Mapping of Organizational Mastenbroek Networks by Network Theory Methodology

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Abstract—**Organization's operations are carried out through the social network of the organization members. This network consists of four different types of sub networks and these sub networks jointly form the complex human network of the organization. The structure of sub networks within a given organization is affected by the different forms of visible and hidden power relationships and the different forms of social support. It is possible to explore fully the different organizational networks by network theory methodology, quantitative and topological analysis can be carried out. The study presents how it is possible mapping the Mastenbroek networks of an organization by network theory methodology and how the differences and similarities between different networks can be shown.**

I. INTRODUCTION

The organization's operations can be achieved through human relations. The network system of the organization members creates formal and informal networks, where expert, coercive, power, sympathy and other types of structures are formed in the organization. There are interactions among people during the operation, and in the course they try to assert their own and the narrow group interest. The individual is the part of the different network simultaneously and connects to other people depending on the characteristics of each network. Moreover, the different networks connect to each other through the people as well and this complex network system forms the human network of the organization.

Mastenbroek defined four different types of networks in the complex organizational human network. [1] In the Mastenbroek network typology, in the *instrumental relationships network* the people in relations with each other are considered as means of production. Since the performance of professional activities requires the co-worker's activity as well, this results the division of labor and coordination. The professional information flows in this instrumental network, there is the provision of data, the communication and the decisions are made in this network as well.

The *socio-emotional relationship network* is based on the emotional relationships of co-workers structured on the basis of sympathy and dislike. Other key principles belong to the group and through that the loyalty, the elements of group cohesiveness such as common language or group image. Furthermore, individual norms may be set up in the socio-emotional networks. The emotions dominate this emotional network.

The *power and dependency network* is the place, where organizational power game is being played, inner political manoeuvres take place here, and people fight for their positions and resources in this network. These power games typically take place in the background, participants often use the strategy of misrepresentation, and their individual intentions are covered under the organization interest.

The fourth Mastenbroek relationship network is the *negotiation relation network*, where the organization appears as an inner market, individuals compete for resources in this network, divide the inner market, and in order to receive greater part of resources and to be more dominant in decision-making people tend to expand their own market borders continuously at other's expense.

In the Mastenbroek "one to three" approach the power and dependency relationship is the most important and at the same time the most predominant relation and the other three relation forms can be deduced from that one. From the power point of view Mastenbroek considers a relevant issue the rate of dependence and independence of individuals and organizational units in the organization that is determined by three factors:

The level of uncertainty. Uncertainty in this case means that how much information the individual or the organizational unit has for the future. Those who have information about the future events that are more likely to occur it is an advantage and they may have an influence on the others' position in the organization.

The level of substitution. An individual or a group that is difficult or impossible to substitute within an organization, may get considerable power by being indispensable. Hence, it is a common behavior in the organization that the individuals or the groups tend to be indispensable for the organization.

The level and form of centrality. Interdependence may be between the individuals and the groups. In case there is interdependence between the individuals and/or the groups, mutual dependence occurs and results a strong interdependence between them. The greater importance the person has in the organization, the bigger power he or she might have.

The study examines Mastenbroek model's components of this kind in a specific organization applying network analysis methodology.

II. POWER RELATIONS IN RELATIONSHIPS

In the Mastenbroek approach beside the power relations the dependent relationships are also of great importance. From the point of organizational operation the power

plays key role as the system of relations. The power has visible and invisible signs, but different forms of power manifest in the organization. According to Weber [2] the power is "...to realize their own will in communal action, even against the resistance of others, whether there is a chance or not ...All thinkable human qualities and in all thinkable constellations may create a situation, in which he carries his or her point by any means." In fact, the power is the dependent relation based on necessity and uncertainty. [3] According to the basis of the dependence, the source of the power can be classified into three groups:

The personal power sources are derived from charismatic power from the individual's attractive personality, specific knowledge or expert power that comes from the possession of information that is necessary for others. Although the expert power is one of the most significant natures of power, it is the most transient at the same time. This power is the result of extra knowledge, but in case the followers access to this extra knowledge, the power situation ends, and the knowledge that is possessed by many people, does not guarantee power to that person anymore. Familiarity with the place also may be the source of the personal power, because if someone spends more time in an organization, then he or she has greater access to the people, information and resources. These are the informal forms of the power resources in the organization.

The organizational power sources are derived from the position in the organization. This is called legitimate, organizational or positional power. The level and limits of this kind of power are defined by set of rights. Reward and coercive power come from the organizational power. The reward power uses the rights of managing financial and non financial things that others desire (such as salary benefits, reward, inside information), the coercive power uses threats to force others to obey. These may be considered as formal power resources.

