
STRATEGIC NETWORKING IN THE TECHNICAL HEI'S OF THE BALTIC SEA REGION

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Abstract. This paper presents the results of the empirical research of the networking of Technical Higher Education Institutions (HEI'S) of the Baltic Sea region. The research was conducted in order to understand how the Social Network Analysis (SNA) and network mapping methods could help to strengthen institution's strategic perspective through networking. The author analyse the interaction phenomena in the Higher education sector; its' impact for networking of institutions and for the network itself; the role of the position in the networks; abilities to strengthen the node's perception of the network for the strategizing purposes. The research was based on the SNA of the Erasmus programme student mobility data. The results of the research cover the implications of aspects of the network centrality, clustering and ego networks let to identify the node's position in the network, and to understand surrounding network. The research disclosed that the SNA could be applied in supporting the strategizing process by: increasing of understanding of embedded networks, having more realistic network picture, also could be used as supplement evaluation and development planning method for the relationships portfolio management for HEI's.

Keywords: networks, networking, Higher Education, social network analysis, strategy.

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1. Introduction

The Higher education institutions (HEI's) constantly strive to use various forms of collaboration in order to gain well-known benefits. With the internationalisation of the Higher education the institutions are forced to expand their perspective with a broad range of activities in teaching and research which take place in cooperation with local and international partners, and have crucial effect on competitiveness (Kehm 2007; Jongbloed *et al.* 2008).

There is a strong indication that high quality educational provisions have become a business which – at least in some countries – is a factor in the generation of institutional

income (Kehm 2007; Jongbloed *et al.* 2008). In this paper the HEIs are treated as a business model. The cooperation of entities from the different perspectives is approached by several scholars (Chen 2008; Jaržemskis 2007; Stein, Ginevičius 2010; Zeng *et al.* 2010; Meženiece, Rivža 2011). One of the most advanced approaches in the theory is to analyse cooperation through interaction in business networks (Ford *et al.* 2008; Håkansson *et al.* 2009). The aim of this paper is to analyse how Social Network Analysis (SNA) methods and various theories of business interaction and networks can strengthen HEIs strategizing process.

2. Interaction and networking

In the business context multidimensional interaction is understood as one of the basic features of the business landscape – entities are seen as interdependent, with a constant life in relation with each other. The interaction is usually defined as the ability to relate to the world around an entity in a much more multidimensional way than the strictly antagonistic. Interaction with others is the key means for those who live in the business environment in order to prosper and develop. The resources and activities of these ‘others’ are as important for a single actor as are its own. It is through combining resources and linking activities with each other that actors develop, create value for each other and address each other’s problems. It is only through others that business actors can acquire their respective and collective identities and roles. It is through interaction with others that business actors learn, teach, serve, utilize and become appreciated (Håkansson *et al.* 2009).

Interaction of the companies is realised by embedding in long-term strategic *business networks*. A network is defined as a collection of relationships that binds a group of independent organizations together (Gulati 1995, 1998; Das, Teng 2002; Nugaras, Radzevičienė 2009). There are two commonly mentioned types of networks in the literature *vertical* and *horizontal* (Boschma, Wal 2007; Jindraa *et al.* 2007; Mason *et al.* 2007; Gebauer *et al.* 2012). In the HEIs the horizontal networks are predominant – implicated in research, organizing joint teaching activities, and working together with business entities. In the Higher education background it is too narrow to see the networks (Street, Cameron (2007) approach) as only commercially oriented inter-organizational connections.

There are several commonly seen benefits of embeddedness in the network of inter-firm relations: to gain access to complementary resources (Spekman *et al.* 2000; Lavie 2006) in order to support business development, survival and profitability (Street, Cameron 2007; Gilsing *et al.* 2008; Busquets *et al.* 2009). Also accessibility to formal and informal business networks and markets is considered as a significant source of sustainable small business success (Anon 2003) – this factor could be used as an opportunity for the development of small periphery HEIs.

The benefits of networking disclose the need of the companies to take networking in to account in strategizing. Forming and managing external relationships is an important part of the strategy for HEIs development. Recently in the field of HE the partners for exchange and cooperation are selected more carefully with strategic and competition oriented considerations (Kehm 2007; Radzevičienė, Girdzijauskaitė 2012). The portfolio of the partners forms the network for the institution, and through the links with others defines the institutions position in the network.

