

IDENTIFICATION OF ESSENTIAL EMPLOYEES BY SOCIAL NETWORK ANALYSIS

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ABSTRACT

Aim of this article is to show how social network analysis could help companies overcome process or organizational changes, splitting or merging of companies. Creation and use of sociogram before an organizational change and evaluation of possible or probable effects of planned changes could ease and reduce its costs. During the organizational change one should consider how and when should be sub clusters within the network connected. Goal of this mapping is to provide all employees of the company information sources and connections which they need to work, making decisions or act efficiently.

Keywords: *change, employee, organization, process, social network analysis, structure*

1. INTRODUCTION

In current turbulent and globalized world any company is under pressure by its competitors, emerging challengers and also inner problems connected with growth, efficiency and risks. These crises pose threats to the sustainability of an organization's operations, and the organization's survival depends upon their readiness and supporting tools in the face of these threats. European economy is still in quite good condition (A World Bank Group Flagship Report, 2016), but problems could be seen on the horizon (*Spring 2016 Economic Forecast*, 2016). In the upcoming years we can expect decline of the global gross domestic product, raising inflation and other symptoms of recession. Companies must be ready to this inevitable development. Getting to know own employees, their value and importance for the company is one way how to improve quality of decisions made about these employees.

We propose set of processes which could support evaluation of employees by social network analysis.

2. SOCIAL NETWORK ANALYSIS

Social Network Analysis (SNA) goals are to reveal, describe and evaluate the relations among e.g. individuals or organizations. Different tools (e.g. sociogram, matrix and metric) can be used to represent social network structure e.g. the nodes and connections between them.

Jacob Levy Moreno laid foundation of Social Network Analysis in 1930s of previous century when he observed the interactions within small social groups and he has developed a system of communication and interaction records which were published in his work in 1934. He is also one of the first researchers who has used a graphical representation of social networks and who has created a sociogram (Moreno, 1934).

Siegfried Frederick Nadel described the theory of social structures (Nadel, 1957). His theory is fundamental for mathematical analysis of the networks. The idea how to use the theory of social networks in practice has arisen as relationship sociology in the 1980s and could be used until present days.

For every node (a person or an organization) and whole network can be observed or calculated a number of parameters, e.g. closeness centrality, clustering coefficient, degree, durability,

eigenvector and betweenness centrality, intensity, etc. (Scott, 2013). For example, people (in next text we mark them like nodes) with high value of betweenness centrality are in general important to spread information or could be good source of new information from the rest of the network. Removing this node from the network without any replacement could and probably would harm flow of information and could end up in losses or unnecessary additional costs. These metrics could be used to describe individual relationships between nodes and to draw conclusions.

Survey (Yang & Tang, 2004) has stated that:

- "Group cohesion was positively related to overall performance.
- Group characteristics, e.g., cohesion and conflict, fluctuated in different phases, but in later stages, much less cohesion occurred and the advice network seemed to be very important.
- Group structures seemed to be a critical factor for good performance."

In the work of Leenders et al. are presented results supporting the idea of the importance of social network analysis for mapping and explaining efficiency of some teams compared to other, less effective teams (Leenders, Kratzer & van Engelen, 2007). It seems that the key factor for effective work and innovation is a presence of some alternative communication paths and good links to well-connected knowledgeable others.

In time of structural changes of the company teams and departments are often divided, moved or dispersed. As a result of these action connection between teams, department and overall connections within company could be reduced (Lau, Tashiro & Kajikawa, 2014). Result of this reduction can be observed as drop in average degree (number of connections which an employee has), his or her centrality and closeness mainly because short paths through the social network were damaged/disconnected. The same result could be lost of important connections to important people outside of the company. This could harm future development of the connection, access to important knowledge and information to avoid serious consequences.

Problem of knowledge discovery and decision making processes within organizations discuss (Windhager, Zenk & Federico, 2011). They stated that visualization of processes and also SNA could ease over watching processes, enterprise dynamics and the interconnected actors in changing organizational network.

SNA tools could be developed by a researcher or it could be used prepared tools like Gephy, NodeXL and Pajek. We used Gephy and NodeXL to record and analyze social networks and to prepare sociograms.

The work of Kazienko et al. lists main data sources (Kazienko, Michalski & Palus, 2011). There are several cheap and fast sources of information about structure of the social network within the company. Mainly e-mail communication, instant messaging records, information about meetings and phone calls could be used to get brief image about how the social network of the company could looks like. Additional tools could be used to get more accurate picture of actual social network structure. Questioners for employees about their contacts and frequency of the contact could be also used. Connections like meeting at lunch, smoking room or out of work activities could be discovered when we use a questionnaire.

Also there is newer statistical approach how to reconstruct the network (Corallo et al., 2015) when e.g. detailed information (e.g. exact time) is not available in the log files of the tracked events. Some files might not include time range when a given user participated to a given activity. We can use set of matrix and heuristic manipulation to reason probable result.

