Knowledge Networks
and
e-Learning Futures

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Overview

Part 1 – Knowledge Networks
• Context
• Theories of Learning and Knowledge, Sense-Making
• Intersections of Knowledge Management & e-Learning
• Models

Part 2 – e-Learning Futures
• Context
• More Models
• Scenario Planning & Strategic Foresight
• Trends
“Someday, in the distant future, our grandchildren’s grandchildren will develop a new equivalent of our classrooms. They will spend many hours in front of boxes with fires glowing within. May they have the wisdom to know the difference between light and knowledge.”

Plato
An immense and ever-increasing wealth of knowledge is scattered about the world today; knowledge that would probably suffice to solve all the mighty difficulties of our age, but it is dispersed and unorganized. We need a sort of mental clearing house: a depot where knowledge and ideas are received, sorted, summarized, digested, clarified, and compared.

H.G. Wells, 1940
• Convergence of e-infrastructure
  • e-learning
  • knowledge management
  • performance support
  • and more … [keyword = services]

• e-learning is maturing
  • transforming access & delivery of education and training … & its traditional resource base
  • spans home, workplace, and institution
Context

• New capabilities of Internet technologies
  • Web 2.0
  • Service Oriented Architectures
  • Grid computing
  • Wireless & mobile access
  • Open source innovation
  • Semantic Web
  → Standards & specifications are key
A multiplicity of ways of doing things …

Networks form within & between organizations …

Organizational structures are typically hierarchical …

For example, organizations working on ICT standards …
Who else?
Properties of Networks

• Self-organizing

• Built on trust & relationships

• Enable rapid flows of information

• Resilient

• Connections propagate

• Enormous capacity for growth (c/f “pyramid marketing”)
Knowledge Networks

Making sense of → What is happening
Who is involved
When to participate
Where to go to find out
Why things are the way they are
How things could change

Is essentially what Knowledge Networks do
How to Model this?
“Consider, if you will, Me++. I consist of a biological core surrounded by extended, constructed systems of boundaries and networks. These boundary and network structures are topological and functional duals of each other. The boundaries define a space of containers and places … while the networks establish a space of links and flows.”

William Mitchell
“I Link, therefore I am”

William Mitchell, *Me++*

“We participate, therefore we are.”

John Seely Brown & Richard Adler, *Minds on Fire: Open Education, The Long Tail, & Learning 2.0*
A Metaphor
The Cathedral has:
- Ordained leaders
- Sacred dogma
- Codes & protocols
- Prescribed culture
- The "official" story

The Cafe has:
- Heretical ideas & passion
- Open source activity
- Leaders at all levels
- Networked community
- Emergent stories

Source: Richard Hames, 2002

InterCog
### Balancing Organizational & Individual Perspectives on Knowledge

<table>
<thead>
<tr>
<th>The Cathedral</th>
<th>The Café</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexible delivery</td>
<td>Flexible access</td>
</tr>
<tr>
<td>Brand X-Portal</td>
<td>My-Portal</td>
</tr>
<tr>
<td>Corporate/enterprise knowledge</td>
<td>Individual learning and expertise</td>
</tr>
<tr>
<td>Defined palette of offerings</td>
<td>Open palette of choice</td>
</tr>
<tr>
<td>Data-centric service models</td>
<td>Needs-based service models</td>
</tr>
<tr>
<td>Knowledge management: streamlining workflow and management of knowledge capital</td>
<td>Learning management: easy integration of disparate information and communications sources/services</td>
</tr>
</tbody>
</table>
Dualities

Boundaries
- Organizations
- Packets
- Components
- Content
- Containers
- Collections
- Repositories
- LMS/MLE
- (Intranets)

Defined ↔ Porous

Networks
- Connections
- Relationships
- Systems

Open ↔ Closed
So, how to Model Knowledge?
One Model is often not sufficient!
Realizing the "Knowledge Society"

Source: http://www.jaist.ac.jp/~kouhou/General_info/organization-e/TISHIKI-e.html#kiso
Knowledge is a Thing & a Flow

Peter Drucker
Three Heuristics

- Knowledge is volunteered, not conscripted
  - shared knowledge is more powerful than pooled information. Trust is key

- We will always know more than we can tell, and tell more than we can write down
  - writing is reflective knowledge

- We only know what we know when we need to know it
  - knowledge is always contextual

Source: Dave Snowden, [http://www.cognitive-edge.com/](http://www.cognitive-edge.com/)
**nouns**

- Knowledge
- Information
- Data

**verbs**

- Know
- Learn
- Reflect
- Communicate

**context**

- Complex Adaptive Systems
- Communities of practice
- Individuals
- Organizations

**Recursive Cycles**

- Meaning
- Sense-making
- Application

**Sense-making**

- Application
Figure 1  Knowledge and learning key pillars


The SECI Model

Source: Nonaka and Takeuchi (1998)
“Excessive focus on explicit knowledge leads to paralysis by analysis.”

