

Understanding Complex Social Network of Government Officials in Decision Making

CPRSOUTH 2017

POLICY BRIEF

Bangladesh government has created a Facebook group named “Public Service Innovation Bangladesh” to encourage the spread of ideas and interaction among experienced senior civil servants and junior officers. Currently, this group has around 14500 members. This peer-supported and mentor-ship platform will host innovative ideas and ambitions of government officials. Our study emphasizes on the understanding of the complex network of this group, based on their interactions in the group.

In order to understand the interactions and the nature of the group, we have analyzed different complex network metrics such as degree centrality, betweenness centrality, eigenvector centrality, characteristic path length, network assortativity, and other parameters of the network.

Our findings reveal that the network is similar to both the core periphery network and the scale free network. Only few members publish posts, likes, comments, shares and so on. Some are more influential in terms of posts/likes/comments than others in the group. Furthermore, we observe that the network is becoming sparser day by day. Findings of the structure should help policy makers to innovate new ideas and mechanisms to make the group more interactive. This may also help researchers to suggest more interactive social networks for policy makers and government officials. The consequence of more interactivity may be reduction of principal agent problem that slows down the field level policy executions in the developing world.

SUMMARY OF FINDINGS/RECOMMENDATIONS

- 1. The network is dense in the core and surrounded by many dangling nodes:**
We find that the network structure has a dense core since clustering coefficient of the network is 0.446. Only 4-5 persons, who are in the core, publish posts often. Other members, who are not in the core, give likes or comments or shares on those posts. The network is depending on these core members. Without these key members, the group will be less active.
- 2. Over time network is becoming sparser:**
Analyzing network measures such as, degree centrality, clustering co-efficient, network assortativity, etc. we find that, gradually, clustering co-efficient is decreasing. Hence, network is becoming sparser. Various types of posts are increasing and many new members are joining in this group. New members are making likes, comments, shares on the posts rather publishing posts themselves.
- 3. The present network demonstrates 4 degrees of separation between people:** The network has characteristic path length of 3.94. Characteristic path length is the average shortest path length from one node to another. It suggests that the degree of separation between two members in the group is near to 4. It would be good, if the value is close to 1. In that case, members would be directly connected with each other.

THE RESEARCH

I Data Description

In order to conduct this research, we have collected data of 5183 posts published in the group between January 1, 2016 and June 30, 2017. Currently, this group has around 14500 members and counting. All members in the group are government officers from different ministries and departments. Among 14500+ members, 1571 members (10.83%) made at least 1 post, 3141

members (21.66%) made at least 1 comment, 8609 members (59.36%) made at least 1 reaction.

II Network Construction

The network data set is composed of an $n \times n$ matrix M , where n is the number of nodes in the analysis. For our research, we have used such a network where all the nodes are users and edges represent the linkage between users. We have 3155 nodes and 11744 edges in the network. If one user publishes a post and another user likes or

comments or gives reaction to that post, then, we consider them as connected users. Edge weight encodes the number of reactions or comments a user makes on another user's posts.

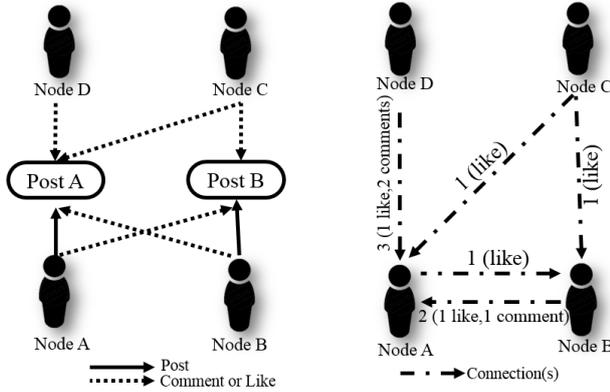


Figure 1. Construction of the interaction network.

Suppose, node A and B publish 2 posts. Node D gives 1 like and 2 comments, node B gives 1 like and 1 comment, node C gives 1 like to post A. Additionally, Node A and C both give 1 like to post B (left). Considering this scenario, we have constructed our interaction network and have got the following edge weight, $W_{DA}=3$, $W_{CA}=1$, $W_{BA}=2$, $W_{AB}=1$, $W_{CA}=1$ (right).

