Bibliometric Analysis of European Research on Digital Divide: An Exploration of the Corporate Landscape

Luis Carlos Castillo

University of Urbino
Ph.D. Program in Global Studies

16 May 2023

Content I

Content II

1. The Digital Divide Overview I

- The digital divide is also known as the digital gap, inequalities, or disparities.
- The interaction with other existing gaps such as income, education, gender, age, and regional, among others (Ragnedda, 2017).
- The evolution of the concept has pointed out the phenomenon's complexity and the effects on the different layers of society and the economy (van Dijk and Hacker, 2003; Ragnedda, 2017; Shakina et al., 2021).

1. The Digital Divide Overview II

- Waves of Research
  - **The first wave:** Physical access to technology -> possession of computers and access to the internet (Norris, 2001; James, 2002; Castells, 2003).
  - **The second wave:** Usage of digital technologies and skills (Hargittai, 2002; van Dijk, 2005, 2006; van Deursen and van Dijk, 2011).
  - The divide is not exclusively a matter of access or possession of technology. It encloses the ability to effectively search, access, and evaluate information using digital technologies.

1. The Digital Divide Overview III

- Waves of Research
  - **The third wave:** expands upon the inequalities previously identified in the 1st and 2nd wave.
  - Focuses on the benefits previously gained from access, skills, and usage of digital technologies.
  - Emphasize on the ability to benefit from digital technologies in a data-driven market to improve personal and professional aspects (Ragnedda, 2017).
  - The disparities from the tangible outcomes gained from different forms of access and usage of digital technologies (van Deursen and Helsper, 2015).

1. The digital divide overview VI

The corporate landscape

- Digital revolution -> different aspects of daily activities -> how we conduct business.
- Disparity in digital capabilities and resources among businesses (Shakina et al., 2021).
- The corporate digital divide is a topic that remains under-explored (Pejic Bach et al., 2013; Shakina et al., 2021).
- Understanding and addressing the divide, policymakers, and businesses owners can target their efforts to ensure inclusive digital transformation.

2. Motivation

- Investigating the transformative effects of digital technologies on society and economy, while highlighting both opportunities and challenges.
- Aligning with the Digital Europe program's vision by devising strategies to bridge the digital divide effectively.
- Diversifying bibliometric research by extending its application beyond health sciences, computer science, and technology to understand the digital divide.
- Harnessing the power of comprehensive data from three leading academic platforms to generate insightful and actionable findings on the digital divide.

3. Objectives and Research Questions I

Objectives

- Understand the intellectual structure within the domain of the digital divide.
- Examine the intellectual interactions, and thematic relationships of European research components.
- Explore the corporate digital divide among the collected corpus and identify trends and patterns within the literature.

3. Objectives and Research Questions II

Research Questions

- Q1: How have the main trends, focus shifts, and key themes in European research on the digital divide evolved over time, and how do they reflect the current state of knowledge in this field?
- Q2: What are the intellectual interactions and thematic relationships among European research components on the digital divide, and how do they contribute to the identification of core subtopics and literature clusters?
- Q3: How are European studies addressing the corporate digital divide, and which unexplored topics within this domain warrant further examination?

4. Data I

- Specific search within titles and author keywords on the "*digital divide*" merging data from the Web of Science, Scopus, and Dimensions platforms.
- Search criteria: "digital divide*" OR "digital inequalit*" OR "digital gap*"
- The sample includes articles, book chapters, conferences, and proceeding papers.
- Authors with European affiliations within the **business, management, economics, technology, and computer science** disciplines were included

4. Data II

- After conducting a thorough data cleaning, a total of 1609 unique documents from 2000 to 2022 were incorporated.
- Number of Documents by Database
  - WoS:946
  - Scopus: 254
  - Dimensions: 409
- To track the evolution of the digital divide literature, the data was divided into three periods: 2000-2007, 2008-2015, and 2016-2022.
- The R programming language environment(bibliometrix, igraph packages) was used to carry out the analysis.

5. Methodology I

Bibliometric Analysis

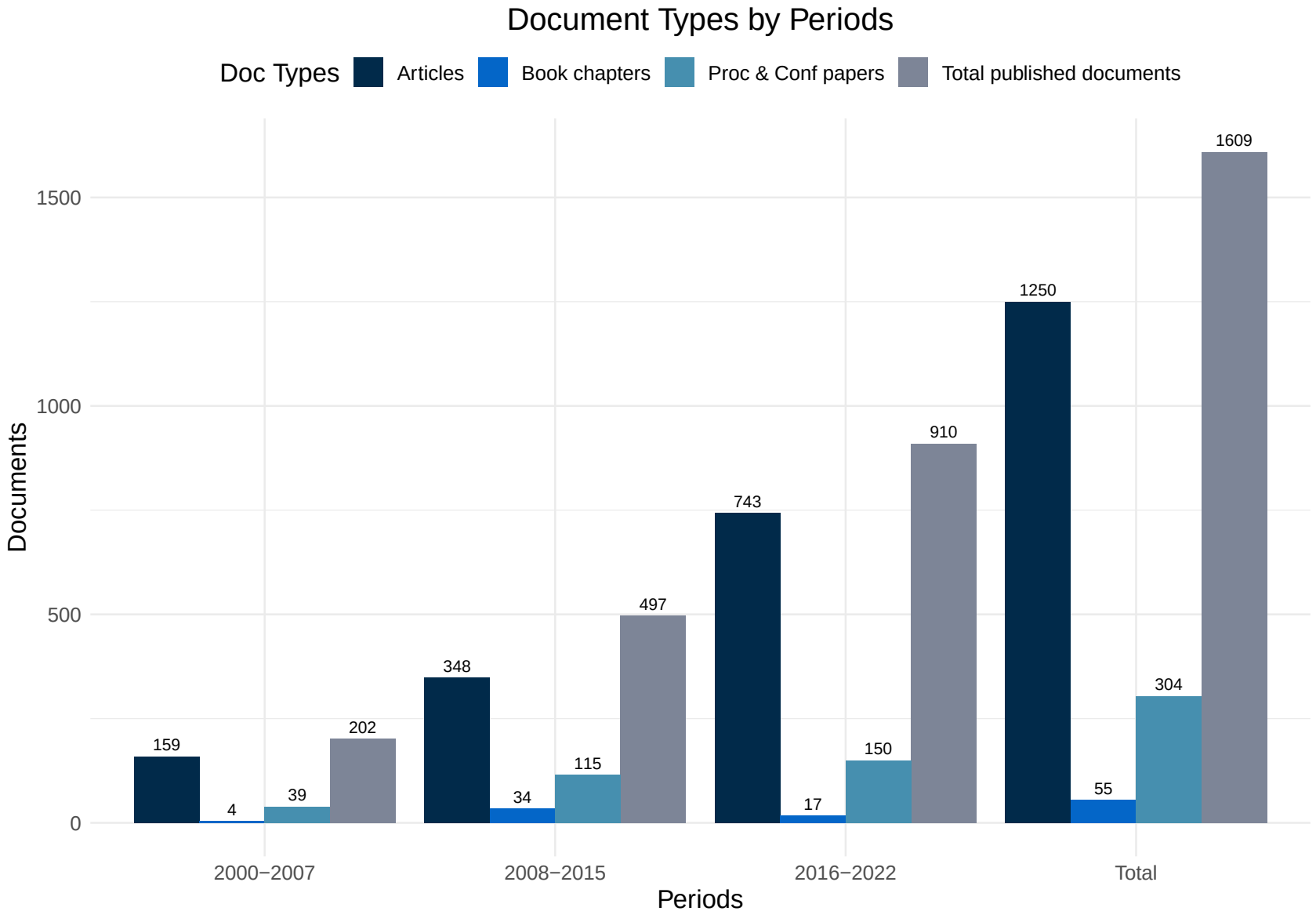
Following Donthu et al. (2021), Aria and Cuccurullo (2017), Ellegaard and Wallin (2015) and Bornmann and Mutz (2015) bibliometric analysis:

- Is a methodology that applies quantitative techniques to bibliographic data and plays a vital role in evaluating research output.
- This technique allows researchers to uncover emerging trends identifying knowledge gaps in specific domains and analyze a significant quantity of documents .
- It offers three types of analysis: performance analysis, science mapping, and network analysis.

