Chapter 11
Social Network Analysis in Corporate Management

Sebastian Palus and Przemysław Kazienko

Abstract. The chapter provides an overview of essential analyses and comparisons helpful in corporate human resources management based on social network approach. Several ideas, measurements, interpretations and evaluation methods are presented and discussed, in particular group detection, centrality degree, dynamic analysis, social concept networks.

11.1 Introduction

Over the past few years, corporations have evolved from sets of individual units to collaborating social beings. Recent companies are implementing various ideas to help their employees to get known and co-operate with each other and therefore improve performance of their work. Some of them are company integration events, trips and more fresh as well as less expensive intranet social websites. Hence, people get into various relationships due to their different job activities. Based on these relationships, a typical social network describing organizational connections can be created. These social connections between employees can be extracted from the data about pure communication like email exchange, phone calls or teleconferences. This chapter describes a general social network approach to help analyzing the knowledge flow in the organization [12] and therefore supporting corporate management.

Each company or organization can be compared to a living organism [5]. Like in the nature, each unit is dependent on others and only altogether they really form a complete system. Nevertheless, the essential part of a human body is the nervous system which steers and supervises all other processes. The similar role plays the knowledge flow for the corporate lifecycle. Thus, analysis and optimization of communication efficiency within organization is very important. Such analysis
can detect invisible anomalies and suggest some improvements in managing corporate policies, hierarchy structure and social approach to employees.

11.2 Social Network Approach to Corporate Assessment

11.2.1 Social Network Extraction

A corporate social network can be extracted from various IT systems utilized in the organization, in particular from internal communication like email logs, phone billings and from common activities, e.g. events, meetings, projects, etc. Some other sources for the social network extraction may be intranet community forums and physical location of workplaces, i.e. fact of sitting in the same office room.

A process of generating social network requires to determine the objects connecting people – concentrating humans activities. These can be an email message, for which two roles of users can be distinguished: email sender and email recipient. Some additional recipients extracted from fields ‘To’, ‘Cc’, ’Bcc’ can, in turn, effect relationship strengths. A phone call object can be treated similarly with roles of caller and receiver. These two object types (email and calls) are an example of direct relationships where actors through their mutual communication directly know about their connections.
Some other objects are container type. People are connected indirectly through them by being a part of an activity and it is not certain that they communicated directly at all. These objects are common events/meetings/projects in which some employees can participate in. For example, if two humans are both the team members in the same project, they are thought to be in common social relationship. The same approach can apply to Active Directory group memberships, forum discussions and even office room co-workers.

11.2.2 Comparison with Corporate Hierarchy

In most corporate information system structures, directory services are used to reflect internal hierarchy [3]. These directory services allow the administrator to build a hierarchy tree of organization units, departments, teams and individuals; leaves in this tree are single employees. The most common implementation of directory services is Microsoft Active Directory [6]. Assuming that information contained within directory structure is correct and up-to-date, the organizational hierarchy derived from Microsoft Active Directory can be directly used in structural comparisons, Fig. 11.3. This comparison confronts the known and visible organizational structure (extracted e.g. from Microsoft Active Directory) against the real but invisible social relationships computed from communication and common activities (structure of the social network).

![Fig. 11.3 Social Network vs. Corporate Hierarchy](image)

Having both the formal structure of the organization and the structure of the social network we can estimate their equivalence. To be more accurate, we would like to know whether the positions and roles of actors in the network structure correspond to their official roles and positions. Summing up, all needed data can be divided into two groups: a) the data necessary to build the social network, b) the additional data for comparative analyses. Note that both source types can be automatically processed using data available in appropriate IT systems.
11.3 Static Analysis of Social Networks

11.3.1 Centralities

There are several structural measures which can be applied to static social network analysis (SNA). Primary benefit from applying graph theory analysis to social networks is the identification of most important actors [8,13,17]. In one measure, a central node of the graph is the one with the greatest number of connections to other nodes. Therefore, a central person in the social network is the most popular person in the certain community (local centrality) or in the whole network (global centrality) [9,16]. However, the main goal of the concept presented in this chapter is not to detect such actors, but to point out differences between the invisible social position (extracted from the social network in the analytical way) and the official, visible position in the organizational structure. It is suspected that the most important people in the corporation should probably be the department directors or team leaders. What happens if there are some other people with the higher centrality degree than them? Conclusions can be ambiguous. It could mean that there are some “hidden natural leaders” who may not fulfill their potential and their role in the official hierarchy may be too low [1]. However, it may also mean the opposite; the real leader position is too high for his abilities. It depends on the scale of difference between centrality degree of the real leader and the potential one. If this difference is small, there is probably no reason to apply any changes into organizational structure. For example, there can be a secretary who manages most of the business cases for the leader. Nevertheless, if the difference is high, it is highly probable that some serious changes in the hierarchy structure need to be performed to optimize team’s performance.

