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

From Renaissance Scholars to Renaissance Communities: Learning and Education in the 21st Century

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http://l3d.cs.colorado.edu/~gerhard/

Collaboration Technologies and Systems Conference, San Diego, June 2013
Basic Message

- fostering, nurturing, and supporting Renaissance communities is a necessity and not a luxury in the 21st century

- the objectives, theories, frameworks, and systems underlying Renaissance Communities are central topics for the present and future of the Conference “Collaboration Technologies and Systems”
Learning and Education in the 21st Century

The co-evolution between learning, new media, and new learning organizations

- learning, working and collaboration
- new media and new technologies
- new learning organizations
Overview

- Renaissance Scholars

- Renaissance Communities

- Conceptual Frameworks for Renaissance Communities
  - Meta-Design
  - The Seeding, Evolutionary Growth, and Reseeding (SER) Model
  - Social Creativity
  - Cultures of Participation
  - Rich Ecologies of Participation
  - Communities of Interest

- Implications
Examples of Renaissance Scholars

- **Leonardo da Vinci (1452-1519)** — artist, astronomer, sculptor, geologist, mathematician, botanist, animal behaviorist, inventor, engineer, architect, musician

- **Herbert Simon (1916-2001)** — multidisciplinary creativity: PhD in Political Science, administrative and organizational theory, cognitive psychology, design, complex systems, artificial intelligence (Turing Award), economics (Nobel Prize); **unifying focus: human problem solving and decision making**
Leonardo — the Artist
Leonardo — the Inventor (Design of a Glider)
Problems Transcending the Individual Human Mind

- problems of a *magnitude* which individuals and even large teams cannot solve and require the contribution of all interested stakeholders

- problems of a *systemic nature* requiring the collaboration of many different minds from a variety of backgrounds

- problems being *poorly understood and ill-defined* and therefore requiring the involvement of the owners of problems because they cannot be delegated to others

- problems modeling *changing and unique worlds* supported by open and evolvable systems based on fluctuating and conflicting requirements
From Renaissance Scholars to Renaissance Communities

“Superhuman”: Desired but Unrealistic

Tools/Media Knowledge

high

low

Domain Knowledge

high

low
Realistic: Learning “something” about the Other Domain

<table>
<thead>
<tr>
<th>Tools/Media Knowledge</th>
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<tbody>
<tr>
<td>high</td>
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<table>
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<tr>
<th>Domain Knowledge</th>
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<tr>
<td>low</td>
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<td>high</td>
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Objective: Renaissance Communities

Tools/Media Knowledge

Domain Knowledge

reflective community
Renaissance Communities

- “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, M. (1996) *Creativity — Flow and the Psychology of Discovery and Invention*

- “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, D. T. (1969) "Ethnocentrism of Disciplines and the Fish-Scale Model of Omniscience."

- “None of us is as smart as all of us” — Bennis, W., & Biederman, P. W. (1997) *Organizing Genius: The Secrets of Creative Collaboration*

- “Linux was the first project to make a conscious and successful effort to use the entire world as a talent pool” — Raymond, E. S. (2001) *The Cathedral and the Bazaar*
Models Underlying Renaissance Communities:  
Ivan Illich’s Learning Webs

<< source : Chapter 6 “Learning Webs” in “Deschooling Society” (1971)>>

- **Criteria for a Good Educational System**
  - provide all who want to learn with access to available resources at any time in their lives
  - empower all who want to share what they know to find those who want to learn it from them
  - furnish all who want to present an issue with the opportunity to make their challenge known

- **Four Approaches**
  - reference services to educational objects + skill exchange + peer-matching + reference services to educators-at-large

- **Foundations for the Claim:**
  - Teaching and learning are not inherently linked. There is a lot of learning without teaching. And there is a lot of teaching without learning. (Wenger, 1998)
Models Underlying Renaissance Communities: T-Expertise Model

- **T-shaped skills (or T-shaped persons)**
  - metaphor to describe the abilities of persons in the workforce
  - the vertical bar on the T represents the depth of skills and expertise in a single field
  - horizontal bar is the ability to collaborate across disciplines with experts in other areas and to apply knowledge in areas of expertise other than one's own
  - T-shaped person is not a jack-of-all-trades (with “knowledge a mile wide and an inch deep”), but a master of one
Models Underlying Renaissance Communities: The Fish-Scale Model

