Is Centrality the Key to High Performance?

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Abstract

Social Capital, the outcome for individuals from networks with shared norms and values, has already been discussed as a driver for innovation and performance improvement. Social Capital is a resource embedded in social structures, which can be accessed as well as mobilized in purposeful actions. There are various theories about social resources and structures leading to discussions on whether network closure or the absence of ties is the key to the success of Social Capital. Nevertheless, little is known about the relationship between network centrality and Social Capital. Therefore, this paper aims at contributing to the discussion by analyzing, using a case study, the structural position of actors who are rich in Social Capital. The study also assesses if the actors who are central in the social network are the ones with the highest performance. This study was based on a survey of 170 students from a Czech University, who form three different networks. For the detection of Social Capital, a procedure developed and tested in the European Values Study Surveys was applied. The relational data was analyzed using UCINET and illustrated with the use of VISONE.

The outcomes suggest that there is a connection between the centrality of an actor and their performance, not only in terms of average grade but also Social Capital. Furthermore, the data analysis shows that the number of languages an actor speaks as well as experiences in foreign countries impacts on their performance and location within a network.

Key words: Social Networks, Social Capital, Network Structure, Performance.

1 SOCIAL CAPITAL AND ITS MEASUREMENT

Social Capital has become a scientific buzzword and the discussions about its definitions, forms and attempts to measurement are widespread. Nevertheless it is questioned whether Social Capital is actually a form of capital (Halpern 2005). What is known for sure is that the importance of this form of capital is imbedded in social networks and that its importance increases under imperfect competition (Burt 1992).

While Lin defined it as a "…resource embedded in a social structure that are accessed and/or mobilized in purposive actions," (Lin et al. 2008). Putnam sees that "the central idea of Social Capital is that networks and associated norms of reciprocity have value," (Putnam 1996). Another component in building this resource is trust, which is defined as an expectation that arises within a community of regular, honest and cooperative behavior based on commonly shared norms (Fukuyama 1995). Tsai divided Social Capital into three dimensions, the structural, where the contacts of an actor are located, relational, where the assets such as trust and trustworthiness are rooted, and a cognitive dimension which includes a shared code and vision (Tsai 1998). Therefore it can be summarized that in general Social Capital is a resource which is embedded in social networks based on trust and specific norms.

How can these resources be attained or even measured? We know that due to participation in associations individuals are likely to change their values and preferences (Paxton 2002), and trust and civic-minded behavior emerge by involvement in formal and informal groups and associations (Putnam 1996). This can be explained by self-enforcing agreements which are reached in repeated interactions and lead to trust within the group, but also to civic behavior in general (Knack, Keefer 2003).

In the UK this principle was taken in order to grow community involvement by "corporate and employee volunteering" in order to fight economic stagnation. The benefits are not only leading towards a trusting and networking community, but moreover it exhibits benefits for every individual as well as the companies (Muthuri et al. 2009). These benefits are intangible (reputation, knowledge) as well as tangible (financial and material). Moreover a shared vision helps an organization to develop Social Capital and combine resources (Tsai 1998).

Social Capital leads to benefits on multiple levels, on an individual, group and community level (Paxton 2002), but in general it contains structural and action-oriented elements (Lin et al. 2008) and the returns can be categorized into returns to instrumental action and returns to expressive action (Lin 1999). Returns on instrumental actions are economic, political and social return. Economic return can be the increase of turnover due to a new customer. Political return is for instant the influence on a legislative change and social return can be a contribution to a better reputation. Return on expressive action enforces and secures one's resources against possible losses. Moreover these effects make a positive contribution to one's physical and mental health as well as life satisfaction (Halpern 2005), which goes with Cooke's statement: "Human Capital is judged by individual income, while Social Capital is judged by quality of life," (Cooke 1999). Following Cooke, the benefits lead back to embeddedness (communication benefits, integration and synergy) as well as to autonomy (integrity, linkage) (Cooke 1999).

This leads to the assumption that actors with higher Social Capital have the possibility to perform better than other actors with lower Social Capital, as they can mobilize higher amounts of resources which lead to returns on instrumental or expressive action.