11.3.2 Social Groups

A social network can be divided into smaller groups (subgraphs, communities). The equivalent structures in the corporate hierarchy are subtrees of teams and departments. As a result, corporate analysis of groups includes comparison of social network groups and hierarchy subtrees to detect differences. One of the possible scenario in such case is when a person is more connected to the other team members in the social network than it comes from the organizational hierarchy. As in the example in section 3.1, the possible set of actions for the management depends on the difference between link strengths to the own group in opposite to strengths of the links to other groups. If this difference is significant, then the system may suggest to move this employee to another department/team in order to improve his or her efficiency.

Other scenario is linked to the idea of developing swarm intelligence in the form of Collaborative Innovation Networks [4,5]. The groups, which are not present in the corporate hierarchy can be recognized as independent collaborative initiatives and, if given a free hand and the friendly environment, may lead to creation of new, fresh ideas. A perfect example of such structure is the Linux
kernel developers community, where members of different corporations in the whole world are working together on new ideas and taking knowledge development to the higher level based on their interests [11].

11.3.3 Lonely Entities

In each society, there are “outliers” - people who are not fitting well into their group. Such actors can be easily detected in the social network. Because of their weak ties to other people, they usually far from the centers of the network [14]. According to psychological studies, it is obvious that teamwork is not performing well because of them. Unless they are real geniuses, it is required to find out reasons of this behavior by doing internal investigation and take steps to deal with it, e.g. move them to another team or dismiss.

11.4 Dynamic Social Network Analysis

Studying dynamics of changes in social networks over time is currently one of the most interesting research topics [17]. Even in stable environments, social networks evolve. People establish new friendships as well as break others. Anyway, this chapter focuses on changes caused by HR management. Moving employees to other teams/departments, hiring new workers, dismissing others, promoting, relegating – all of these actions have a huge direct impact on social network structure. It usually requires some time to gather the appropriate data but after it happens, managers have a very powerful knowledge of rules linking HR management with corporate social structure. The analysis of dynamics in the social network, which is extracted from the long term data about user activities and communication, provides the answers to some tough questions. Which employees should be promoted? Which ones should be relegated? Which people should be fired to strengthen the others and their social ties? Which workers should be assigned to a new project? The more and diverse data is available for analysis the better prediction accuracy.

11.5 Social Concept Networks (SCN)

Concept maps are structures showing which terms are connected with each other by co-occurrence in the same object such as email message [2, 15]. Social concept networks is an idea of joining concept maps with social networks where the relationship between actors is based on email messages and common activities. Relationship strength is computed from the usage frequency of given terms/phrases in the linking objects. Actually, all SN-specific analysis can be applied to social concept networks. Interpretation of them is slightly different, though. For example, in this kind of social network, centrality degree identifies actors with the highest knowledge on given topic, experts.
Once keywords specific for a given project are declared, the social concept network immediately shows people with the expertise relevant to it. After comparing them to the group of people officially assigned to the project, it is possible to reveal actors with a “hidden knowledge”, i.e. people who are not formally part of the project but are socially considered to be helpful. It can be a sign for the management to add these experts to this project and the future ones. Same analysis will also expose project members who are, in fact, not involved in discussions on project-specific topics.

11.6 Discussion

11.6.1 Profile of Relationships

Throughout the process of building and analyzing the social network only the existence of mutual communication of common activities has been considered so far. However, the fact that email message sent from person A to person B does not determine itself the nature of the relationship between A and B, e.g. whether it is rather positive or negative. The emotional character of the single message should also affect relationship strength. Nevertheless, sophisticated and powerful text recognition tools would be required to examine the profile of the messages, not mentioning the advanced forms of expression like irony, sarcasm or even the meaning of the attached images or videos. There are no effective methods for these purposes yet [10,19]. This is just to point out that even a strong relationship between two people not necessarily means that they like each other. We should always be aware that connections in the artificially extracted social network do not completely reflect the complex nature of human relationships.

11.6.2 Decision Making

All presented analysis methods should focus on two general evaluation rates: similarity of the structural position and the role both in the social network and in the official organizational hierarchy.

Having the differences between the social network and hierarchy recognized, the management of the organization can undertake appropriate decisions to decrease these differences. For example, the position in the structure can be affected by moving employees to other teams/departments. Changes of roles in the hierarchy are achieved by promoting/relegating.

Moreover, new positions and roles can be discovered in the social network which do not exist in the corporate hierarchy structure. As a result, the managers can create new positions in the organization.

11.7 Conclusions and Future Work

Social network approach to manage problems is capable to significantly improve the Human Resources efficiency by either detection of hidden anomalies in the
corporate hierarchy or making communication between employees more effective and easier. By analyzing semantics of email messages exchanged within the corporate network we are able to identify individuals with “the hidden knowledge”.

Overall, social network approach to the problem of corporate management appears to be very helpful, however, all analysis need to be well interpreted to improve performance and social health of the company. This is only a tool. Still, human resources have to be managed by humans.

Future research will focus on interpretation of some measures not mentioned in this chapter, e.g. betweenness, prestige, density, etc. as well as on development of new reliable metrics for quantitative comparison of social network structures with corporate hierarchies.

Acknowledgments. This work was supported by The Polish Ministry of Science and Higher Education, the development project, 2009-11.

References