

DRIVERS, PROCESSES AND OUTCOMES OF STI AND DUI MODES OF INNOVATION: A SYSTEMATIC REVIEW

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Agenda

1. Introduction
2. Research Methodology
3. Results
 - 3.1. Bibliometrics
 - 3.2. Content Analysis
4. Conclusion

1. Introduction

Science, Technology and Innovation Mode (STI)¹

- Formal, codified, and analytical knowledge (Know-Why and Know-What);
- R&D collaboration (research center/lab, Universities, specific firm department or consulting service).
- High technologies industries as pharmaceutical, biotechnology, nanotechnology, research intensive firms.

Doing, Using and Interacting Mode (DUI)¹

- Informal, tacit and synthetic knowledge based on learning by doing, using and interacting (Know-How and Know-Who);
- Innovation happens due to cooperation with other organizations as suppliers, customers and competitors;
- Low to medium-tech industries like food, services, or engineering.

1. Introduction

➤ Objectives:

- (1) To cross-reference the literature about the STI and DUI innovation modes through a systematic review methodology^{2,3}.
- (2) To bring some clarity and structure to the academic discussion on whether innovation drivers, processes and outcomes of DUI and STI modes of innovation.

➤ Relevance:

- (1) the innovation literature is a fragmented field^{4,5}.
- (2) a systematic review can provide useful information for practitioners interested in innovation who are confronted with a large and complex literature^{2,3}.

2. Research Methodology

• Selection criteria

Publication type: article

Topic: “network”

Topic: “form of innovation” or “innovation form” or “modes of innovation” or “innovation modes”

Publications from 1990 to 2020

Peer reviewed publications

Publications in English

Categories: management, economics, and business

Scimago journal ranking classification: Q1 and Q2

• Exclusion criteria

No access to article

Duplicate articles

Not specifically about STI or DUI innovation modes

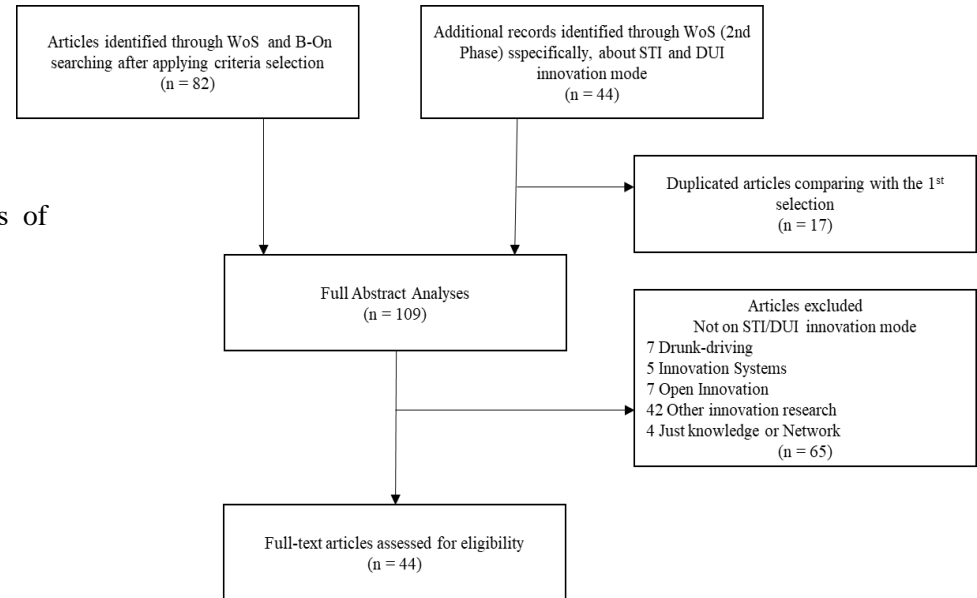


Fig. 1. The systematic review collection process⁶

3. Results 3.1. Bibliometrics

Table 1. Publication Year, Number of Articles and Scimago Journal Ranking (SJR) of selected journal articles.

