

Organizational Social Network Analysis – Case Study in a Research Facility

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Abstract. In this paper we address the need of the extension of social network analysis from online social networks to companies. We conducted an analysis in a German research facility and analyzed the network in several dimensions. While we found that inside the work groups were no problems easy to spot we found that the communication between the groups was pretty low. Aside from this fact the facility in question has a working communication network.

1 Introduction

Companies have recognized the emergence of social networks and are applying a similar behavior for the evaluation of their employees, as well as they changed their recruiting behavior. There are attempts to include organizational science in companies (Scott, 2000). Still, there are few companies really interested in their internal network. They have an organizational chart and believe that knowledge flows along its structure. That is rather untrue as Cross and Parker showed several times for different U.S. companies. Knowledge management might be highly improved if existing connections could be used more efficiently as well as companies could use the knowledge they get from their internal structure to form better teams for new projects. Leveraging these potentials is up to now only done intuitively and could use these informations to a certain extent.

In this paper we conducted an online survey at a German research facility and analyzed their internal network. We will explain the measures we took, followed by some of the facts we found. Finally, we will discuss future improvements for this research as well as some problems that emerged.

2 Survey

We conducted an online survey for a time period of one and a half months to guarantee participation possibility to all employees. They were asked to give some of the co-workers they rely on in their daily processes, but also people they estimated to be potentially helpful although they did not communicate with them. It is important to note that we did not hand them a list to check the people they work with, but rather gave them the possibility to ponder the question of who is important for themselves.

We collected four dimensions of the social behavior inside the company. First of all, what do they know of the capabilities of their chosen co-workers, since we figured this to be a crucial part for choosing them. Secondly, we were interested in the ease of access to those persons. Furthermore we asked for the perceived engagement in a posed question, if the answers are short but precise or too extensive. And last but not least we wanted to know if the communication with the considered persons changed recently, i.e., if they increased or decreased the communication with their peers. We also asked for some information about the relationship to the other persons, i.e., how long they know them and how often they interact with them. These dimension are mostly based on a similar survey conducted by Cross and Parker (2004) but also other ideas were taken into account like the metaphor of the learning organization and team (Page et al., 1999).

3 Results

We sent the survey to two research departments of a company. We actually started in a small setting in one city to see the results and judge if it is worth to perform the analysis with the whole company. A total of 67 employees got the survey and we got 48 responses, resulting in an answer rate of about 70%, which is a reasonable result to start with. All but one respondent belonged to the scientific staff and only two of the respondents were females. Nevertheless, the results will give a better understanding of the communication network if everyone participates.

The average respondent named between 3 to 5 persons as contacts, the maximum number of named persons was 22. On the other hand, only 14 people were named for being not contacted sources of knowledge. This indicates a good structure and a good communication profile for the company. This is shown in the other answers as well. Less than a quarter of the company needed to communicate more with a person to become more efficient. Considering only those respondents who need the improved communication urgently, the number drops down to only 14 members. Apart from this, there were no obvious deficits in the answers.

Keeping in mind that the perception of other people always depends on the person and we can not assume that everyone had the same reasoning process, we analyzed the survey data we gathered in the course of one month. We had several hypotheses how the network would look like.

- (a) Inside a work group the connectivity will be high, between groups the connectivity will be low.
- (b) The number of outgoing-connections will be in average between 5 and 8.
- (c) No group will have a density of one.

We found hypothesis (a) to be less true than we thought. Between the two major groups we surveyed, there were not as many connections as we expected. Nevertheless, one group had a sub-group with a different research topic. The

connectivity between the sub-group and its main group, called group A, was surprisingly high and almost everybody of the subgroup had at least one person to talk to in the main group. In Figure 1 one can see the main group A in the upper left corner, the subgroup in the upper right and group B is in the lower left corner. On the other hand, between the sub-group and the other main group, called group B, there were no connections at all. We are sure this is not caused by their physical distance since the survey was conducted in one building.