3. PROPOSAL OF SNA SUPPORT OF ORGANIZATIONAL CHANGE WITHIN A COMPANY

In this chapter we will introduce set of processes to map social network, identify essential employees and also tables with attributes to evaluate.

3.1. Social network data source identification and creation of social network map

Figure 1 shows process social network map creation. The process starts with information sources description and evaluation of their quality. Selected sources are mined to receive information about who is communicating with whom, how often and if it is possible what is the topic of the communication (e.g. subject of the e-mail). Based on these records, we can create social network model. To evaluate if the model is covering real structure of the network we can ask a sample of employees if recognized connections are all they have within the company or we missed some of them. If the sample of employees say, that we didn't miss any or just small part of their connection we can conclude that structure of the map is sufficient. After that we can validate the model of the network by interviews with different sample of employees. If we discover that our model missed more that small amount of connections (depends on structure of the company, number of employees etc.), there should we a meeting with responsible project team and they should search for the reasons why the model is not sufficient. Most common reasons are company culture and unofficial meetings which are not covered by electronic devices (e.g. smoking room). Decision if it is possible to effectively improve the model and if so, which data sources should we use.

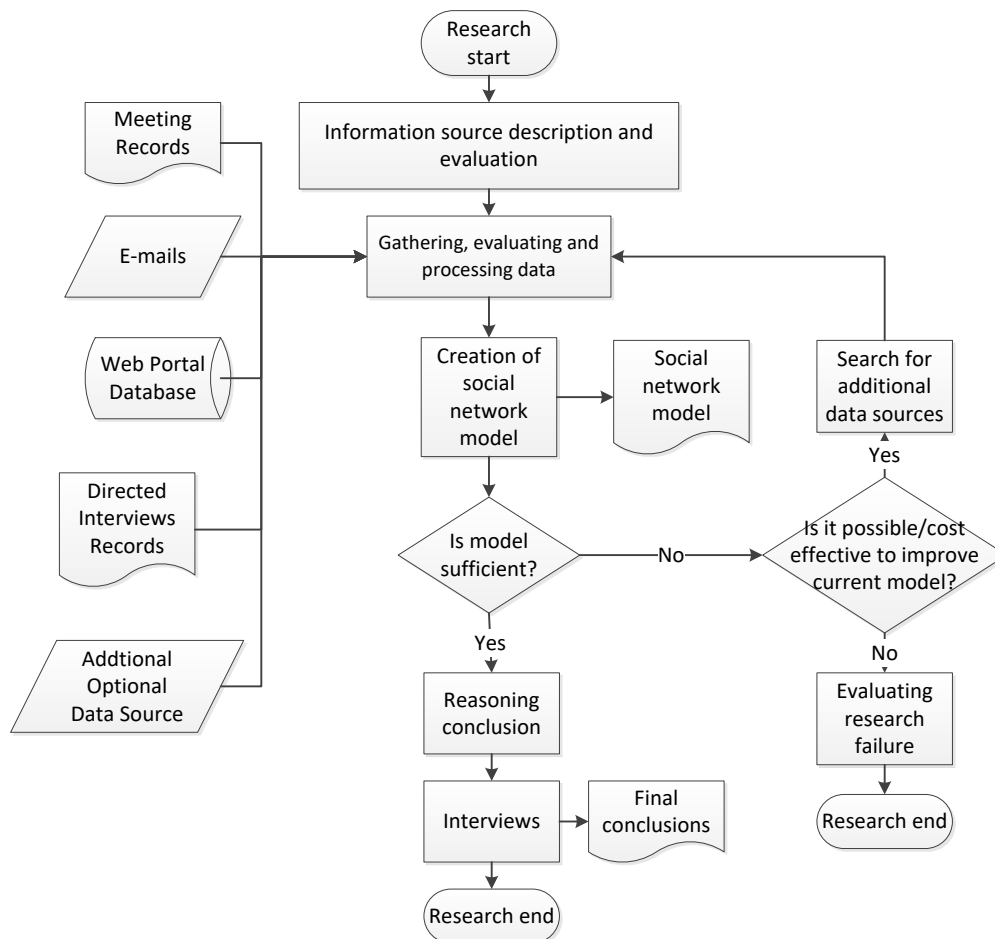


Figure 1: Social network data source identification and creation of social network map

3.2. Tables of attributes to evaluate

The presented list in this sub chapter is just an example of possible parameters which could be evaluated. Every performed analysis has to select own applicable attributes according to available data, budget and conditions within the company.

Table 1 shows example of attributes to evaluate when we focus on employees of a company and the network as a whole.