Attempts of measuring this kind of capital, lead from Lin's Position-Generator, where professions in one's ego-network are queried (Lin et al. 2008), to Snijder's Resource-Generator, where specific services in one's Ego-Network are asked for (Van Der Gaag, Snijders 2005). Van der Gaag and Snijders argue this as follows: "Here, we concentrate on measuring Social Capital within the 'access' perspective, and define Social Capital as the collection of all potentially available network members' resources." (Van Der Gaag, Snijders 2005).

Another approach comes from Beugelsdijk and Van Schaik, who combine general and institutional trust, group-membership, volunteering, free-time behavior and trustworthiness, in order to generate a Social Capital Index, by taking data from the European Value Studies (Beugelsdijk 2005), (Beugelsdijk, Van Schaik 2001), (Beugelsdijk, Van Schaik 2005), (Beugelsdijk et al. 2004). This fits to the idea that "Social Capital is a communal property involving civic engagement, associational membership, high trust, reliability and reciprocity in social networks," (Cooke 1999). Moreover as Social Capital has been defined as a resource embedded in a social structure (Lin et al. 2008), it measures the investments made into one's social network in general. These investments are done over a longer time, as social networks and trust needs time to be built and tested (Fukuyama 1995), so that when needed they are a channel for information and resource flow and therefore an entrance ticket for future options (Tsai 1998), (Lechner 2003).

2 NETWORK POSITIONS AND THEIR EFFECTS

From numerous studies it is know that there exists a connection between Social Capital and economic performance (Beugelsdijk 2005), between Social Capital and the quality of governance and economic growth (van Bouma 2005), and between education and Social Capital as well as between Social Capital and health (Halpern 2005).

Also concerning the influence of the structure of a social network and the positions of actors within it, we know that productivity (Granovetter 2005), resources-access (Lin et al. 2008, S. 76), knowledge-transmission (Halpern 2005) and innovation (Cooke 1999) is influenced. Burt classifies these benefits into information and control benefits and ascribes the advantages of actors in a social network to their position as brokers, next to structural holes (Burt 1992). Coleman sees the reason for network benefits in the network closure (Coleman 1988) and Granovetter ascribes benefits to the type of the actors ties' (Granovetter 2005).

Within a network, specific structural positions can be identified, which all have different characteristics and opportunities due to their location in the network. Central connector, boundary spanner, information broker and peripherical specialist (Cross, Prusak 2002), or broker, consultant, gatekeeper, representative and liaison (Hanneman 2007), as they can be analyzed in the Social Network Analysis Software UciNet, can be distinguished. Following Cross, central connectors link most people in a network, boundary spanners link different network parts, information brokers are local stars in a network and peripherical specialists are consulted for specialized information (Cross, Prusak 2002). Due to their structural position these actors provide certain benefits for themselves, which leads to the idea that they are able to perform due to their position in some way better. Due to their structural characteristics it is possible to find them within a social network, though we do not know anything about their general characteristics. This leads to a list of questions which shall be discussed in this paper using data from a case study.

Actors which are central in a network, central connectors, are, because of number and type of their contacts, more central within the network and therefore it can be assumed that they have the possibility to get access to a broader field of information. This could provide them with an advantage leading to better performance, compared to those actors who are not so centrally positioned. Therefore it will be asked in the scope of this paper whether there is a connection between centrality within a network and the performance of the actor having a central position.

Another interesting question is whether those actors having a central position within a network, are also those who are more likely to have higher resources in Social Capital. It has been discussed above that trust; civic engagement and trustworthiness are main components of Social Capital. It can be assumed that an actor, who trusts more, is trustworthy and more engaged in society in general, is also more likely to be social and connecting within a specific network.

3 TRUST AND ITS INFLUENCE

Trust can be defined on a general network or societal level as "Expectation that arises within a community of regular, honest and cooperative behavior based on commonly shared norms on the part of other members of that society," (Fukuyama 1995) but also at an individual rela-

tionship level as an attribute of a relationship, which is an expectation that alleviates the fear that the other one could behave opportunistically. Trustworthiness on the other side is an attribute of an individual (Tsai 1998).