The power from the structure is not only derived from the position of the hierarchy. There can be positions, which do not come with power in practice, but there are hidden positions in the hierarchy of the organization, these positions are seemingly without power, but possess significant power possibility in reality. [4] This kind of power position is derived from the relation network of the organization members and it is called centrality. The quantity of these centrality values for each member of the organization can be defined by network methodology in the different relationship systems. [5]

In case of previous power sources the resources for the organization were considered granted. The power is not only derived from inner dependency relations but outside dependency as well. The source of the power may be the way that the organization is able to get the necessary resources from outside of the organization. Those can achieve power positions, who can get resources exclusively that are critical for the organization. The greater the dependency on that resource in the organization, the more influences the individual can have.

III.   THE ROLE OF SOCIAL SUPPORT IN RELATIONSHIP NETWORK

The social support is the manifestation of helping people or intention to help other people, but power and informational relationships are also parts of social

relations. Those who have a wide relationship system, they can access information more easily, and therefore they can assert their interest better in the organization. So, social support is as determinative a feature of the organization as is power relations.

There are three forms of the social support: emotional, instrumental and informational support and the common manifestation of emotional and informational supports is the appreciation.

Referring to emotional support there are two approaches. According to the first one it is sufficient for the individual to feel that he or she is accepted, his or her opinion is important, while according to the other approach it is important to feel the positive emotions, such as: affection, respect and acceptance of the other.

The instrumental support externalizes as resources are released in order to help the other person. This often feels like emotional support, as gratis resources indicate affection or appreciation.

Informational support is rare in itself, as the information can be converted into instrumental goods, and it appears to follow the above sensation of emotional support as well. A special type of informational support is the sharing of personal information, the gossip. In the case of mapping the gossip network a picture about the structure of trust based connection network can be received. The interpersonal trust is an important factor of the operational safety in the organization. [6]

IV.   METHOD OF DATA COLLECTION

The company which participated in the research has 144 employees, providing HR service, it has been on the Hungarian market for 20 years. As one of the market leaders it covers the entire area of Hungary with its service and operates a regional network.

Since one of the questions (question referring to instrumental network) is not connected directly to the work, privacy is involved, the survey could have been carried out only on a voluntary basis, the participants had to declare their intention to participate by written declaration. The survey was carried out by web based software. All participants received an individual code to enter the software, and the participants had to answer a person for open ended questions. The graphs of networks were prepared on the basis of the responses and the related quantitative analyses.

V.   THE POWER NETWORK

In the survey with the help of this network the legitimate or so called organizational or positional power structure of the network was revealed, namely the power structure determined by the position in the hierarchy of the organization. This is the structure where the tools of reward and punishment may be applied.

In order to map this network the following question was applied *"Who is/are your direct superior(s)?"*. It is clearly shown in Figure 1 that the power network follows a tree structure entirely, compared to the completely tree structure there are only three more connections in the network. From network theory topology point of view this is a so-called decentralized network structure [9] with the advantage that people can be reached with low number of contacts. On the other hand its disadvantage is the high-

level of fragility. In our case the only targeted element- the member holding the highest central value- its exclusion would mean serious problems, but blocking the communication of the four most central elements would disable functioning in the entire network. If the communication took place only in this channel, the organization would involve high operation safety risk. According to Mastenbroek approach this is the power and dependent relationships network, where power games are played. It is clearly shown that the almost tree type structure of the network ensure the hierarchical
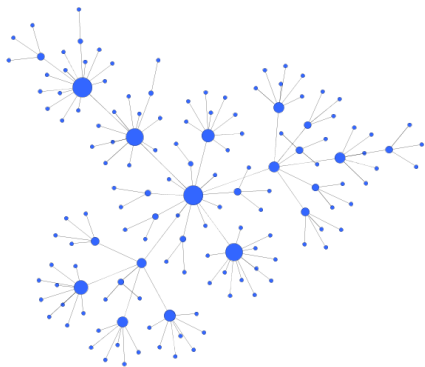

Figure 1.   Power network of the examined organization

communication and at the same time this network displays the coercive relations.

VI.   Substitution Based Dependency Network

From the power point of view this network is mapping the structure derived from the power resources. The person who can be substituted by fewer people gets the power position in the organization, because his or her absence influences the performance of the organization.