Table 1: Example of attributes to evaluate focusing on employees from social network analysis point of view

Attribute	Employee 1	Employee 2	Employee N
Betweenness Centrality			
Closeness Centrality			
Clustering Coefficient			
Eigenvector Centrality			
In Degree			
Out Degree			
...			

Table 2 shows example of attributes to be evaluated when we focus on formal position of an employee within a company. This table sum up selected attributes of evaluated employees and as a result we should be able to make conclusions about their overall performance, background and possible attitude towards planned changes. In case we find an important employee with possible hostile opinion (based on e.g. interview) we should take action to change his or her mind, explain core idea of the change again and try to convince him or her about necessity of the change.

Table 2: Example of attributes to evaluate focusing on employees from personal point of view

Attribute	Employee 1	Employee 2	Employee N
Age			
Education			
Current work position			
Years of experience at current position			
Current work position description			
Past work position			
Years of experience at past position			
Past work position description			
Results of last five 360° evaluations			
Work attitude			
Loyalty to the company			
...			

Table 3 shows example of attributes (e. g. clustering coefficient, number of vertices, density) to evaluate when we focus on formal position of an employee within a company social network. We can fill in values and use it as a lead to evaluate or compare one or several companies, departments, etc.

Table 3: Example of attributes to evaluate focusing on social network

Attribute	Whole network	Depart. 1	Team 1	...
Betweenness Centrality (average, etc.)				
Closeness Centrality (average, etc.)				
Clustering Coefficient (average, etc.)				
Edges With Duplicates				
Graph Density				
Maximum Geodesic Distance				
Reciprocated Edge Ratio				
Reciprocated Vertex Pair Ratio				
Single-Vertex Connected Components				
Total Edges				
Unique Edges				
Vertices				
...				

3.3. General evaluation of social network

Based on Table 3 we can describe metrics of the network and also easily every group of employees (team, departments, members of middle management, etc.). Precise social network metrics values and their meanings could be found at (Scott, 2013). This will help us with concluding which employees are connected well and if the commission of the analysis included this, what nature has the relationship (if they are friends, enemies, just colleagues, etc.). Another result of the general evaluation of the network is information if there are clusters with only one gateway person. It is important to stress that good position within the network (high Eigen vector etc.) is not the only criteria, there could be important employee with most important skill/knowledge with low level of degree.

3.4. Identification of essential employees within studied company and their equivalent at a merging company

During evaluation of social network and the company as a whole we can use previously presented tables with filled in values (or text information, attached documents) to identify best rated, well connected employees. If we remove gateway person during planned reorganization (somebody who is connecting one cluster or group to the rest of the company) who form the network, there must be sufficient replacement to keep information flowing. From our experience during transformation of the company, often are some parts of the company in fact cut off from the rest of the company, despite there is official replacement of the gateway person.

3.5. Creation of recommendations

Study of Lau et al. had showed that during the organizational restructuring, the employee's closeness decreased, but the degree and the betweenness recovered over time (Lau, Tashiro & Kajikawa, 2014). We can map the network, identify crucial employees who provide communication flows through the company and help them to regain connections during and after new structure of the organization is established. With this plan they can easily reach full performance and also network within the company will recover faster. Also continuity of knowledge transfer will be assured by linking employees as soon as possible to help each other during often difficult and stressful transformation time. Organizational culture and will to cooperate could be one of the factors which divides successful project from a failure (Mesicek & Petrus, 2016).

4. DISCUSSION

Presented approach showed that social network analysis could be used as additional supporting tool during organizational change. As previous research showed, employees or teams and their connections greatly affect their overall performance.

However, there are risks to be mentioned. First risk of this approach could be seen as false estimate that our map is accurate and values used to evaluate employees are right. We can almost certainly say, that every model of a big company will be affected by some error, even though we use additional sources of information (questioners, etc.). That's the reason why this approach is more suitable for SME's than for large companies.

Second risk of this approach is that we make mistake and evaluate an employee as essential or not essential. It is necessary to use as much information sources about how the company operates as possible to get full image of the company.

Third risk is connected with knowledge transfers and linked prejudices in general. In the work of Duric and Ivanovic they mentioned several prejudice connected with knowledge flow management and also partial solutions of this problems (Duric & Ivanovic, 2014).

In case of merging two companies, we need to perform social network analysis and evaluation of nodes in both companies. Also connection of employees at same position should be preserved and in case of transformation of department, disconnected employees should be connected as soon as the merge ends.

5. CONCLUSION

Period of any change or transformation is stressful for every company and its employees. This article showed a proposal of sets of processes and criteria to identify position of an employee within the network (social network metrics and also attributes of an employee) and evaluate his or her importance to the communication flows within a company and also to help him or her to find and establish new connection with important colleagues. This will facilitate smoother transformation and help to overcome occurring problems. Before any major transformation the company management should consider running this social network mapping to improve and limit impacts of the change on processes performance, employees and their performance.

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