There exist different kinds of trust, the basic, simple one as in a friendship, the blind trust to a superior and the authentic trust based on skills and relationship (Dervitsiotis 2006). Trust is built over time, through interaction and evaluation on integrity (ethical attitude), benevolence (goodwill) and competence (ability) (Becerra, Huemer 2002). The basis of building trust is interpersonal communication and proximity in psychological, cultural, social and physical dimensions (Becerra, Huemer 2002), (Lechner 2003), (Gössling 12:5). As proximity is a criterion of trust it can be assumed that high trust is going along with high proximity within a network, or on the opposite a low trust level goes together with lack of proximity and therefore a low network density.

The effects of trust on the networks in which it arises as well as on the actors within trusting networks have been studied. Trust is said to enable more efficient operating processes (Dervitsiotis September 2006), matters in the effectiveness of exchange relations, especially in inter-organizational relationships (Becerra, Huemer 2002).

On a societal level higher trust increases investment and growth (Van Schaik), and on the relationship level trust is associated with greater open communication, lower emotional conflict, faster decision-making and greater willingness to take risks. As trust reduces the complexity, the need for constant surveillance, the constraint of opportunism it leads to a decrease of transaction costs for individuals as well as for companies (Becerra, Huemer 2002). This is possible as trust reduces monitoring costs and enables heuristic-based decision-making (Uzzi 2008). Another positive influence of trust is that information exchanges are more proprietary and tacit, and it reduces therefore the information asymmetry between parties. As trustful relations within a network are said to increase information flow and lower monitoring cost, it can be assumed that within a network of a higher trust level, the performance will be better.

4 ASSUMPTIONS AND METHODOLOGY

In Part 1 till 3, several assumptions, based on scientific literature and studies which have been done, shall be discussed and enlightened by a small survey which was conducted at Tomas Bata University between December 2009 and May 2010:

- Assumption 1: Higher Social Capital of an actor is connected to higher performance.
- Assumption 2: Central position of an actor is connected to higher performance.
- Assumption 3: A higher level of Social Capital is connected to higher centrality.
- Assumption 4: The level of trust of a network is connected to its overall performance.
- Assumption 5: A higher level of trust of an actor is connected to higher performance.

For analyzing these assumptions three groups of students at Tomas Bata University Zlín (CZ) have been asked to fill in a questionnaire. A total number of 170 students filled in the questionnaire, from this number 41 were second-year students which subscribed to a Desktop-Publishing lecture, 56 first-year students who followed statistics lecture and 73 PhD were students of the faculty of Management and Economics on Tomas Bata University.

The questionnaire contained questions about students' relationships to their colleagues, the number of languages they spoke, if they had already been abroad for more than three months and questions linked to Social Capital which were used in the European Value Studies (Beugelsdijk, Van Schaik). First it was asked: "Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?" Then the students were asked to evaluate their level of trust in institutions like a church, parliament, press and so on. Furthermore they were asked if they are a member or volunteering in certain organizations, how they spend their free-time and finally in order to evaluate their trustworthiness they were asked to estimate whether certain statements like "Claiming state benefits which you are not entitled to" are always, sometimes, rarely or never justified.

From the relational questions social network analysis of the whole network using Ucinet has been done. Social network analysis is a social ethnological method, which can be used to measure and visualize the social structure of a group as a whole and the social embedment of its individuals / actors (Schnegg and Krenn 2009), (Jansen 2006), (Wasserman, Faust 2008). The focus of a social network analysis can be a single actor or an aggregate of persons - whole groups, as it has been done in this study. The components are the social relations between these actors, which can be based on kinship or friendship. In our case communication, going-out, advice-seeking and lending-money relations have been collected.

Using the aggregated total network centrality and prestige measures of the whole network and from individual actors has been calculated. These concepts are based on the idea that the actor who has many ties within the network is more central and therefore more visible. Prestige measures show actors who can influence the network. It is a contribution to Social Capital, as more prestigious actors have more access to resources. As there is not a single measure which describes centrality best, all three major centrality measures, degree-based, closeness-based and betweeness-based centrality have been calculated in order to correlate them later with the performance data of the students (Hanneman 2007), (Burt 1992).