5. Methodology II

1506
UNIVERSITÀ
DEGLI STUDI
DI URBINO
CARLO BO

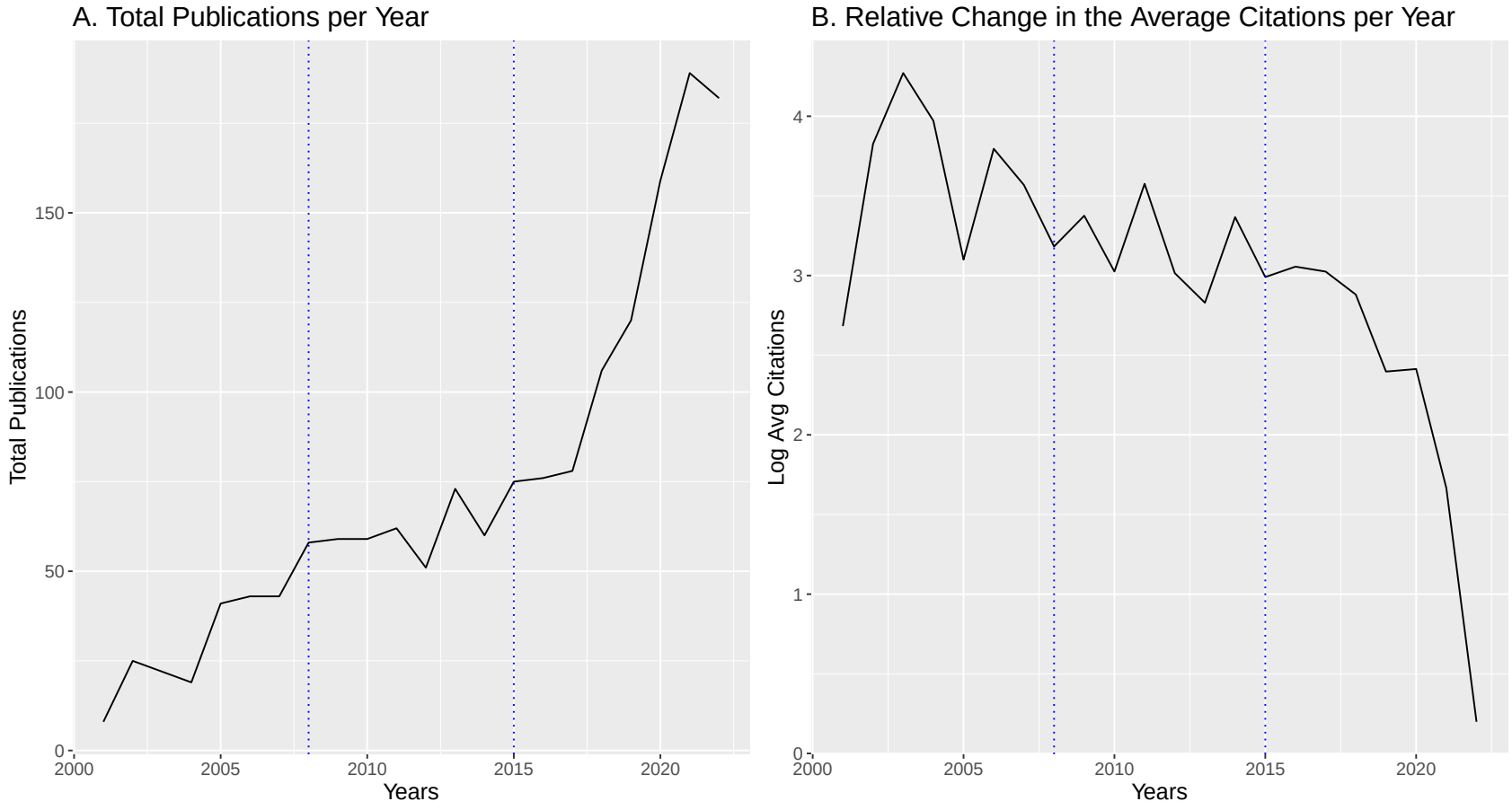
Distribution of Document Types Across Time Periods



6. Performance Analysis I

Is a descriptive interpretation of research constituents.

