What Systems Thinking Means to Different Networks of Researchers

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Extended Abstract

There is a growing body of literature on the applications of Systems Thinking (ST); yet, a consensus on what constitutes ST remains elusive. Various studies have demonstrated the necessity to revise the definition of ST, especially for the purpose of ST assessment. Classification of the available definitions in the literature is an essential step to reach a common language among the scholars in the field. By using Social Network Analysis (SNA), this paper identifies the main authorship networks around ST. The analysis of 1462 papers with ST in their title leads to the emergence of three large components. Looking at the main concepts, definitions and applications in each component reveals systems thinking functions differently for each network of researchers. In the first component, ST is used as the backbone of other frameworks such as Critical Systems Thinking (CST) or Open System Thinking; while, in the second component, the applicability of ST concepts and the gap from knowledge to action are highlighted. Finally, the third component points to the potential application of ST to transform different sectors.

Introduction

Considerable research has been conducted on the definitions, approaches, methodologies, and tools of Systems Thinking (ST). A search in Scopus alone, returns more than 1500 papers that contain the term “systems thinking” in their titles. However, ST still suffers from the lack of common definitions and approaches. That is one of the reasons why a comprehensive revision of ST definition is needed especially in order to improve ST assessment methods. Many papers do not provide any specific definition or framework. A clear definition and understanding of ST can help researchers to use ST in many contexts effectively. Since 1994, considerable efforts have been made to form a common understanding and definition of ST. All such efforts have been unsuccessful. A serious challenge to address this issue is that ST has been employed in different and sometimes contradictory approaches and methods. The first step in having the ability to create a common definition of ST and improve current approaches is to cluster current definitions and approaches. However, ST definitions and approaches can be clustered in a variety of ways. This paper proposes a new method for the classification of ST research based on network analysis.

Method and data

The proposed method to classify definitions and applications of Systems Thinking, is to use a list of the most active researchers, and the definitions and applications in their publications. In this respect, by using social network analysis, a network of authorship is created. Each node represents a paper, and the link between two nodes highlights there is at least one author shared between the two papers. As a result, a number of isolated sub-networks (the so-called components) and isolated nodes emerge. In large components, there is a possibility of the emergence of clusters, where nodes within each cluster have a stronger bond with each other than the rest of the same component (Dehdarian & Tucci, 2021).To find clusters, here an algorithm called modularization is used, which results in the identification of modules (Clauset et al., 2004).

The data used in this network includes all papers with the term “systems thinking” in the titles in Scopus, which results in a total number of 1502 papers. The biggest components with at least two modules are considered here, which leads to a total of three biggest components.

Results

The biggest component is composed of six modules. The main focus in this component is on theories and approaches that emerge from systems thinking characteristics and its practical applications. They include soft systems methodology, open systems thinking, critical systems thinking, the Vanguard method, lean management and total system intervention. There are also comparisons between Systems thinking and other methods or approaches such as Operations Research (OR) and System Dynamics (SD).

The second component is composed of four modules that can be divided into two groups. The first group includes frameworks to transform Systems thinking theories and concepts into learning and action. Then, systems thinking potentials and functionalities are explored in the case of the health system. There is the possibility of looking at the health system as an example of a complex adaptive system that provides the opportunity for a systems thinking approach to grasp the inherent complexity of such systems. However, in reality there is a gap between knowledge and action. Furthermore, there are potential applications for systems thinking to improve functions in the health system as a practical need, which highlights the importance of learning and experience in using systems thinking principles.

Finally, the third component focuses on interventions and practical solutions facilitated by systems thinking to address practical challenges in different sectors. They range from health system issues to different aspects of systems engineering such as planning or education, as well as examples of large infrastructural systems such as energy and maritime systems.

Discussion

Looking at the results of network analysis shows that in the largest networks of authorship and co-authorship, which can be interpreted as the network of the most active ST researchers, ST and some other concepts are being used interchangeably. These concepts range from frameworks and methods such as critical systems thinking and open systems thinking, to definitions that highlight one aspect of ST such as connection between parts, or a holistic approach. In addition, ST is understood as a required mindset to resolve issues in complex adaptive systems or large engineering systems. In this respect, our results show that instead of providing a clear definition of ST and the requirements to make the best use of ST principles and mindset in different contexts, practical issues arising in these systems are attributed to the lack of ST, which can be resolved by filling the gap from knowledge to action or apply ST for system transformation.

This research is a first step to analyze the structure of the research community around ST definitions, concepts and application, and different patterns emerging from different types of collaboration. This research can be complemented by looking at other modes of collaboration and knowledge exchange through the network of co-authorships (authors as nodes), main path analysis of the ST research strands and their knowledge trajectories, and citation networks. Each of these networks can shed light on the evolution and dissemination of knowledge about ST and help us understand why the ST community, even though equipped with ST as a critical asset for analyzing complex issues, has not reached consensus about its associated concepts, skills and definitions, that can differentiate ST from other relevant theories and frameworks.

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