

CS5056 Data Analytics SNA – Case Study



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Summary

- ▶ **Purpose:** Assessment of the Research Policy of Tecnológico de Monterrey.
- ▶ **Data:** 15 years of history in CRIS-Tec (2,400 researchers, 24,000 publications in 15 disciplines)
- ▶ **Techniques:** Social Network Analysis, Scientometric indicators, Longitudinal Analysis.
- ▶ **Results:** collaboration intensified and research performance improved along time.

Introduction

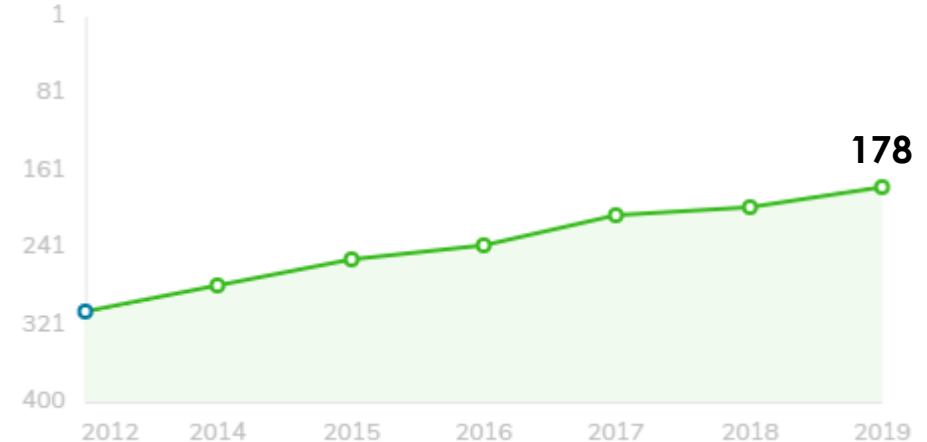
- ▶ Research as strategy for improving on University Rankings.
- ▶ Collaboration at university fosters productivity and knowledge transfer.
- ▶ Research Groups for resource allocation and performance evaluation.

QS World University Ranking

Chart

Data

○ Starting Rank ○ Ranked Higher ○ Ranked Lower



Data sources

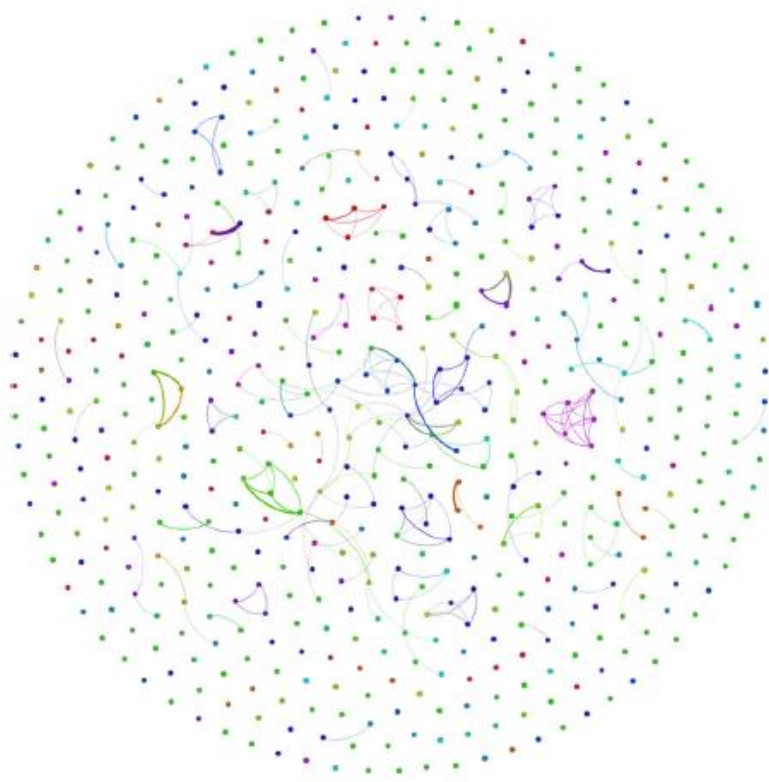
- ▶ CRIS-Tec: Current Research Information System
 - ▶ 15 years and include 24,844 publications by 2,401 researchers
 - ▶ 15 disciplines in 5 broad research areas: Life Science, Natural Science, Engineering, Social Science and Management, and Arts and Humanities
- ▶ Web Of Science: publications and citations.