III Network Structure of “Public Service Innovation Bangladesh” Facebook Group

We calculate complex network metrics such as characteristic path length, clustering coefficient, network assortativity, betweenness centrality, eigenvector centrality, etc. to better understand the structure of the network.

Table 1. Network Level Measures of the Group.

Network and Node Level	Values
Characteristic Path Length	3.940
Clustering Coefficient	0.446
Network Assortativity	-1.031
Betweenness Centralization	0.104
Eigenvector Centralization	0.909

The structure has a dense core and many periphery nodes (which are connected to the core and have no connections among themselves). On the other hand, the structure also seems kin to the scale free network with most nodes are connected to few other nodes and few nodes are connected to many other nodes.

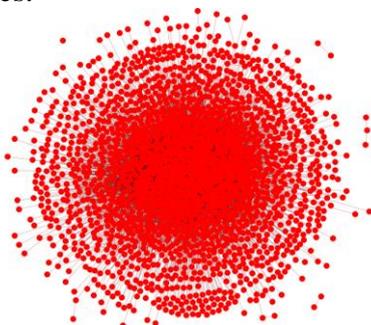


Figure 2. Interaction network of Public Service Innovation Bangladesh Facebook group.

Since the network is scale-free, the distribution of node linkages follows a power law distribution, in that most nodes have just a few connections and some have a tremendous number of links.

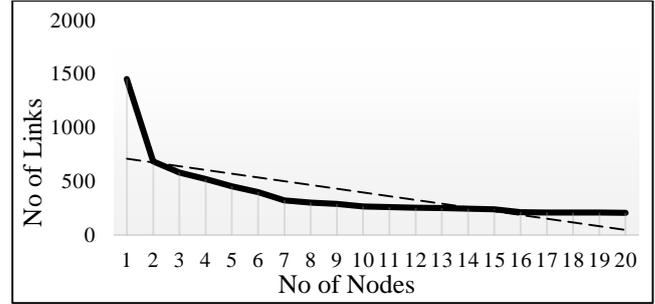


Figure 3. Power law degree distribution of node linkage. It demonstrates that only 4-5 persons contain the most number of links.

We observe that day by day, number of posts are increasing and new members are joining. However, clustering coefficient is decreasing. It means that, the network is becoming sparser. New members are making likes, comments, shares on the posts rather publishing posts themselves.

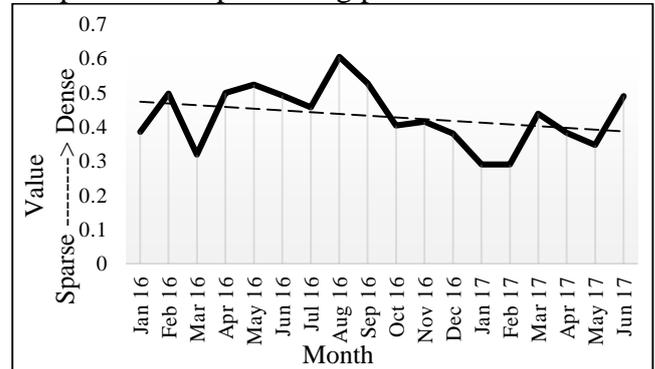


Figure 4. Month wise clustering coefficient is decreasing which denotes that, the network is becoming sparser.

Moreover, we find that the present network demonstrates 4 degrees of separation between people. Characteristic path length is the average shortest path length from one node to another. The network has characteristic path length of 3.94. It would be good, if the value is close to 1. In that case, members would be directly connected with each other.

AUTHORS

Dipankar Chaki, Department of Computer Science & Engineering, BRAC University, Bangladesh.

Email: joy.dcj@gmail.com

Moinul Islam Zaber, Department of Computer Science & Engineering, University of Dhaka, Bangladesh.

Email: zabermi@gmail.com

Amin Ahsan Ali, Department of Computer Science & Engineering, University of Dhaka, Bangladesh.

Email: aminahsanali@gmail.com