“Only when tacit and explicit knowledge interact can innovation occur.”

Ikujiro Nonaka, *The Knowledge Advantage*
If you want understanding, you have to reenter the human world of stories. If you don’t have a story, you don’t have understanding.

David Weinberger
“Sense making and sense unmaking is a mandate of the human condition”

“The sense making and sense unmaking that is knowledge is a verb, always an activity, embedded in time and space, moving from a history toward a horizon”

Brenda Dervin: http://communication.sbs.ohio-state.edu/sense-making/
InterCog Sense-Making Model
InterCog Sense-Making

- Who
- What
- When
- Where

{ Key Questions of Information

- Why
- How
- Which

{ Key Questions for Learning

- If

{ Discernment & Wisdom

{ Key Question for Futures Thinking
Theories & Models

Learning

• Behaviourism
• Cognitivism
• Constructivism
• Connectivism
• ...???

Knowing

• SECI
• Technocratic
• Economic
• Behavioural
• Complexity
• Sense-Making
• ...???
Thinking

- Analysing
- Concentrating
- Connecting – (laterally)
- Contemplating
- Day dreaming
- Engaging
- Inferring
- Intellectualizing

- Making Sense
- Operating
- Planning
- Recalling
- Reflecting
- Strategizing
- …
Epistemology

- The study of theories of knowledge
- Deeply philosophical

Why is it important?
- Provides perspective on learning
- Provides perspective on managing data & information
- Provides perspective on communication
- Provides perspective on interface design
- Assists in cross-cultural understanding

http://en.wikipedia.org/wiki/Epistemology
What about shared Knowledge?
Communities of Practice

- Standards
- Protocols
- Conventions
- Etiquettes
- Fashions
- Norms
- Mores
- Innovations
- Conversations

Orthodoxies

Heterodoxies
## Communities, Organizations, Networks

<table>
<thead>
<tr>
<th>Organizational Structures</th>
<th>Purpose/Membership</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communities of Practice</td>
<td>Create, expand, and exchange knowledge and develop individual capabilities/Self-selection based on expertise or passion for a topic</td>
<td>Fuzzy boundaries</td>
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<tr>
<td></td>
<td></td>
<td>Held together by passion, commitment and informal</td>
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<tr>
<td></td>
<td></td>
<td>teaming through identification with community</td>
</tr>
<tr>
<td>Formal Departments</td>
<td>Deliver a product or service/Everyone who reports to group manager</td>
<td>Clear boundaries</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Held together by job requirements and common goals</td>
</tr>
<tr>
<td>Operational Teams</td>
<td>Take care of an ongoing operation or process/Membership assigned by management</td>
<td>Clear boundaries</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Held together by shared responsibility for the operation</td>
</tr>
<tr>
<td>Project Teams</td>
<td>Accomplish a specified task/People who have a direct role in accomplishing the task</td>
<td>Clear boundaries</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Held together by project goals and milestones</td>
</tr>
<tr>
<td>Communities of Interest</td>
<td>Be Informed/Whomever is interested</td>
<td>Fuzzy boundaries</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Held together by access to information and sense of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>like-mindedness</td>
</tr>
<tr>
<td>Informal Networks</td>
<td>Receive and pass on information, know who is who/Friends and business acquaintances</td>
<td>Undefined boundaries</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Held together by mutual need and relationships</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Know-Who” is intellectual capital</td>
</tr>
</tbody>
</table>

Learning & Knowledge Capital
A Knowledge Ecosystem

Knowledge Management System

Learning Object Repository

Transfer of Tacit Knowledge

Creating Explicit Knowledge

Organize Knowledge

Organize Learning

Learning Explicit Knowledge

Feedback

Learners

Faculty, Mentors, Practitioners

Knowledge Managers

Instructional Designers
Organizational Hierarchies & Networks
The fundamental challenge of Knowledge Management is the “silo problem”