Degree-based centrality is measured by the outdegree of an actor, which computes all outgoing relations to other actors in the case of an asymmetric and directional network. For a symmetric and nondirectional network all relations are computed. Closeness-based centrality measures not only the direct but moreover the indirect relations to other actors (path distances). The closeness of an actor is measured by the reciprocal of the sum of all path distances of an actor. Betweeness-based centrality has a different logic as degree-based and closeness-based centrality as it starts from a dyad and computes the shortest path distance from one to another, called geodesic. The idea behind it is the probability that communication from actor a to actor b will run over actor c. The ratio between the number of geodesics between a and b going through c to the total number of shortest paths between a and b is computed in order to get the betweeness-based centrality (Wasserman, Faust 2008), (Jansen 2006). The next step was to run factor analysis, which can be used to reduce the number of variables, to detect structure in the relationships between variables and to classify them (StatSoft 2010). Therefore, as factor analysis can be applied for data reduction, the five trust, trustworthy and public involvement questions have been reduced to one variable called "Social Capital" as it has been done by Beugelsdijk before with three variables in order to create a Social Capital index using data from the European Value Studies (Beugelsdijk, Van Schaik 2001), (Beugelsdijk, Van Schaik 2005), (Van

Schaik 2002). After this step correlations were done from the new variable "Social Capital" as well as the original ones, the performance variable, the number of languages, being abroad and the centrality measures of the actors.

Moreover the relationships between the average performance, level of Social Capital and trust, centralization and density of the whole networks were computed. Finally the structural position of the better performing actors in means of their grades as well as Social Capital, have been analyzed qualitatively.

5 ANALYSIS

5.1 Statistical Analysis

a.) Correlations

After aggregating the different relations in every network, the centrality measures degree, closeness, reach and betweeness have been calculated in Ucinet for every actor from each network. For analysis we used the values number of languages, being abroad, average degree, trust, institutional trust, involvement, free time and trustworthiness to correlate them with the centrality measures, calculated in Ucinet. For correlating other values with the performance measure average grade we had to exclude the network of PhD Students as they do not get any grades and their performance could have been measured only by the number of their publications.

On a significant level of p-value under 0,05 we found several weak correlations and one moderate correlation. The moderate correlation we found between involvement and free time with r=0,565.

On a weak level being abroad correlates with the number of languages an actor speaks and the number of languages someone speaks correlates with the variable in-Closeness. Which is an interesting finding, as the students networks are not bilingual, but all of them from the Czech Republic or Slovak Republic. It seems that speaking more languages makes actors more communicative on the one hand and more likely to go abroad on the other hand. Moreover did we find a weak negative correlation between the average grades and being abroad, which leads us to the conclusion that learning languages and spending abroad is advantageous for centrality and moreover for the performance of a student, as the negative direction of the correlation can be explained as a lower average grade means a better performance than a higher average grades. The grades are measured on a scale 1 till 3.

For the main question of this survey we found a weak and negatively correlation between the average grade with the centrality measures degree, share and reach, which allows us to conclude that in this specific survey higher centrality is connected to higher performance. Surprisingly is the negatively weak correlation between institutional trust and inCloseness, but positive with outCloseness. So an actor with higher institutional trust is more likely to have a lot of out-going relations, but not likely to receive also a lot of relations.

Another negative weak correlation has been found between the value trustworthiness and outCloseness and outward Reach. This shows a similar effect as for institutional trust. A higher trustworthiness of an actor leads to a higher number of outgoing relations of this actor, but

not as was supposed from theory that other actors would evaluate an actor due to his trustworthiness.

A weak positive correlation has been found between the values for free time behavior and the centrality measure degree. So an actor spending more time with colleagues and friends is also in the specific network of his lecture more central.

A significant correlation has neither been found between the five Social Capital Values, nor between trust and performance. Also on a meta-level comparing the average of the three networks there was no correlation found between density, centralization and clustering and Social Capital. One strong correlation from 0,997 at 0,05 p-Value has been found between the average level of trust and Social Capital, which is derives from Social Capital being based on trust.

b.) Factor Analysis

Before doing Factor Analysis from all five Social Capital values as Van Schaik proposed (Van Schaik 2002), we ran Factor Analysis from Trust, active and passive Membership as Beugelsdijk and Van Schaik did in 2005 (Beugelsdijk 2005).

Our factor loadings from these three variables are 0,246 for trust, 0,654 for passive Membership and 0,827 for active membership. The result of their factor loadings were 0,49 for trust, 0,75 for passive membership and 0,89 for active group membership.

Our factor loadings were about 0,2 points smaller, which can be explained by the difference in n, we were calculating from 170 items, while Beugelsdijk and Van Schaik, used the database from the European Value Studies and had supposedly many more items. Nevertheless the rank and the differences in factor loadings were similar.

