CoCo Seminar Series Fall 2021

Network Topologies of Corporate Organization Charts and Their Correlation with Corporate Performance

**Dr. Hiroki Sayama, Professor of Systems Science and Industrial Engineering, Binghamton University
(Work in collaboration with Dr. Junichi Yamanoi, Waseda University)**

**Wednesday November 3, 2021   11:00am-12:00pm EDT
Hybrid (EB-T1 & Zoom; meeting link available on http://coco.binghamton.edu/)**

The organization structure of corporations, which represents formal pathways of corporate chains of command, has potential to provide implications for performance of corporate operations. However, this subject has remained unexplored in the fields of management science, social network analysis and complex systems science, primarily because of the lack of readily available organization network datasets. Most of the information about corporate organization structures are publicized in a graphical organization chart, which may be used for a small number of manual case studies but would not be suitable for large-scale quantitative statistical analysis. To overcome the above gap in corporate organization research, we developed a new heuristic image-processing method to extract and reconstruct organization network data from a published organization chart. Our method analyzes a PDF file of a corporate organization chart and detects text labels, boxes, connecting lines, and other objects through multiple steps of heuristically implemented image processing. The detected components are reorganized together into a NetworkX's Graph object for visualization, validation and further network analysis. We applied the above method to the organization charts of all the listed firms in Japan shown in the "Organization Chart/System Diagram Handbook" published by Diamond, Inc., from 2008 to 2011. Out of the 10,008 organization chart PDF files, our method was able to reconstruct 4,606 organization networks (data acquisition success rate: 46%). For each reconstructed organization network, we measured network density, average clustering coefficient, and average distance of nodes from the CEO. We conducted multivariate regression analysis using the calculated network diagnostics and other control variables as independent variables and the firm's ROA (return on assets) as a dependent variable that characterizes its performance. The result showed statistically significant negative correlation between ROA and network density as well as between ROA and the average distance from the CEO, while the average clustering coefficient had no statistically significant correlation. These results imply that, the more complex a firm's formal organization structure is, the less effective its decision making and operation may be.

Hiroki Sayama is a Professor in the Department of Systems Science and Industrial Engineering and Director of the CoCo Center at Binghamton University. His research interests include complex dynamical networks, artificial life/chemistry, human social dynamics, interactive systems, and complex systems education.   http://coco.binghamton.edu/