The dependency network was examined according to the level of substitution. In this case, the members of the organizations had to answer the following question *"Who does usually substitute you?"*. This network is completely different from the power network structure. It does not look like a tree, it consists of many, independent sub networks [10] and does not form connected graph. (Figure 2.) This is not necessarily a bad thing in itself, hence the observed organization operates with more than one regional center, and obviously on the account of the geographical distribution of the organization there are many independent sub networks of the substitution network. The problem can be, if there is a person in the network, who cannot be substituted, and there is a task that can be done only by this person. The Figure 2 shows the substitution network of the observed organization. The size of the network peak-points indicates that by how many employees the given person can be substituted. The employees who do not have substitute are signed with red. This means advantage from dependency point of view, and comparing to the formal power position ensures a higher power position for them. From the operation safety point of view it has to be examined what kind of professional task they do, whether there is a task that they can only execute, hence in case of their absence these tasks surely will be postponed.
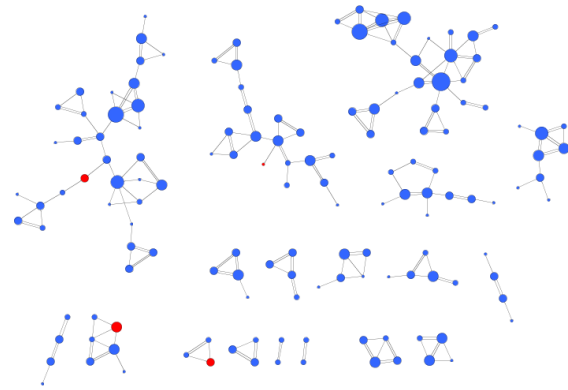

Figure 2.   Dependency substitution network of the examined organization

The substitution network opposite to other networks does not form connected network. As a result of this there is an asymmetric distribution of power, which means that in one connected sub network the power strength derived from the substitution is interpreted independently and in reverse order. In this case, in terms of power it does not matter who is the most central person from substitutability aspect, but who are the people who do not have substitute. That person has the greatest power who cannot be substituted and not that one who can substitute the most people.

VII.   Negotiation Network

From the power point of view the negotiation network is also a position based power structure. The expert position is partly different from the hierarchical position, typically ensures restricted power, hence the expert power position does not involve direct employer's authority. It is common that the expert leader does not reassert its employer's rights even informally, and only after long arguing can achieve that his or her employees are fired. This comes from the different level of power structure, e.g. maybe so that one of the employees of the professional leader holds such outside connections that power position is ensured from the company's outside dependency.

Mapping the negotiation network is possible through the expert instruction network. The following question was applied: *"Who are you able to give professional instructions?"* Resource distribution questions are asked in expert instruction network, and all participants represent force corresponding to its own network weight during the negotiation. Similarly to the Mastenbroek's power network, this network has less tree structure, besides the tree structure cross-connections appear in it as well. This is due to the fact that in case of a really well-functioning hierarchy there should be connections between some expert clusters because it is required by the professional communication. Thus, although the dominance of individuals with high-level of centrality is considerable, as a result of the connections between clusters this does not mean such level of power position, than the purely dependency relationships in case of power network.
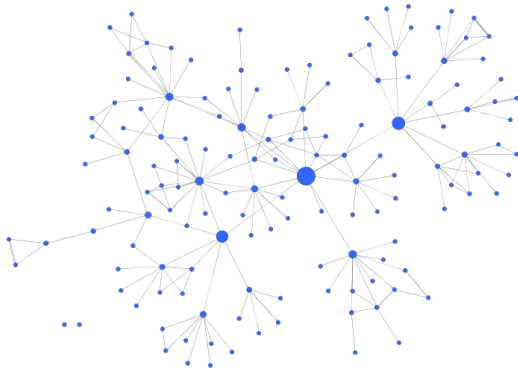
Figure 3. Negotiation network of the examined organization

There is much resemblance between the negotiation and power networks of the examined organization as clearly shown in Figure 3. The difference is, although the network has tree structure, there are more interconnections in the power network. It can be said essentially that the negotiation network does not differ from the power network considerably, so it can be concluded that the professional arguments are measured by the power positions in the given organization.

VIII. INSTRUMENTAL NETWORK

This network shows that the members of the organization used to provide expert information to whom even if it is not compulsory. Accordingly the basis of the network is the voluntary distribution of the expert information. From the power point of view it performs double function. On the one hand it provides personal power resource to the information holder. On the other hand, it weakens the similar power resources by sharing the information. Therefore, this network rather supports the appearance of the informational form of social support. As social support is not a one-way process, the network consists of mutual relationships.

Mapping the instrumental network the following question *"Who do you usually provide expert information?"* and its control question was used *"Who do you usually receive expert information from?"* Hence, the instrumental network covers the voluntary distribution of expert information, it is a decision network as well, so one of the key elements that what kind of system the co-workers communicate with each others about professional issues.