Tab. 1 - Correlation of the five Social Capital Values. Source: Author's own.

	Trust	**ITrust**	**Inv**	**Free**	**Twor**
Trust	1.00000000	0.14766883	0.15876757	0.11571389	0.02182192
ITrust	0.14766883	1.00000000	0.10386980	-0.04641903	0.05485412
Inv	0.15876757	0.10386980	1.00000000	0.21750242	0.06182872
Free	0.11571389	-0.04641903	0.21750242	1.00000000	-0.05979438
Twor	0.021821920	05485412	0.06182872	-0.05979438	1.00000000

Even as the correlations of the five Social Capital values were not significant as you can see in Table 1, we proceeded to do factor analysis from all five values. By calculating one factor we got a lower p-value as for calculating two factors, which supposes on the one hand that two different factors would be a more adequate explanation. On the other hand, some of the factor loadings are higher than 0,4, which is sufficient as moreover in total all five variables describe 66.5% of all variance, while p-value suggests that the null hypothesis is correct. Therefore we decided to proceed later one with one factor called Social Capital.

Tab. 2 - Factor Loadings of the five Social Capital Values. Source: Author's own.

Loadings:	Loadings:
Factor1	Factor1 Factor2
Trust 0.351	x1 0.135 0.288
Inst 0.357	x2 0.994
Invol 0.430	x3 0.501
Free 0.407	x4 0.432
Twor 0.252	x5 0.176 0.140
The p-value 0.624	The p-value 0.656

The two different factors provided by factor analysis derivate from different variables, as can be seen in Table 2. Factor 1 derives mainly from Institutional Trust followed by Trust and Trustworthiness. This factor could be described as an overall Trust Value. The second one is mainly based on Involvement (Group Membership) and Free Time Behavior, complemented by Trust and Trustworthiness. This factor can be described as a societal value of an actor.

When analyzing the scree plot of the five variables, which describes how many variables are sufficient, we see that the fifth variable trustworthiness is not significant. The reason behind this phenomenon could derive from social desirability, or from a lack of connection between the trustworthiness of an actor and its trust and social involvement.

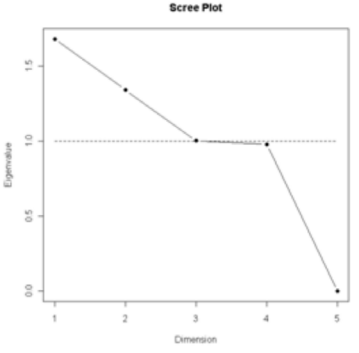

Fig. 1 - Scree Plot of the five Social Capital Values. Source: Author's own.

In order to analyze if Social Capital has an influence on the centrality or performance of an actor, we calculated a Social Capital Value based on the factor loadings. Differently than Beugelsdijk and Van Schaik, we did not rescale the new variable, as the primary use was to calculate the size of actor nodes attributes based on Social Capital Value, similar as it has been done with performance.

Correlating the new Social Capital Value with the centrality measures gave a low but on 0,05 p-value significant correlation of 0,225 with InCloseness. Also Degree and Reach-centrality were on a similar level significant. Which shows that the Social Capital Value, based on the factor loadings of trust, institutional trust, involvement, free-time behavior and trustworthiness, has indeed a connection to the centrality of an actor within his network. The low contribution of trustworthiness to the Social Capital value shows that these values are not yet a fully developed tool for measuring Social Capital, though an important step into the right direction. Neverthe-

less no significant correlation was found between Social Capital Value and the performance of a student. This means that different than expected due to literature review the Social Capital of an actor does not influence his performance.

5.2. Qualitative Analysis

For qualitative analysis the aggregated social networks of the statistic-students and desktop-publishing students have been displayed by Visone. The relational ties have been kept bidirectional and the graph-theoretical layout of the network was generated by spring embedding, an algorithm that uses iterative fitting to locate the points to each other according to their smallest geodesic distance.

