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Loet Leydesdorff, the Triple Helix and ways to capture societal impact—a tribute

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Abstract
Much can be said about the seminal contributions Loet Leydesdorff has made overall to the literature on science & technology indicators and innovation. Many have already highlighted the legacy that Loet has left behind (e.g., Amaral et al in Triple Helix 10:161–187, 2024). This note sets out to pay tribute to the contributions Loet has made in the space of Triple Helix, indicators, and societal impact by developing frameworks and models that bridge quantitative, information-driven and qualitative social sciences.

Keywords Loet Leydesdorff · Key word analysis · Co-authorship analysis

Introduction

Much can be said about the seminal contributions Loet Leydesdorff has made overall to the literature on science & technology indicators and innovation. Many have already highlighted the legacy that Loet has left behind (e.g., Amaral et al., 2024). This note sets out to pay tribute to the contributions Loet has made in the space of Triple Helix, indicators, and societal impact by developing frameworks and models that bridge quantitative, information-driven and qualitative social sciences.

Data

To do so, I draw on a data set that comprises Loet's work of 376 papers in the social sciences citation index and a subset of 146 papers that focus on the Triple Helix and policy economic social or societal impact whether policy, government or management

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implications are covered.[1] The dataset was cleaned and then explored using VOSviewer (CWTS, 2025).

Findings

A comparison of topics of the full oeuvre in Fig. 1 and the Helix and impact focused papers in Fig. 2 show on the one side the multitude of contributions that Loet has made to the science communication, scientometrics and social science area overall, and, on the other, the seminal contributions he made integrating otherwise often very disconnected fields of research.

Figure 1 shows the breadth and depth of Loet's work with clusters focusing on (1) *science indicators, collaboration* and *social network analysis*, (2) *citation analysis* and *research performance*, (3) *diversity maps* and *networks*, also including *innovation*, (4) *knowledge* and *matrices*, and then finally (5) *technology dynamics*, *Triple Helix*, *information*, *communication* and *redundancy.* Figure 2 highlights three interconnected clusters around key words such as: (1) *innovation dynamics* and *non-linearity*, *evolutionary,*

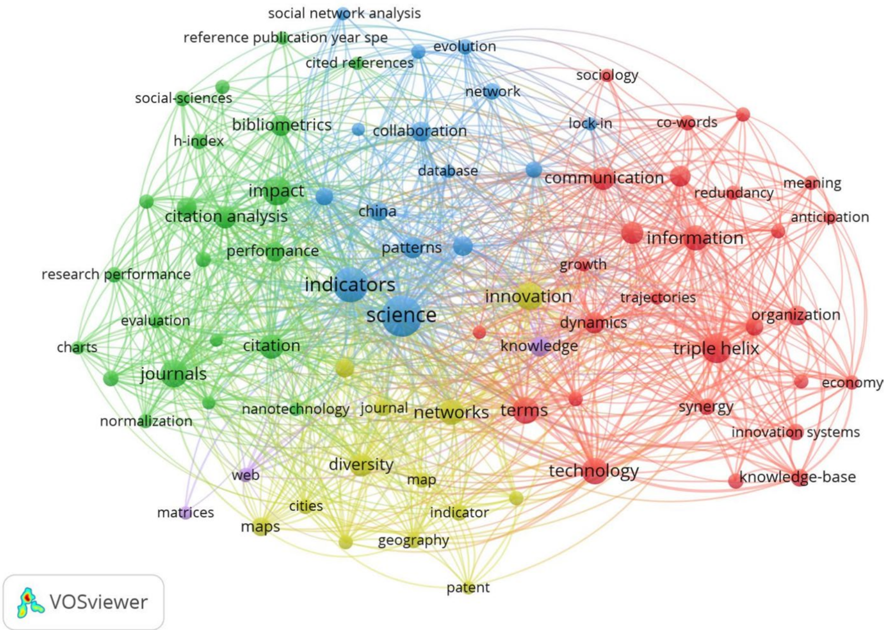

Fig. 1 Keyword co-occurrence map of Loet Leydesdorff's oeuvre as recorded in Clarivate's Web of Science

[1] The search strategy is basic combining author with topics such as *innovation system*, *government*, *policy*, *helix*, their spelling variations, as well as combinations of *Impact* with *policy/political*, *management*, *social*, *societal* or *economic* dimensions.

