Exploring Disciplinarity

JSMF Workshop on Standards for Science Metrics, Classifications, and Science Mapping

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Conceptualizations

Social
“a recognized community of researchers”

Communicative
“established manner for communication their findings”

Cognitive
“coherence of content”

Methodological
“finite set of methods of inquiry”

Institutional
“group of institution that persist and remain stable over time”

Educational
“a system for perpetuating the discipline by training new practitioners”
The disciplinary diversity of an article was constructed from the distribution of ISI SCs in the references of an article. "Rafols and Meyers, 2010"

"...the Gini coefficient can be considered as an indicator of disciplinarity..." Leydesdorff and Rafols, 2010

If we assume that textbooks represent the content of the core of a discipline, we may examine references in a textbook to describe the nature of that core."
## Table 1: Cognitive Science

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of factors</th>
<th>Number of journals</th>
<th>Rank of core factor</th>
<th>Rank of core journal</th>
<th>Explained variance</th>
<th>Explained variance factor 1</th>
<th>Main factors²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1982</td>
<td>7</td>
<td>21</td>
<td>1</td>
<td>3/8</td>
<td>26.2</td>
<td></td>
<td>CP (incl. CogS), P, CDP, Phil, AI (single)</td>
</tr>
<tr>
<td>1984</td>
<td>12</td>
<td>40</td>
<td>1</td>
<td>13/13</td>
<td>22.4</td>
<td></td>
<td>CP (incl. CogS), Phil, IS&amp;CS, AI &amp; PR, Communication</td>
</tr>
<tr>
<td>1986</td>
<td>11</td>
<td>29</td>
<td>1</td>
<td>8/8</td>
<td>21.5</td>
<td></td>
<td>CP, CDP, AI, EP, IS, Language, CogS</td>
</tr>
<tr>
<td>1990</td>
<td>10</td>
<td>38</td>
<td>3</td>
<td>3/5</td>
<td>8.8</td>
<td>19.5</td>
<td>CP, CDP, AI (incl. CogS), BS, Linguistics, EP</td>
</tr>
<tr>
<td>1992</td>
<td>12</td>
<td>44</td>
<td>4</td>
<td>4/4</td>
<td>7.6</td>
<td>20.3</td>
<td>CP, AI, NN, CogS, EP, BS,</td>
</tr>
<tr>
<td>1994</td>
<td>17</td>
<td>61</td>
<td>5</td>
<td>4/4</td>
<td>5.4</td>
<td>18.2</td>
<td>CP, HCI/AI, EP, NN (inc SN), AI (incl CogS), CDP, Linguistics, CS/MIS</td>
</tr>
<tr>
<td>1996</td>
<td>18</td>
<td>71</td>
<td>12</td>
<td>3/3</td>
<td>2.9</td>
<td>15.8</td>
<td>CP, AI, NN, BBS, CDP, Instruction (incl. CogS), Ergonomics, CD,</td>
</tr>
<tr>
<td>1998</td>
<td>13</td>
<td>50</td>
<td>1</td>
<td>11/11</td>
<td>3.7</td>
<td>15.7</td>
<td>CP (incl CogS), AI, EP, SN, NN, CDP, HCI</td>
</tr>
</tbody>
</table>

1. Core journal is *Cognitive Science*. Threshold = 0.5%; this means that all journals are included with at least either 0.5% of the total number of references in that year to the core journal, or 0.5% of all citations by the core journal. Analysis: Principal component analysis, Varimax, Kaiser rotation.

Conceptualization

Social

Communicative

Cognitive

Methodological

Institutional

Educational

Trace

University Website

Pub. Index (journal, ISI SCI, conf. proceeding, etc.)

Listserv

Association Index (lab, professional, etc.)

Social Network Profile

Syllabus

Report (Grant, etc.)

Thesis / Dissertation

Publication

Patent

Discipline

list of publications, authors, date

university affiliations, email texts, subscribers, dates

disciplinary identity / mission statement, member list

friends/coworkers/connections, interests, locations, dates, affiliations, publications

references, instructors, full text

authors/collaborators, text descriptions, titles, budget, locations, publications, patents

title, abstract, full text, author, advisor / committee members

references/citations, authors, abstract, date, full text, title, location, acknowledgements

references/citations, full text, inventors, dates

faculty, degrees, publications, ideas, journals, departments

Analysis

Content

Word/Language

Citation

Mentorship

Collaboration

Weblink

Associative

Entities

Betweenness Centrality as an Indicator of the Interdisciplinarity of Scientific Journals

Leydesdorff, 2007
FIG. 8. Betweenness centrality among the 40 journals in the citation environment of *Social Networks* using exclusively the *Social Sciences Citation Index* as a database (cosine $\geq 0.2$).
Conceptualization

- Social
- Communicative
- Cognitive
- Methodological
- Institutional
- Educational

Trace

- University Website
- Pub. Index (journal, ISI, SC, conf. proceeding, etc.)
- Listserv
- Association Index (lab, professional, etc.)
- Social Network Profile
- Syllabus
- Report (Grant, etc.)
- Thesis / Dissertation
- Publication
- Patent
- Discipline

Content

- Word/Language
- Citation
- Mentorship
- Collaboration
- Weblink
- Associative

Entities
Fig. 1. Intra-UCM collaboration rate in the scientific publications of the main schools (1994-96)
Interdisciplinarity in LIS

1930s 1940s 1950s 1960s 1970s 1980s 1990s 2000s

<table>
<thead>
<tr>
<th>Year</th>
<th>LIS</th>
<th>NonLIS</th>
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</thead>
<tbody>
<tr>
<td>1930s</td>
<td>12%</td>
<td>88%</td>
</tr>
<tr>
<td>1940s</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>1950s</td>
<td>65%</td>
<td>35%</td>
</tr>
<tr>
<td>1960s</td>
<td>65%</td>
<td>35%</td>
</tr>
<tr>
<td>1970s</td>
<td>68%</td>
<td>32%</td>
</tr>
<tr>
<td>1980s</td>
<td>69%</td>
<td>31%</td>
</tr>
<tr>
<td>1990s</td>
<td>62%</td>
<td>38%</td>
</tr>
<tr>
<td>2000s</td>
<td>59%</td>
<td>41%</td>
</tr>
</tbody>
</table>

Percentage of advisorships

1930s 1940s 1950s 1960s 1970s 1980s 1990s 2000s

<table>
<thead>
<tr>
<th>Year</th>
<th>LIS</th>
<th>NonLIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930s</td>
<td>25%</td>
<td>75%</td>
</tr>
<tr>
<td>1940s</td>
<td>64%</td>
<td>36%</td>
</tr>
<tr>
<td>1950s</td>
<td>40%</td>
<td>60%</td>
</tr>
<tr>
<td>1960s</td>
<td>52%</td>
<td>48%</td>
</tr>
<tr>
<td>1970s</td>
<td>52%</td>
<td>48%</td>
</tr>
<tr>
<td>1980s</td>
<td>53%</td>
<td>47%</td>
</tr>
<tr>
<td>1990s</td>
<td>46%</td>
<td>54%</td>
</tr>
<tr>
<td>2000s</td>
<td>44%</td>
<td>56%</td>
</tr>
</tbody>
</table>

Percentage of committeeships
Committee member trends

The vision

1. Improved connections between conceptualizations and operationalizations in studies of knowledge

2. Large-scale utilization of academic genealogy as an indicator for the birth, maturation, and interaction of disciplines

3. Holistic metrics for identifying points of emergence, stability, fragmentation, and decline of disciplines