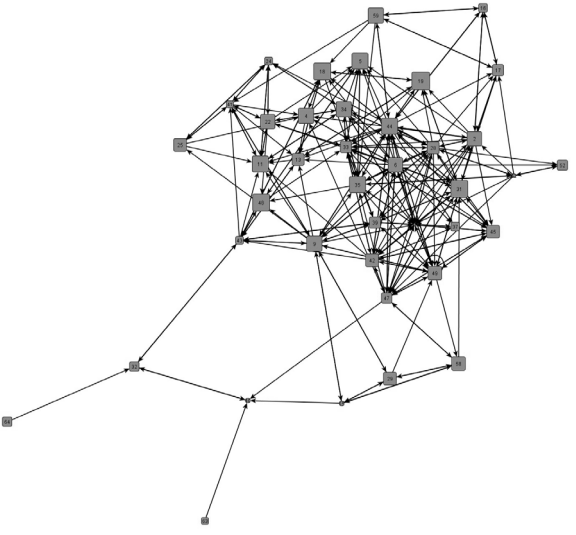

Fig. 2 - Social Network of DtP-Students in the Relation of talking regularly with each other, node-size according to the descending rank of the average-grade. Source: own.

In figure 2 the node size in the students' networks has been visualized according to the descending rank of their average grade, which shows us better performing students with a lower average grade indicated by a bigger node size.

When analyzing this network of dtp-students, we can find bigger nodes, which indicate that those are good students, in the center and having many ties to others. On the periphery of the network several small nodes, poor performing students, are located. This observation is a visible confirmation of the correlation done prior. Nevertheless we find also small nodes in the center, which shows that there is not a perfect correlation between these two variables. The network graph of statistic-students in the same relation-type confirms these findings.

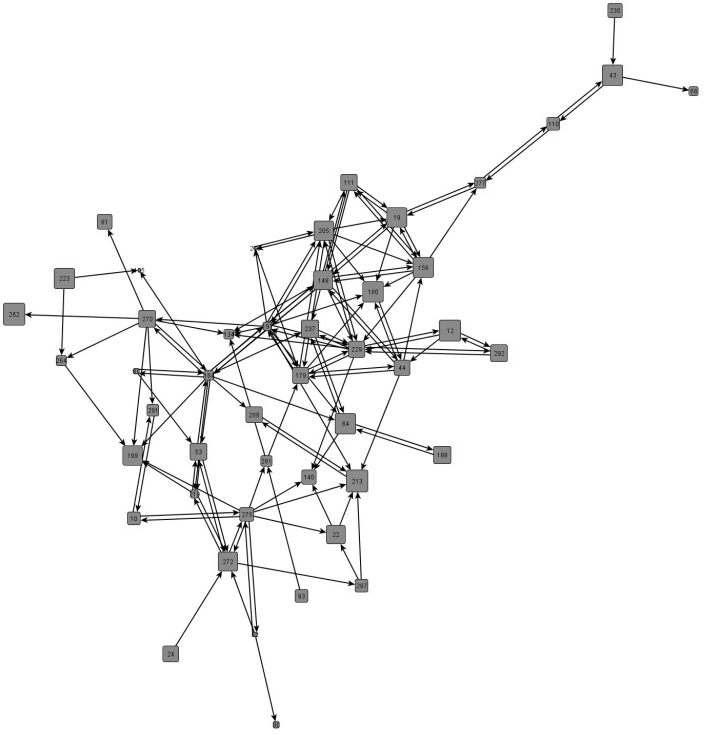

Fig. 3 - Social Network of Statistics Students (right), Relation according to Study Advice seeking. Node-size according to the descending rank of average grade. Source: own.

More visible and also logical is the effect when closer analyzing the relation of Study Advice seeking as in figure 3. Here the tendency of bigger nodes being more central is clearer, indicating good students being chosen as a source for study advice. But we find also small nodes (weaker students) in the center due to their outgoing-relations seeking for study advice. Moreover sub-groups connecting bigger nodes are visible in the network and can be calculated using k-core analysis. Those sub-groups of better performing groups within this specific relational type seem to show study groups. Though same as for figure 2, is this only an application of a tendency, as exceptions can be found as well.

