Industry 4.0
Mapping the Structure and Evolution of an Emerging Field

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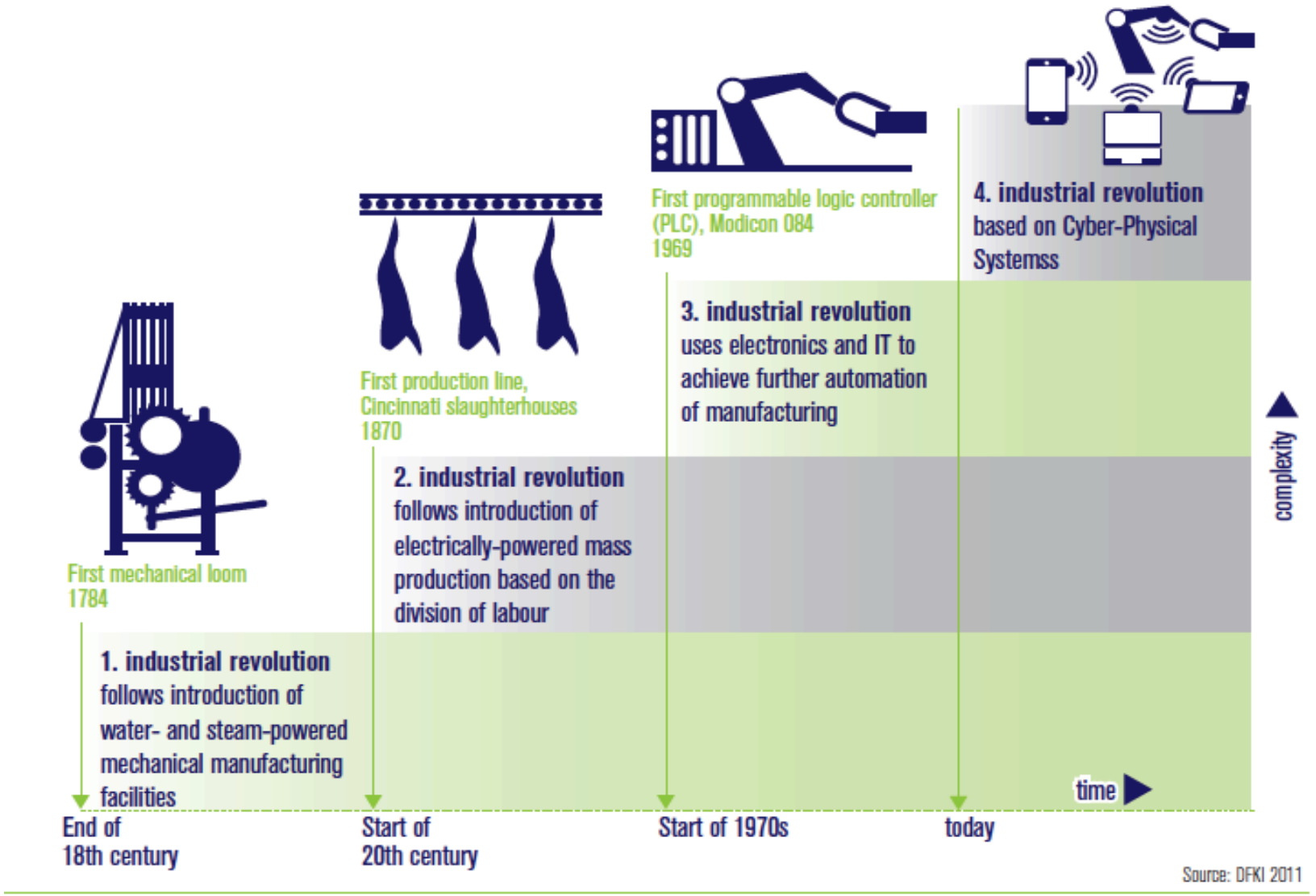
Outline