Methodology

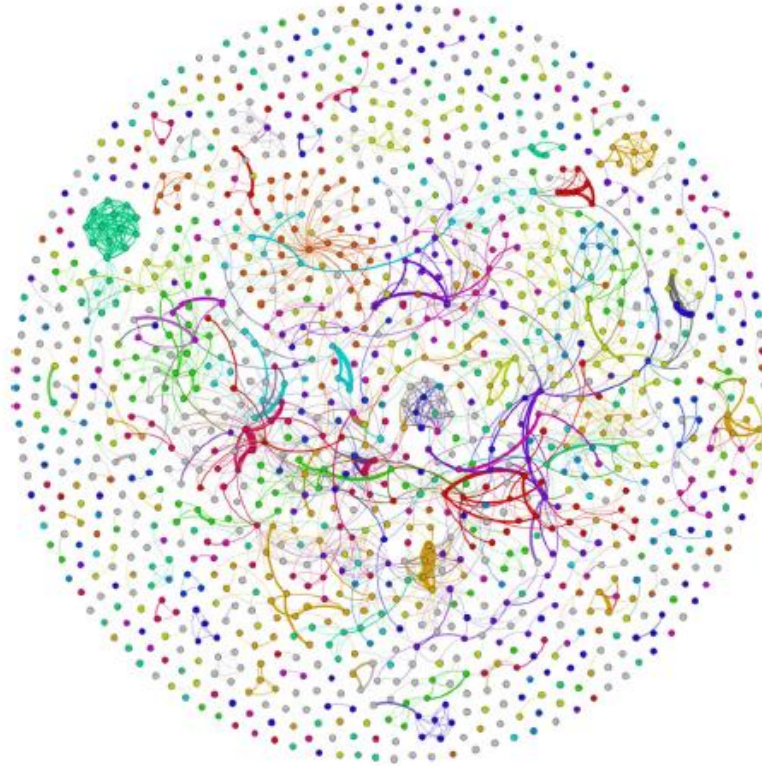
- ▶ Longitudinal: 2000–2002, 2003–2005, 2006–2008, 2009–2011, and 2012–2014 (five triennia).
- ▶ Collaboration indicators
 - ▶ Coauthorship networks
 - ▶ SNA metrics: Modules
- ▶ Scientific Productivity indicators
 - ▶ Documents
 - ▶ Citations per document (impact)

Internal scientific collaboration

a Internal collaboration by author 2000-2002



a Internal collaboration by author 2009-2011



Coauthorship network

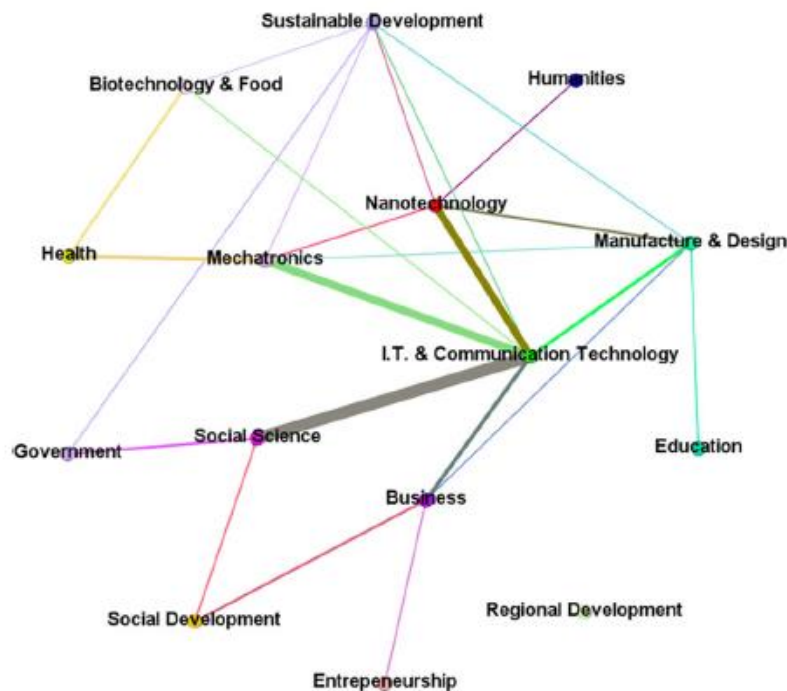
- **Nodes:** Researchers
- **Edges:** coauthorships
- **Edge weight:** collaboration intensity