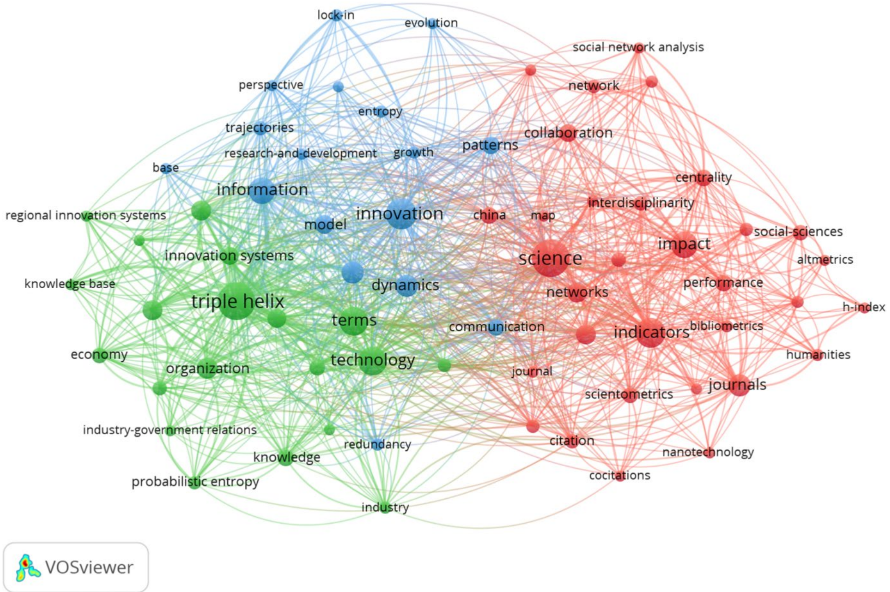

Fig. 2 Keyword co-occurrence map of Loet Leydesdorff's Helix and impact subset of papers as recorded in Clarivate's Web of Science

Fig. 3 A (neo-)institutional versus an evolutionary appreciation of the Triple Helix mode (Source: Leydesdorff & Meyer, 2006)

	Sub-dynamics		
Functions	Wealth generation	Novelty production	Normative control
Carriers	Industry—University—Government		

trajectories and *patterns*; (2) *Science*, *impact* and *interdisciplinarity;* (3) the *Triple Helix* linked with *innovation systems*, specifically *regional innovation systems.*

While the first map illustrates the wealth of contributions Loet has made, the second one really highlights how he has connected concepts such as *interdisciplinary* and *impactful science* to notions of *technology and innovation systems* with the *Triple Helix* as a tool to integrate different sub-dynamics, carriers and their functions (see Fig. 3). These are held together by *modelling innovation* in evolutionary and institutional frameworks, capturing *patterns* and especially the *dynamics* of *information* and *communication* flows.

Figure 4 illustrates how connected and embedded his thinking and approach has been, linking the term of innovation to a range of key concepts in the other areas and truly integrating notions from different fields. The map points to the *systemic approach* Loet advocated to better understand the knowledge-based economy, proposing it operates through complex interactions between economic, political, and knowledge production systems. Guided by these insights, Loet suggested policies and policy makers should acknowledge and support these systemic interactions to foster sustainable economic growth (e.g. Leydesdorff, 2006).

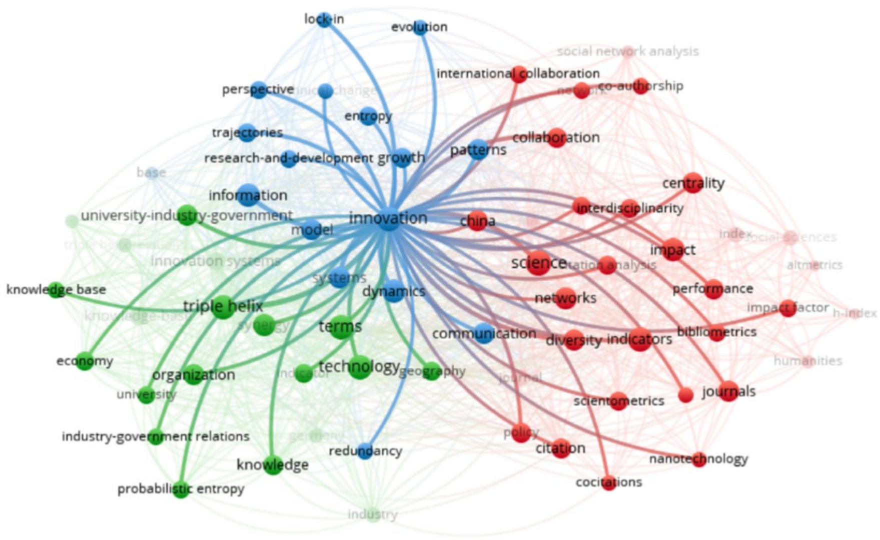

Fig. 4 Focus on 'innovation' and its connections to other concepts in Loet Leydesdorff's Helix and impact work