3. Position in the network

Network scholars acknowledging that the role of different actors and their views of the activated structure are significantly dependent on the actors' evolving network positions (Huemer 2012). Empirical researches have proven that better position in the network generates more benefits for the participants (Boschma, Wal 2007; Nugaras, Radzevičienė 2009). There is no commonly agreed method how to measure and evaluate this position. One of the ways is to do Social Network Analysis (SNA) and to calculate characteristics of the network. It is more easily to reach the resources and to gain power if the institution has better connections and if your partners also have a good portfolio of relationships. The existing portfolio of relationships and position in the network depends on previous activities, internal and external factors, also it could be change by strategic intense. The changes in the networks and position are constant, for instance, in recent years the influence of what could be called the "periphery" on international activities in higher education has increased (Kehm 2007).

Picture of the network: participants' perspective

Usually the activities and links in the network are not disclosed - each actor has its individualistic 'picture' of the network which forms the basis for its assessments, intents and approaches to others. This picture is based on the institution's experiences, its position in time and space within its relationships and its interdependencies with others. The structure of the business network cannot be adequately described in terms of companies and their products. The structure is ephemeral and difficult to capture because it consists of the relationships and individuals that stretch between actors (Håkansson *et al.* 2009).

In the phase of growing national and international competition for resources and best talent higher education institutions have started to become more selective in their choice of partners (Kehm 2007). Also the relations with partners (Radzevičienė, Daniūnas 2010), internationalization and networking activities are more considered as a part of HEI's strategy.

The individualistic picture is one of the factors impacting the strategizing towards the better relationships portfolio and general strategy of HEIs. Better individualistic 'picture' could lead to more appropriate strategic decisions and to support the process of strategizing.

4. Research questions

Institutions face the problem that in order to make good strategy they need to have better understanding of the surrounding networks and institution's position in those networks.

The main research question is: could the SNA help to strengthen HEIs ability to understand its' state of art in the network and to capture more realistic network picture view for the strategizing. Objectives are as follows: to investigate how the "snapshot" of the network picture in the process of strategizing could help the institutions; to use SNA to identify directions for the partnership portfolio management.

5. Methodology

The research is based on the assumption that even networks are constantly changing, the snapshot of the network is still valuable because the networks in HEIs are usually based on long term perspective and are not changing so fast to lose the relevance of the research.

Data collection methods: in the network studies usually statistical sampling methods as a part of all population are not used. Rather, methods tend to include all of the actors in some population or specific feature sapling is used. Of course, the populations included in a network study may be a sample of some larger set of populations. The *limits* for the size of population depend on resources, time, and cognitive capacity to analyse (Hanneman, Riddle 2005). The bigger population was more than 300 universities from the Baltic Sea region. As a smaller population (sample) 146 technical orientated universities and universities of applied sciences have been chosen.

The methodology was based on *snowball method* (Hanneman, Riddle 2005). It began with a focal actor in central geographical location. From the actor's website the list of partner universities for Erasmus student exchange programme was selected. This programme was chosen as the most popular collaboration tool that was used in various types of HEIs and the process of collaboration was unified and commonly understood. After that it was decided to choose the Baltic Sea region and institutions with high orientation to technological sciences. Those two choses were made in order to reduce sample size and to have more homogenous network. Partners mentioned in the list of Erasmus partners were included in the network. Then, all the actors founded in the list were tracked down and the list of Erasmus partners was searched in the website for all of their ties. The process continued until no new actors were identified. There are two major potential limitations and weaknesses of snowball methods. First, actors who are not connected (i.e. "isolates") are not located by this method. Where does one start the snowball rolling? If the start is in the wrong place or places, it may miss whole sub-sets of actors who are connected -but not attached to our starting points (Hanneman, Riddle 2005). Also during the research it was realized that not in all institutions the Erasmus partner list was public, or only the most important

partners were listed. It could be that some meaningful nodes and links are not in the scope of this research. This kind of data collection is also limited because the chosen method could indicate the links between HEIs, but not the real relationships. Even if the importance of link is not known the research makes sense to show the complexity and possibilities of interaction.

The distribution of the institutions by countries are as follows: Baltic countries (Estonia, Latvia, Lithuania) – 6 institutions; Scandinavian countries (Finland, Sweden, Denmark) – 18; Germany – 86; Poland – 18. The research was conducted in spring of 2012. For the data analysis the 3.0.0.2 version of *Ora- netScenes system was used (Carley, Columbus 2012; Carley *et al.* 2012).