SNA Metrics

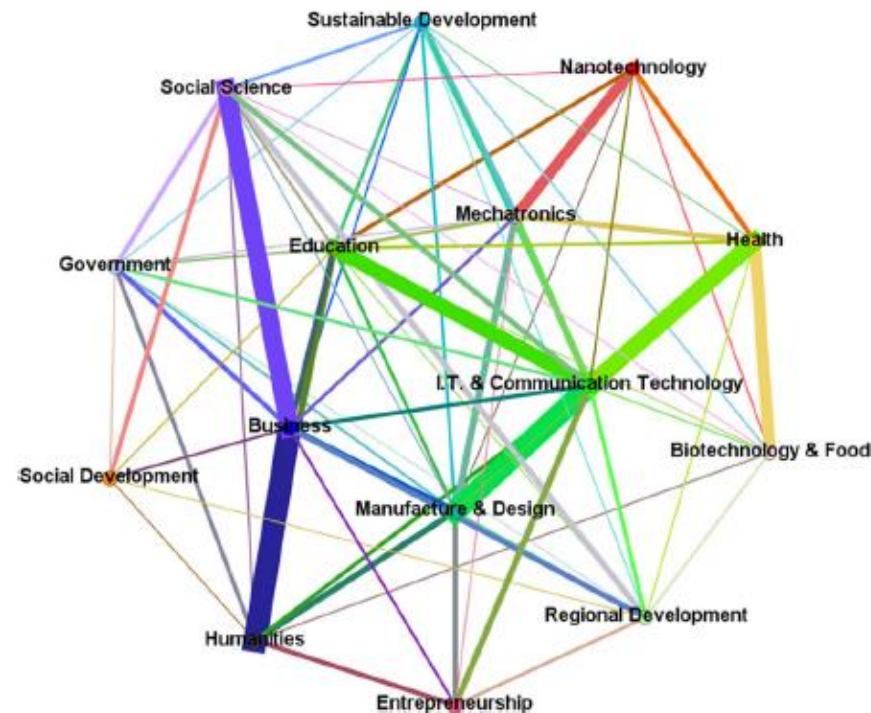
- Modules
- Clustering coefficient
- Average Weighted Degree
- Isolated nodes

Multidisciplinary collaboration

b Internal collaboration by area 2000-2002



b Internal collaboration by area 2009-2011



Disciplinary network

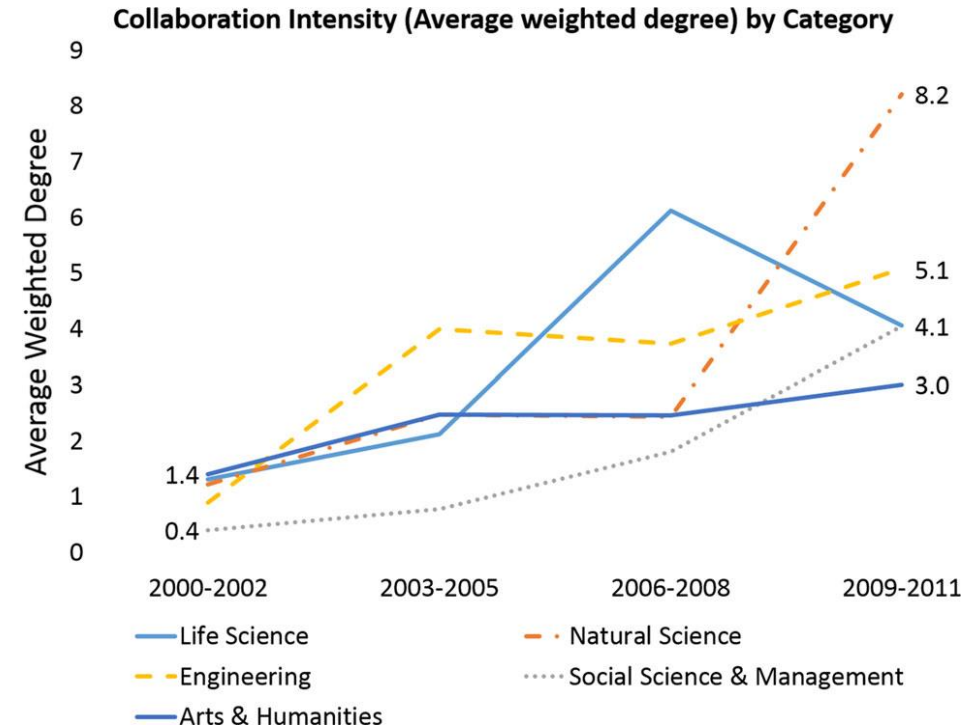
- **Nodes:** Researchers of a Discipline
- **Edges:** coauthorships
- **Edge weight:** collaboration intensity

