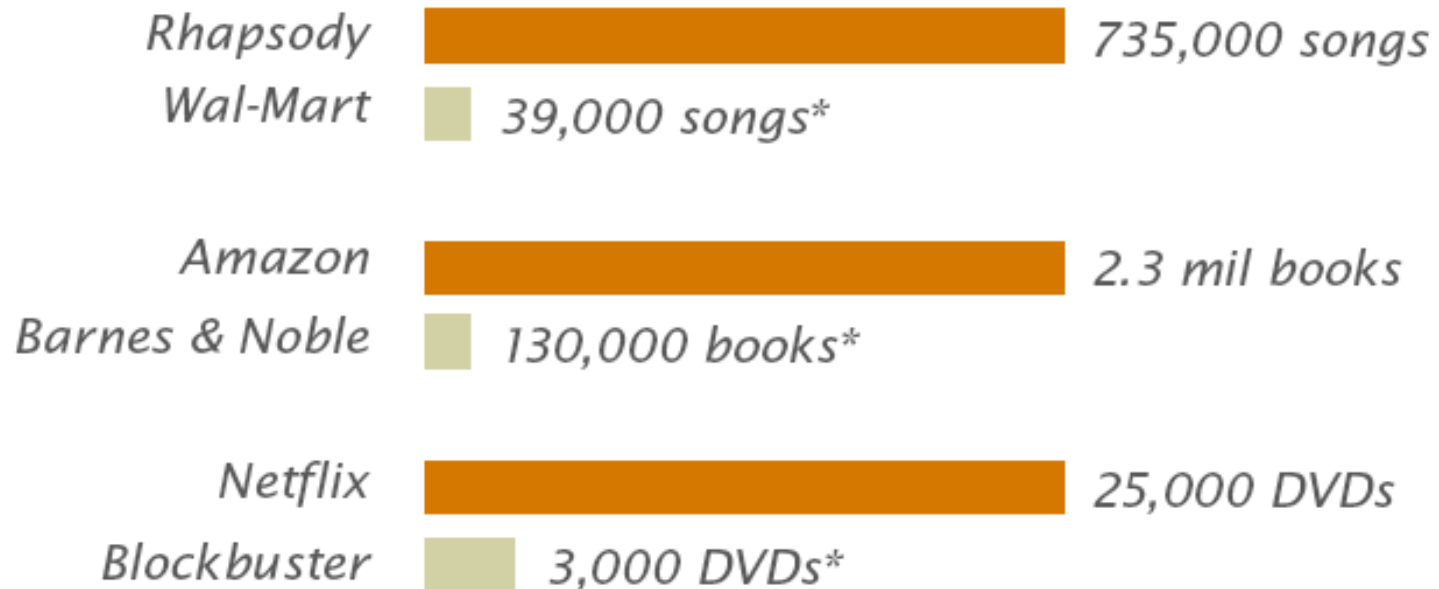
The New Marketplace



The Long Tail

TOTAL INVENTORY

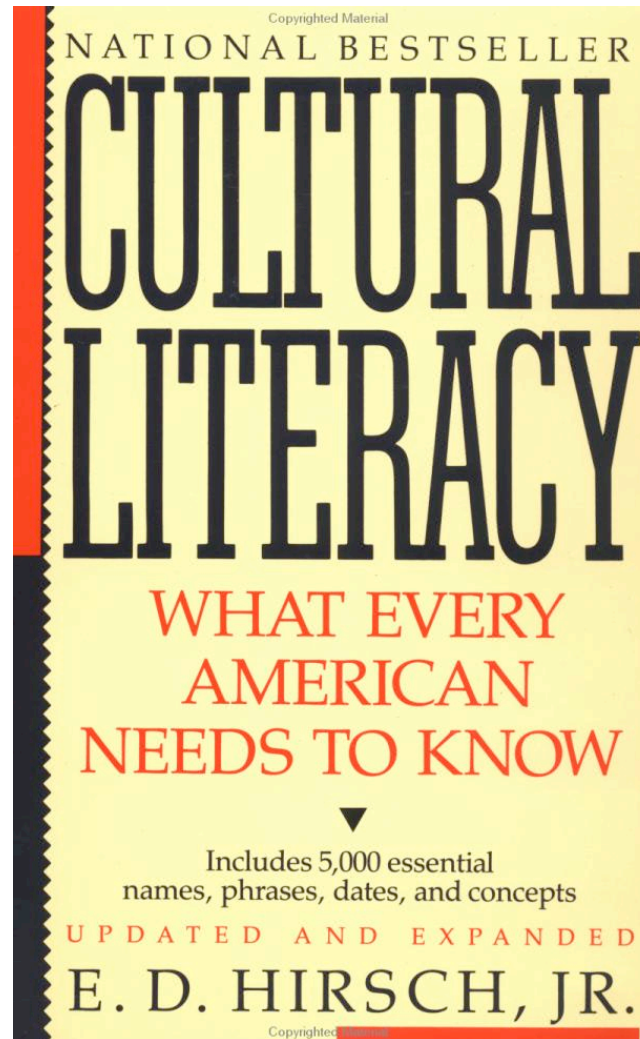
* inventory in a typical store



An Educational Interpretation of the “Long-Tail” Phenomena

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

The Other End: Cultural Literacy



It is not a Zero-Sum Game — A new Synergy: Integrating Basic Knowledge + Long-Tail