- "collective comprehensiveness through overlapping patterns of unique narrowness" (Campbell, 1969)

- **research questions:** symmetry of ignorance, common ground, shared understanding, boundary objects, ……
Conceptual Frameworks and Examples for Renaissance Communities
Conceptual Frameworks and Examples for Renaissance Communities

- **Meta-Design**

- The Seeding, Evolutionary Growth, and Reseeding (SER) Model

- Social Creativity

- Cultures of Participation

- Rich Ecologies of Participation

- Distances and Diversity in Renaissance Communities
Meta-Design

- **meta-design** = design for designers

- **assumptions:**
  - future uses and problems cannot be completely anticipated at design time, when a system is developed
  - users, at use time, will discover mismatches between their needs and the support that an existing system can provide for them
  - requires some level of digital literacy to be acquired by users

- **contributions:**
  - creates new (additional) design methodology democratizing design
  - expands boundaries by supporting users as active contributors
  - distributes control among all stakeholders in the design process — users become independent of “high-tech scribes”
  - creates foundations for cultures of participation
  - supports social creativity
A Fundamental Aspect of Systems: Design Time and Use Time

world-as-imagined
prediction
planning

world-as-experienced
reality
situated action
Meta-Design: Extending Other Design Methodologies

- professionally-dominated design
  - works best for people with the same interests and background knowledge

- user-centered design
  - analyze the needs of the users
  - understand the conceptual worlds of the users

- participatory design (“design for use before use”)
  - involve users more deeply in the process as co-designers
  - focus on system development at design time by bringing developers and users together to envision the contexts of use

- meta-design (“design for design after design”)
  - create design opportunities at use time
  - requires co-creation

What Do Meta-Designers Do?

- use their own creativity to create socio-technical environments supporting users (domain professionals, owner of problems) to be creative

- create technical and social conditions for broad participation in design activities which are as important as creating the artifact itself
NSF Program “CreativeIT”

Developing the Synergies between Research in Creativity and Computer and Information Science and Engineering

A Wiki about the CreativeIT Program

http://swiki.cs.colorado.edu:3232/CreativeIT
Conceptual Frameworks and Examples for Renaissance Communities

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The Seeding, Evolutionary Growth, Reseeding (SER) Model

- at design time:
  - development of an initial system that can change over time (seed)
  - underdesign: creating design options for users

- at use time:
  - end-user modifications allow users to address limitations they experience
  - evolutionary growth through incremental modifications

- reseeding:
  - significant reconceptualization of the system
  - account for incremental modifications, mitigate conflicts between changes, and establish an enhanced system
The SER Model

Seeded Information Space

Evolved Information Space

Reseeded Information Space

Users

Developers

Seeding

Evolutionary Growth

ReSeeding
Courses-as-Seeds

- examples: http://l3d.cs.colorado.edu/~gerhard/courses/index.html

- teachers act as meta-designers and create seeds
  - lecture notes
  - readings
  - assignments
  - questionnaires
  - project proposals

- students are active contributors → evolutionary growth
  - answers to assignments and questionnaires: contributors and summarizers
  - project ideas, initial proposal, progress report, final report

- fundamental transformative change:
  teacher, learner = f{person} → teacher, learner = f{context}
Home Page of one Of Our Courses

Human-Centered Computing Foundations, Fall 2010

Human-Centered Computing Foundations, Fall 2010

Last modified by Hal Eden on 2011/12/05 06:37

Gerhard Fischer, Hal Eden, and Holger Dick — Fall 2010

CSCI 3002: Human-Centered Computing Foundations

and

CSCI 7000: Current Topics in Computer Science: Human-Centered Computing Foundations

Time: Monday and Wednesday 04:00pm-05:15pm

Location: ITLL 1850 (Integrated Teaching and Learning Lab, next to Engineering Center)

This course will introduce the foundations for Human-Centered Computing (HCC). As computing is changing our lives, this transformation is shaped not only by technology but also by how people express themselves, how they think, how they interact with computational artifacts, and how they collaborate with other humans. The broad-based research area of HCC will prepare students to contribute to this accelerating global process. Students will learn about, design, develop, and assess socio-technical environments that tie together technology with communication, collaboration, and other social processes to address the challenges and opportunities of our future world.