SNA Metrics

- Clustering coefficient
- Average Weighted Degree
- Isolated nodes

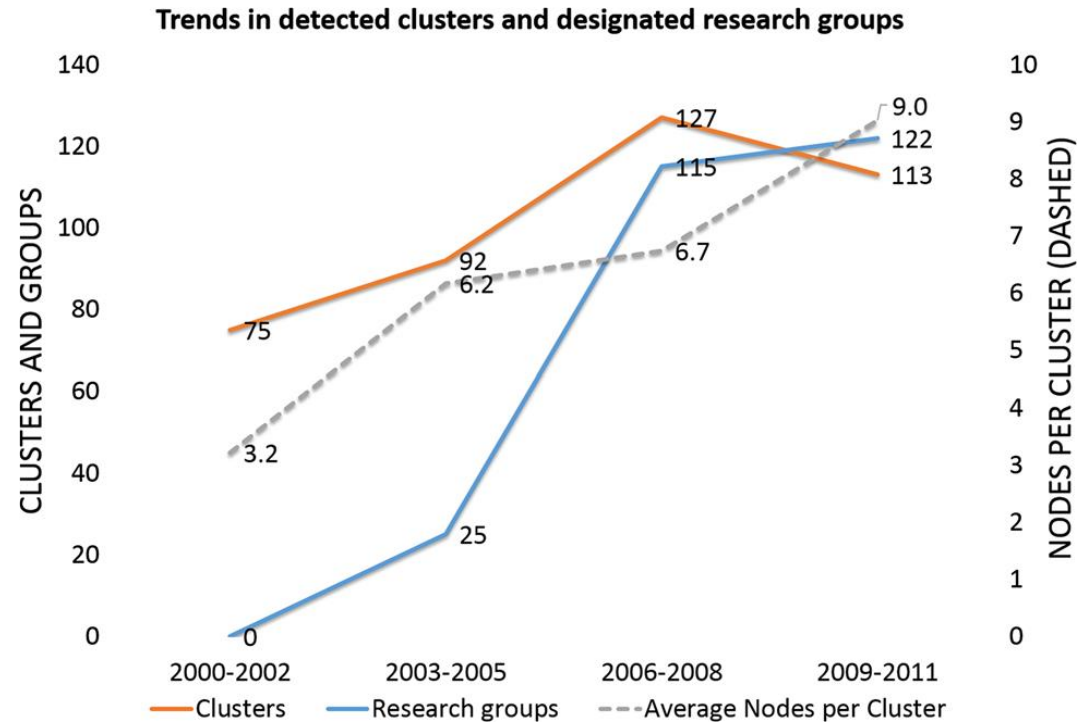
Quantitative assessment of collaboration

- ▶ The average weighted degree indicates how many papers were published in coauthorship by researchers of a given field.
- ▶ Each discipline has a different collaboration pattern (e.g. Arts & Humanities).



Formal vs informal groups

- ▶ The number of formal research groups increased over time.
- ▶ Informal collaboration (clusters) existed before formal groups.
- ▶ Nevertheless, the number of researchers per cluster was small and increased because of the formation of formal groups.



Presenting information from multiple data sources

- ▶ WoS and CRIS have different figures for the same institution.
- ▶ We demonstrated representativeness of CRIS data in regard to WoS for validating our results.