6. Research results

Firstly, it is worth to discuss general overview of the network. The network consists of 146 nodes and 1260 links in it, with average institution of 9350 students. The general network map is presented in Fig. 1 (node size adjusted to centrality) and Fig. 2 (macro view). In the Fig. 1 the most centrality is measured and represented in the size of nodes. From the macro perspective the exact universities could be identified in the network. The most central is U with the centrality 0.4469, AVG: 0.088, STDDEV: 0.077 (scaled authority); 0.2134, AVG: 0.007, STDDEV: 0.023 (scaled betweenness). This measure indicates that institutions are very different in terms of network ties and position in the network.

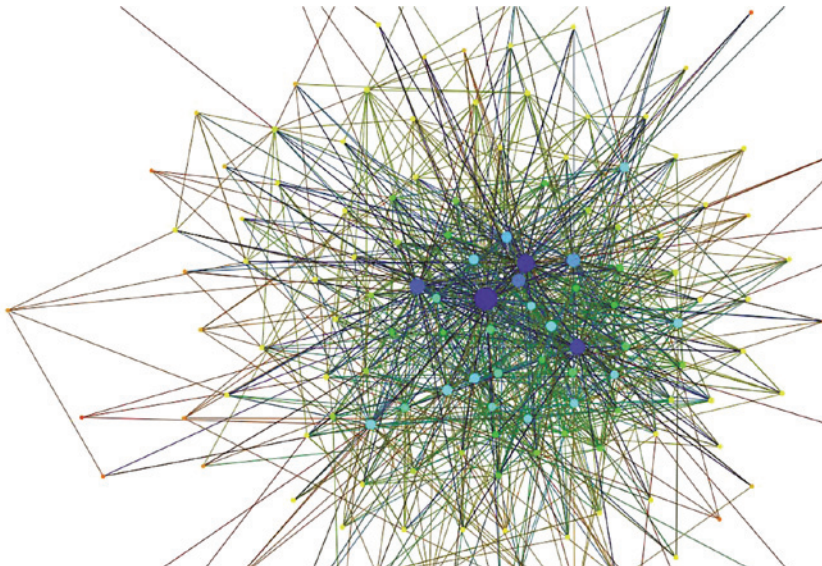


Fig. 1. Centrality based university network (Source: created by author)

In Fig. 3 it is seen that the most central are middle size institutions (Baltic countries – Yellow; Poland – Dark blue; Germany – Light blue; Scandinavian countries – Light green). The correlation of size and Centrality – Authority equals to 0,532 (to Centrality – Betweenness 0,662) and shows that the size of university is important to the position in the network. Also middle size universities are more central than bigger ones.

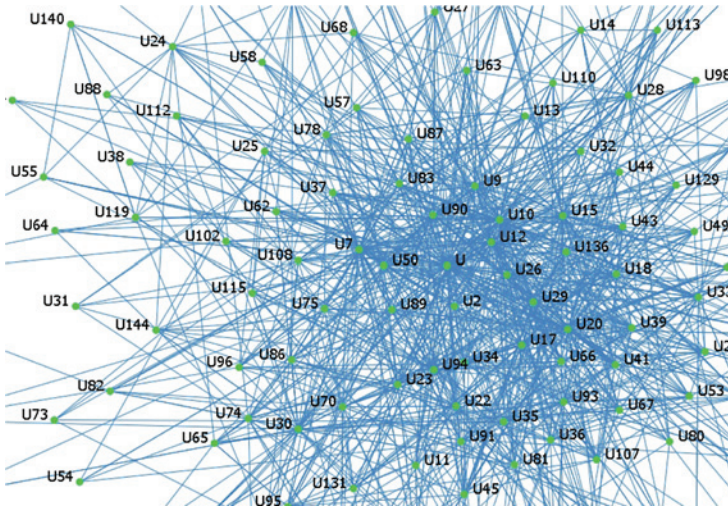


Fig. 2. The main university network (macro view) (Source: created by author)

