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The strategic assessment of networking of a higher education institution

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The development of economy in the region is highly dependent on the effective management of higher education institutions (HEIs). The effective incorporation of networking in the strategies of HEIs is one of the core issues in the development of current HEIs. This incorporation raises two major issues: the lack of tools to monitor the progress of networking and the lack of ability to generate needed and network-related insights for strategy. The aim of this article is to suggest a networking assessment tool and to apply it empirically. This tool consists of multi-criteria evaluation and evaluation with network pictures. It adapts simple additive weighting (SAW) – data normalisation and Social Network Analysis methods (SNA). The empirical application of the tool showed the possibility to assess and monitor the institution's networking performance and support strategising in the fields of research and studies.

Keywords: network; networking; higher education; strategy; assessment

JEL classifications: O31, O32

1. Introduction

The development of the economy of a country or region is highly dependent on the performance of its higher education institutions (HEIs) that implicates higher emphasis on the strategic management of Higher Education. This implication is being emphasised as the core issue by European Universities Association (EUA) as well as scholars (Locke, Cummings, & Fisher, 2011; Sursock, Smidt, & Davies, 2010). The strategic management of HEI is increasing in scale and scope using even more advanced planning and assessment, and quality management tools and techniques. There are two major trends changing the strategies of the HEI: firstly, the role of internationalisation in all institutions is constantly growing; secondly, the importance of various rankings and benchmarking systems is effecting the development of the aims and achievement criteria. EUA report states that internationalisation has been identified by HEIs as the third most important change driver in the past several years and is expected to move to the first place within the next few years (Sursock et al., 2010). Internationalisation is understood as policies and practices undertaken by academic systems and institutions to cope with the global academic environment including motivations to gain commercial advantage, and to acquire knowledge and language, enhancing the curriculum with international content (Altbach & Knight, 2007). New financial support programmes Horizon 2020

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and Erasmus + launched by European Commission (EC), highlights the role of internationalisation by emphasising the importance and support availability for collaboration-based activities. It is clear that the European Union (EU)-driven processes for innovation and knowledge-based economies will further multiply and deepen the links of higher education including regional, national or international networks and partnerships, and international franchise programmes or branch campuses (Girdzijauskaite & Radzevičienė, 2013; Sursock et al., 2010).

Motivation to create or participate in international networks of the HEI such as to boost their visibility, combine strengths, mark status of institution, and gain understanding of the situation of higher education worldwide (Sursock et al., 2010) is very similar to motives broadly analysed by networking theory scholars e.g. the competitive advantage (Dyer & Singh, 1998), complementary resources (Bratkovič, Antončić, & DeNoble, 2012; Hakanen & Jaakkola, 2012), economy of scale, better usage of operational costs (Joglekar & Lévesque, 2013), development, survival and profitability of the participating entity, small business development (Gilsing, Nooteboom, Vanhaverbeke, Duysters, & Oord, 2008; Street & Cameron, 2007); organisational learning and learning from partners including access to information, knowledge transfer and acquisition (Dyer & Hatch, 2006; Lawson, Petersen, Cousins, & Handfield, 2009; Shang & Poon, 2013). More generally speaking, the term 'networking' puts an emphasis on the initiation and maintenance of a relationship (Biloš & Kelić, 2012) by specific parnership quality variables such as trust, business understanding and communication (Ee, Halim, & Ramayah, 2013).