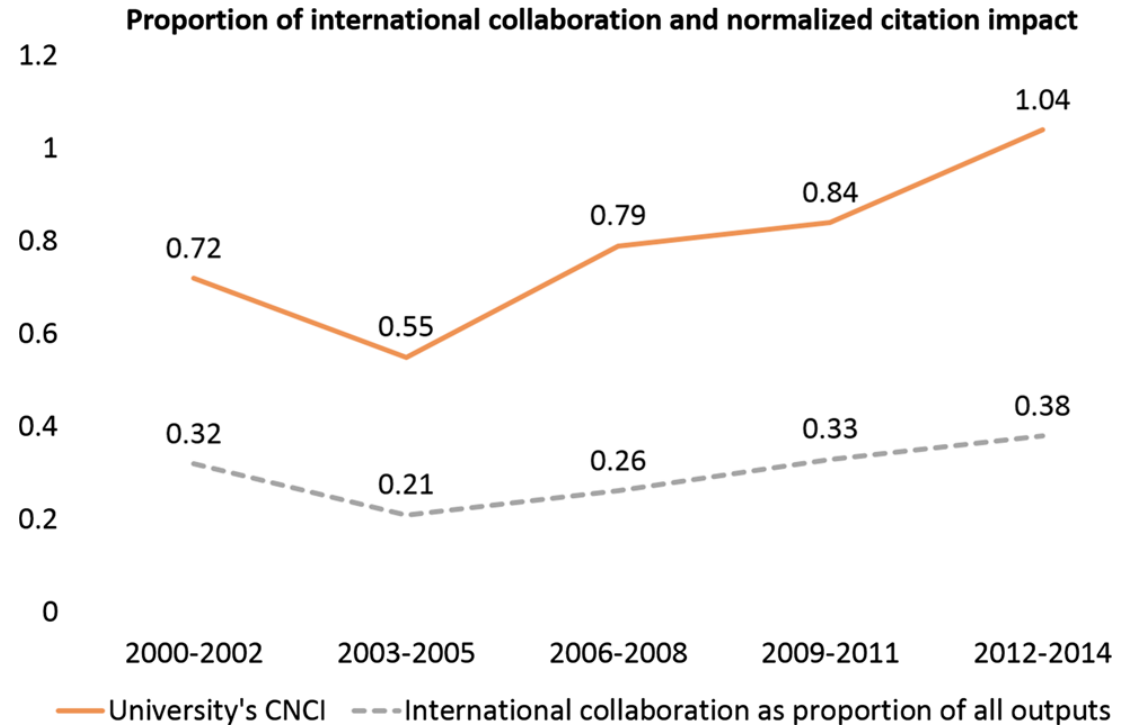
Table 1 Scientometric outputs from Web of Science and CRIS

	2000–2002	2003–2005	2006–2008	2009–2011	2012–2014
WOS documents	234	514	659	734	1152
WOS citations	2628	4101	5684	5267*	5089*
CRIS journal articles	436	862	1348	1699	NA
CRIS conference proceedings	1059	1904	1907	1966	NA
CRIS books	103	159	308	408	NA
CRIS books chapters	150	337	682	768	NA

*Citations naturally take several years to accumulate, and these marked figures will continue to rise

Impact and International collaboration

- ▶ The more international collaboration, more impact.
- ▶ The number of papers increases, but international collaboration grows as well.
- ▶ Is international collaboration the only cause?



Final remarks

- ▶ We demonstrated the effectiveness of the research policy implemented in Tecnológico de Monterrey between 2003 and 2014.
 - ▶ Formal Groups → Collaboration → Impact → Rankings
- ▶ We compared two data sources (without merging data), by observing the variations on collaboration (CRIS) and impact (WoS).
- ▶ Longitudinal analysis permitted to attribute these changes to the implementation of the policy (causal effect).

Reference

Héctor G. Ceballos, James Fangmeyer Jr., Nathalíe Galeano, Erika Juarez & Francisco J. Cantu-Ortiz (2017). **Impelling research productivity and impact through collaboration: a scientometric case study of knowledge management**, Knowledge Management Research & Practice, 15:3, 346-355, DOI: 10.1057/s41275-017-0064-8