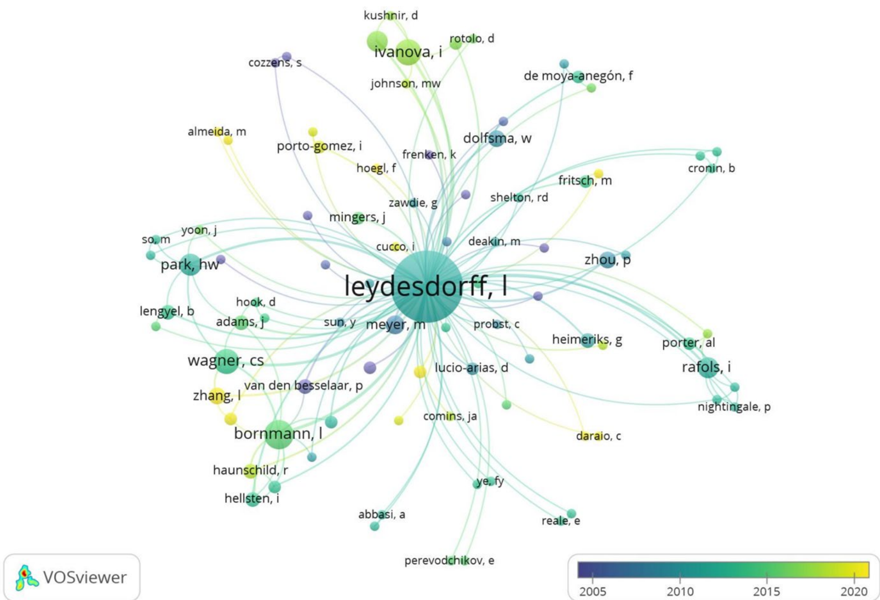

Fig. 5 Co-authorship map capturing Loet Leydesdorff's Helix and Impact work

He also highlighted the need for different sectors to anticipate and respond to changes in each other, thereby mitigating or reducing uncertainty and enhancing the innovative capacity of the knowledge-based economy (ibid.).

Evolutionary and institutional perspectives

Loet has established this broad body of work outlined above capturing and measuring overlays, fluxes and dynamics in the trilateral relations between university, industry and government. Loet and others termed this the 'neo-evolutionary' perspective on the helix and indicators (Meyer et al., 2014). Figure 5 points to some of Loet's companions in this effort which has stretched across three decades.

This is complemented by work that focused more on the entrepreneurial university and indicators of science–technology linkage, what Loet called a 'neo-institutional' perspective (Leydesdorff, 2013). That perspective has also been associated with Henry Etzkowitz, Loet's congenial partner and the other founding father of the Triple Helix concept.

What both strands of work share is a common knowledge base or point of reference (Meyer et al., 2014). Among the commonly cited works is the influential paper on the dynamics of innovation co-authored by both (Etzkowitz & Leydesdorff, 2000), Loet's paper on the Triple Helix as an evolutionary model of innovation (Leydesdorff, 2000) and then the innovation systems books by Lundvall (1992) and Nelson (1993).

Pioneer, boundary spanner and integrator

Trying to summarise some of Loet's contributions to our field, his roles as a pioneer, boundary spanner and integrator come to mind. By developing a rich body of work on indicators to capture the performance and impact of innovation systems, pointing to the complexities of how the different strands of the Helix are interrelated, Loet pioneered and opened up a new research area.

Being uniquely able to cross disciplinary and specialties, reaching far beyond the information, communication and scientometrics literatures, Loet managed to span boundaries. Integrating sophisticated quantitative approaches with scholarship on innovation beyond the scientometrics literature, Loet also helped to open up our field to new researchers and make it more accessible to scholars from other disciplines.

These are just some of Loet's lasting contributions. He will be sorely missed.

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Declarations

Conflict of interest To the best of the author's knowledge there are no conflicts of interests or competing interests. There has been no funding for the work.

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