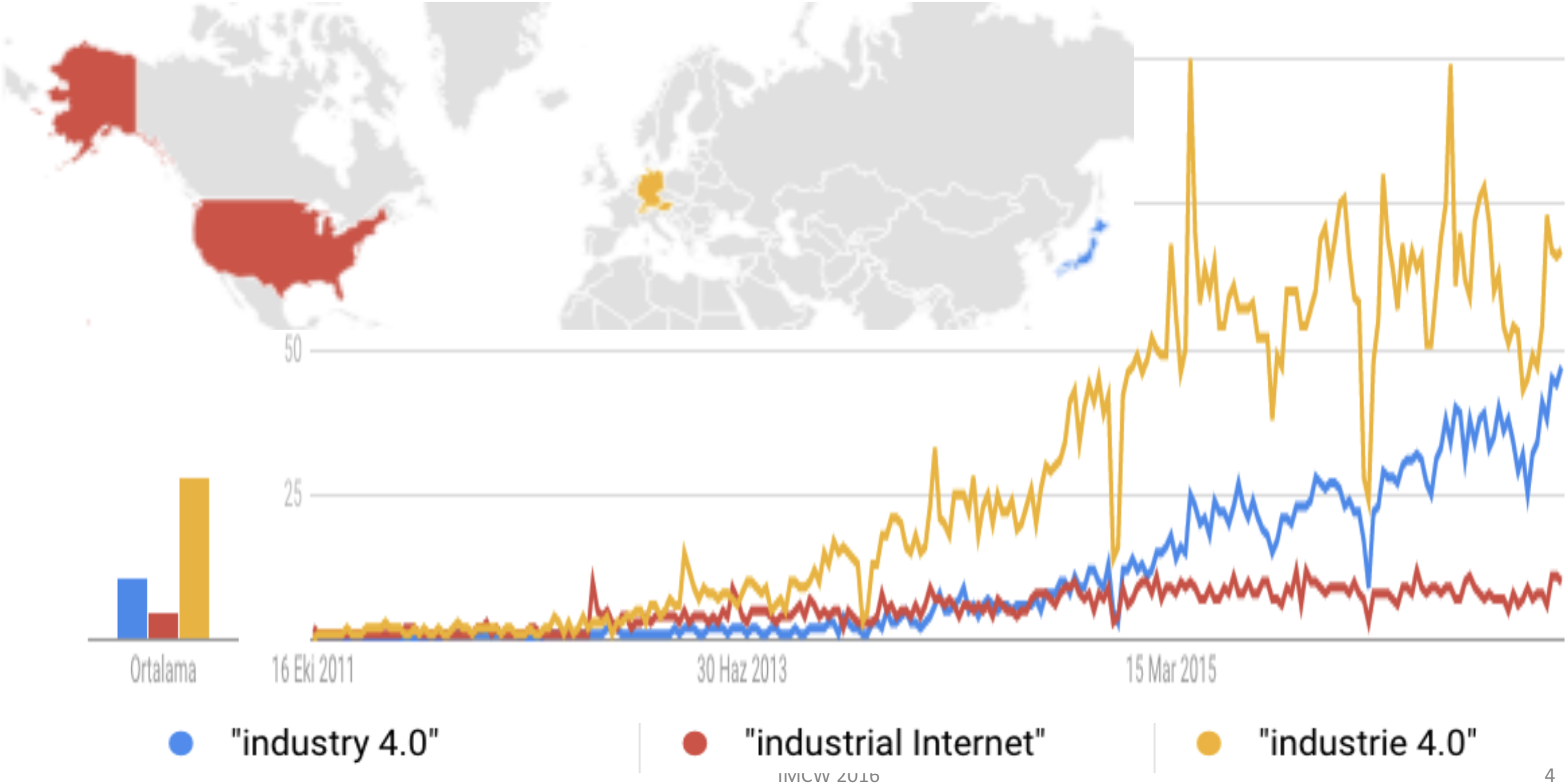
- Introduction to Industry 4.0
- Research Question and Method
- Findings
- Conclusions

