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Information Technology, Cognition, and Communication

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Abstract

Information technology is varied and human use and impact can be examined at different levels. I will report on two studies that examine IT at very different levels: 1) the ubiquitous hyperlinks as instruments of cognition in e-learning, and 2) digital repositories as networks and invisible colleges of scholarly communication.



Outline

- Background
 - Information & Communication Technologies (ICTs) rather than IT, academic disciplines or sub-disciplines, and my own background
- Instruments of cognition
 - Study, findings, limitations, and future work
- Communication colleges
 - Brief look only (not covered)
- Q&A (importance)



ICTs

- Information and Communication Technologies
 - Technologies
 - laptops, wireless networks, Internet, digital objects, digital resources, Adobe Acrobat reader, digital libraries, digital repositories
 - Uses of ICTs
 - at work, for play, at home
 - Public administration
 - Learning
 - Users of ICTs
 - usually studied in groups & contexts
 - students, architects, citizens



Other aspects & approaches

- Barriers (example: access)
- Social informatics
 - Social aspects of computerization (CRITO)
- CMC
 - Computer-mediated communication (Lee Sproull & Sara Kiesler, *Connections*)
- HCI
 - Human computer Interaction



Library/Information Sciences

- Organization of Information
 - Bibliography, Cataloging, Classification, Controlled Vocabularies, Indexing
- Human Information Behaviors
 - Information needs, Uses of Information, Information Seeking behaviors
- Scholarly Communication
 - Bibliometrics, Informetrics, Scientometrics, Librametry
- From Information Retrieval (IR) to Information Architecture (IA)



Research interests

- Complex objects (networked digital information)
 - Digital resources
 - Learning objects
 - Scientific models
 - Interactives
 - Embedded small technologies
 - Hyperlinks – this is a [hyperlink](#)
 - Citations – as Web links
- Human Information Behaviors
 - E-learning, interdisciplinary contexts
 - Interaction behaviors



Instruments of Cognition

- “Citations provide pellets of the peer recognition that is central to the normative reward system of science.” Merton (2000, p. 438)
- Citations serve two different functions
 - Symbolic institutional
 - maintains the character of scientific intellectual property
 - Instrumental cognitive
 - Leads readers to assess the validity claims made in the citing paper



Research Questions

- What are the different types of citations and web links that can be found in instructional materials?
- Why do students use citations and web links?



Data Collection & Analysis

- Citations and Web links
 - Counts
- Citation and link content/context analysis
 - Categorization
- User study
 - Two types of written surveys and follow-up focus group interviews
- Usage tracking
 - Monitoring student activity on Web links in the course pages



The Course & Materials

- Spring 2003, Course based in the Geography & Regional Development Dept., College of Social & Behavioral Sciences
- On-campus + Interactive Learning Modules + Labs
 - ILMs provide the theory and the labs the practice; the on-campus, real-time lectures served as the bridge between theory and practice.
 - 10 ILMs, Glossary, 12 lectures, 12 labs; No text
 - Each ILM had a similar structure



The Participants

- 45 students participated
- Total class enrollment of 90
- Full participation turned out to be lower: mean $n=26$



Findings - Demographics

- The typical student in this GIS course was
 - Male
 - Caucasian
 - Undergraduate senior
 - In the age group of 20-30
 - Was from out-of-state
 - Majoring in Regional Development
 - Worked fewer than 20 hours a week in a job



Findings - Nature of C & W

- 10 citing documents (ILMs)
 - Size: 50.2 MB
 - Glossary had 315 terms
 - 16 bibliographic citations and 20 Web links (navigational links not included)
- Previously established categorization scheme (Duncan et al, 1981) of form and context (Implied purpose of the link)



Nature of citations

- Form
 - 16 citations
 - Books
 - Illustrations (130)
- Context
 - Definition
 - Example
 - Illustration



Nature of Web links

- Form
 - 20 links
 - 8 *.edu, 8 *.gov, 2 *.org, 2 *.com
- Context
 - Historical, Biographical information; Further detail; Data; Example
- Content
 - URL; Text; Graphic, Directive



Results - Use and Non Use

- The number of students who did not use the citations and links is greater than those who used them.
- Reasons for use
 - Starting points “Citation offers a starting point from which to become really familiar with the history and information about GIS”
 - Further details “I wanted to receive more information about what ArcView has to offer.”
 - Clarification “I was curious to know about Ian McHarg. Confused because I thought he did something else.”



Reasons for non use

- Time constraints
- Information overload
- Uninteresting
- Familiarity
- Irrelevance
- Information elsewhere
- Technical problems



Cognitive Instruments

- Written comments analyzed in terms of five rudiments of cognition.
- These include:
 - Anxiety
 - Arousal
 - Attention
 - Motivation
 - Self-regulation



Summary

- Citations did not generate anxiety; links generated a greater negative or apathetic response
- Simplistic conclusion: citations and links don't arouse.
- In general citations didn't gain attention but when they did it was to trigger a memory recall function; some web links were successful in gaining attention
- Exploratory learning behaviors stimulated by self-regulation



Suggestions

- Categorization of links as required, recommended, optional
- Present citations and web links as web citations
- Highlight citations and web links distinctively
- Compile lists (Lists of examples)
- Integration of IT environments
- Rate the quality of the citations and web links



Limitations & Challenges

- Small study
 - Participation rates fluctuated
- Human subjects
 - Too many protocols
- Technical problems
 - Usage tracking with monitoring software turned did not really work
- Presentation of results
 - Negative findings about ICTs are not well received by anybody ☺
- Infrastructure for E-Learning research
- Collaborative research needs



Future work

- Expand the study
 - More students
 - More courses (and more of conscious design)
 - More disciplines
- Investigate options for partnering
 - CRITO
- Establish a test bed for e-learning (integrating digital libraries & learning)
 - SDSC + NSDL



Scholarly Communication

- Use of IT for scholarly communication
 - Invisible colleges
(communication colleges)
 - Specific technology: Digital Repositories – Open Access Archives
 - DLIST (Digital Library of Information Science & Technology)

<http://dlist.sir.arizona.edu/>



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The End!

- Thank you!
- Q & A
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