6.1. Publications vs Citations



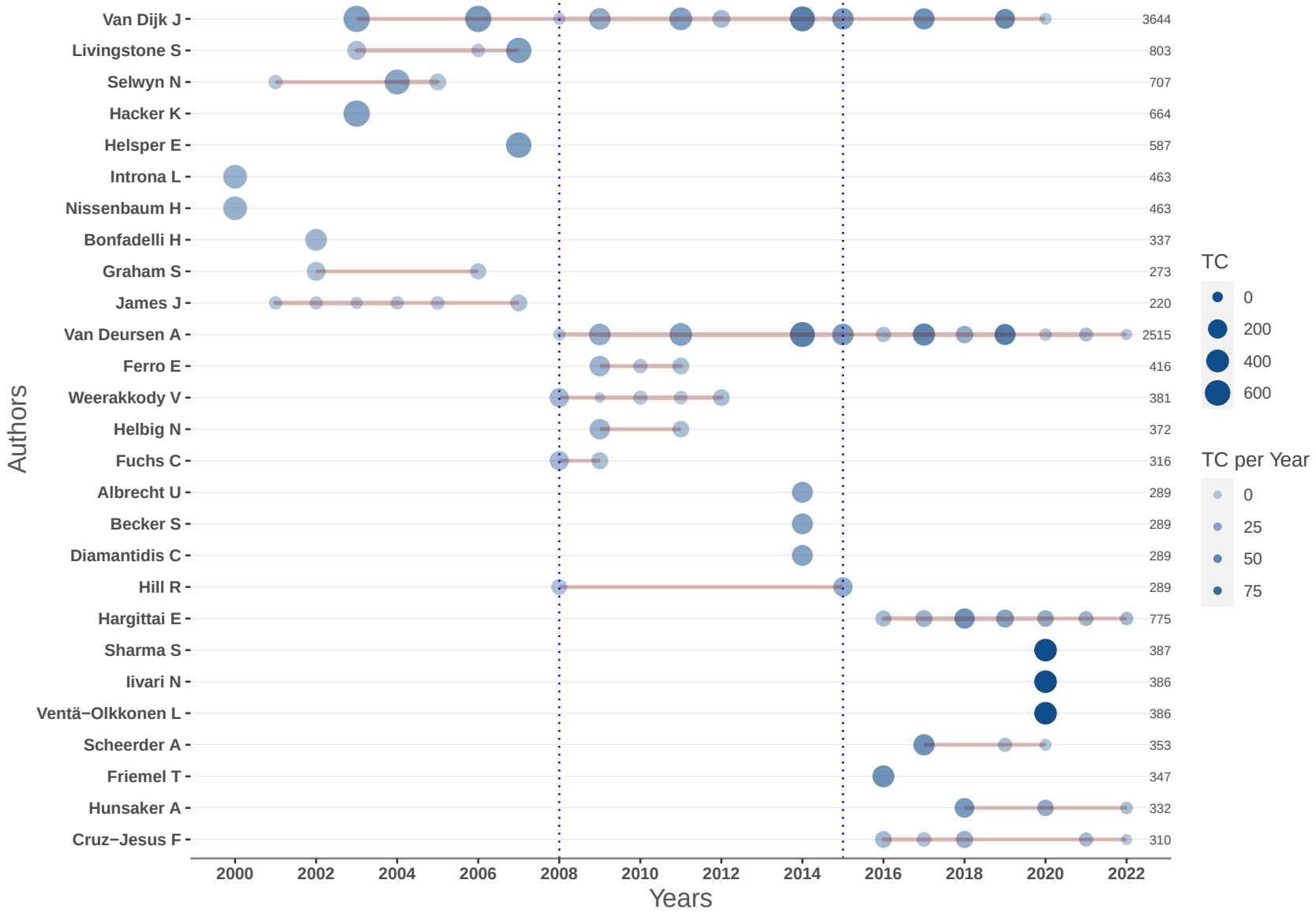
6. Performance Analysis II

1506 UNIVERSITÀ DEGLI STUDI DI URBINO CARLO BO

6.2. Authors' publications patterns over time.

6. Performance Analysis III

6.2. Trends in authors' citations across time periods



6. Performance Analysis V
6.2. Articles

1506 UNIVERSITÀ DEGLI STUDI DI URBINO CARLO BO

Table 1: Most Cited Articles

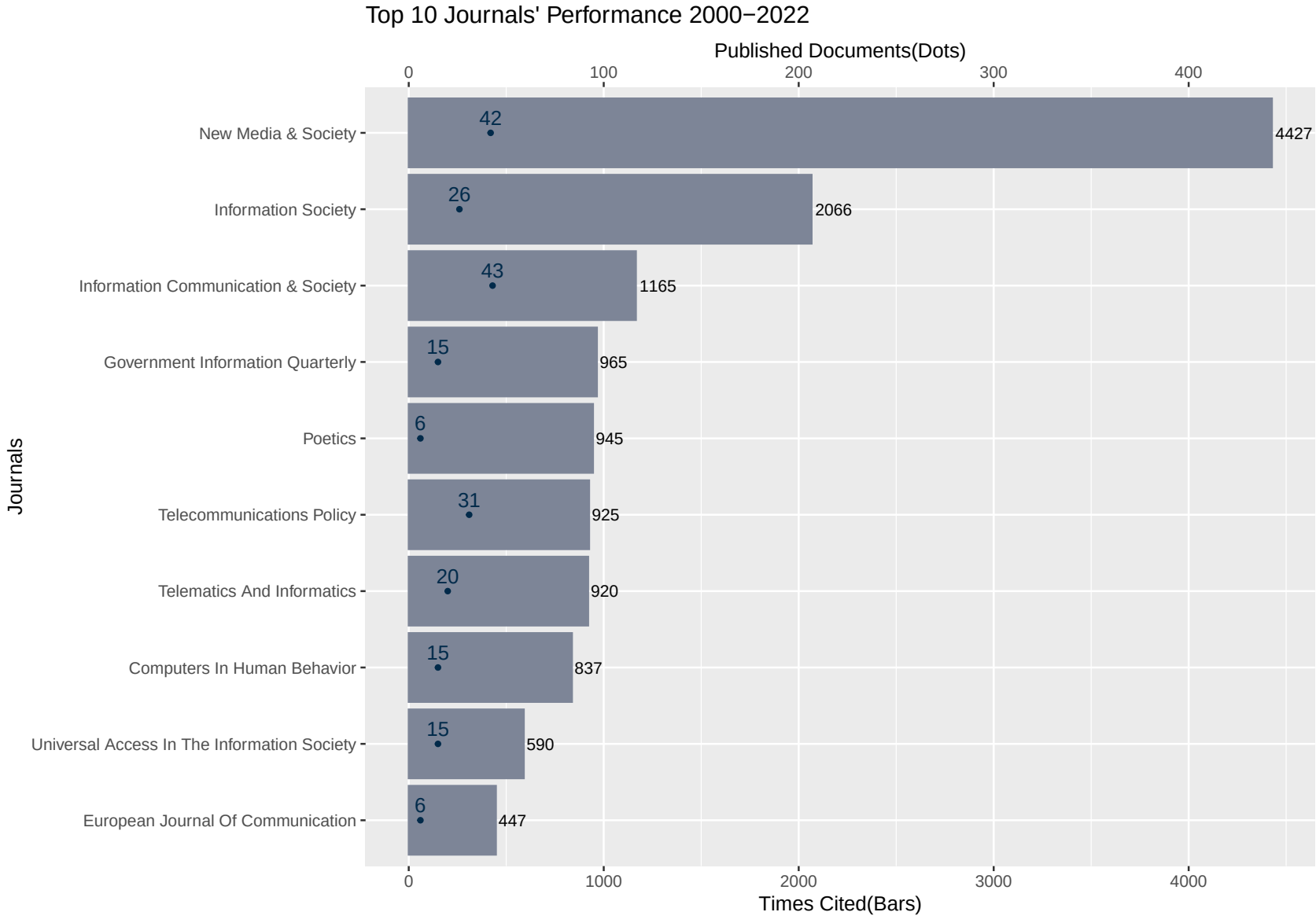
Rank	Article	TC
	Period 1: 2000- 2007	
1	Van Dijk J; Hacker K (2003) -The Digital Divide As A Complex And Dynamic Phenomenon	664
2	Van Dijk J (2006) -Digital Divide Research, Achievements And Shortcomings	660
3	Livingstone S; Helsper E (2007) -Gradations In Digital Inclusion: Children, Young People And The Digital Divide	587
4	Selwyn N (2004) -Reconsidering Political And Popular Understandings Of The Digital Divide	560
5	Introna L; Nissenbaum H (2000) -Shaping The Web: Why The Politics Of Search Engines Matters	463
	Period 2: 2008- 2015	
1	Van Deursen A; Van Dijk J (2014) -The Digital Divide Shifts To Differences In Usage	555
2	Van Deursen A; Van Dijk J (2011) -Internet Skills And The Digital Divide	402
3	Becker S; Miron-Shatz T; Schumacher N; Krocza J; Diamantidis C; Albrecht U (2014) -Mhealth 2.0: Experiences, Possibilities, And Perspectives	289
4	Helbig N; Gil-García J; Ferro E (2009) -Understanding The Complexity Of Electronic Government: Implications From The Digital Divide Literature	268
5	Carter L; Weerakkody V (2008) -E-Government Adoption: A Cultural Comparison	208
	Period 3: 2016- 2022	
1	Iivari N; Sharma S; Ventä-Olkkonen L (2020) -Digital Transformation Of Everyday Life – How Covid-19 Pandemic Transformed The Basic Education Of The Young Generation And Why Information Management Research Should Care?	386
2	Friemel T (2016) -The Digital Divide Has Grown Old: Determinants Of A Digital Divide Among Seniors	347
3	Scheerder A; Van Deursen A; Van Dijk J (2017) -Determinants Of Internet Skills, Uses And Outcomes. A Systematic Review Of The Second- And Third-Level Digital Divide	307
4	Hunsaker A; Hargittai E (2018) -A Review Of Internet Use Among Older Adults	223
5	Van Deursen A; Van Dijk J (2019) -The First-Level Digital Divide Shifts From Inequalities In Physical Access To Inequalities In Material Access	198