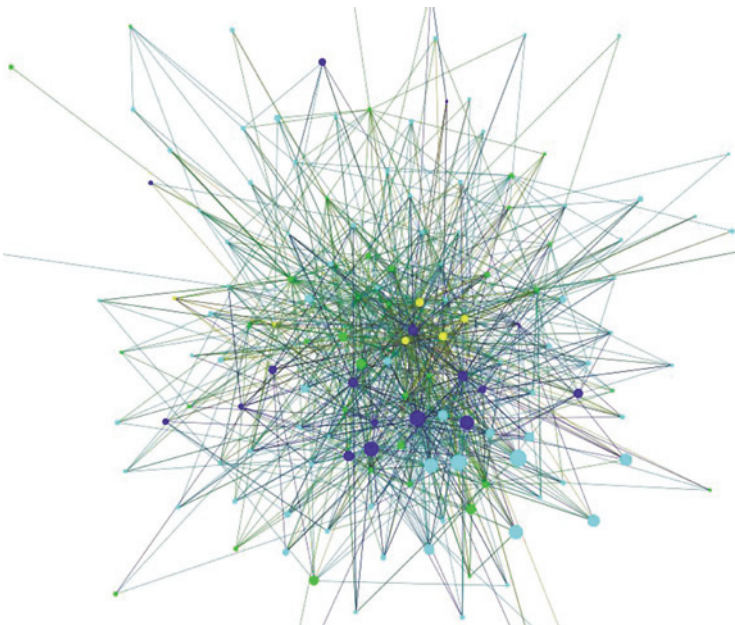


Fig. 3. Centrality, size of institution, countries (Source: created by author)

6.1. Analysis of subgroups

There were 7 features (*Controlling Agency (total degree centrality)*; *Inter-organization Leader (eigenvector centrality)*; *Inter-organization Leader Per Component (eigenvector centrality per component)*; *Acts as a Hub (hub centrality)*; *Acts as an Authority (authority centrality)*; *Information Conduit (betweenness centrality)*; *Connects Agencies (high betweenness and low degree)*) measured to identify 10 key players in this network. There are five repeatedly top-ranked institutions: U and U10 – 100%; U7 – 70%; U9 and U20 – 14% - the value is the percentage of measures for which the University was ranked in the top three. Also 10 institutions are all connected with each other or are from the same country and the Erasmus network does not show such connections. This leaders' sub network could be object of interest in the strategizing process from several perspectives: firstly, each participant could be as a good entrance to others in order to strengthen the position, secondly, the identification of the leaders sub network could strengthen internal connections between them and gain more power.

Using Newman's Clustering Algorithm five clusters groups of this network were identified (see Table 1 and Figs. 4, 5). The key players are bolded. It is seen that Group 1 and Group 2 is bigger and have more key players inside the group. This fact makes those two clusters more central and more powerful in the network, also Group 2 has very high clustering coefficient – 0,303. Also even U has the best centrality and are 1st in all other key element measurements, it participates in strong related (Clustering coefficient = 0,478), but smaller, less powerful cluster. This fact shows that institution has chosen quantity instead of quality of links. In order to strengthen position in the hall network some portfolio management should be done expanding non existing relations in other clusters.

Table 1. Newman's Clustering Algorithm results (Source: created by author)

Group	Size	Density	Clustering Coefficient	Members
1	49	0,074	0,141	U5, U7 , U16, U19, U22, U24, U27, U30 , U37, U45, U52, U55, U62, U64, U65, U72, U73, U74, U75, U76, U78, U81, U82, U83, U84, U85, U86, U87, U89, U90 , U92, U94 , U95, U96, U100, U102, U105, U115, U117, U119, U124, U126, U132, U134, U137, U139, U140, U143, U145
2	35	0,185	0,303	U4, U6, U9 , U10 , U12 , U18, U21, U26, U29 , U33, U35, U36, U39, U41, U43, U44, U46, U49, U53, U58, U60, U66, U67, U71, U91, U93, U98, U99, U107, U109, U116, U120, U121, U136, U146
3	31	0,123	0,196	U2, U8, U15 , U17, U20 , U23, U25, U32, U34, U47, U48, U50, U69, U70, U77, U88, U97, U101, U103, U104, U118, U123, U127, U128, U129, U130, U131, U133, U138, U142, U144
4	25	0,105	0,478	U, U3, U11, U13, U14, U28, U31, U40, U42, U51, U54, U56, U57, U59, U61, U63, U68, U79, U80, U106, U111, U113, U114, U125, U141
5	6	0,233	0,000	U38, U108, U110, U112, U122, U135