Four Stages of Industrial Revolution



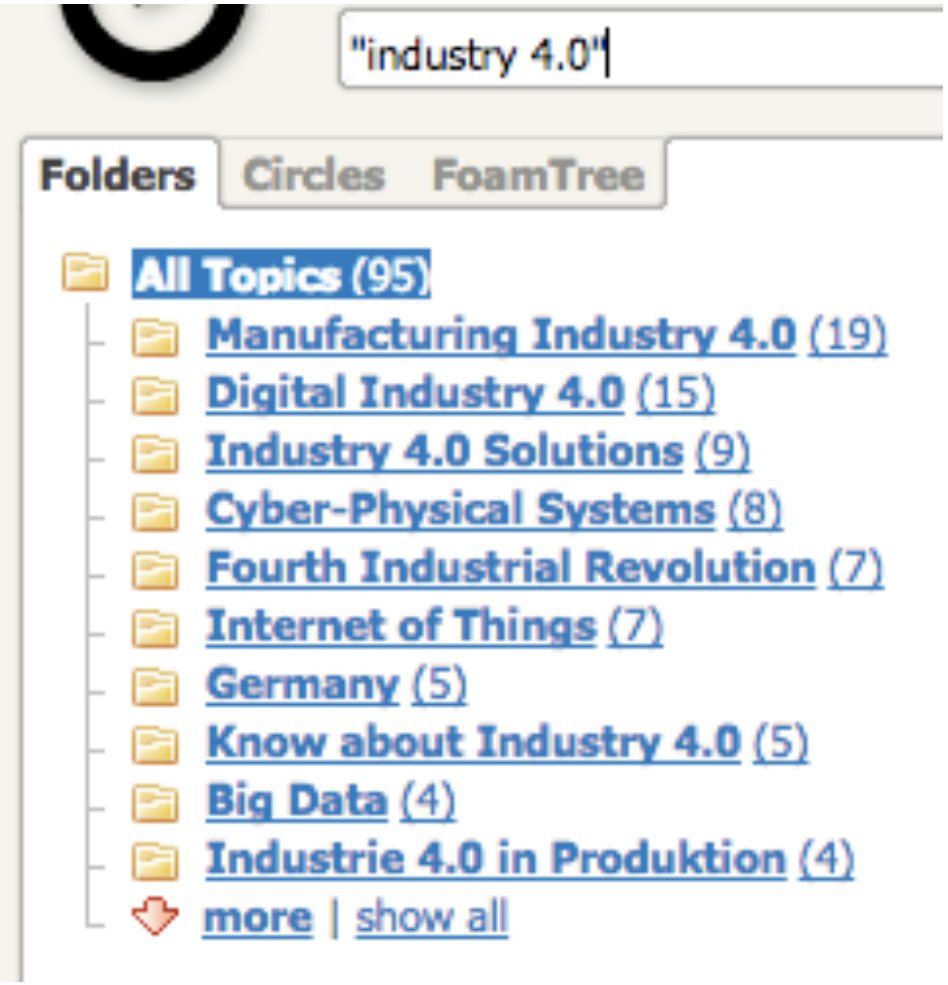
Source: Kagermann et al., 2013, p. 13

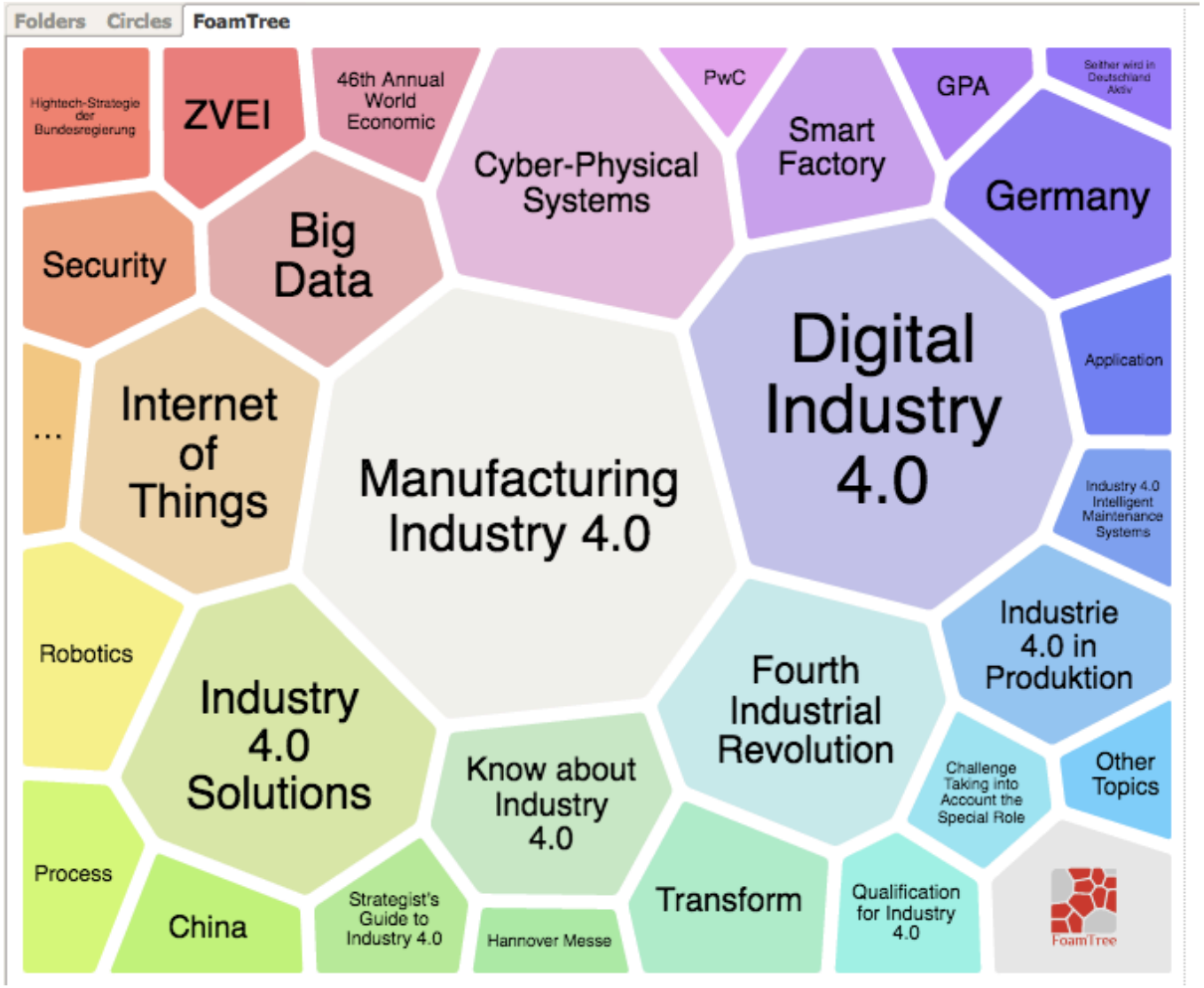
“Industry 4.0”/ “Industrie 4.0” vs. “Industrial Internet”



Source: https://www.google.com/trends/explore?q=%22industry%204.0%22,%22industrial%20Internet%22,%22industrie%204.0%22 (Oct. 11, 2016)