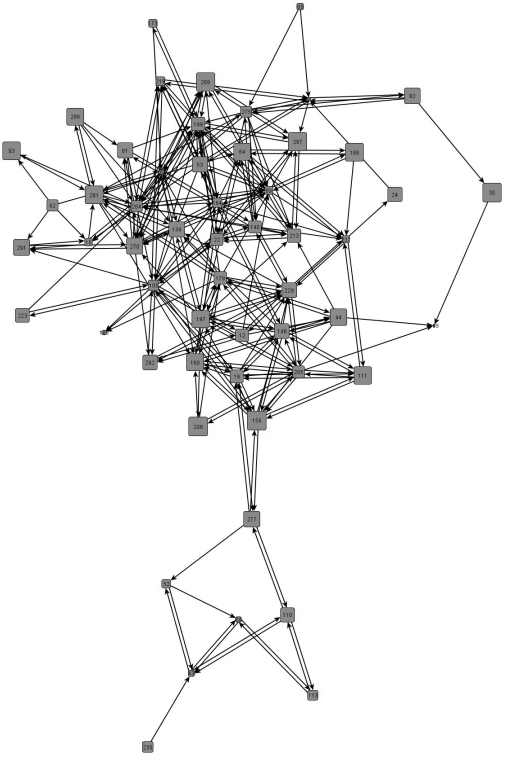

Fig. 4 - Aggregated Social Network of Statistics-Students, Node-Size according to the ascending rank of Social Capital. Source: own.

The network in figure 4 shows an aggregation of all five relational types: regular talking, going-out, study advice, private advice and lending money. Therefore this network shows us any kind of existing relation between two nodes. The node size has been calculated based on the Social Capital level of the student and illustrated according to the ascending rank of Social Capital in order to better visualize the differences in Social Capital between the students. Therefore a bigger node indicates a higher level of Social Capital, which has been calculated based on the factor loadings from the factor analysis. Not as obvious as for performance, but still we can find bigger nodes in the center. Several "big" nodes, which are rich in Social Capital we can find next to global payers in the role of an insider or hub. Actors can be found which are acting as a hub, building the link between the sub network and the main network and having considerable bigger node size, and therefore higher level of Social Capital, than the actors around him. Moreover central players in a sub-group of the network appear having a bigger node size, which was assumed that actors having higher Social Capital are somewhat more social also in this specific network.

A clearer picture explaining the effects of Social Capital on an actor shows as figure 5.

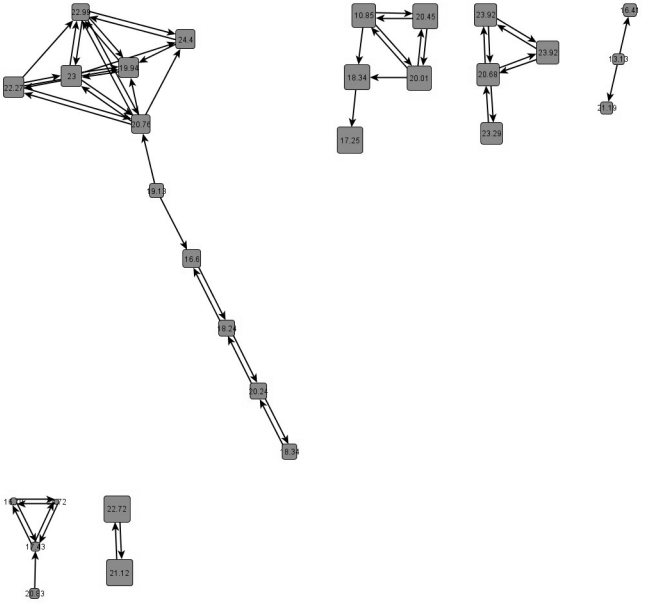

Fig. 5 - Lending Money Network of DtP-Students (right), Node-Size according to the ascending rank of Social Capital, the actor-labels indicate the Value of Social Capital. Source: own.

Figure 5 shows the networks of actors willing to lend another actor an amount of 500 Czech Crown. The node size in this network was again illustrated according the the ascending rank of the Social Capital of an actor. In this network shown in figure 5, as well as in the same relation network of statistic students, we find small actors connected to bigger actors, but not the other way round. This means that actors having low Social Capital are willing to lend actors with higher Social Capital money, but those actors are not reciprocating this relation. Moreover the phenomenon of reciprocity of this relational type seems to depend on the level of Social Capital. The labels of the nodes show the specific amount of the Social Capital of the actor. This allows us to compare the Social Capital level of two actors having a reciprocal relation or one-sided. And on majority reciprocal relations are between actors having similar level of Social Capital, while one-sided ties are between actors having a different level of Social Capital. The conclusion that actors having lower Social Capital are less likely to receive lent-money suggests itself.