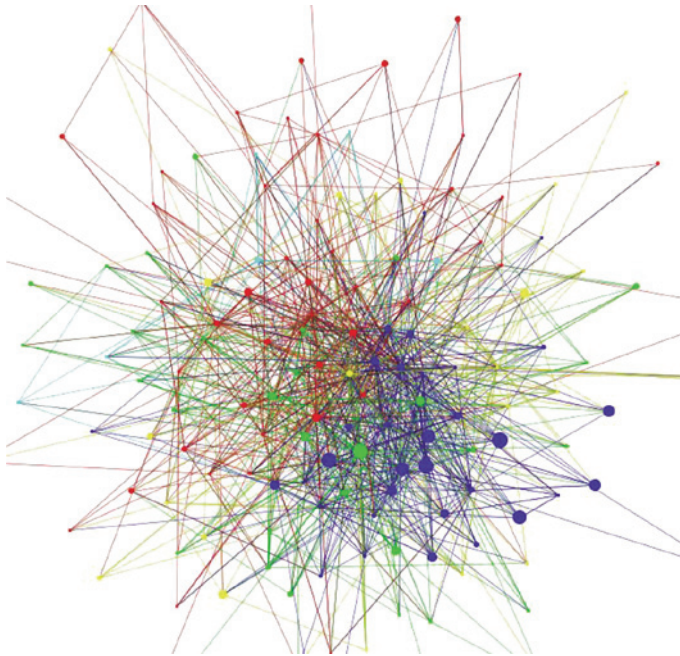


Fig. 4. Newman grouping (node size adjusted to amount of students)
(Source: created by author)

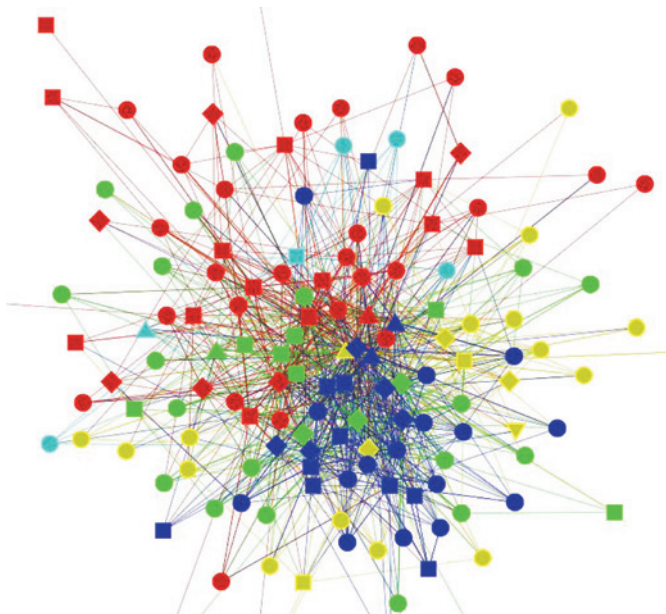


Fig. 5. Newman grouping (nod shape by countries BL-▲; Pl -◆; Ge-●; SC-■)
(Source: created by author)

6.2. Sphere of influence (ego networks) analysis

One of the most relevant ways to look in to the networks from the participant's perspective is to use sphere of influence analysis and to analyse Ego networks. In the Higher education sector to analyse networks from this perspective is possible because most network connections are not under cover, so any institution could advantage from that. For the scientific purposes there is no need to show every possible case of ego network in this paper, because all ego networks are different and the analysis should be based on strategic incentives of particular institution that are out of the scope of this research.

Ego networks of two different networks would be compared – one from the top 10 most influential institutions in this network; and one with similar to average total centrality ration. Those two networks have been chosen in order to show significant differences of the influence of ego network to the whole network. In the Fig. 6 the influence of U15 and U87 is compared. The possibility to see real influence and possibilities from the Ego node perspective is given, as all inter-links of partners are also marked. The institution could use this method to compare itself to similar or more successful nodes. This comparison could lead to identification of needed agents for the portfolio management. For example, less central and less powerful node U87 is connected to 6 from 10 most powerful institutions (U7; U10; U12; U15; U94; U20). The strengthening of relationships (more exchange students to send/receive, participate in the Intensive Programmes, research exchange etc.) with those institutions could lead to the connections to other stronger, more powerful partners. Also there is a possibility to have a strategy to become an agent that strengthens the connections between the most powerful institutions – this strategy could lead to the better of the position in the network.