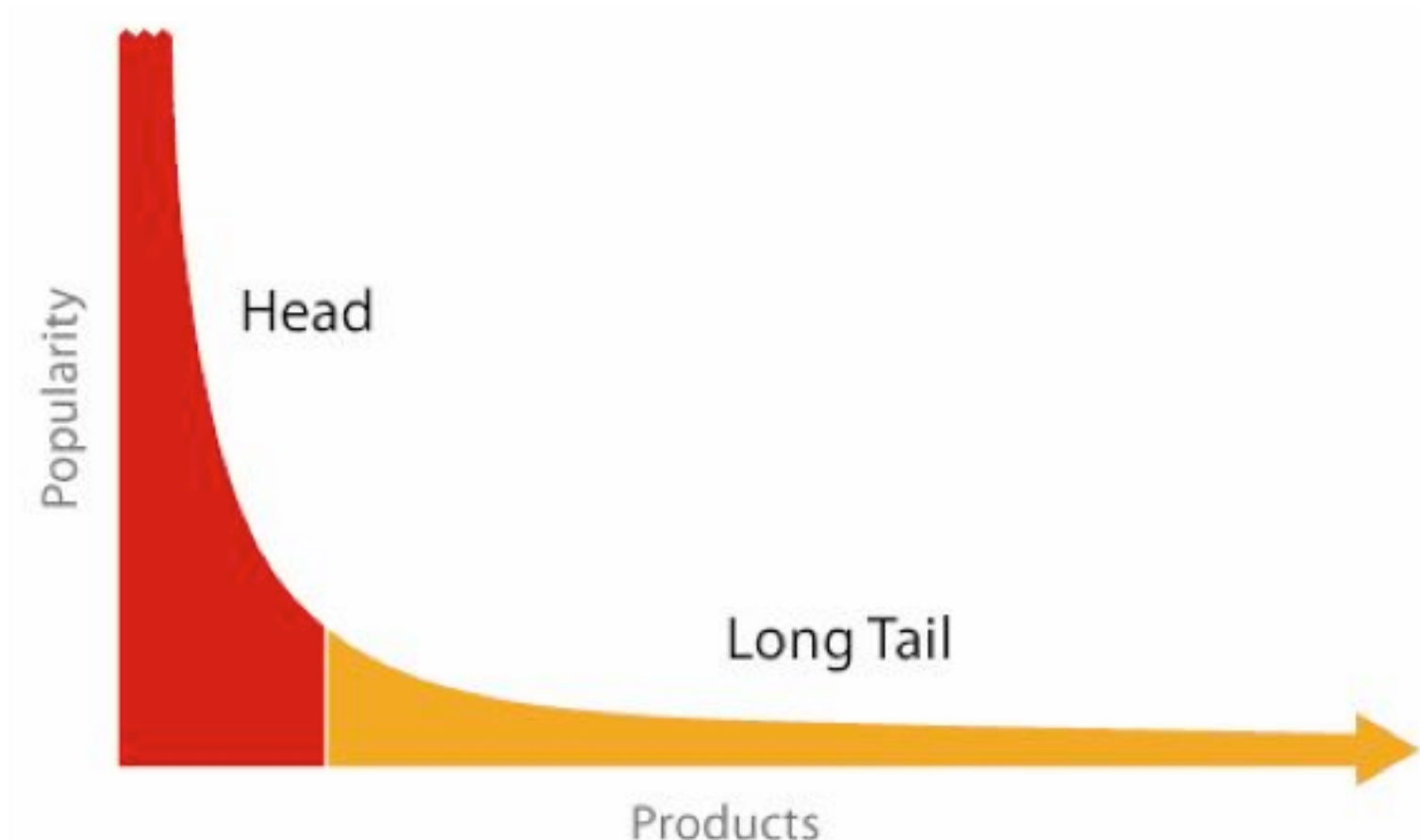
- **basic skills:** learning to learn, learning on demand, preparation for future learning, soft skills
- **long-tail:**
 - interest and passion
 - self-directed learning and intrinsic motivation
 - personally meaningful problems
 - interesting example → movie: “October Sky”
- **extensive coverage** needed for supporting the infinite numbers of interesting topics — will be facilitated by a “meta-design” culture → examples: Wikipedia, 3D objects in Google Earth / 3D Warehouse

Fundamentally New Learningscapes for the 21st Century

core curriculum

+

passion-based participation in niche communities



The Synergy of Different Objectives

	head	tail
motivations for participation	monetary economy (what we are paid to make)	reputation economy (what we want to make)
creation of content	experts, large budgets	(pro-) amateurs, personally meaningful, fun
acceptance / interest	topics of broad interest	niche interests
publishing	make money	distribution of a message

▪ empirical evidence:

- when consumers are offered infinite choice, the true shape of demand is revealed
→ it turns out to **be less hit-centric** than we thought
- people gravitate towards niches because they **satisfy narrow interests** better, and in one aspect of our life or another we all have some narrow interest