Review of: Leydesdorff, Loet. The evolutionary dynamics of discursive knowledge. Communication-theoretical perspectives on an empirical

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Book Reviews

Leydesdorff, Loet. *The evolutionary dynamics of discursive knowledge. Communication-theoretical perspectives on an empirical philosophy of science.* Cham: Springer Nature, 2021. x, 247 p. ISBN 978-3-030-59951-5 (eBook). Open access. (Qualitative and Quantitative Analysis of Scientific and Scholarly Communication - QQASSC)

The concept of information is key to both cybernetics and information research. Despite this common ground, the impact of cybernetic research in information studies has been limited in comparison with other scholarly fields (see Tunstel et al., 2021). The recent book *The evolutionary dynamics of discursive knowledge* is arguably a significant and long-waited contribution to both cybernetics and information research. The author, Loet Leydesdorff, is Professor Emeritus in the Dynamics of Scientific Communication and Technological Innovation at the University of Amsterdam. This publication presents previous works by Leydesdorff in a new version. Earlier works are revised and convincingly combined in a theoretical system that stems from the author's long career, here presented in a unitary fashion.

The book is divided into three parts, and its primary focus, as the title suggests, is set on the systems of discursive knowledge (i.e., the meanings created from the sharing of information) and its evolutionary patterns (i.e., the patterns of change embedded in the dynamics of communication). The first section is dedicated to scholarly communication as a cybernetic system (chapters 2-4). The Triple Helix of university-industry-government relations is treated as an empirical exemplification of this *sociocybernetic* approach (chapters 5-7). The last section discusses the self-organisation of communication systems (or, in more cybernetic terms, their autopoiesis). This last part proceeds then to computer-aided simulations for the study of innovation. The author concludes the book by proposing the agenda for an *empirical philosophy of science* (chapters 8-11). Chapters 1 and 11 are key in the book's structure as they introduce and summarise, respectively, the unifying perspective of the work. The autobiographical tone of the first chapter makes it particularly pleasant to the reader.

The book's subtitle *Theoretical perspectives on an empirical philosophy of science* reveals the approach proposed by the author to the study of scientific and technological change. Information theory and the concept of Shannon information are applied in the book's framework as tools for an *empirical* philosophy of science. In other words, utilising cybernetics and information theory, Leydesdorff operationalises the concepts that describe the dynamics of science, as in the well-known case of the Triple Helix Model, discussed at length in Part II.

In the context of information studies, Leydesdorff's contribution has been most often associated with bibliometrics and related metrics fields (the author was awarded the Derek de Solla Price Memorial Medal, bibliometrics' most prestigious mark of recognition in 2003). However, his contributions exceed information studies and include his development of the Triple Helix Model as well as Niklas Luhmann's sociology. Even if the whole book is highly relevant for anyone interested in information research, the first section is arguably the most immediately capitalisable in this field, even if references to key concepts in information studies are found throughout the entire publication. Exemplary in this respect is the discussion on the ontological nature of Big Data (in chapter 10).

The book's audience is broad since it can be read as inspiration for further bibliometric analyses in innovation and technology studies as well as a work in the philosophy of science. In fact, against the monist stance of physicalism, according to which all systems are reducible to lower-level systems that the domain of physics can explain, Leydesdorff proposes in chapter 10 an intrinsically pluralist approach. For the author, meanings affect systems in ways that are not reducible to the dynamics of physical systems. In other words, meanings are to be understood as causes that affect the domain of discourses (and beyond, as shown by scientific innovations turned into technological artefacts of material nature). Once meanings are created, they determine what future information can be shared and what other meanings can be created. Scholarly communication is exemplary in this regard: meanings that are communicated (published, for instance, in journals) contribute to determining which other future meanings can be added (the genre of the book review illustrates quite well this point, in my opinion). As the author writes:

> *The sharing of meanings on top of but different from the communication of information can generate synergy under specifiable conditions. Synergy enlarges the number of options at the above-individual level (p. 10).*

Leydesdorff's book has value as a theoretical and methodological publication in bibliometrics and innovation studies and, in my view, as a pivotal contribution to the philosophy of science (and the philosophy of information). The book reminds me of Jerry Fodor (2004) and Gregory Bateson (1972) in its defence of the autonomous nature of knowledge systems compared with physical systems. Traditional categories such as Descartes's *res extensa* and *res cogitans* are translated into the language of cybernetics. The author applies the Cartesian concept of *res extensa* to physical systems, whereas he considers the *res cogitans* as instantiated in systems where information is created (and is shared qua meanings). The effects of meanings in communication systems can be studied quantitatively at the 'above-individual' level, as often done in bibliometric research. The philosophy of science is then turned into a plurality of empirical enquiries (as stated in the book's subtitle).

In terms of readership, it is to be mentioned that the book mirrors the broad knowledge of its author and recalls concepts from a vast spectrum of disciplines, from philosophy and sociology to calculus and computer science. While this could be a challenge to beginners, the author facilitates the reader with effective abstracts and index, many figures strategically placed in the book, and additional software material available for his website. Praise should go to the author, and whoever else has made that possible to publish this work in the open-access format. The book is always clearly written and consequent in its argumentation. However, future editions of this work could benefit from adaptations of the computer codes in the original programming language used by Leydesdorff (Visual Basic 6) to other languages with which the readers could be more familiar (e.g., R and Python).

The published works on which the book builds upon are well-cited publications whose impact is already established. Nevertheless, the book shows the red thread that connects them and makes them part of a more extensive theoretical system. In any case, this work, in my view, does not need to be read in one go, although doing this will reveal the internal coherence of a research program that corresponds to fifty years of quite diverse research. In this aspect, the book might remind the reader of *Steps to an Ecology of Mind* (Bateson, 1972). Like the latter, the book is destined to be a classic in cybernetics and an essential reference for information researchers.

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Marco Schirone
University of Borås
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