Journals	Publication years	No. of articles	SJR 2019
Research Policy	2007,2012,2013,2015-2017,2019,2020	9	Q1
Technovation	2011;2016	2	Q1
Small Business Economics	2012	1	Q1
Technological Forecasting & Social Change	2017-2018	4	Q1
Environment & Planning A	2011	1	Q1
Ecological Economics	2017	1	Q1
Journal of Technology Transfer	2015	1	Q1
Regional Studies	2015	1	Q1
European Urban and Regional Studies	2013	1	Q1
Oxford Review of Economic Policy	2017	1	Q1
Entrepreneurship and Regional Development	2015	1	Q1
European Planning Studies	2010, 2012-2015, 2017-2018, 2020	12	Q1
Journal of the knowledge Economy	2012,2016,2017	3	Q2
Sustainability	2018	1	Q2
Economic Change and Restructuring	2016	1	Q2
International Journal of Innovation Management	2019	1	Q2
Foresight and STI Governance	2018	1	Q2
Chinese Management Studies	2020	1	Q2
International Journal of Social Economics	2017	1	Q2

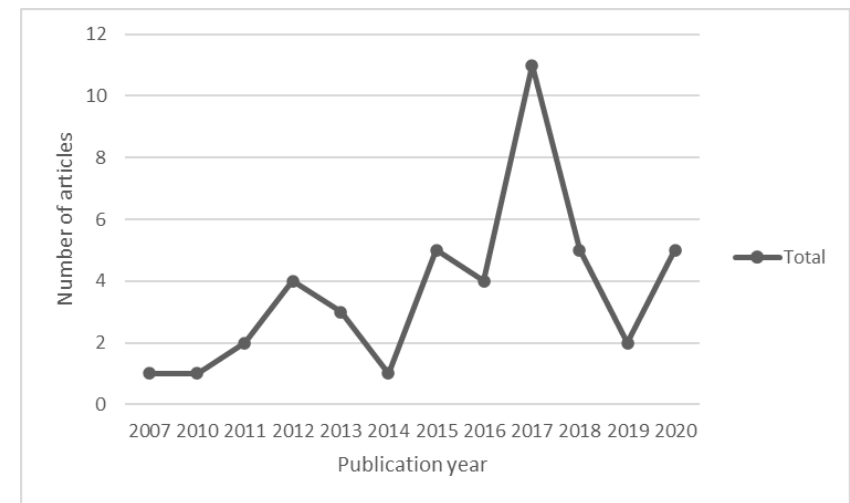


Fig. 2. Evolution of 44 article published during 2007- 2020.

3. Results 3.1. Bibliometrics

Table 2. Research methods of 44 selected articles.

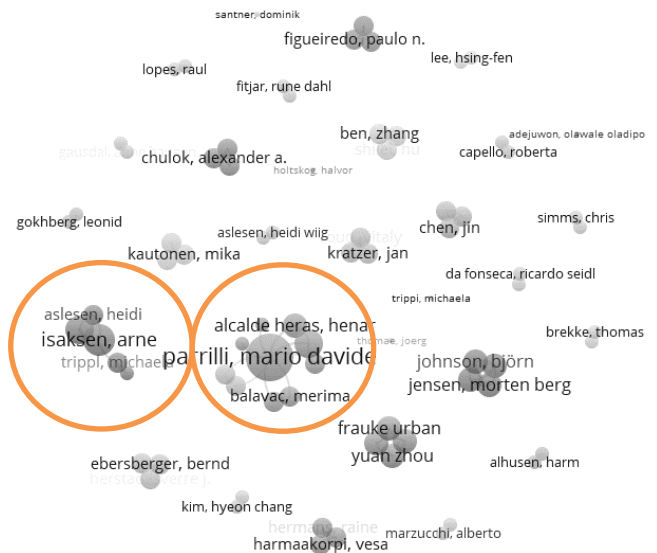


Fig. 3. Bibliometric mapping of articles authors and their relationship link cluster within selected articles