The problem is deeper than just a “mentality” or attitude

We are compelled to create this problem each time we create knowledge – because meaning is contextual!
Learning & Knowledge Capital

Virtuous Circle
The wheel that drives the future of organizations

- New patterns of organizing work and commerce are emerging
- The unleashing of creativity and distributed intelligence
- New ways of using the power of technologies
- New forms of social interaction and coordination
Relationship is the only thing strong enough to resist the siren call of ten million other sites that are just a click away …

In the digital world, the one with the best conversation usually wins.

And … there are many dialogues out there still in search of a village square.

Mikela Tarlow, 2002
Collaborative Activities

Outputs

Consensus Building

Knowledge Sharing

Technologies that Work

Standards & Protocols

TRUST
Questions for Further Investigation

- Why are Knowledge Networks important?
- Are networks stimulating your learning?
- Are lifecycles of Knowledge Networks significant?
- What role does established knowledge play?
- What new standards are needed in order to build a sustainable and supportive infrastructure for learning, education, and training?
  - Technical (ICT) infrastructure standards?
  - Organisational infrastructure standards?
- Who will or should develop such standards?
  - Formally constituted bodies?
  - Open source communities?
  - Industrial consortia?
Part 2 – Overview

- Context
- Thinking about the Future
- Models
- Trends
- Scenario Planning
Context – Venues for Learning

• Individual
  • home, workplace, leisure, … socially

• Community of Practice
  • Co-located
  • Geographically distributed, networked, virtual
  • As narrative & discourse

• Organization
  • Physical environment
  • Abstract environment
    ✓ Strategic
    ✓ Operational

• Virtually, in cyberspace

Lifelong learning for All!
Thinking About the Future

- Many commentators predict where trends are heading
  - Some are high profile research organizations (e.g., Gartner)
  - Some are individuals (Stephen Downes, Wayne Hodgins, …)

- It is instructive to check up on past future predictions – e.g.,
  http://www.paleofuture.com/
  http://www.youtube.com/watch?v=-1I6aBgX5UY

- Also established disciplines for dealing with futures
  Scenario Planning

  Strategic Foresight
  http://www.strategicforesight.com/
The Machine is Us/ing Us
http://www.youtube.com/watch?v=6gmP4nk0EOE
HOW to scope?

Learning, Education & Training

e-learning

http://www.elframework.org/
Explorations in Learning & Instruction:
The Theory Into Practice Database

Welcome to the Theory Into Practice (TIP) database!

TIP is a tool intended to make learning and instructional theory more accessible to educators. The database contains brief summaries of 50 major theories of learning and instruction. These theories can also be accessed by learning domains and concepts.

- About TIP
- The theories
- Learning domains
- Learning concepts
- About the Author
- Other related web sites

For more information about many of the theories and theorists included here, see the “People & History” section of http://www.psychology.org

http://tip.psychology.org/
Learning Theories

- ACT* (J. Anderson)
- Adult Learning Theory (P. Cross)
- Algo-Heuristic Theory (L. Landa)
- Andragogy (M. Knowles)
- Anchored Instruction (J. Bransford & the CTGV)
- Aptitude-Treatment Interaction (L. Cronbach & R. Snow)
- Attribution Theory (B. Weiner)
- Cognitive Dissonance Theory (L. Festinger)
- Cognitive Flexibility Theory (R. Spiro)
- Cognitive Load Theory (J. Sweller)
- Component Display Theory (M.D. Merrill)
- Conditions of Learning (R. Gagne)
- Connectionism (E. Thorndike)
- Constructivist Theory (J. Bruner)
- Contiguity Theory (E. Guthrie)
- Conversation Theory (G. Pask)
- Criterion Referenced Instruction (R. Mager)
- Double Loop Learning (C. Argyris)
- Drive Reduction Theory (C. Hull)
- Dual Coding Theory (A. Paivio)
- Elaboration Theory (C. Reigeluth)
- Experiential Learning (C. Rogers)
- Functional Context Theory (T. Sticht)
- Genetic Epistemology (J. Piaget)
- Gestalt Theory (M. Wertheimer)
- GOMS (Card, Moran & Newell)
- GPS (A. Newell & H. Simon)
- Information Pickup Theory (J.J. Gibson)
- Information Processing Theory (G.A. Miller)
- Lateral Thinking (E. DeBono)
- Levels of Processing (Craik & Lockhart)
- Mathematical Learning Theory (R.C. Atkinson)
- Mathematical Problem Solving (A. Schoenfeld)
- Minimalism (J. M. Carroll)
- Model Centered Instruction and Design Layering (A. Gibbons)
- Modes of Learning (D. Rumelhart & D. Norman)
- Multiple Intelligences (H. Gardner)
- Operant Conditioning (B.F. Skinner)
- Originality (I. Maltzman)
- Phenomenography (F. Marton & N. Entwistle)
- Repair Theory (K. VanLehn)
- Script Theory (R. Schank)
- Sign Theory (E. Tolman)
- Situated Learning (J. Lave)
- Soar (A. Newell et al.)
- Social Development (L. Vygotsky)
- Social Learning Theory (A. Bandura)
- Stimulus Sampling Theory (W. Estes)
- Structural Learning Theory (J. Scandura)
- Structure of Intellect (J. Guilford)
- Subsumption Theory (D. Ausubel)
- Symbol Systems (G. Salomon)
- Triarchic Theory (R. Sternberg)