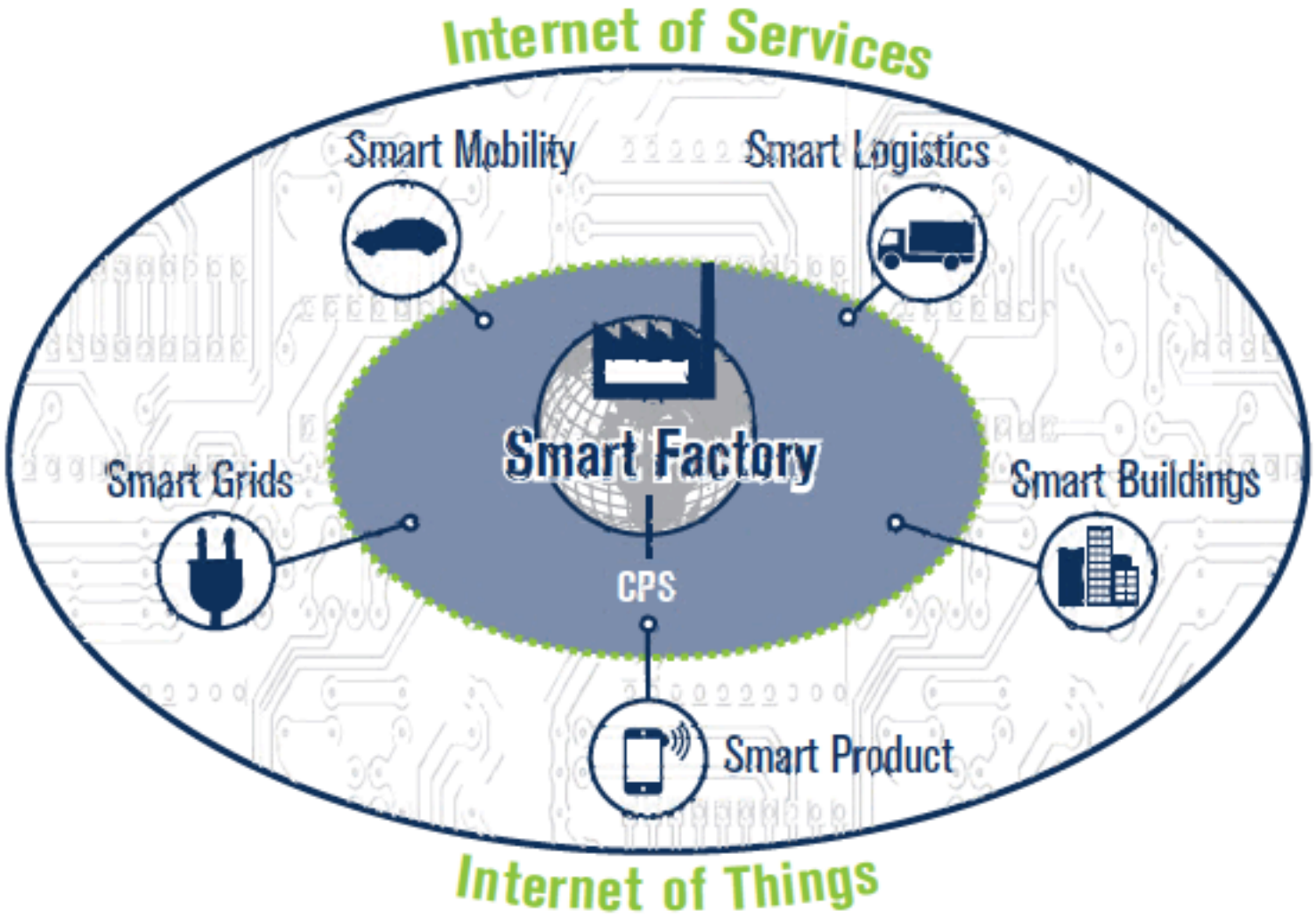
“Industry 4.0” on Carrot Search





Source: http://search.carrot2.org/ (Oct. 11, 2016)