[1] Source: Author's elaboration

[2] TC: Times Cited

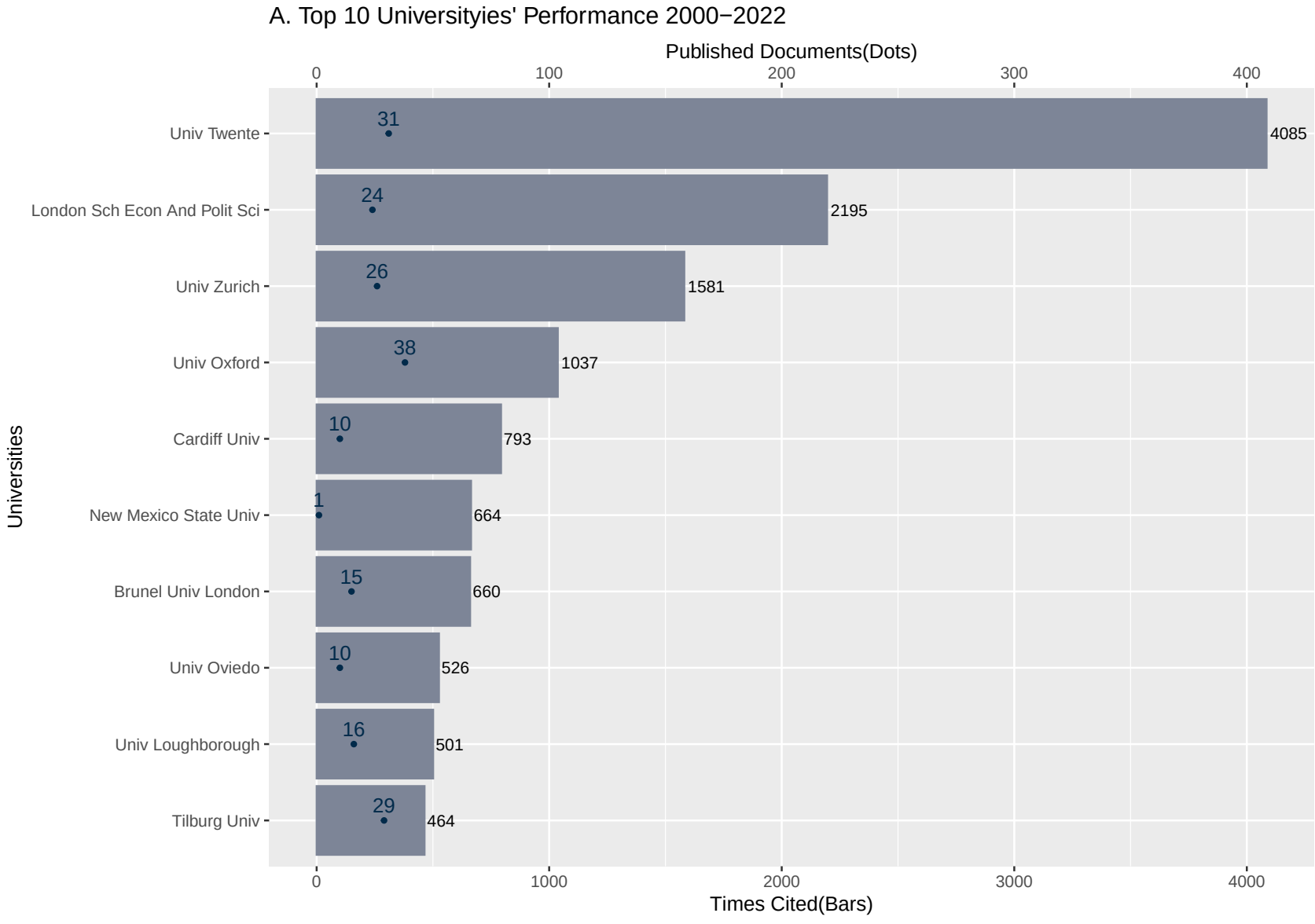
6. Performance Analysis VI

6.3. Journals



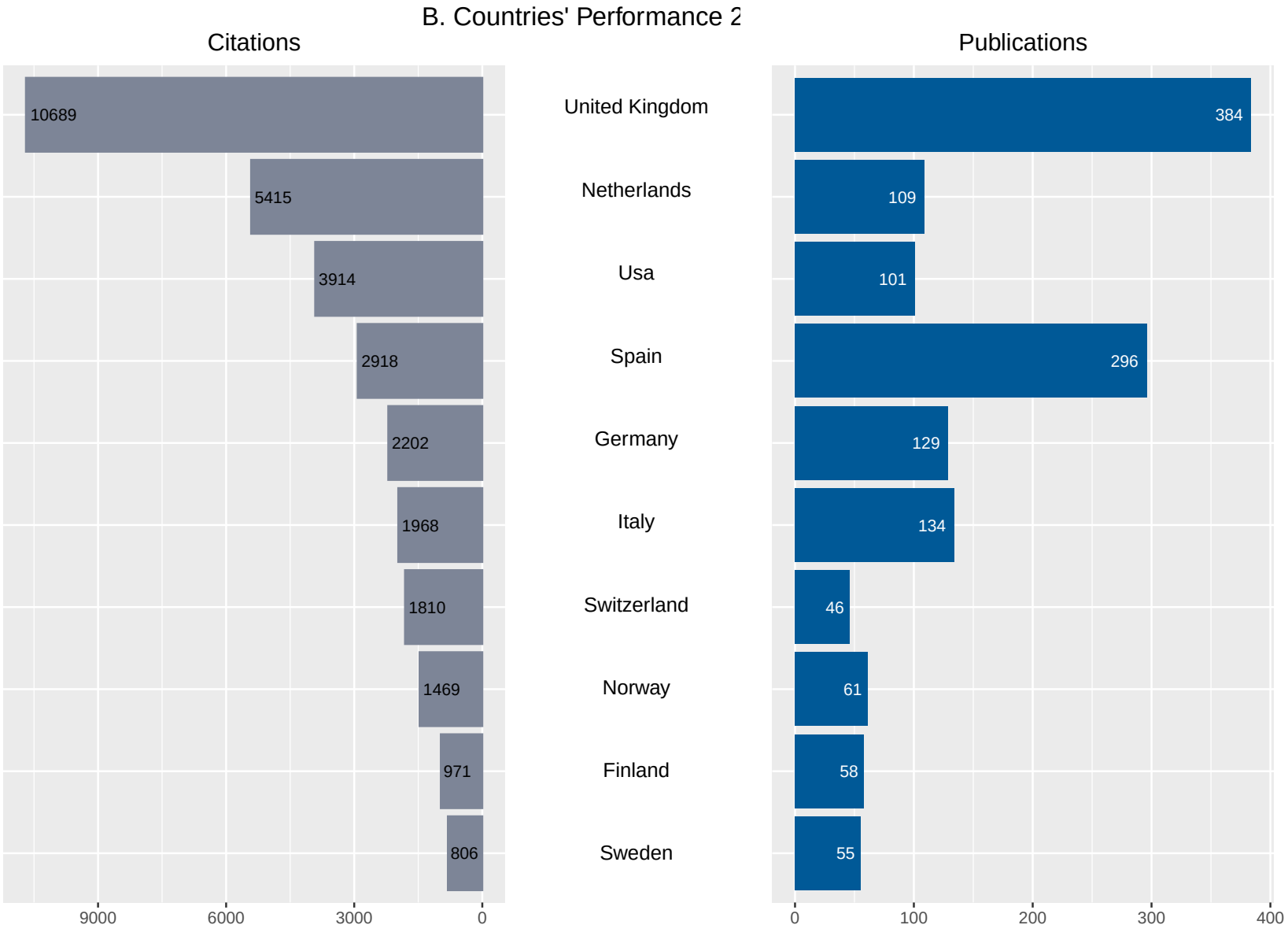
6. Performance Analysis VII

6.4. Affiliations/ Universities



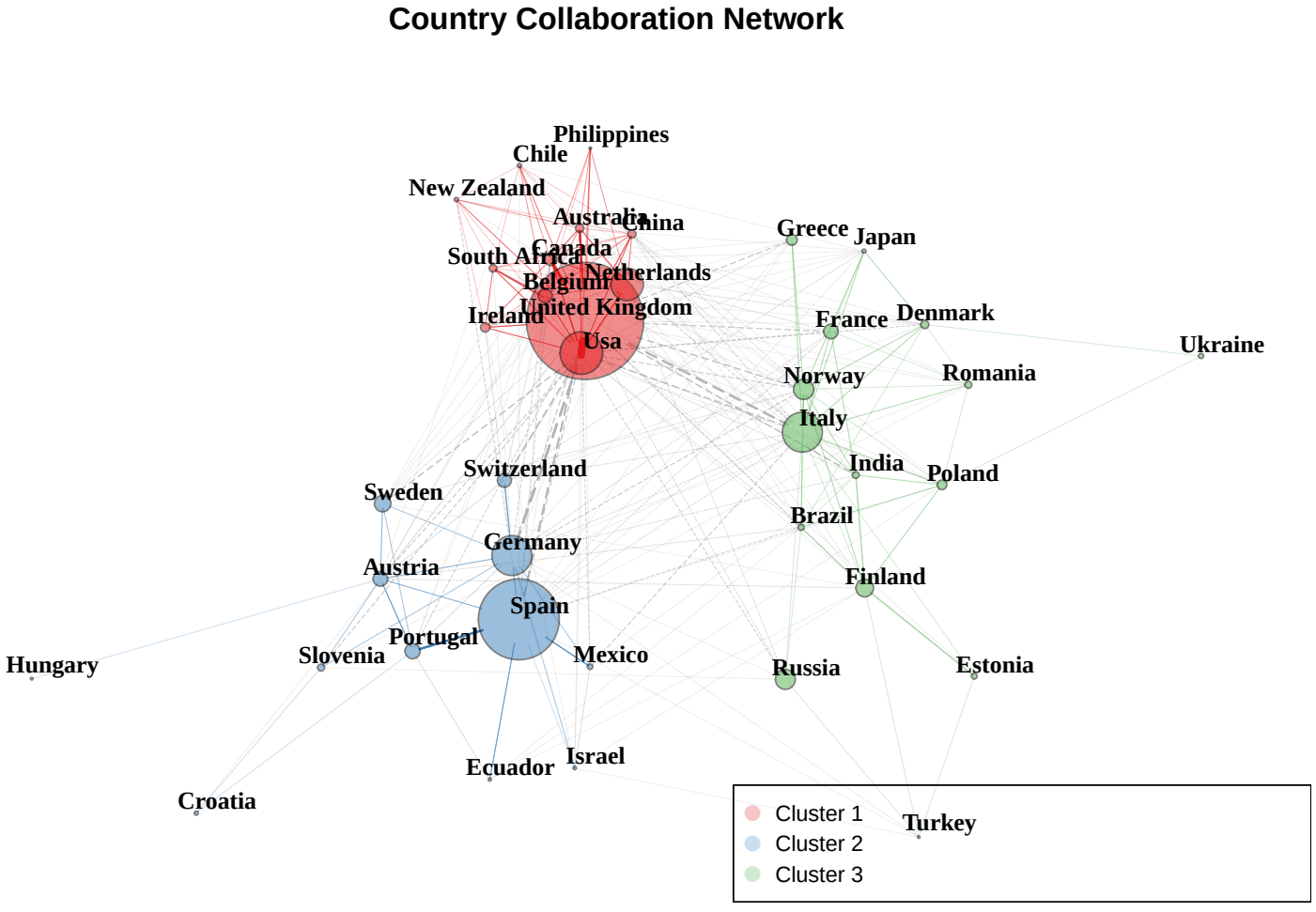
6. Performance Analysis VIII

6.5. Countrys' Performance 2000-2022



6. Performance Analysis IX

6.6. Countries Collaboration Network



7. Science Mapping I

Is a set of techniques and tools used to visualize and analyze the structure, relationships, and patterns within a scientific field or discipline.

7.1. Citation Analysis

Table 2: Most Cited References 2000-2022

Rank	Article	TC
1	Norris P (2001) -Digital Divide Civic Engagement, Information Poverty, And The Internet Worldwide	204
2	Van Dijk J (2005) -The Deepening Divide: Inequality In The Information Society	172
3	Hargittai E (2002) -Second-Level Digital Divide: Differences In People's Online Skills	136
4	Van Dijk J (2006) -Digital Divide Research, Achievements And Shortcomings	129
5	Van Dijk J, Hacker K (2003) -The Digital Divide As A Complex And Dynamic Phenomenon	114