The instrumental network is the real network of the division of work within the organization and the coordination. Hence performing professional work activities requires the co-workers work activities, non-compulsory expert relations appear, and therefore the real expert information is conveyed in this instrumental network. This network may be considered an instrumental network in the sense of Mastenbroek, because the nature of the organization, the information is the most important "raw material" to perform effective work.
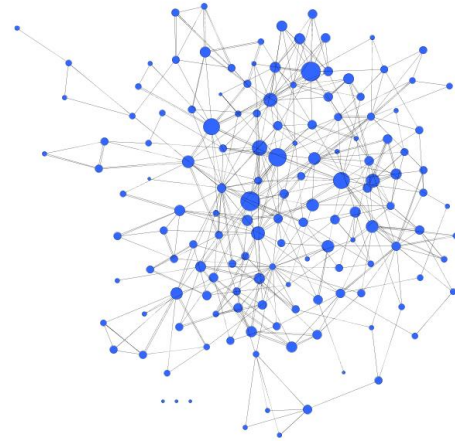

Figure 4. Instrumental network of the examined organization

As shown in Figure 4 the result is a network with inter-connections, it is visible the high number of connections. From topology the point of view the instrumental network is completely different from the power network. It is not a tree structure, not the people with high centrality are the glue of this network structure, but the great number of weak relationships. Weak relationships do not follow the organizational and expert hierarchy. As a result of this the network is a kind of small-world, that ensures to spread information quickly and a large volume of the information flow. [11]

IX. SOCIO-EMOTIONAL NETWORK

The socio-emotional network based on emotional relations standing on the sympathy and antipathy between the co-workers, during the research the focus was on the relationship network, which is based on the distribution of non-professional information. On the one hand this is narrower relationship system, the entire socio-metrical network, but presents a true picture of the operation in practice because it is based on daily communicational relationships. If someone is nice, it does not mean necessarily, that we share information on a daily basis with him or her. The sympathy is necessary, but is not enough to have an informal relationship between two people.

In order to map this network the following question was applied *"Who do you usually talk about non-professional issues on a daily basis?"* assuming that besides the daily contact there is sympathy between them at the same time. This assumption is reasonably applicable according to the Mérei sociometric measurements.
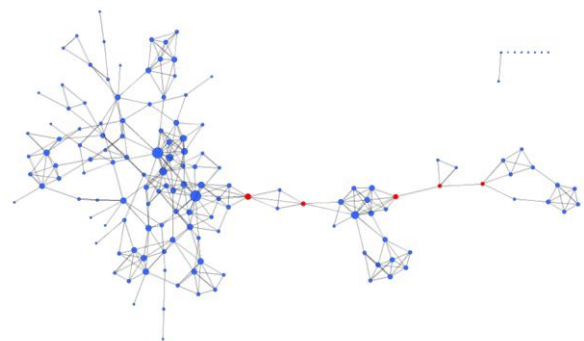

Figure 5. Socio-emotional network of the examined organization

As shown in Figure 5 the socio-emotional network differs from all other networks topologically. In this network those people are centralized who have bridge positions between the different subgroups in the total network. [12] They are marked with red in the Figure 5. Obviously, it should also be taken into consideration that the geographical distribution of the organization determines the communication between people, but not at such level than in case of the substitution based dependency network. Regionalism constraints less the socio-emotional network and this correlate with the broad application of information communication technologies. Mobile phones and internet based communication opportunities ensure the possibility for people to keep contact independently of the geographical distribution and this affects considerably the socio-emotional network of the organization.

X. CONCLUSIONS

It can be seen that it is possible to map the Mastenbroek relation networks of an organization by network theory methodology, and the differences and similarities between different networks are demonstrable. The power and dependency and the negotiation networks bear resemblance topologically referring to the similar tree structure in the examined organization.

The result supports the belief that both relationship networks are the sources of the organizational power from the point of view of power, and therefore the relationships of these two networks are the sources of the formal power. The two networks bear resemblance also in the examined organization because the coercive hierarchy and the expert hierarchy have similar structure in the organization.

The voluntary professional information relationship that corresponds to instrumental network's structure differs from the power and negotiation network essentially. It can be said that this is a greatly connected network, where neither the power nor the expert structure are dominant. Instead of it a "small-world" type network occurs that ensures the quick spread of high-volume information, moreover it helps complete the information with practical experience.

The substitution network ensures to explore another form of the power. It can be shown the individuals in the organization who do not have substitution, and as a result of this they can achieve personal power sources in the coercive and expert hierarchy against those who are above them. The socio-emotional network differs from all other networks. It depicts a network that consists of some bigger clusters, but it is not as connected as the instrumental network. Key position people who maintain and spread informal information and whose exclusion could block considerably the informal communication between certain areas can be easily identified.

The explored networks clearly show that the Mastenbroek relationship networks can be very different within a given organization, and they provide useful information connected to social supports. With their help it is possible to map the emotional, instrumental and informational social support's organizational structure, and the quantitative dimension.

Further research directions are shown by the network theory analyses, various person's status in the different networks can be dealt together, and by this the complex power state can be defined from all their power positions, and the joint power space may be defined.

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