Industry 4.0 and smart factories as part of the Internet of Things and Services



Source: Kagermann et al., 2013, p. 19

Industry 4.0 keywords and concepts

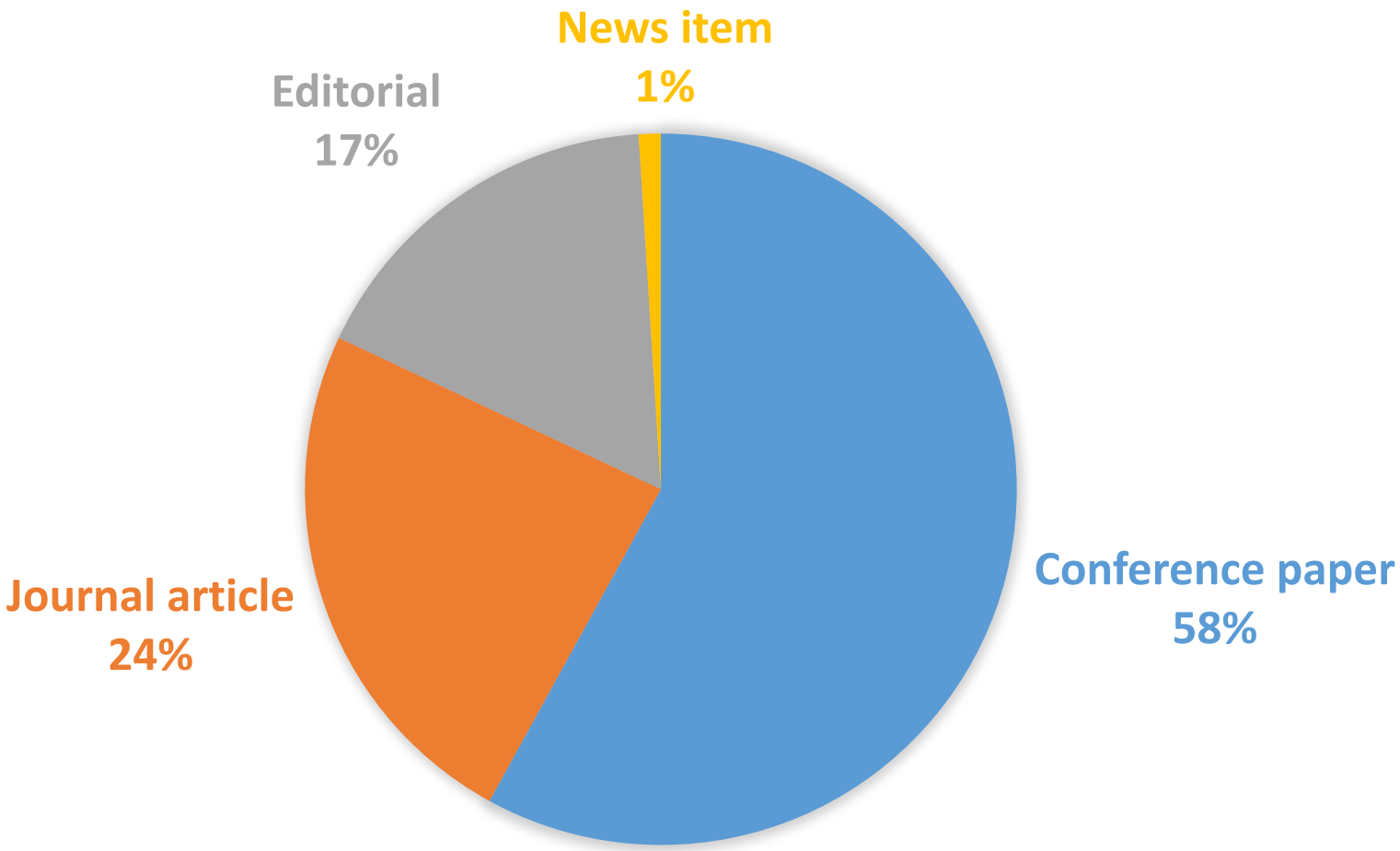
- CPS, IoTS, SF
- Smart grids, smart products, smart buildings, smart logistics, smart mobility, smart factories
- Intelligent technical systems, cloud-based design, big data analytics, cloud computing, predictive manufacturing

Research Question and Method

- Emergence of a new field: Industry 4.0
- Its intellectual structure and interactions with other disciplines
- Data: Thomson Reuters' Web of Science (1945-2015)
- Search query: ti=("industry 4.0") or ts=("industry 4.0") or ti=("industrie 4.0") or ts=("industrie 4.0") or ti=("4th industrial revolution") or ts=("4th industrial revolution") or ti=("fourth industrial revolution") or ts=("fourth industrial revolution")
- Bibliometric analysis of 89 records using CiteSpace

Findings

Document types



Use of the term ‘4th Industrial Revolution’

- 1978, L. Steipe
- 1984, D. Hague
- 1986, W. W. Rostow
- 1999, D. A. Smith
- 2012, Hofmann et al.
- 2014-2015 (84% of 89 papers)