6	Selwyn N (2004) -Reconsidering Political And Popular Understandings Of The Digital Divide	108
7	Dimaggio P, Hargittai E, Celeste C, Shafer S (2004) -From Unequal Access To Differentiated Use: A Literature Review And Agenda For Research On Digital Inequality	105
8	Van Deursen A, Van Dijk J (2014) -The Digital Divide Shifts To Differences In Usage	103
9	Zillien N, Hargittai E (2009) -Digital Distinction: Status-Specific Types Of Internet Usage	82
10	Hargittai E, Hinnant A (2008) -Digital Inequality: Differences In Young Adults' Use Of The Internet	80

[1] Source: Author's elaboration

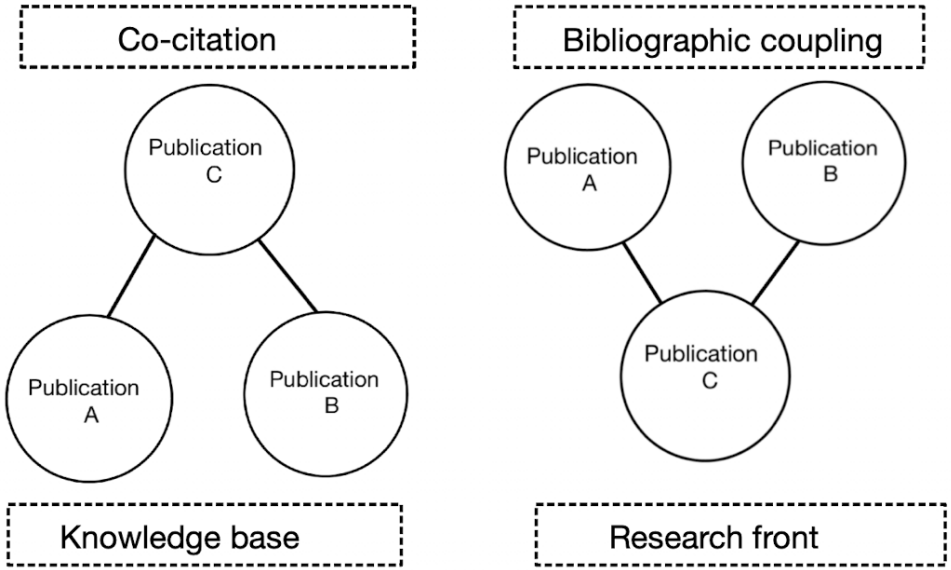
[2] TC: Times Cited

7. Science Mapping II
7.2. Similarity measures

Quantify similarity, connections and relationships among academic entities.

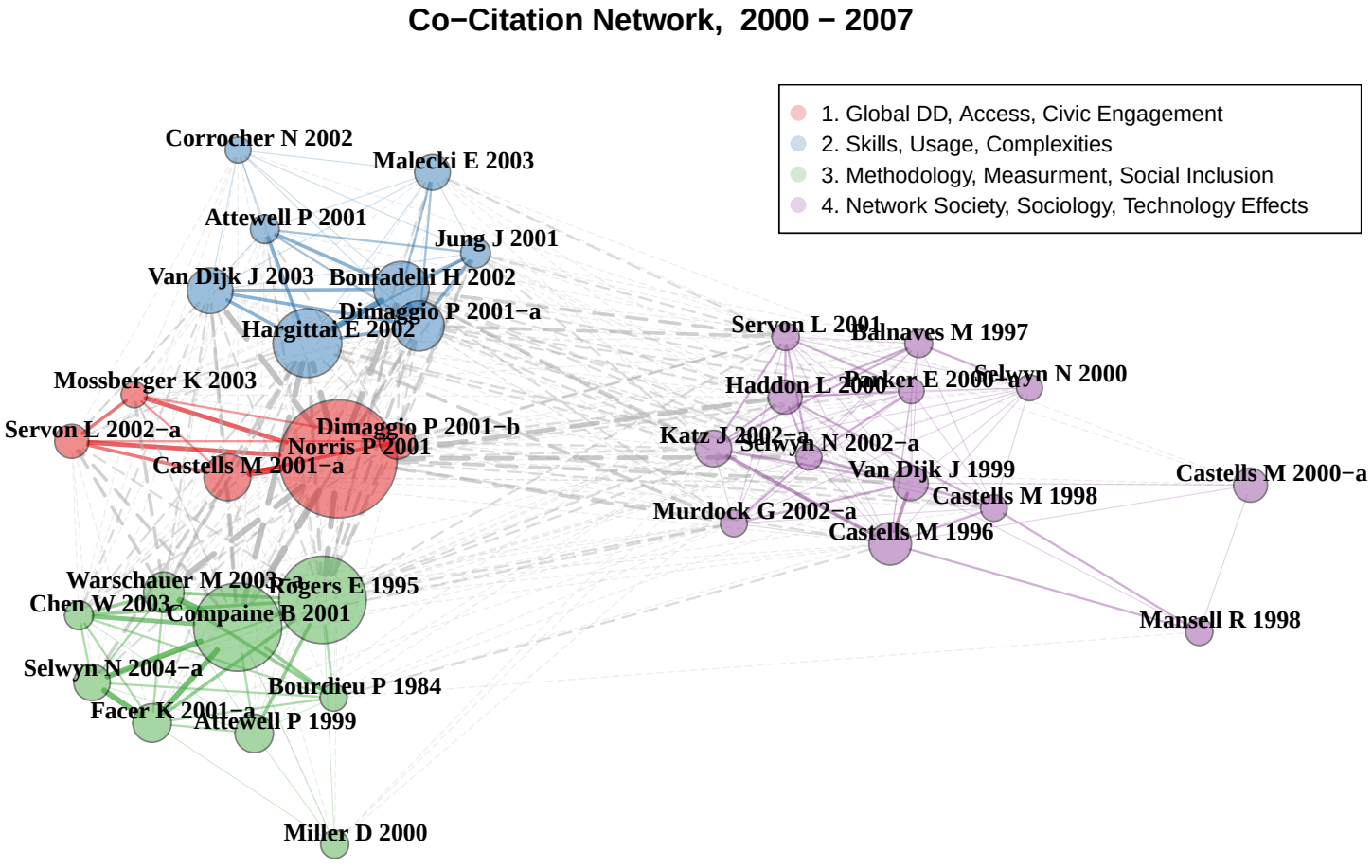
Following Kammerer et al. (2021)

- **Knowledge base:** cluster of academic publications in a research field that are considered fundamental to the development and understanding of the field.
- **Research front:** cluster of academic publications that refers to emerging active areas of research considering themselves with a similar unsolved research problem.