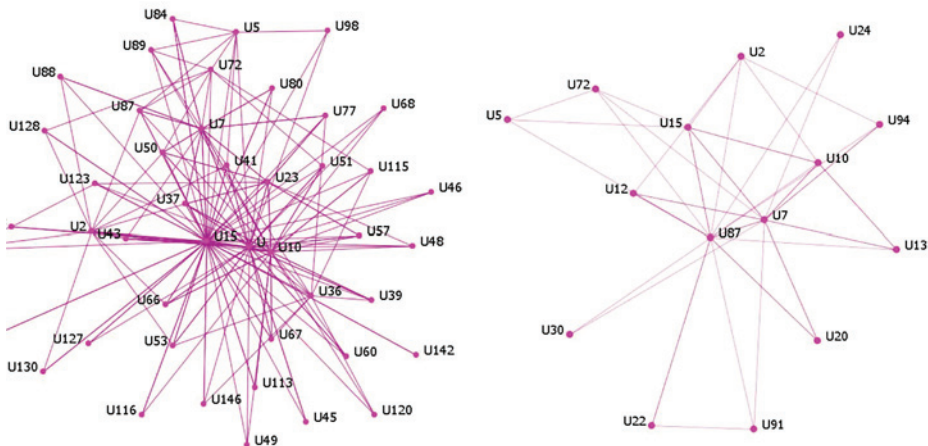


Fig. 6. The comparison of Ego networks of U15 (left) and U87 (right)
(Source: created by author)

In the Table 2 the features of the nodes are compared with the average of the top 10 nodes and hall network average (where possible). Comparing the ego networks centrality total could be basic ratio to evaluate basic networking performance; also it could be a quantitative strategic aim. For example, U15 is quite ahead from the average of the network, but the ratio is lower than average of top 10.

Table 2. Ego networks (Source: created by author)

Text	U15	U87	Average top 10	Average hall network
Centrality total	0,228	0,066	0,235	0,060
Network size (nodes)	45 (30,82%)	15 (10,27%)	47,91 (32,81%)	146 (100%)
Shared nodes: average (max)	2,58 (20,00)	2,03 (9,00)	2,76 (19,27)	-

Comparing the ego’s network size with others lets to evaluate the amount of partners needed for the position change. This could be seen as a room for improvement. As the network size depends on the choice of the researcher so the ratios could not be treated as absolute values. The last row of the tale shows the common nodes with other network participants – nodes that shares neighbours with the ego. This indicates the nodes that are already shared with others and could be useful for the expansion of the further collaboration.

7. Conclusions

The results of the empirical research show that the SNA methods could help to strengthen the network’s picture and understanding of the higher education institution in several ways:

1. Snapshot, nodes mapping, and visualizations could help institution to evaluate its’ position in the network, and to prepare better for the strategizing and strategic decisions.
2. The centrality analysis disclose that the most central and active institutions are middle size. Also the universities from Baltic States are more central than from other regions. Centrality analysis enables to target the central nodes for expansion of collaboration.
3. Clustering analysis identifies that not necessarily the most central institution is clustered in the most powerful clusters. This analysis showed to be useful and indicating for the portfolio management - it evaluates nodes relationships quality vs. quantity perspective.
4. Ego networks analysis enables to compare the nodes state of art from its’ own perspective or to see some parts of the network from different node perspective. The comparison of the different ego networks could lead to strategic incentives, rooms for improvement and better strategizing process.

The SNA method is highly applicable in this case and could be used as supportive tool in the developing of the strategy of the HEI’s.

Further discussion: in the scope of this research, the strategizing process was discussed in very abstract way – strategy to expand was taken as a basis for analysis, strategic goals and the incentives of the strategy of the institution were unknown and had been taken as abstract. It could be interesting to see how strategizing process of the particular institution, with particular goals could be supported by this kind of analysis. The network portfolio management of the HEIs lacks some empirical and theoretical insights. Also it is still open question how to strengthen the abilities of the entity (mostly company) to strengthen its perception to the more realistic network picture then the network ties are not disclosed and only some ties of other ego networks are known.

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