

## Scientific Development as Diffusion on a Social Network: An Empirical Case Study

**Authors :** Anna Keuchenius

**Abstract :** Broadly speaking, scientific development is studied in either a qualitative manner with a focus on the behavior and interpretations of academics, such as the sociology of science and science studies or in a quantitative manner with a focus on the analysis of publications, such as scientometrics and bibliometrics. Both come with a different set of methodologies and few cross-references. This paper contributes to the bridging of this divide, by on the one hand approaching the process of scientific progress from a qualitative sociological angle and using on the other hand quantitative and computational techniques. As a case study, we analyze the diffusion of Granovetter's hypothesis from his 1973 paper 'On The Strength of Weak Ties.' A network is constructed of all scientists that have referenced this particular paper, with directed edges to all other researchers that are concurrently referenced with Granovetter's 1973 paper. Studying the structure and growth of this network over time, it is found that Granovetter's hypothesis is used by distinct communities of scientists, each with their own key-narrative into which the hypothesis is fit. The diffusion within the communities shares similarities with the diffusion of an innovation in which innovators, early adopters, and an early-late majority can clearly be distinguished. Furthermore, the network structure shows that each community is clustered around one or few hub scientists that are disproportionately often referenced and seem largely responsible for carrying the hypothesis into their scientific subfield. The larger implication of this case study is that the diffusion of scientific hypotheses and ideas are not the spreading of well-defined objects over a network. Rather, the diffusion is a process in which the object itself dynamically changes in concurrence with its spread. Therefore it is argued that the methodology presented in this paper has potential beyond the scientific domain, in the study of diffusion of other not well-defined objects, such as opinions, behavior, and ideas.

**Keywords :** diffusion of innovations, network analysis, scientific development, sociology of science

**Conference Title :** ICCSS 2017 : International Conference on Computational Social Science

**Conference Location :** Amsterdam, Netherlands

**Conference Dates :** May 14-15, 2017