The course will cover practice and research in human computer interaction, design of interactive systems, computer supported cooperative work, computer supported collaborative learning, educational technology, tools that support creativity, user-developed knowledge collections, and gaming. Specific topics addressed will include: Cultures of Participation, Web 2.0 Environments, Design, Meta-Design, End-User Development, (Social) Creativity, and Distributed Cognition.

Tags: [ ]

Created by Hal Eden on 2010/06/20 12:22
Conceptual Frameworks and Examples for Renaissance Communities

- Meta-Design

- The Seeding, Evolutionary Growth, and Reseeding (SER) Model

- **Social Creativity**

- Cultures of Participation

- Rich Ecologies of Participation

- Distances and Diversity in Renaissance Communities
Social Creativity

Creativity — The “Wrong” Image?

“The Thinker” by Auguste Rodin
Social Creativity

“The strength of the wolf is in the pack,
and the strength of the pack is in the wolf.”
Rudyard Kipling

- social creativity: requires designers not consumers — domain professionals, discretionary users, and competent practitioners worry about tasks and are motivated to contribute and to create good products

- individual versus social creativity → individual and social creativity
  - not a binary choice
  - explore the relationship between the individual and the social
    (e.g., autonomy ↔ collective goals)

- assumption: Renaissance Communities should consist and bring together knowledgeable and engaged individuals
The Envisionment and Discovery Collaboratory (EDC)
Boulder City Council and University of Colorado Regents
Buildings Sketched into a Google-Earth Client
Conceptual Frameworks and Examples for Renaissance Communities

- Meta-Design

- The Seeding, Evolutionary Growth, and Reseeding (SER) Model

- Social Creativity

- **Cultures of Participation**

- Rich Ecologies of Participation

- Distances and Diversity in Renaissance Communities
Cultures of Participation
—
Fundamental Challenge and Opportunity

consumer cultures
focus: produce finished goods to be consumed passively

cultures of participation
focus: provide all people are with the means to participate actively in personally meaningful problems
Consumer and Designers — Beyond Binary Choices

- **claims:**
  - there is nothing wrong about being a consumer (watching a tennis match, listening to a concert, ...)
  - the same person wants to be a consumer in some situations and in others a designer → consumer / designer is not an attribute of a person, but of a context
    \[\text{consumer / designer} \neq f\{\text{person}\} \rightarrow f\{\text{context}\}\]

- **problems:**
  - someone wants to be a designer but is forced to be a consumer → personally meaningful activities
  - someone wants to be a consumer but is forced to be a designer → personally irrelevant activities
## Environments Created by Cultures of Participation

<table>
<thead>
<tr>
<th>Site</th>
<th>Objectives and Unique Aspects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wikipedia</strong></td>
<td>web-based collaborative multilingual encyclopedia with a single, collaborative, and verifiable article; authority is distributed (<a href="http://www.wikipedia.org/">http://www.wikipedia.org/</a>)</td>
</tr>
<tr>
<td><strong>iTunes U</strong></td>
<td>courses by faculty members from “certified institutions”; control via input filters; material can not be remixed and altered by consumers (<a href="http://www.apple.com/education/itunes-u/">http://www.apple.com/education/itunes-u/</a>)</td>
</tr>
<tr>
<td><strong>YouTube</strong></td>
<td>video sharing website with weak input filters and extensive support for rating (<a href="http://www.youtube.com/">http://www.youtube.com/</a>)</td>
</tr>
<tr>
<td><strong>Encyclopedia of Life (EoL)</strong></td>
<td>documentation of the 1.8 million known living species; development of an extensive curator network; partnership between the scientific community and the general public (<a href="http://www.eol.org/">http://www.eol.org/</a>)</td>
</tr>
<tr>
<td><strong>SketchUp and 3D Warehouse</strong></td>
<td>repository of 3D models created by volunteers organized in collections by curators and used in Google Earth (<a href="http://sketchup.google.com/3dwarehouse/">http://sketchup.google.com/3dwarehouse/</a>)</td>
</tr>
</tbody>
</table>
# Environments Created by Cultures of Participation