http://tip.psychology.org/
The impact of the Web:

- Connectivism (George Siemens)
- Social Learning (Seely Brown, et al)
Impact of Networks

Source: G. Siemens [http://www.connectivism.ca](http://www.connectivism.ca)

23 March 2008
Connectivism

- Networks, Networks, Networks
- Connections, Connections, Connections
- Diversity not uniformity
- Knowledge resides in networks
- Knowledge also resides in non-human appliances
- Learning is enabled/facilitated by technology
- Capacity to know is of high value
- Emergent patterns

Source: G. Siemens [http://www.connectivism.ca](http://www.connectivism.ca)
Connectivism – identifying key skills

1. Anchoring
2. Filtering
3. Connecting
4. Being human
5. Creating and deriving meaning
6. Evaluation/authentication
7. Critical/creative thinking
8. Pattern recognition
9. Navigate knowledge landscape
10. Acceptance of uncertainty
11. Contextualizing

Source: G. Siemens [http://www.connectivism.ca](http://www.connectivism.ca)
But are Networks the end game?
The Networked & Symphonic Self

**Networked**
- Play, emergence, agility entrepreneurialism, flexibility
- Ease, speed, low-cost integration
- Aggregation, association
- Relationships
- Collection, list, link, snapshot
- Web 2.0 and social software

**Symphonic**
- Integrity, commitment, intellectual engagement, balance
- Time, effort, high cost integration (author, context, audience)
- Synthesis, symphony
- Relationships b/w relationships
- Theory, story, interpretation, map
- e-Portfolios, systems, Web 1.0

Darren Cambridge - The Lifelong and Lifewide Learning Vision
Australian ePortfolio Symposium, Brisbane, Queensland, Australia, 2008-02-07
http://www.eportfoliopractice.qut.edu.au/
Identifying Key Trends
EDUCAUSE Learning Initiative
Horizon Report 2008

- Identifies key tech trends … 1-5 years
  - Grassroots video
  - Collaboration webs
  - Data mashups
  - Mobile broadband
  - Collective Intelligence
  - Social Operating Systems

Trends

• Open Access Movement
  
  http://www.oercommons.org/
  http://en.wikipedia.org/wiki/Open_educational_resources
  http://creativecommons.org/
  http://commons.carnegiefoundation.org/

• E-portfolio services

• New scaffolding to support deeper learning

Share, Remix, Reuse!
Beyond textbook learning:

learning-about ===> learning-to-be

Explicit

Learning about

Learning to be

dimensions of knowledge

(Michael Polanyi)
Reversing the Flow

Learning about

Learning to be

Explicit

Tacit

Key: unleashing productive inquiry

http://connect.educause.edu/Library/EDUCAUSE+Review/Minds onFireOpenEducationt/45823?time=1205809478
The Brewing Perfect Storm of Opportunity

Transformative Initiatives

OER ...
eScience
eHumanities
Web 2.0 & beyond

Tying it all together:

Open Participatory Learning Ecosystem

New kinds of ecosystems for supporting learning 2.0

http://connect.educause.edu/Library/EDUCAUSE+Review/Minds onFireOpenEducationt/45823?time=1205809478
How to prepare for the future, while making the most of the present?
Scenario Planning

