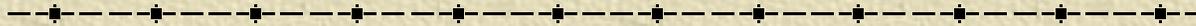




How Do Disciplines Grow?



By
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In the Beginning...

✦ Disciplines

◆ Modes of formation

- Agglomeration – loose subject bundles
- Loose assemblage – two phases in a document (s)
- Clustering – subjects are loosely focused on a nodal idea
- Distillation – segments of the parent discipline are distilled out
- Fusion – two disciplines form a new one

✦ Interdisciplinarity – viewpoint of many disciplines

✦ Scholarly Productivity – published literature

✦ Citation Analysis – who, what, where of citations

The History

✦ Research programs - Interdisciplinarity

◆ OECD (CERI), 1972

- *Interdisciplinarity: Problems of Teaching and Research in Universities*. Paris: OECD, 1972.

◆ Klein, 1990

- *Interdisciplinarity: History, Theory, and Practice*. Detroit, Wayne State Univ. Press, 1990.

◆ Lattuca, 2001

- *Creating Interdisciplinarity: Interdisciplinary Research and Teaching among College and University Faculty*. Nashville, Vanderbilt Univ. Press, 2001.

Productivity

✦ Scholarly productivity

- ◆ Research productivity
- ◆ Creative / Intellectual works
 - Publications
 - Patents
 - Performances

Citation Analysis - background

- ✦ Larger area: Bibliometrics, Informetrics, Scientometrics
- ✦ Newer areas: webometrics, e-metrics
- ✦ Scholarly communication, Scientific communication, Knowledge production
- ✦ Evaluation, Social issues (digital divide)

Citation Analysis - Definitions

- ✦ When document A is mentioned in document B, the mention is a citation
- ✦ Reference is sometimes a synonym for citation
- ✦ Example statements:
 - ◆ Doc. A receives a citation from Doc. B (Doc. B gives Doc. A as a reference)
 - ◆ Doc. A receives a reference from Doc. B (Doc. B refers to Doc. A)
 - ◆ Doc. A is cited by Doc. B (Doc. B cites Doc. A)

What is citation analysis?

- ✦ CA studies the citations to and from documents
- ✦ Units of analysis – observables may be documents themselves, or on such matters as their authors, the journals (when documents are journal articles) in which articles appear, organizations or countries in which documents are produced; the purpose of citations
- ✦ Data ranges from: format of materials cited, age of the cited materials, most frequently cited journals, most frequently cited individuals.

Types of citations

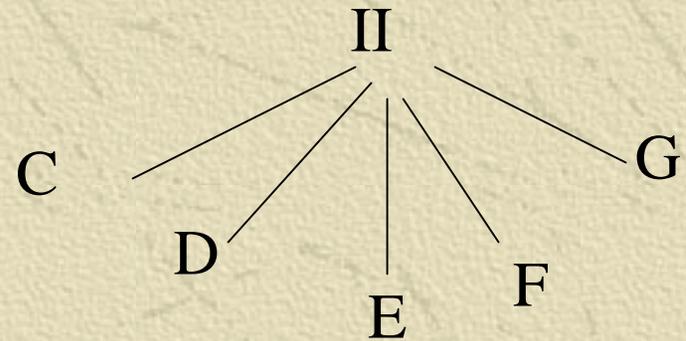
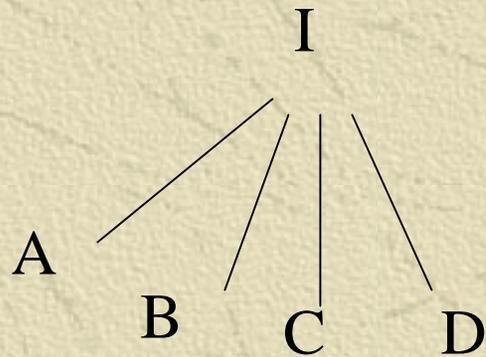
- ✦ Autocitation
- ✦ Allocitation
- ✦ Internal citation
 - ◆ Incomplete
 - ◆ Complete
- ✦ Outside citation
- ✦ Interjournal citation
- ✦ Intrajournal citation

Citation type (taxonomy)

✦ Normative theory of citing

- ◆ The assumption that an author cites another author for appropriate or useful reasons.
- ◆ Citation type (perfunctory, confirming) – related to why authors cite, use or misuse citations
- ◆ Norm of conduct in science (consensual conviction)
- ◆ Reward colleagues whose work they use by citing their work

Cocitation & Coupling



Doc. I cites A, B, C, D

Doc. II cites C, D, E, F, G

Many pairs of documents are co-cited – E+F by II, A+B by I, D+E by II, C+D by I & II

I and II are bibliographically coupled because they both cite C & D and they would still be bibliographically coupled even if they only cited C.