<table>
<thead>
<tr>
<th>Environment</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td><strong>Scratch</strong></td>
<td>Learning environment for creating, remixing, and sharing programs to build creative communities in education (<a href="http://scratch.mit.edu">http://scratch.mit.edu</a>)</td>
</tr>
<tr>
<td><strong>Instructables</strong></td>
<td>Socio-technical environment focused on user-created and shared do-it-yourself projects involving others users as raters and critics (<a href="http://www.instructables.com/">http://www.instructables.com/</a>)</td>
</tr>
<tr>
<td><strong>PatientsLikeMe</strong></td>
<td>Collection of real-world experiences enabling patients who suffer from life-changing diseases to connect and converse (<a href="http://www.patientslikeme.com/">http://www.patientslikeme.com/</a>)</td>
</tr>
<tr>
<td><strong>Stepgreen</strong></td>
<td>Library of energy saving actions, tips, and recommendations by citizen contributors for saving money and being environmentally responsible (<a href="http://www.stepgreen.org/">http://www.stepgreen.org/</a>)</td>
</tr>
</tbody>
</table>
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

challenges:
- what will motivate people to participate?
- participation requires acquiring skills in using SketchUp → create learning environments for SketchUp
CU Boulder in 3D
Downtown Denver in 3D
A Tiny Percentage of a Huge Population → Large Number of Participants
Conceptual Frameworks and Examples for Renaissance Communities

- Meta-Design
- The Seeding, Evolutionary Growth, and Reseeding (SER) Model
- Social Creativity
- Cultures of Participation

- **Rich Ecologies of Participation**
  

- Distances and Diversity in Renaissance Communities
Richer Ecologies of Participation

- **in the past:**
  - software developers and users
  - producers and consumers
  - professionals and amateurs

- **in the future: more roles — beyond** passive, undifferentiated consumers
  - producers, raters, taggers, curators, stewards, active users, passive users

- **roles are distributed in communities:**
  - power users, local developers, gardeners

- **challenge:** support migration paths with “low threshold, high ceiling” architectures
Richer Ecologies of Participation:
Consumer → Contributor → Collaborator → Meta-Designer

Role-0: Unaware consumers
Role-1: Consumers aware of possibilities
Role-2: Collaborators
Role-3: Designers
Role-4: Meta-designers

Transitions:
- Becoming aware of possibilities
- Sharing information, learning from others
- Creating novel artifacts
- Extending the range of the environment
Ecologies in Open Source Communities

- Project Leader
- Core Members
- Active Developers
- Peripheral Developers
- Bug Fixers
- Bug Reporters
- Readers
- Passive Users
Conceptual Frameworks and Examples for Renaissance Communities

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Distances and Diversity in Renaissance Communities

- distribution creates **distances** → these distances are not only **spatial**, but also temporal, **conceptual**, and technological

- conceptual dimension: “Communities of Practice” and “Communities of Interest”
  - **Communities of Practice (CoPs)**, defined as groups of people who share a professional practice and a professional interest
  - **Communities of Interest (Cols)**, defined as groups of people coming from different disciplines who share a common interest, such as framing and solving problems and designs artifacts (Envisionment and Discovery Collaboratory)
Communities of Practice (CoPs)
—
Homogenous Design Communities

- **CoPs**: practitioners who work as a community in a certain domain

- **examples**: architects, urban planners, research groups, software developers, software users, kitchen designers, computer network designer,

- **learning**:
  - masters and apprentices
  - legitimate peripheral participation (LPP)
  - develop a notion of belonging

- **problems**: *“group-think”* → when people work together too closely in communities, they sometimes suffer illusions of righteousness and invincibility
Communities of Interest (Cols): Heterogeneous Design Communities

- **Cols** = bring different CoPs together to solve a problem

- **membership** in Cols is defined by a shared interest in the framing and resolution of a design problem

- **diverse cultures**
  - people from academia and from industry
  - software designers and software users
  - students and researchers from around the world

- **fundamental challenges:**
  - establish a common ground
  - building a shared understanding of the task at hand
  - learning to communicate with others who have a different perspective
  - primary goal: not “moving toward a center” (CoP) but “integrating diversity”
Communication Problems in Cols
Implications

- culture changes

- drawbacks

- Massive Open Online Courses (MOOCs) — Education for Everyone?
Major Cultures Changes Caused by New Media and New Technologies
Drawbacks of Meta-Design and Cultures of Participation

- **participation overload**: burden of being active contributors in personally irrelevant activities
  - “do-it-yourself” societies
  - companies offloading work to customers

- accumulation of **irrelevant information**

- lack of **coherent voices** (leading to fragmented cultures)
Massive Open Online Courses (MOOCs)

—

a hot topic!