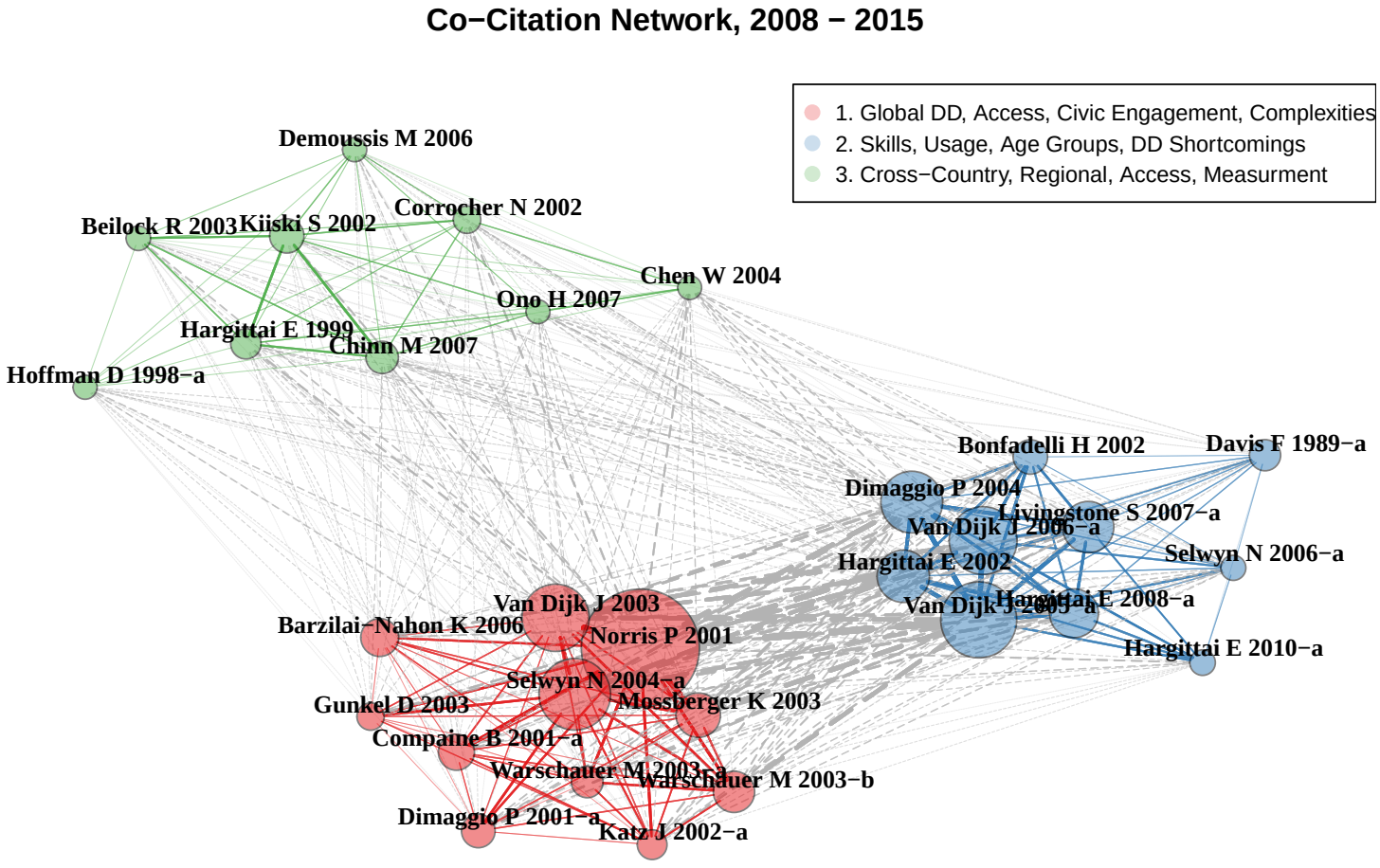
7. Science Mapping III

7.2.1. Co-citations Analysis



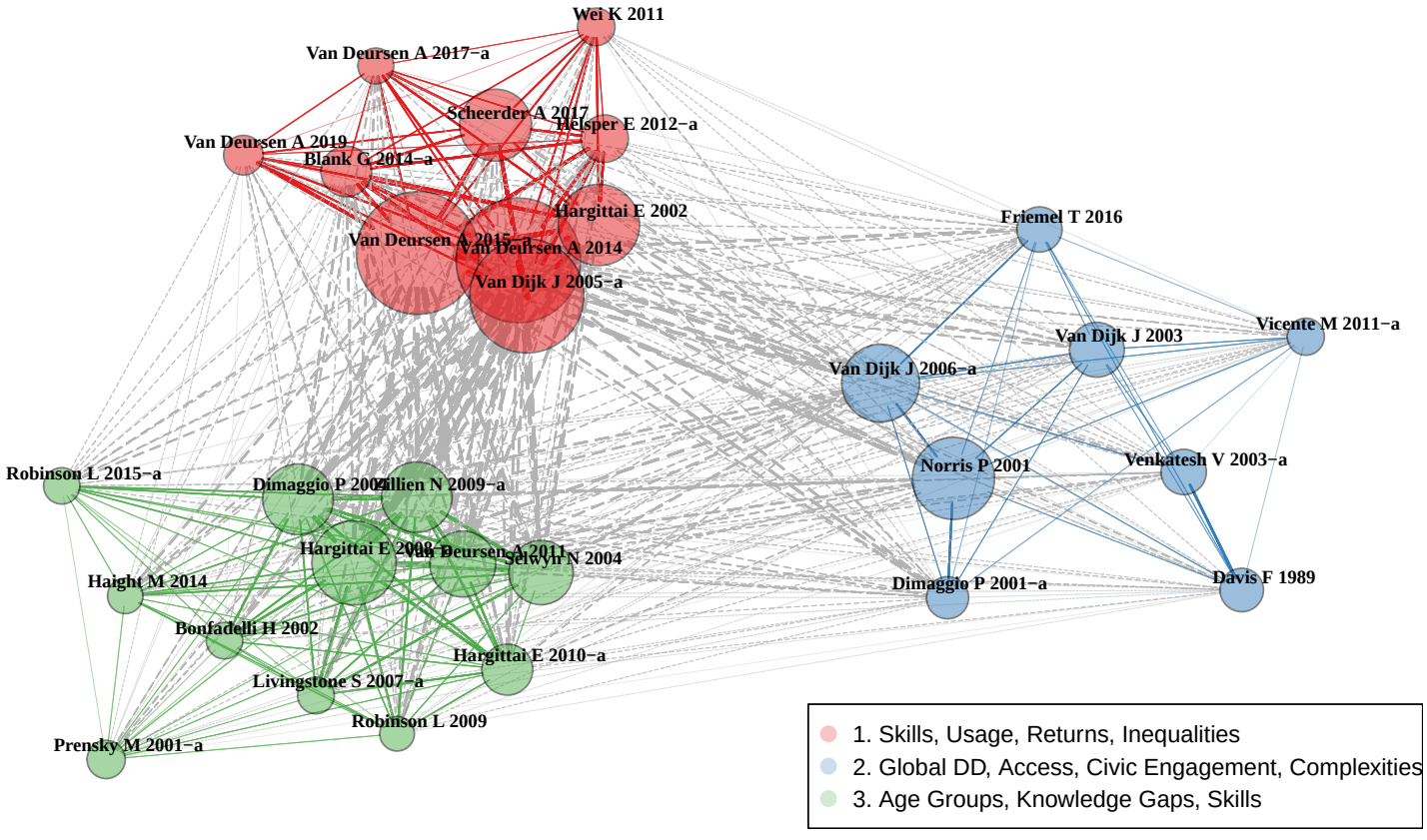
7. Science Mapping IV

1506
UNIVERSITÀ
DEGLI STUDI
DI URBINO
CARLO BO



7. Science Mapping V

1506
UNIVERSITÀ
DEGLI STUDI
DI URBINO
CARLO BO



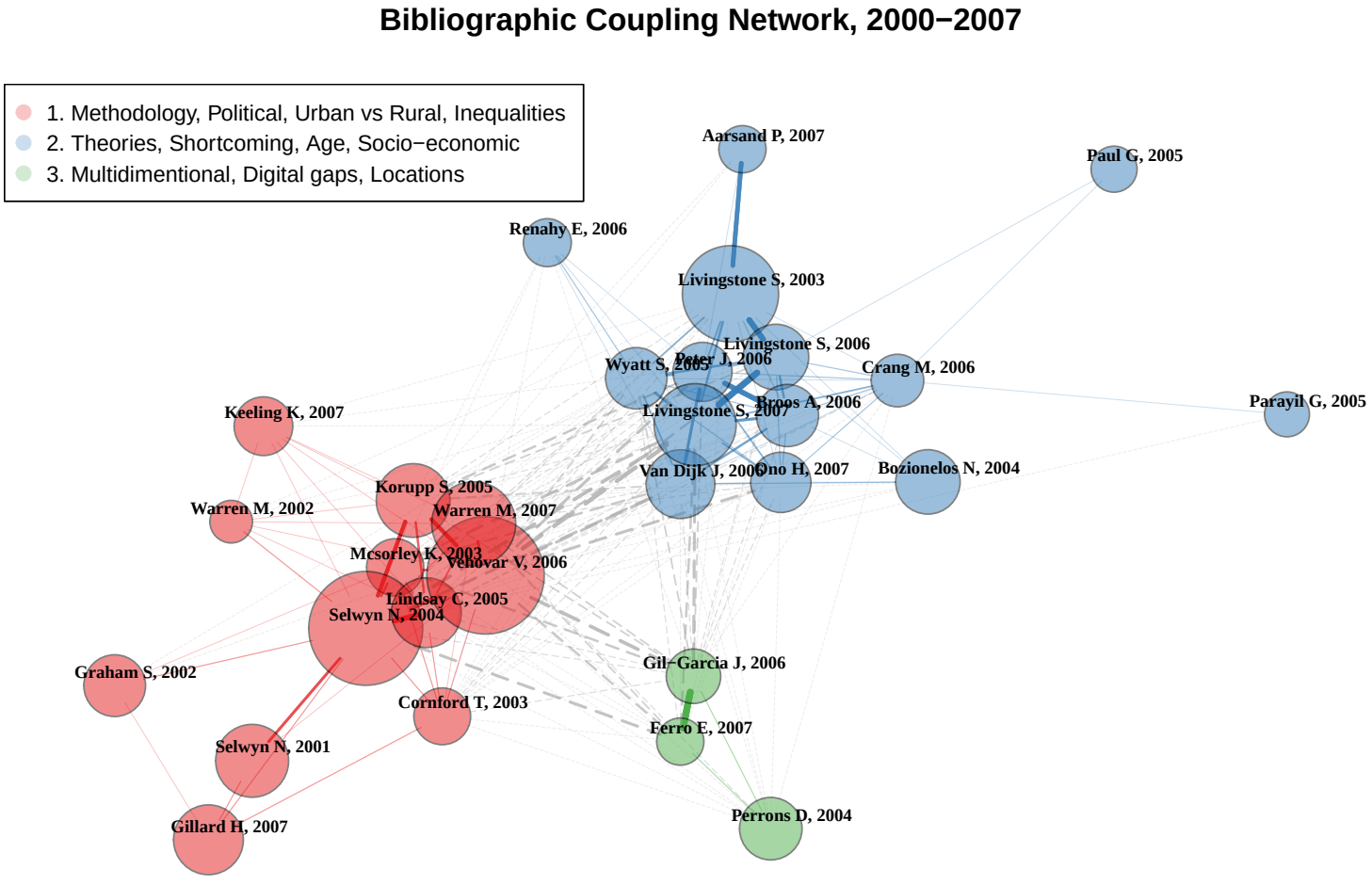
Co-citation Networks Summary

This three networks highlighted:

- **Evolution of research focus:** From internet access and infrastructure to the various facets of the digital divide.
- **Key authors and publications:** These form the knowledge foundations that shapes the discourse, broaden the comprehension of the literature, and guide future research.
- **Emerging trends and themes:** These networks have assisted in uncovering growing themes that highlight research directions that require further examination.