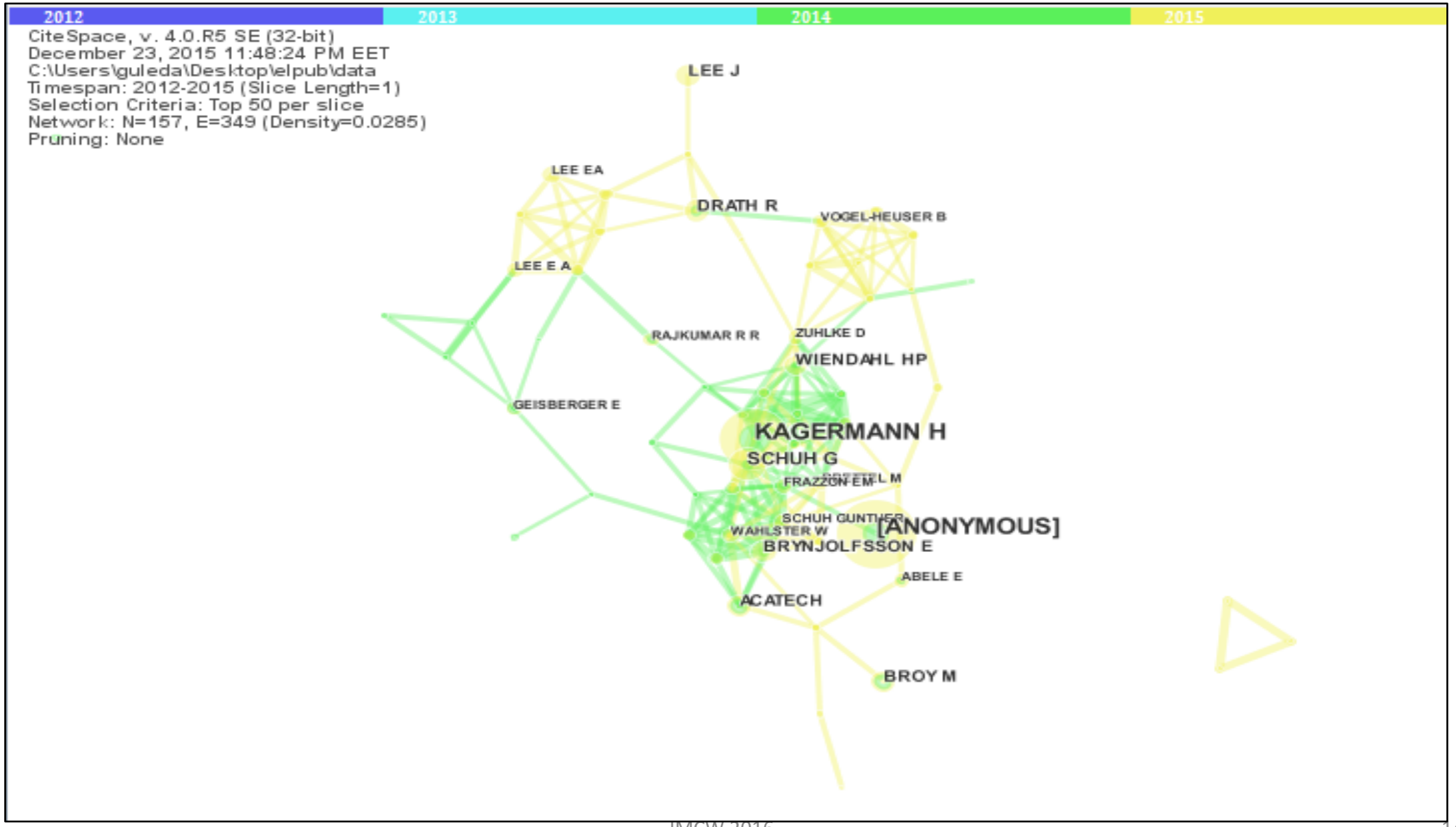
Role of Germany

- Leader of the 4th Industrial Revolution
- '*High-Tech Strategy 2020 for Germany*'
- 59 papers from Germany
- All prolific authors but one affiliated with German institutions
- Most prolific authors: Schuh (6), Toro (4), Jasperneite, Potente and Thoben (3 each)