Another key contemporary issue in strategic management of higher education is the growth of impact and importance of various University Rankings. This phenomenon is also highly related to the networking perspective of HEI in several aspects: firstly, it uses a lot of internationalisation and other network-related results to compare institutions; secondly, rankings shift the portfolios of university partners (Rauhvargers, 2013) not only for those 1–5% of all 17,500 universities listed in the rankings, but also for non-listed institutions as newly ranked institutions become more selective (IBNLive, 2012; Olds & Robertson, 2012). As rankings are highly based on the research outcomes, there are many good HEIs worldwide that should be considered for partnerships, taking into account other aspects than position in the ranking criteria because they are more teaching-oriented or concentrate mainly on the arts and humanities (Rauhvargers, 2013). All HEIs are also increasingly called on to use data for decision-making purposes and to document student and institutional success (IHEP, 2009), thus the growing number of universities has started to use data from rankings for analysis, strategic planning and policymaking (Forslöw, 2012; Yonezawa, 2012). One of the reasons for universities to report using such data is to establish comparisons with rival universities (Hwung & Huey-Jen Su, 2012; Proulx, 2012). This process is complicated for non-listed HEIs.

2. The problem of networking assessment

The activities of networking being incorporated in the strategies of HEI not in a systemic way and management science does not say much about the ways to evaluate institution's position in the broader network as institutions are looking to their networking from ego perspective (Nugaras, 2012), also HEIs are lacking tools to assess networking in a more holistic approach. Such possibilities for non-listed institutions are even more limited. The assessment results should lead to strategic insights and institutional empowering to monitor general progress of networking and set targets, as strategies should

include the identification of targets for short-term and full-degree mobility, the geographical target areas, target numbers of mobile students, the types of cooperation that fit their overall needs, and the specific higher education (HE) networks which they are part of (Sursock et al., 2010).

Two major problems could be distinguished in the larger use of networking perspective when developing HEI's strategy: (1) the lack of ability to monitor process of networking in a holistic way; assessment of not only the performance of the institution in which strategy is being developed, but also the structure and performance of portfolio of the partners; and (2) the lack of ability to generate and incorporate insights from the bigger network information in strategy development, e.g. sense-making and strategising with network pictures (including interrelations of partners and competitors, their positions in the network, and clustering of core institutions, etc.) (Ford & Ramos, 2006; Mouzas, Henneberg, & Naudé, 2008). We suggest combining multi-criteria and network picture assessment methods to address those problems.

3. Multi-criteria assessment

To address the problem of holistic monitoring of implementation of networking related targets we suggest adapting multi-criteria evaluation methods. Multi-criteria evaluation methods are used in range of assessment activities such as evaluating reliability of the banks (Ginevičius, Podvezko, & Novotny, 2010), determining the effectiveness of enterprise marketing (Ginevičius, Podvezko, & Ginevičius, 2012) contractor selection (Zavadskas, Vilutiene, Turskis, & Tamosaitiene, 2010), complex proportional assessment of projects (Zavadskas, Kaklauskas, & Sarka, 1994), assessment of process management maturity (Radosavljevic, 2014) and others. In the case of networking of the HEI assessment, Simple Additive Weighting (SAW) method has (see formula 1).

$$S_j = \sum_{i=1}^{m} w_i \tilde{r}_{ij} \tag{1}$$

where S_j is the value obtained in multi-criteria evaluation of the j-th alternative; w_i is the i-th criterion weight; is the normalised value of the i-th criterion for the j-th alternative. As can be seen from the formula (1), you should have normalised values of the criteria to determine the quantity of multi-criteria evaluation. For the normalisation, the Ginevičius (2008) method is used, which relies on the largest value of the criterion, taken as the largest quantity.

Firstly, networking in research activities is evaluated. Using formula (2) n International Collaboration of research is normalised – institution's output ratio produced in collaboration with foreign institutions is used. The values are computed by analysing an institution's output whose affiliations include more than one country address. Institutional data and maximum values could be indicated by SIR World Report 2013: Global Ranking (Bornmann, Moya-Anegón, & Leydesdorff, 2011; SCImago, 2013), or any other sufficient data source.

$$\tilde{r}_{IC} = \frac{Ic_r}{Ic_{rMax}} \tag{2}$$

Where $\tilde{r}_{IC}$ – normalised International Collaboration of research, Ic_r- International Collaboration of research, Ic_{rMax} – maximum value of the Ic_r values. In formula (3) we suggest that in the networking of research $\dot{N}_r$ not only the scientific collaboration but also the impact of the instruction should be evaluated.