Cluster

-
- ✦ A collection of authors, documents, journals or other entities that share some characteristics
 - ✦ Cluster can be shown as a graph
 - ✦ A cluster or group may represent a subject specialty, school of thought, or research front
 - ✦ Examples: co-citation maps, dendograms

Examples

✦ Webometrics

- ◆ <http://hyperion.math.upatras.gr/webometrics/>
 - Co-citation matrix, clusters

✦ Journal Cocitation

- ◆ <http://dolphin.upenn.edu/~olson/anthrocite/>
 - Lists, tables, matrix, frequencies, correlations, clusters

✦ Information Visualization

- ◆ <http://www.dlib.org/dlib/october01/boyack/10boyack.html>

Research Design

- ✦ RQ: What is the intellectual structure of GIS, specifically with reference to information science versus information technology?
- ✦ Limitations: published, reviewed literature; no patents or other indicators
- ✦ Methods: citation analysis of Geographic Information Systems (Science) – GIS - literature

IS versus IT

- ✦ Are they the same?
- ✦ What are IS concepts and how are they different from IT?
- ✦ Controlled vocabulary is a central concept in IS; Information Management is a core idea in IT
- ✦ Medical Informatics structural relationships
 - ◆ Confluence of IS/IT with the research problems and applications within biomedical research, clinical practice, and teaching.

IS / IT Disciplines

- ✦ CS (Computer & Information Science)
- ✦ LIS (Library & Information Science)
- ✦ MIS (Management Information Systems)
 - ◆ <http://www.cgu.edu/is/> - Claremont
- ✦ GIS (Geographic Information Science)
- ✦ Medical Informatics - <http://www.amia.org/>
- ✦ BioInformatics (computational molecular biology) <http://bioinformatics.org/faq>

Information Systems



And Where Taught?

- Business
 - MIS
 - Management
 - Accounting
 - Decision Science
- CS/CIS
- Engineering/SE
- Library Science
- Social Work
- Technology
- Education
- Communications
- Design / Art
- Journalism
- ...

Nunamaker, 1996; Cohen, 1996

Literature Review

✦ Relationship between I Science & I System

◆ *Information Science and Information Systems: Conjoint Subjects & Disjunct Disciplines* by Ellis, Allen, Wilson, JASIS 50 (12): 1095-1107

- User studies
- Information Retrieval
- Information Systems

✦ “Relation between I Science and I Systems research would appear to be nonexistent.”

Researchers (Ellis study)

✚ Information Systems (IS) – cited in 850 journals

- ◆ Izak Benbasat, Neils Bjornandersen, Peter Checkland, Claudio Ciborra, Michael Earl, Rob Galliers, Rudy Hirschheim, Blake Ives, Michael Jackson, Rob Kling, Kenneth Kraemer, Albert Lederer, Kalle Lyytinen, Lynne Markus, Franklin Warren Mcfarlan, John Mingers, Enid Mumford, Wanda Orlikowoski, N. Venkatraman, Geoff Walsham, John Ward, Charles Wiseman, Rob Zmud.

✚ User Studies (US) -

- ◆ Thomas Allen, Marcia Bates, Michael Brittain, Brenda Dervin, David Ellis, William Garvey, Belver Griffith, Carol Kuhlthau, Maurice Line, John Martyn, William Paisley, Robert S. Taylor, Gernot Wersig, Tom Wilson

✚ Information Retrieval (IR)

- ◆ Micheline Hancock-Beaulieu, Nick Blkin, Bertie Brookes, Cyril Cleverdon, Bruce croft, Carolos Cuadra, Stephen Harter, Peter Ingwersen, Fred Lancaster, Stephen Robertson, Gerry Salton, Tefko Saracevic, Alan Smeaton, Karen Sparck-Jones, Keith van Rijsbergen, Brian Vickery, Peter Willett.

Geographic Information Science (Systems)

✦ Is it a tool or a science?

- ◆ Michael F. Goodchild

- ◆ NCGIA Core Curriculum

- ◆ <http://www.ncgia.ucsb.edu/giscc/>

- Information organization and data structure
- Non-spatial database models (DBMS)

- ◆ Old and new NCGIA curriculum

Methods



Citation analysis of GIS

- ◆ JCR
 - Identify core journals
- ◆ ISI indexes (SCI, SSCI)
 - 1980 – 2001
 - Download citations in subject categories related to GIS
 - ◆ Geography, Physical
 - ◆ GeoSciences, Multidisciplinary
 - ◆ Computer Science, Interdisciplinary Applications
 - ◆ Remote Sensing

Types of data collected

- ✦ Concepts (topics; Hot Topic Index)
- ✦ Types of concepts (traditional classification)
- ✦ Coherence
- ✦ Difference
- ✦ Cited
- ✦ Non-cited
- ✦ Others: Publication age, author affiliation, funding, collaboration

Results

- ✦ Maps of concepts, concept categorizations, and research specializations
 - Visual representation of the pattern of proximities;
Classification of IS/IT knowledge structures in GIS
- ✦ Methodology for mapping research fronts in IS-IT intensive interdisciplinary fields (an index/indicators that correlate IS-IT concepts to discipline formation, interdisciplinarity, and integrative maturity of the discipline)

Citation Tools & Databases

✦ ISI Web of Science

- ◆ Citation Indexes
- ◆ Journal Citation Reports

✦ Autonomous Citation Indexing

- ◆ CiteSeer (Research Index)

✦ ACM Portal (ACM DL)

- ◆ Forward linking

Limitations & Considerations

- ✦ Big and unmanageable to do all GIS
- ✦ Could I limit by using Digital Libraries?
- ✦ Limit or explore using Hot topics – technologies like BlueTooth

The End! Thank You!!