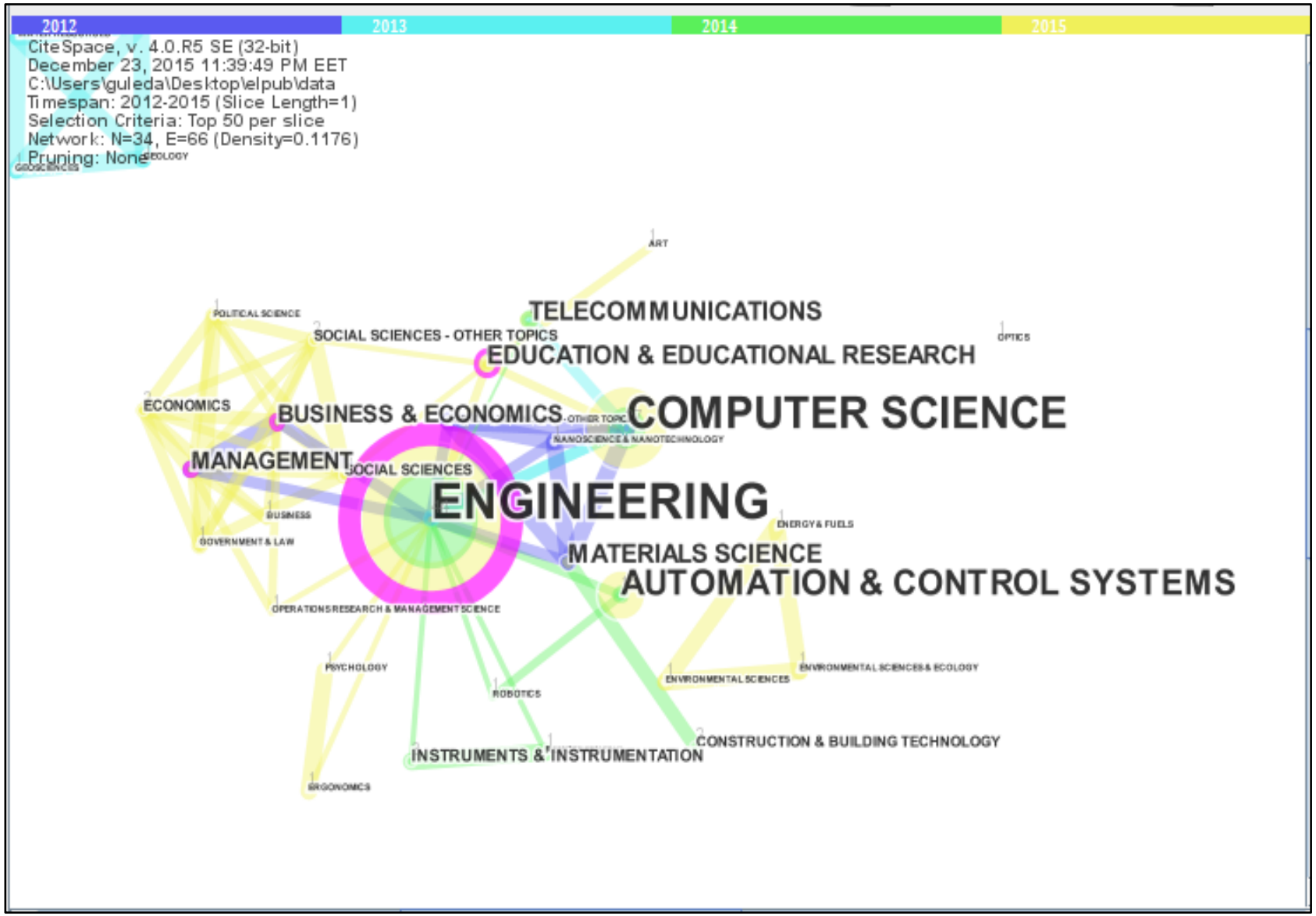
Citations

- 29 citations (incl. 14 self-citations) mostly (24) from 2014 papers
- Most cited papers:
  - *Scalability of OPC-UA down to the chip level enables 'Internet of Things'* (5)
  - *Industrie 4.0: Hit or hype* (4)
  - *Service innovation and smart analytics for Industry 4.0 and big data environment* (4)
  - *Cyber-physical production systems: Roots, expectations and R&D challenges* (4)
- Most cited authors: Schuh G (5), Jasperneite J (5) and Imtiaz J (5)

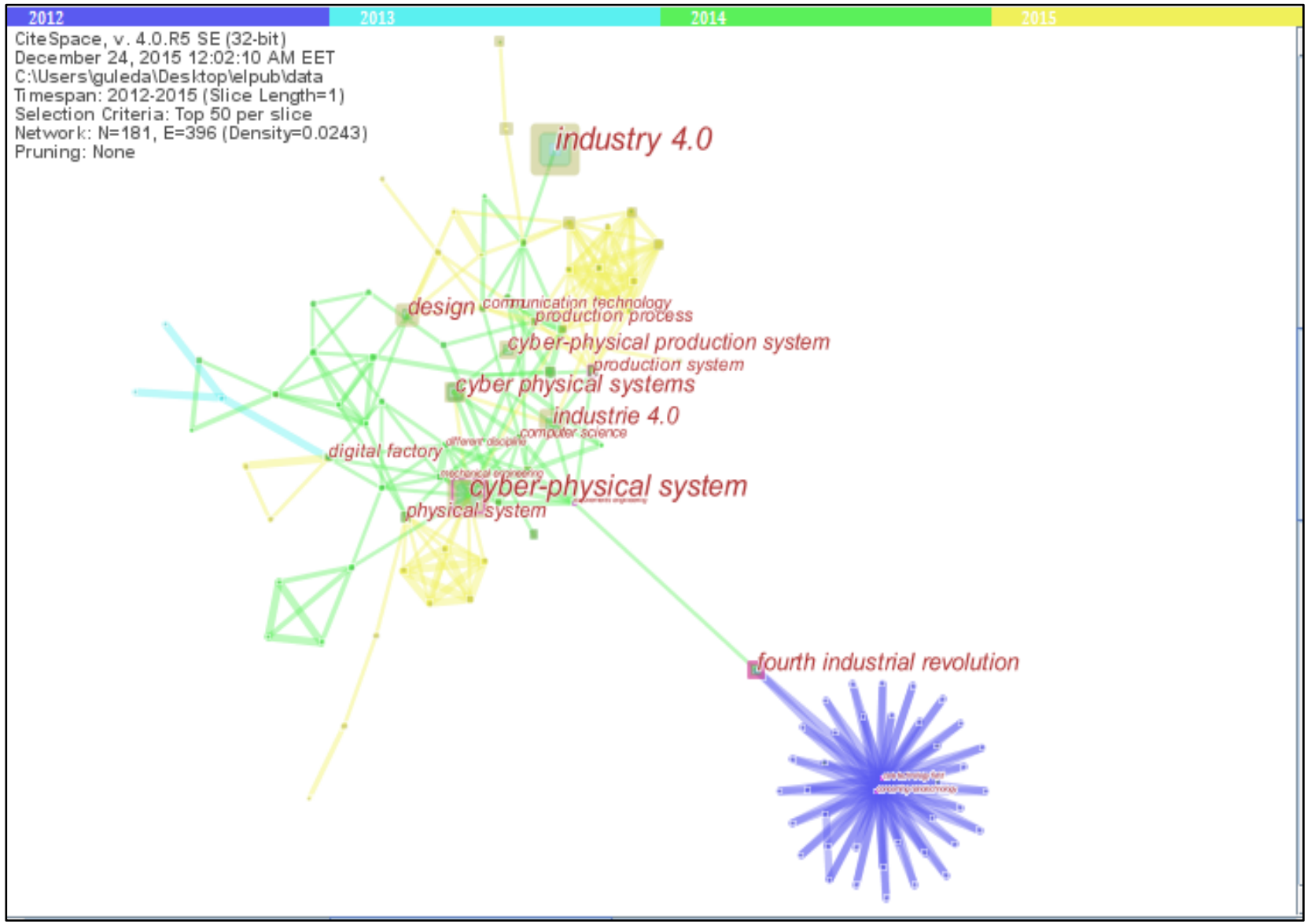
Co-citation network (N=157)