$$\dot{N}_r = \tilde{r}_{IC} I_N \tag{3}$$

There I_{Ni} value (in %) shows the relationship between the institution's average scientific impact and the world average set to a score of 1, i.e. a I_{Ni} score of 0.8 means the institution is cited 20% below world average and 1.3 indicates it is cited 30% above average. In this case, I_{Ni} is used as the weight coefficient (SCImago, 2013). Using this formula, only institutional results are reflected, however the partnership portfolio and the changes in the portfolio are not shown. Therefore, we suggest using the SAW method and taking into consideration the partners of the institution, which is reflected in the formula (4).

$$\ddot{N}_r = \sum_i \tilde{r}_{ICi} I_{N_i} \tag{4}$$

When $i = 1$, the results of evaluated HEI are taken, when $i = 2 \ldots n$ the results of partner institutions of evaluated HEI are taken. The list of partners could be generated in two ways: either only partners listed in a ranking strategically chosen by the institution, or all the partners that have a formal agreement with the evaluated HEI should be taken into account. But there is a strong weakness in using the formula (4), namely, the impact of the evaluated institution to the end result is decreasing if the number of partners is increasing. Empirical research shows that it is possible for institutions to have more than 50 partners (Nugaras, 2012). This method would be more applicable to evaluate all the system (bigger network) in general, but not to assess it from the institution's (ego) perspective. Thus, we suggest using formula (5) instead.

$$\dddot{N}_r = \tilde{r}_{IC} I_N + \sum_{i=n}^{m} \frac{\tilde{r}_{ICi} I_{N_i}}{n} \tag{5}$$

There $\dddot{N}_r$ networking in research, $\tilde{r}_{IC} I_N$ – networking of research of the assessed HEI, and the $\tilde{r}_{ICi} I_{N_i}$ is networking of i-th partner institution. In this case, the networking assessment results evaluate the portfolio of partners as well as the impact of the assessed institution.

In the assessment of studies the same logic as for networking in research assessment is used. We suggest using student and teacher's mobility results as indicators for the networking of studies assessment. Normalisation is done using the same method as normalising research activities. In formulas (6–7) normalisation is done.

$$\tilde{w} = \frac{So_s}{So_{sMax}} \tag{6}$$

There $\tilde{w}$ – normalised students' mobility (including outgoing for exchange and placements) ration, S_{Os} - students' mobility ration, S_{OsMax} – the maximum value of students' mobility ration.

$$\tilde{k} = \frac{Ti_s}{Ti_{sMax}}; \tag{7}$$

There $\tilde{k}$– normalised outgoing personnel mobility (including teaching and administrative staff), Ti_s – personnel mobility, Ti_{sMax} – the maximum value of personnel mobility. Networking in studies is calculated using the same principle as in networking in research, as shown in the formula (8):

$$N_s = \left(\tilde{w} + \sum_{i=n} \frac{\tilde{w}_i}{n}\right) + \left(\tilde{k} + \sum_{i=n} \frac{\tilde{k}_i}{n}\right) \tag{8}$$

There N_s – networking in studies, $\tilde{w}, \tilde{k}$, normalised mobility ratios in networking of studies, $\tilde{w}_i, \tilde{u}_i, \tilde{k}_i, \tilde{g}_i$ - ratios of the preselected partners from the strategic ranking, and n – the number of selected partners. It is also suggested to combine networking in studies and research into one ratio by the formula (9):

$$N = \alpha N_r + \beta N_t \tag{9}$$

There N – general ratio of networking, and α, β – weight coefficients defined by the strategically based selection of participation in ranking by the institution. These coefficients should represent the same weights as those representing studies and research in the ranking.

