Knowledge Domain Visualizations

Research Interests

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• Cognitive Justification for Domain Maps
• Pedagogical Use of Domain Maps
• User Testing of Domain Maps
• History of Domain Maps
• Mapping Legal Topics
Descriptive → Scientific Cartography

Prior to the 1600’s cartography was predominately descriptive. Advances in calculating location on the planet made it scientific.

- Triangulation over large distances from a known base measure.
- Using the moons of Jupiter to establish longitude on land.
- Using accurate time pieces to establish longitude at sea.
- Accurately measuring depth and altitude, and representing them on maps.

The same is now occurring with domain maps.

- We had descriptive maps for a long time.
- Now they have become methodologically rigorous and scientific.
1870

- The mapping of India by triangulation.
- Captain George Everest


1696

- First Accurate Map of the Earth
- 40 points of accurate longitude
- Based on Moons of Jupiter to compare with local time in Paris.
- Cassini.

Pre-Bibliometric History

Domain Maps utilizing the distance—similarity metaphor for non-spatial data are created by hand based on the viewpoint and experience of the creator.


Madeleine de Scudéry (b. 1607-d. 1701), Clélie, histoire romaine, première partie (Clélie: A Roman Story, part I), Paris, 1654, Reserve of Rare and Precious Books, Rés. Yý: 1496

“Madeleine de Scudéry’s novel, Clélie, served as pretext for the description of acquaintances, stately residences, and palaces, and for dialogues based on actual conversations of her salon. The most immediate stir was created by the Carte du tendre (Map of Affection), engraved by François Chauveau and inserted in the first part of the novel. A salon game, the Map sparked a fad for “amorous geography” that took the form of allegorical almanacs and imaginary maps.”
1794
Map of the Various Paths of Life, Benjamin Johnson, Philadelphia, 1805, originally published as a jigsaw puzzle in 1794, Map Collection, Yale University Library.


1939
John D. Bernal was a world renowned physicist, a historian of science, and a sociologist of science. He is considered to have produced one of the first ‘maps’ of science.


1895 – Paul Otlet realizes that Melvil Dewey’s Decimal Classification could be used to map knowledge domains. Begins work on converting Dewey’s system into the more faceted Universal Decimal Classification (UDC).

1918 – Otlet states again that the UDC may be used to create “an immense map of the domains of knowledge” (Otlet, 1918, p. 78).

1965 – Derek De Solla Price - published contemplation of using bibliometric techniques to create maps of scientific literatures.


**Historiograph of DNA Development**

*Garfield, Sher, & Torpie, 1964*

“The Use of Citation Data in Writing the History of Science.” Published by The Institute for Scientific Information, December 1964. Report of research for Air Force Office of Scientific Research under contract F49(638)-1256.

Eugene Garfield, recent photo. Creator of the ISI Web of Science citation database.

http://www.garfield.library.upenn.edu/
Using Co-Citation to create domain maps.


Shepard’s Citations

• 1875, Frank Shepard published his first citator, Illinois Citations.

• He was a business person with no legal training.

• Manual Hyperlinks.
<table>
<thead>
<tr>
<th>History of Case</th>
<th>Treatment of Case</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a</strong> (referred)</td>
<td>The court is disagreeing with the conclusion of your decision, although the court may not have the jurisdiction or the authority to completely correct the procedural error.</td>
</tr>
<tr>
<td><strong>b</strong> (distinguished)</td>
<td>The case is different from your case in significant aspects. It cannot be directly applied in its entirety.</td>
</tr>
<tr>
<td><strong>c</strong> (rejected)</td>
<td>The court is not going to accept your position.</td>
</tr>
<tr>
<td><strong>d</strong> (harmonized)</td>
<td>The courts differ on the same point, but the court finds a way to harmonize the differences.</td>
</tr>
<tr>
<td><strong>e</strong> (rejected)</td>
<td>Your opinion is not the final word.</td>
</tr>
<tr>
<td><strong>f</strong> (dismissed for lack of jurisdiction)</td>
<td>The court is not going to accept your opinion.</td>
</tr>
<tr>
<td><strong>g</strong> (overruled)</td>
<td>The court has decided that the reasoning in your case is no longer sound, either as part of or in its entirety.</td>
</tr>
<tr>
<td><strong>h</strong> (parallel)</td>
<td>This letter is usually found in other cases where your case was described as &quot;on all four&quot; or &quot;sympathetic&quot; to the citing case. Your case is being relied upon as a controlling or persuasive authority.</td>
</tr>
</tbody>
</table>
Garfield’s Model For ISI

• And in 1953 I learned, through William C. Adair, a former vice president of Shepard’s Citations, that there was an index to the case literature of the law that used citations. Shepard’s Citations is the oldest major citation index in existence; it was started in 1873 to provide the legal profession with a tool for searching legal decisions. …

The legal “citator” system provided a model of how a citation index could be organized to function as an effective search tool.


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Google: PageRank Relevance Algorithm

• Developed by Stanford PhD Computer Science Students in 1996

• Larry Page and Sergey Brin

• “Inspired by citation analysis, Page theorized that a raw count of links to a page would be a useful guide to the page’s rank.”

Legal Citation Practices

Law -- Attribution with Precision

• Legal style guide for citations is a 300+ page book known as the Bluebook

• Tradition of Student Edited Journals

• Extensive Cite Checking and Validation

• Does Not Rest on the Credibility of the Author

• Every non-obvious original thought is attributed to a specific page or paragraph.
Example Citations (Case)


- Even assuming that those decisions meant to refer literally to the Taking Clause of the Fifth Amendment, and therefore stand for the proposition that regulation may effect a taking for which the Fifth Amendment requires just compensation, see *San Diego*, 450 U.S. at 647-653, 101 S.Ct. at 1302-1304 (dissenting opinion), and even assuming further that the Fifth Amendment requires the payment of money damages to compensate for such a taking, the jury verdict in this case cannot be upheld.

Cognitive Justification and Pedagogy


Benefits of the Big Picture

• Provides a structure or scaffolding that students may use to organize the details of a particular subject.

• Information is better assimilated with the student’s existing knowledge.

• Visualization enhances recall.

• Makes explicit the connections between conceptual subparts and how they are related to the whole.

• Helps to signal to the student which concepts are most important to learn.
While grouped in different West categories (blue = Crimes, green = Remedies), it appears that Criminal Law more closely relates to some Remedies topics than Crimes topics.
Frequency of Voting Blocks in 5-4 Cases (1994 -2003 Supreme Court Terms)

ALL OTHER GROUPINGS OF 5 (34 different groupings) (Highest repetition – 3 times)

Total 5 to 4 Cases = 175

Source: Statistics harvested from the Harvard Law Review

July 2, 2005 New York Times
Towards An Interactive Learning Environment

The End