Measuring the Interdisciplinarity of Technology based on Knowledge Flows in Patents: a Case Study in Synthetic Biology

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With the rapid economic growth and the changing social needs, more and more complex problems need to be solved through interdisciplinary collaborative research.

In the field of technology, the diversity of disciplines, as an important means to promote innovation, can provide the source of power for technological integration and technological evolution, but also provide important strategies for the sustainable development of society.

Despite much research on the interdisciplinarity of publications across subject categories, few studies analyze the interdisciplinarity of technology from the perspective of knowledge flows.

Technological boundaries have become blurred, and thus remarkable inventions are appearing less within a single technological field and rather more between technological fields.

Lai and Liu (2009) confirmed that a citation carries an implied knowledge flow between the citing article and the cited article. Knowledge flow has two ends: a knowledge provider and a knowledge consumer (Zhang et al., 2013).
**Methods**

Data

- target patents (main patents) and citation information (cited patents & citing patents)

**Generating a knowledge flow map between technology categories**

- IPC code extraction
- IPC code cleaning
- IPC code citation matrix generation
- Technology category citation matrix
- Knowledge flow map

**WIPO “IPC-Technology Concordance Table (2014)”**

**Visualization Tool**

(Gephi: https://gephi.org)

**Measuring the technological interdisciplinarity of research entities**

**Indicators for measuring the technological interdisciplinarity of research entities**

- Integration index (I)
- Diffusion index (D)
- Specialization index (S)

**Dataset A**

**Dataset B**

**Dataset C**

**Technology knowledge flow matrix**

**Technology interdisciplinary indexes**

**Technology knowledge flow matrix**

**Further analysis**

**Technology interdisciplinary impact (II)**

- Low II
- High II

**Technology knowledge flow**

- Rately involved in technology knowledge flow
- Actively involved in technology knowledge flow

**Technology knowledge consumer**

- Rately involved in technology knowledge flow
- Actively involved in technology knowledge flow

**Technology knowledge provider**

- Rately involved in technology knowledge flow
- Actively involved in technology knowledge flow
Conclusion and Discussion

- Synthetic biology is an actively interdisciplinary technology, both with its origins in a number of technology categories, and because it also provides feedback to those categories.

- The research entities in this technical field play different roles in the process of technology knowledge flows.

**Contributions:**
Results suggest that this method is valid and could become the basis of a system for assessing technological interdisciplinarity of research entity to further guide the creation of new inventions by converging prominent technologies beyond technology field boundaries.

**Limitations:**
- Don’t distinguish citation between applicants and examiners
- Citing information will change over time, the diffusion indexes also will change accordingly
Thanks you for your attention!

Question & Comments

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