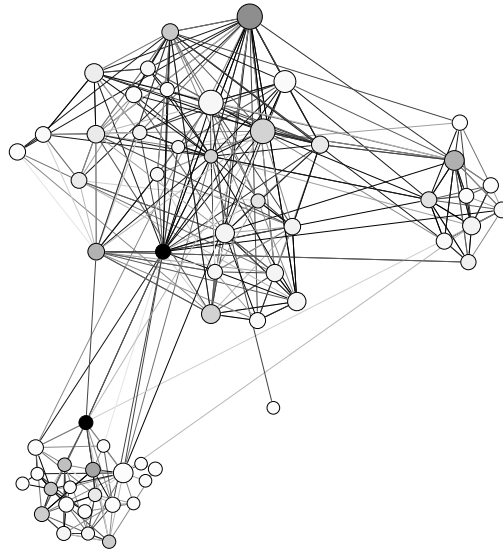


Fig. 1. Company-network. The darker a node the more between, the larger the size of the node the higher the closeness centrality.

Hypothesis (b) is true. The average number of outgoing connections (listed person as contact) as well as the average of incoming connections (was listed as contact) was in the expected region. The in-degree has an average of 6.3, the out-degree had an average of 7.9. The difference is reasoned by the fact that persons who were named but did not respond are included in the network. The difference is easy to explain. Some people are more important, so they had a higher number of connections coming in. One might think of the heads of the groups. Other persons were more communicative, they had much more contacts to talk to and hence caused a higher value for the average out-degree. Interest-

ingly, two persons who work in different groups have direct contact with each other and a good relationship, still they are also very communicative inside their own groups. In fact, they both have the highest number of outgoing connections in their group. They do not have the highest number of incoming connections. It is thus fair to assume that they have a high amount of knowledge they want to spread, or they consider other persons as sources of knowledge and distraction. Distraction is considered to increase productivity or creativity (Fisher, 2006; Wieth and Zacks, 2011) so it should be encouraged to talk to different people.

Hypothesis (c) is true for the communication network if we only take into consideration who considered whom in the survey. If we take the connections without directions we get a different result. The sub-group of group A shows again the different behavior with a fully connected group resulting in a density of one. Even in the former view the sub-group is almost at a density of one. This shows that the communication and also the relations in this group are much better developed, and this might give them an advantage in distribution of knowledge. In communication with some of them we found that they usually go to lunch as a group or did other activities together. This does not only improve the social binding in the group but also gives them the former mentioned distraction bonus.

As an interesting side note one might figure that the answers were evenly distributed throughout the company. In reality, group A had a much higher response rate (85%) than group B (49%).

Summarized, up to this point the results of the survey were interesting and sometimes even surprisingly good. The company seemed to have no need to change the structure of their work since the network showed no fatal flaws and was in some regards beyond expectations. Nevertheless, we were interested in what would happen if one of the persons would leave the company. We decided to remove the persons with the most outgoing connections from the network and investigate in a theoretic scenario what would happen. The network diameter increased from 7 to 8, the average degrees both fell to a much lower value. It seems, even if the person is not talked to much, she is important for information and knowledge distribution. Furthermore, the person is one of the main connectors between group A and group B. Without the person the communication almost ceases.

It is even more important to note that every person in the company has a special knowledge. For the person in consideration it would be bad if he would leave but due to his communicative personality it is fair to assume that she also spreads some of his knowledge and gives information where to look for further information about her special knowledge. If we remove another person from the network, one with a normal or even low connectivity rate who is on the outside of the company, it might not harm the network structure but it will also reduce the knowledge pool of the company.

4 Further research

Overall, the research done on this topic is quite scant. There is much research done in the field of network analysis, but in order to apply the algorithms and theories developed on a real company might either be only appropriate enough to show that the algorithms are working correctly. In social sciences there is also much research done on work relations and on differences between people, but since this was performed in a thesis for computer science the effort for research was more on network theory than on social sciences.

Nevertheless, we mentioned that a higher response rate would give a better view on the network. To get more answers it appears that being known in person by the subjects is a good way. We suggest to go with both, interviews and an online survey with different question sets. In the additional interview can the answers be investigated (only with non-anonymized surveys) or other question could be posed for specific persons, including some made up persons or persons who left the company to see if the interviewed person is talking truth or if he is telling the interviewer what he thinks they want to hear.

On the algorithmic side it could be interesting to predict the network structure. There are several algorithmic ideas, which are able to either track changes in networks (Rosvall and Bergstrom, 2008) or to predict future behaviour of participants (Deffuant et al., 2012). With a combination of those or similar algorithms and repeated surveys, the employer might be able to predict the behavior of his employees.

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