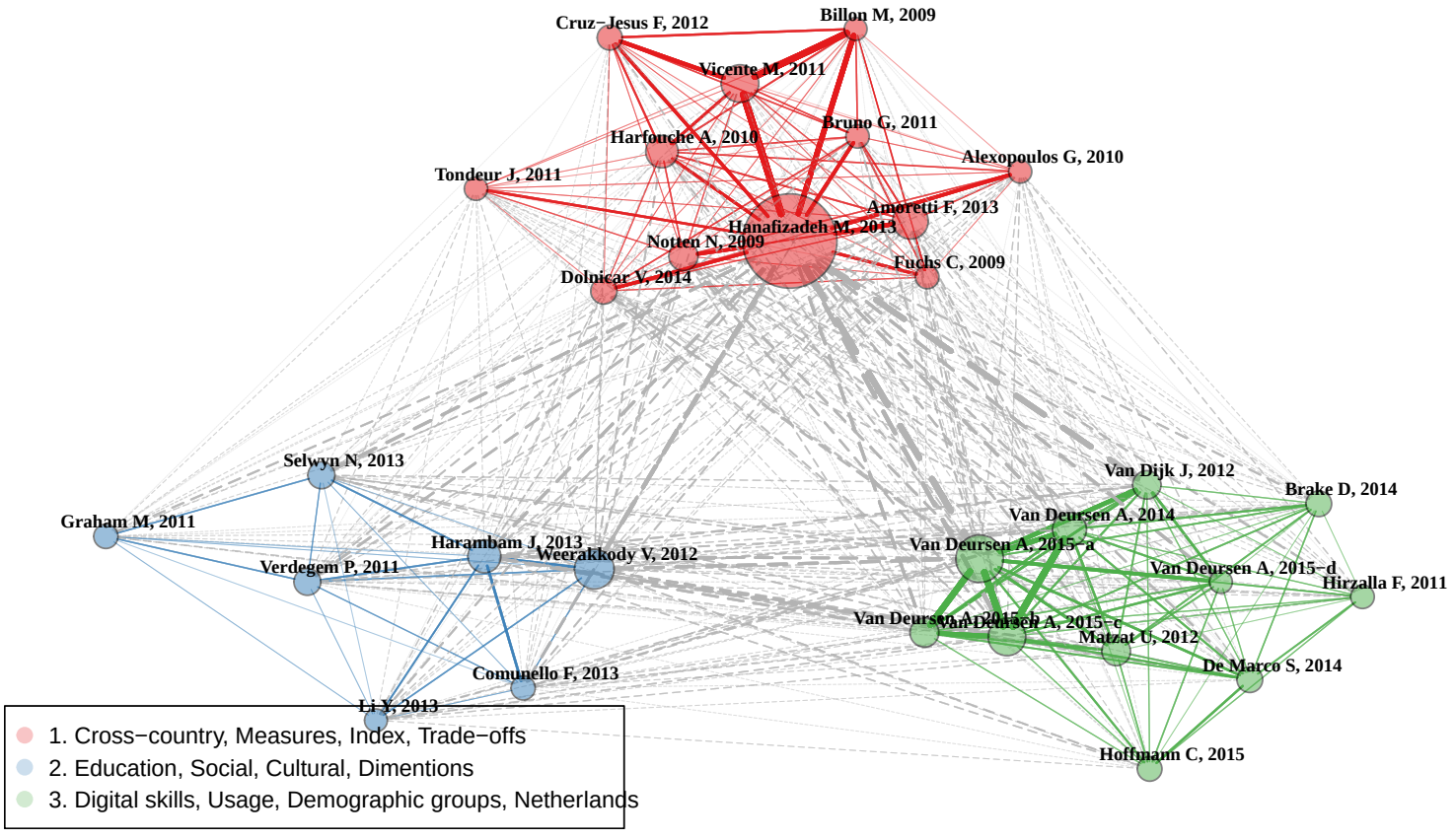
7. Science Mapping VII

7.2.2. Bibliographic Coupling Analysis



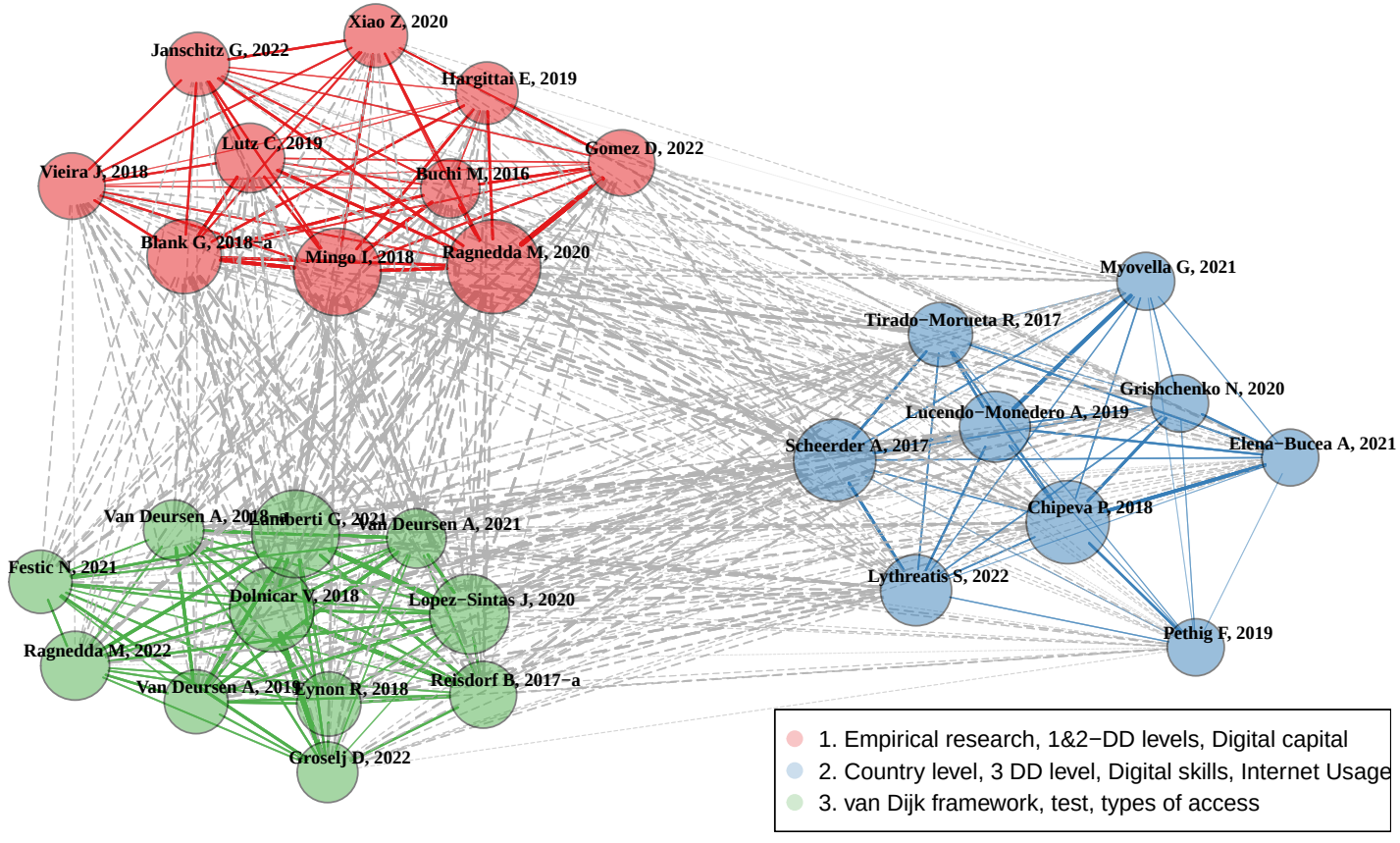
7. Science Mapping VIII

1506
UNIVERSITÀ
DEGLI STUDI
DI URBINO
CARLO BO



7. Science Mapping IX

1506
UNIVERSITÀ
DEGLI STUDI
DI URBINO
CARLO BO



Bibliographic coupling Networks Summary

This three networks highlighted:

- **Evolution of digital divide research:** Themes move from access and socio-demographic factors to a more nuance understanding of skills, usage and emerging technologies.
- **Emergence of key authors:** Represent the influential authors that contributed in the emergence of active areas of research in the development of the digital divide.
- **Growing complexities and specialization:** The diverse research themes in the networks reflect the expanding scope and depth of digital divide research.

7. Science Mapping XI

7.2.2. Co-word Analysis

Conclusions

- We have seen the main trends and focus shifts: from access, infrastructure, and socio-economic factors, to skills, usage and other facets of the digital divide, this highlights the complexity and multidimensionality of the digital divide.
- The networks showcase collaboration among prominent authors that consistently contribute in the field. The thematic relationships show interconnections of various aspects of the digital divide.
- European studies have not extensively addressed the corporate digital divide, leaving room for further examination. The corporate digital divide might be incorporated into other literature streams, such as digital transformation and technology adoption.

Contact information

Luis Carlos Castillo-Tellez

Guest Researcher

PhD candidate in Global Studies

University of Urbino - Italy

email: l.castillotellez@campus.uniurb.it

email: luiscarl@uni-bremen.de

References I

Aria, M. and Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics*, 11(4):959–975. Publisher: Elsevier Ltd.

Bornmann, L. and Mutz, R. (2015). Growth rates of modern science: A bibliometric analysis based on the number of publications and cited references. *Journal of the Association for Information Science and Technology*, 66(11):2215–2222. Citation Key: Bornmann2015 Publisher: John Wiley and Sons Inc.

Castells, M. (2003). *The Internet Galaxy: Reflections on the Internet, Business, and Society*. Oxford.

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., and Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, 133:285–296.