- the amazing facts: reach and impact
  - moved beyond discussion in academics circles
  - 160 000 participants (Stanford AI course) → 10% completion rate → 16 000 students

- Assessment Dimensions:
  - almost all existing analyses: “Wall-Street (= economics) + Silicon Valley (= technologies)”
  - my objective: assessment of MOOCS by the frameworks articulated in my presentation (from the learning sciences)
The Major Players


- [https://www.coursera.org/](https://www.coursera.org/) -- Stanford's alternative to Udacity (not-for-profit)

- [https://www.edx.org/](https://www.edx.org/) — EdX is a joint partnership between: MIT, Harvard, and UC Berkeley (not-for-profit)
The Promises of MOOCs

- courses from the top universities
- for free
- learn from world-class professors
- watch high quality lectures
- achieve mastery via interactive exercises
- collaborate with a global community of students
The Hype: MOOCs will Revolutionize Higher Education

- edX: “Most Important Educational Technology in 200 Years”

- John Hennessey (President, Stanford University): “there’s a tsunami coming.”

- A movement toward online higher education could have an enormous impact on American higher education, comparable to the impact the Internet has had on bookstores and publishers. There would undoubtedly be a very rapid and considerable consolidation of colleges and universities.

- The learning potential for society (globally) is wonderful. (India, Nepal, Africa: university students can’t get the quality of instruction from some of our colleges that they get from MOOCs)

- Professors delight in reaching more students in one course than they could otherwise teach in a lifetime.

- There is a problem of asking questions of the lecturer in a class of ten thousand students, but some MOOCs solve it by allowing students to post questions that the student body votes on, and only the most popular questions are put to the lecturer.
Issues to be Explored

- how interactive are these sites / lectures?
- for which type of learning are these approaches a good fit?
- why are these efforts (or at least some of them) successful and what does success mean?
- why should we pay attention to these developments?
- what can we learn from these efforts for our own activities?
- how are the participants certified / credentialed?
My Interest: To Identify the

Core Competencies of Residential, Research-Based Universities

- Robert Birgeneau (Chancellor, UC Berkeley): “We are committed to excellence in online education with the dual goals of distributing higher education more broadly and enriching the quality of campus-based education.

- “The campus environment offers opportunities and experiences that cannot be replicated online — EdX is designed to improve, not replace, the campus experience.”

- **challenges created by MOOCs**
  - commoditizing the ‘content’ sharpens the focus on the substantive values of residential education: **personal attention** from faculty and **participation** in learning and research communities
  - move away from large passive lectures towards **active learning environments**
  - emphasize “**learning to be**” (in addition to “learning about”)
  - explore learning in contexts “**when the answer is not known**”
MOOCs = one important and exciting dimension in a Multi-Dimensional Learning Landscape
Conclusion

- Renaissance Communities = exciting innovations and transformations
  - past decades: digital media have provided new powers for the individual
  - future: the world's networks are providing enormous unexplored opportunities for communities
  - technologies are necessary, but not sufficient to explore and exploit these opportunities → co-evolution between learning, new media, and new learning organizations

- the themes underlying the Conference “Collaboration Technologies and Systems” are not a luxury, but a necessity to be explored for the years to come
Acknowledgements

- The ideas, concepts, arguments, and system developments described in this paper have been jointly developed over the last two decades with former and current members of the Center for Lifelong Learning & Design (L3D) at CU Boulder (http://l3d.cs.colorado.edu).

- The research was supported in part by the following grants from the National Science Foundation: (1) REC-0106976 “Social Creativity and Meta-Design in Lifelong Learning Communities”; (2) IIS-0613638 “A Meta-Design Framework for Participative Software Systems”; (3) IIS-0709304 “A New Generation Wiki for Supporting a Research Community in Creativity and IT”; (4) OCI-1028017 “CDI-Type I: Transformative Models of Learning and Discovery in Cultures of Participation”; and (5) IIS-1111025 “SoCS: Theoretical Frameworks and Socio-Technical Systems for Fostering Smart Communities in Smart Grid Environments”.

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