Network Analysis of Roethlisberger & Dickson Bank Wiring Room

Introduction:

The original analysis of observational data on a group of 14 employees from the bank wiring room at the Western Electric Hawthorne Plant was introduced by Roethlisberger and Dickson in their 1939 publication. The research gained additional attention with Homans' review in 1950, and further with Breiger and his colleagues' CONCOR analyses in 1975. The study's participants consisted of various roles, including two inspectors, three solders, and nine wiremen or assemblers, with their interactions divided into six distinct types. These interactions ranged from playful antics and debates over open windows to friendships, antagonism, work assistance, and job assignment exchanges. The interaction data were classified differently, with some being symmetrical and others non-symmetrical; the latter category included data on job exchanges, which were also assigned a value. The pioneering documentation of this study appeared in "Management and the Worker," authored by Roethlisberger and Dickson in 1939, and it has since been a subject of scholarly discussion, notably in the context of Breiger et al.'s 1975 analysis that applied clustering techniques to relational data within social network analysis.

Research questions (*Code with figures in the R-markdown file*):

1. How does the structure of the Bank Wiring Room friendship network manifest in terms of centrality, modularity, and community, and how do these measures compare when accounting for the presence of isolates?
2. What is the core structural patterns of the Bank Wiring Room friendship network, and how do they relate to the network's coreness distribution and assortativity?
3. How does the application of block modeling and structural equivalence analysis enhance the understanding of community detection in the Bank Wiring Room friendship network?

Conclusion:

The network's structure is straightforward with a few key players and groups that have significant roles and influence. It's like a community with some members being more central than others, helping to connect different groups and keep information flowing. The study highlighted these key parts and made it easier to understand how individuals within this network interact and relate to each other. It pinpointed pivotal nodes like W3 and S1 that are integral to the network’s information and relationship fabric. Detailed assessments using centrality metrics uncovered the layers of influence and interaction among individuals. Analysis tools such as clique identification, coreness, and modularity illuminated the cohesive subgroups and their interconnections. Overall, it's an organized system with clear patterns of connection rather than a tangled web of complexity.

References:

- Roethlisberger F. and Dickson W. (1939). Management and the worker. Cambridge: Cambridge University Press.
- Breiger R., Boorman S. and Arabie P. (1975). An algorithm for clustering relational data with applications to social network analysis and comparison with multidimensional scaling. Journal of Mathematical Psychology, 12, 328-383.
- Marjan Cugmas, Aleš Žiberna. (2023)Approaches to blockmodeling dynamic networks: A Monte Carlo simulation study,Social Networks,Volume 73, Pages 7-19,ISSN 0378-8733 (https://doi.org/10.1016/j.socnet.2022.12.003).