Ellegaard, O. and Wallin, J. A. (2015). The bibliometric analysis of scholarly production: How great is the impact? *Scientometrics*, 105(3):1809–1831.

Hargittai, E. (2002). Second-level digital divide: Differences in people's online skills. *First Monday*.

James, J. (2002). Universal access to information technology in developing countries. *Regional Studies*, 36(9):1093–1097. Publisher: Routledge _eprint: https://doi.org/10.1080/00343400022000024312.

References II

Kammerer, K., Göster, M., Reichert, M., and Pryss, R. (2021). Ambalytics: A scalable and distributed system architecture concept for bibliometric network analyses. *Future Internet*, 13(8):1–29. Publisher: MDPI.

Norris, P. (2001). *Digital Divide: Civic Engagement, Information Poverty, and the Internet Worldwide*. Communication, Society and Politics. Cambridge University Press, Cambridge. DOI: 10.1017/CBO9781139164887.

Pejic Bach, M., Zoroja, J., and Vuksic, V. (2013). Review of corporate digital divide research: A decadal analysis (2003-2012). *International Journal of Information Systems and Project Management*, 1:41–55.

Ragnedda, M. (2017). *The Third Digital Divide: A Weberian Approach to Digital Inequalities*. Routledge, 1st edition edition.

Shakina, E., Parshakov, P., and Alsufiev, A. (2021). Rethinking the corporate digital divide: The complementarity of technologies and the demand for digital skills. *Technological Forecasting and Social Change*, 162:120405.

van Deursen, A. and van Dijk, J. (2011). Internet skills and the digital divide. *New Media and Society*, 13(6):893–911. Publisher: SAGE Publications.

van Deursen, A. J. A. M. and Helsper, E. J. (2015). The Third-Level Digital Divide: Who Benefits Most from Being Online? In *Communication and Information Technologies Annual*, volume 10 of *Studies in Media and Communications*, pages 29–52. Emerald Group Publishing Limited.

References III

van Dijk, J. (2005). *The Deepening Divide: Inequality in the Information Society*. Thousand Oaks, California. DOI: 10.4135/9781452229812.

van Dijk, J. (2006). Digital divide research, achievements and shortcomings. *Poetics*, 34(4):221–235. Citation Key: vandijk2006.

van Dijk, J. and Hacker, K. (2003). The Digital Divide as a Complex and Dynamic Phenomenon. *The Information Society*, 19(4):315–326. Publisher: Routledge _eprint: https://doi.org/10.1080/01972240309487.