6 DISCUSSION

After statistical and qualitative analysis of the data collected in a small survey, we can now discuss the findings under consideration of the assumption done beforehand in the literature review.

The first assumption made was that higher Social Capital of an actor is connected to higher performance. In the student networks we analyzed, we could not find any correlation between

Social Capital and performance. It can be taken into consideration, whether the kind of Social Capital measurement or the measuring of performance might be the reason, or if these two variables do not have an influence on each other.

The next assumption was that the central position of an actor is connected to a higher performance. Analyzing the networks of statistic and desktop publishing students we found a significant correlation indicating that centrality is to some means connected to performance.

Also for assumption three, concerning the connection between Social Capital and centrality, we found proof in our data. A weak, but significant correlation is between Social Capital and centrality, which leads to the conclusion that in fact in the networks analyzed central players perform better in means of average grade and Social Capital and centrality is the key to higher performance in means of average grade and Social Capital.

Proof of connection between trust and performance was neither found on an individual, nor on an aggregate level. Therefore assumptions four and five were rejected by our data.

Interesting findings were the correlations between being abroad and the number of languages, as well as the number of languages and closeness and the average grade and being abroad. These correlations suggest the conclusion that learning languages and spending some time abroad in a foreign country has a positive influence on the average grade and being in a central position within a network.

The measurement of Social Capital was another important part of our survey. From the literature review the methodology proposed by Beugelsdijk and Van Schaik was integrated into our study. Adopting the questions used in the European Value Studies, where the findings are used to compare countries with each other, for analyzing Social Capital on an individual level, was an experiment, done first in the field of Social Network Analysis and Social Capital Studies. Van Schaik proposed the four dimensions of Social Capital: Interpersonal trust, Institutional trust, Participation in civic society (formal and informal) and trustworthiness (Van Schaik). Nevertheless as the use of these dimensions for generating a Social Capital Index was not found before in scientific literature, factor analysis from trust, active and passive membership as Beugelsdijk and Van Schaik did in 2005 (Beugelsdijk 2005), was done beforehand, in order to see if the factor loadings are comparable even in a smaller amount of data. As the factor loadings were comparable, we ran Factor Analysis from all five dimensions, five values. The problem was that the only significant, but therefore moderate correlation was between involvement and free time with r=0,565. This finding addresses the questions about formal or informal membership and the question about free time behavior, examine the same dimension: Participation in civic society.

Another insight was that trustworthiness does not significantly contribute to Social Capital, though the question is whether this is really the case, or this effect results from social expectancy and cheating.

Nevertheless a weak connection between the variable called Social Capital, calculated from the factor loadings from factor analysis, and centrality within the network was found.

7 CONCLUSION

Disregarding the uniqueness and the novelty of the findings in this survey, limitations due to the size of the survey have to be done. At the center of the analysis were three different networks of students, with a total number of 170 students, which does not allow any generalization. Another limitation is the small size of the correlations found in the data, which is on the one hand clearly disputable, but on the other hand obvious as the performance of a human being, especially the examination performance of a student will never depend on one single variable.

It is a matter of further studies to confirm the findings from these three networks on a broader scope and evaluate if the connections are comparable to other student groups, student groups in different countries, or even to other types of networks.

The connection between Social Capital and centrality within a network, as well as between centrality of an actor and his performance, should be analyzed in detail in the future, as the social-capital-questions used in this study could potentially be posed in job. The Social Capital dimensions and the questions used for collecting them, which were adopted for this survey from the European Value Studies, have to be tested again and analyzed if a Social Capital index generated from its values is justified and comparable.

In business also the centrality of employees within the intra-organizational network can become an evaluation criterion, if a significant connection between centrality and performance could be proved in general. Studying this is always connected with the problem of defining performance. As we had difficulty in this survey to define the performance of a PhD student, also in business the performance of an employee cannot always be measured by a single variable.

Another consideration for further research is to determine whether the number of languages a person speaks and if he or she spent some time abroad also influences other fields.

In summary we can say, that in the survey conducted in the scope of this paper, central players do perform better, in means of average grade and Social Capital.

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