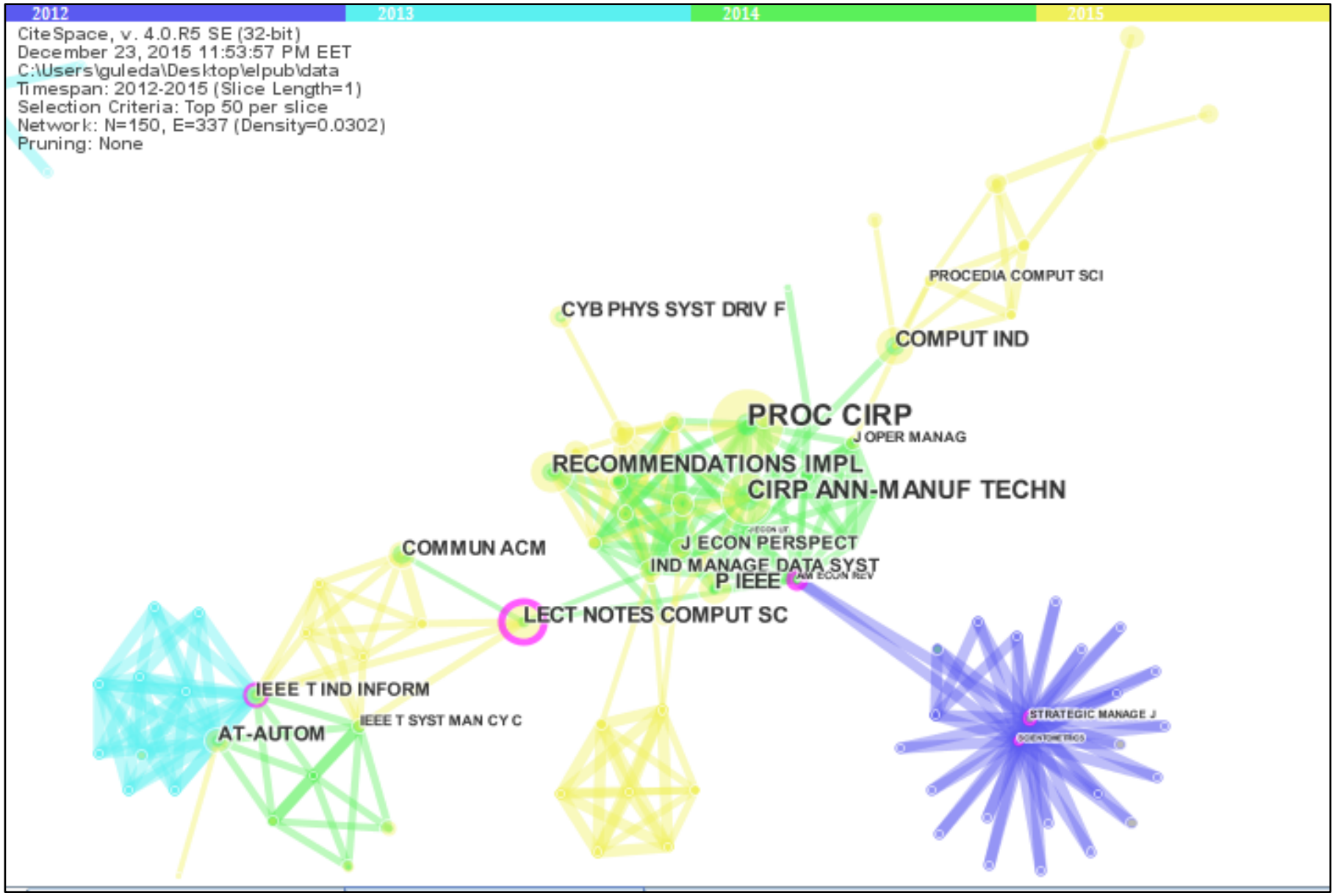
Subject categories



Noun phrases



Journal co-citation map



Conclusions

- Industry 4.0: An emerging interdisciplinary field
- Related fields: Engineering, Computer Science, Telecommunications
- Main components: cyber-physical production systems, Internet of Things and Services, Smart Factories
- Leading role of Germany

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