Publication Year/Research Methods	Conceptual	Mixed Methods	Qualitative	Quantitative	Total_Articles
2007				1	1
2010			1		1
2011			1	1	2
2012	1		2	2	5
2013			2	1	3
2014			1		1
2015			1	4	5
2016			2	2	4
2017	2		4	4	10
2018		1	3	1	5
2019				2	2
2020			2	3	5
Total_Articles	3	1	19	21	44

3. Results 3.2. Content Analysis

Table 3. Major Drivers of STI and DUI innovation mode in literature

STI Drivers	DUI Drivers
<p>Science-driven human capital: R&D investment. R&D knowledge. Scientifically trained human capital (innovators, highly skilled researchers, academic communities).</p>	<p>Experience-driven human capital: Experienced human capital (skilled managers, employees with learning by doing, using, and interacting work experience). Multidisciplinary teams (internal and external actors).</p>
<p>Scientific Technology sharing: Partners/competitors interaction involving techniques, methods and design, patents.</p>	<p>Organizational Interaction: With suppliers, customers, competitors, consultants, etc. Firm to firm collaboration.</p>
<p>Scientific Infrastructure: Research departments, research centers, labs, universities/academic centers</p>	<p>Non-Innovation Networking: Effective use and interaction with machinery and technology. Non-technology innovation as new processes or products that improve.</p>

3. Results 3.2. Content Analysis

Table 4. Major Processes of STI and DUI innovation mode in literature

STI Processes	DUI Processes
<p>Knowledge and learning transfer mechanism: Knowledge sharing between actors through conferences, scientific publications and/or universities activities.</p> <p>Organizational mechanisms: Collaboration focused on intensive collective scientific knowledge creation.</p>	<p>Knowledge and learning transfer mechanism: Knowledge sharing between employees, customers, suppliers and/or competitors. “State-of-art” and experienced actor to daily problem solving and trial and error mechanisms.</p> <p>Organizational Mechanisms: Collaboration focused on collective problem solving and addressing market, firm or customers’ needs.</p>

3. Results 3.2. Content Analysis

Table 5. Major Outcomes of STI and DUI innovation mode in literature

STI Outcomes	DUI Outcomes
New Product Innovation <i>Radical Innovation</i> High Technology Innovation New product to the market New product to the firm	New Product Innovation <i>Incremental Innovation</i> New customers-specific product New product to the market (based on needs) New product to the firm (based on needs)
New Process Innovation <i>Radical Innovation</i> Innovation performance New Marketing feature Organizational innovation	New Process Innovation <i>Incremental Innovation</i> New performance improvement (e.g., cost reduction, quality improvement)
	Non-Innovation <i>Development of new ideas</i> Firm performance Modification of existing product or process (performance, quality improvement) Increase productivity or sales growth

Conclusion

- The definition of STI and DUI as mode of innovation is consensual.
- Three main drivers for each innovation mode.
- The main difference between these two sets of drivers is the type of knowledge supporting innovation (scientific knowledge versus empirical knowledge).
- Two mechanisms are presented: Knowledge and Learning transfer and Organizational mechanisms.
- STI innovation leads to radical innovations while DUI innovation produces incremental innovations.

Conclusion

Future research:

- Distinction between drivers and processes in STI and DUI innovation.
- Network concept is an underlying idea.
- No consensus on the outcomes of a combined (STI and DUI) innovation^{8,9, 10}.
- Heterogeneity (organizations assume different types, dimensions, geographies).

Conclusion

Limitations:

- Articles published in Q1 and Q2 Scimago **J**ournal Ranking.
- 54 excluded articles because they do not address specifically STI and/or DUI modes of innovation.

Contributions:

- Innovation research.
- This work can help managers by creating a reliable knowledge base through putting together findings from a range of articles addressing STI and DUI modes of innovation.



Thank You for your Attention

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<https://advance.rc.iseg.ulisboa.pt/inovnet/en/>

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