- Identifying key trends
- Identifying key uncertainties
- A tool for strategic thinking
- Designed to assist in building plausible futures
- Typically a group process involving input over a defined time period (a few days – a few months)
- Goal is to create divergent stories on possible futures
Scenario Planning

Sustaining Innovation

Disruptive Innovation

Closed Knowledge Networks

Open Knowledge Networks
Scenario Planning

Hierarchies

Orthodoxies

Wired for Learning

Exclusive

Participatory Systems

Orthodoxy

Learning Society

Inclusive

**Identifying Tension Axes**

- Formal ↔ Informal
- Content ↔ Process
- Technology ↔ Pedagogy
- Proprietary ↔ Open
- Boundaries ↔ Networks
- Continuities ↔ Discontinuities
### Scenarios vs. Forecasts

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Forecasts</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Designed to focus on uncertainties</td>
<td>• Designed to reinforce certainty</td>
</tr>
<tr>
<td>• Clarify risks</td>
<td>• Conceal risks</td>
</tr>
<tr>
<td>• Logical pictures of the future</td>
<td>• Single-point linear projections</td>
</tr>
<tr>
<td>• Encourage flexibility and responsiveness</td>
<td>• Foster inertia</td>
</tr>
</tbody>
</table>

*Jonathan Star, eLearn International 2004*

*The Edinburgh Scenarios*
Critical Uncertainties

Acceptance and adoption of technology in society

- Partial acceptance
- Patchy adoption
- Technology frustrates
- Runs counter to needs

- High acceptance
- Widespread adoption
- Technology enables
- Aligns with human needs

Sources of power, influence and new ideas

- Conventional
- Institutionalized
- Centralized
- Established

- Unconventional
- Self-organized
- Decentralized
- Emergent

Jonathan Star, eLearn International 2004
The Edinburgh Scenarios
Scenario Planning

Sources of power, influence and new ideas

Technology empowers

Web of Confidence

U Choose

Back to the Future

Technology frustrates

Established

Emergent

Acceptance and adoption of technology in society

Vanilla
Combining the uncertainties gives us the following matrix...

Virtually Vanilla

Widespread adoption

Web of Confidence

Sources of power, influence and new ideas

Established

Acceptance and adoption of technology in society

Emergent

Back to the Future

Patchy Adoption

You Choose

Jonathan Star, eLearn International 2004
The Edinburgh Scenarios
Technology empowers

- Juggernaut
  - Commodity learning
  - Breakthroughs from big players
  - High tech connections
  - High barriers to entry
  - Learning goes hi-tech
- Big corporations join forces with education and govt
- Retained process dynamics

Technology frustrates

- Discomfort Zone
  - Testing Times
  - Big pushbacks to technology
  - Traditional routes to learning
  - Frustrated learners and technologists
  - Status quo struggles on
  - Maybe Next Time…

Sources of power, influence and new ideas

- Emergent
  - Enables pervasive connections
  - Amazing communities of practice
  - Network buzz
  - Learning from digital natives and mp games
  - Open source, p2p
  - Institutions in hands of learners
  - Ubiquitous environment
  - Tremendous challenges to existing orders

- Established
  - Learners in power, but eschew most technology
  - Fewer go to university
  - Local community learning groups
  - Apprenticeship schemes
  - E-learning gets real
  - Learners want a face-to-face experience
  - The Real Thing
  - Early adopters lose out to mainstream

Acceptance and adoption of technology in society

23 March 2008
Questions

• What are your critical uncertainties?
• What e-learning technologies are of most interest to you?
• What frontiers in e-learning technology show promise?
• Will scenario planning help you prepare for the future?
• How will you balance organisational & networked relationships?
References

• Minds on Fire: Open Education, The Long Tail, & Learning
  http://connect.educause.edu/Library/EDUCAUSE+Review/MindsonFireOpenEducationt/45823?time=1205744243

• Teaching and Learning Commons
  http://commons.carnegiefoundation.org/

• Cognitive Edge
  http://www.cognitive-edge.com/

• The Future of Online Learning & Knowledge Networks (2004)
  http://www.slideshare.net/Downes/the-future-of-online-learning-and-knowledge-networks

• Scenario Planning in Education
Questions

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