4. Assessment with network pictures

The idea of evaluation with network pictures is created to address the problem of insight generation and making sense of a bigger picture. The generation of the network picture (Ramos & Ford, 2011), is based on some institutional collaboration data in the fields of research and studies. The generation of the network pictures is done on a suggested algorithm:

(1) *Identification of the base of relationships.* The base for the network picture generation might be of any form of institutional collaboration, e.g. co-authorship in research papers (Lundberg, Tomson, Lundkvist, Skar, & Brommels, 2006); collaboration in the projects of studies and research; joint or double degree programmes; and students' and teachers' mobility, or other. It is recommended to choose the most developed network as a basis of identification of links and nodes. The most developed network would have the biggest amount of connections and players (nodes). This would indicate the best development possibilities in the means of position in the network adjustment, and involvement of gate keepers and mediators; it would also reflect the existing network in the most sophisticated way.
(2) *Identification of the scope of the assessment.* We suggest generating network pictures by using Social Network Analysis (SNA) methods. It is worth deciding whether to take all nodes and all relations in the analysis, or to set some strategic limitations. The limitations such as geography, type, and size of the HEI, or any performance indicators such as number of study programmes, and general research output could be selected in order to reduce the size and scope of the network. These limitations are set to make the analysis more oriented to strategic goals, or more feasible to conduct.
(3) *Identification of nodes and links.* Using a snowball method of identification of all the nodes and links in the selected scope of network.
(4) *Determination of cut-points to develop network pictures.* These sections should be developed in accordance to the strategic needs. Selected network pictures should indicate HEI's position in the network, subgroups, clustering and possibilities to develop new strategic insights. These cut-points depend on the specifics of institution and strategy, but some general principles of choosing cut-points

Table 1. Cut-points for network picture generation.

Type of picture	Description	Impact on strategic insight
General overview oriented	Network picture is oriented to general features of the institution (country of origin, size in student numbers, and centrality on selected collaboration feature).	To assess a general position in the network and make visibly bigger pictures, and see from the perspective of network and not only ego.
Study output oriented	Network picture is made to show the scale of hubs of studies, and the impact on overall students' mobility. The size of the nodes and links is adjusted to the student's mobility results.	Using longitudinal approach insights of the students' mobility trends can be generated. Possible strategies for further students' exchange collaboration agreements could be generated.
Research output oriented	Network picture is generated to indicate research hubs and collaboration on the institutional level. The size of nodes is adjusted to research output.	The links with the most productive research institutions could increase the productivity of the assessed institution; the network picture assessment could hold to the indicated state of the art and possible development trends.
Position in the ranking oriented	Ranking showing status, but not collaboration, so in this picture any other collaboration-based picture is used as a basis, but the size of nodes indicates the position in the ranking.	Possibility to indicate structures of a better ranked institution and to make a strategy on how to create stronger connections to those institutions.

Source: Created by the authors.

Table 2. Networking assessment results in studies and research.

	Number of partners in ranking	Networking of assessed institution	Partners' portfolio networking	Networking assessment
Networking in studies	33	2.00	0.331	2.331
	33	1.308	0.476	1.784
Students' mobility (adjusted to the size of a university)	33	1.000	0.248	1.248
Students' mobility (not adjusted to the size of a university)	33	0.308	0.241	0.549
Personnel mobility (adjusted to the total amount of workers)	33	1.000	0.082	1.082
Personnel mobility (not adjusted to the total amount of workers)	33	1.000	0.235	1.235
Networking in research	66	0.025	0.429	0.454
Combined networking assessment for studies and research				0.972*

Source: Created by the authors.
*Calculated with a networking assessment of studies, and adjusted to the size of university.

could be indicated. Firstly, network pictures should be generated in order to disclose bigger pictures of HEI surrounding network and its features (this discloser shows the strategic state of art and possibilities to improve the current situation). Secondly, some specific features such as position in the rankings, collaboration flows, more institutionalised relations such as branch campuses, joint degrees or joint research projects, research output, and the amount of exchange students should be indicated by different shapes of the nodes and links. Some typical network pictures are described in Table 1:

5. Empirical research: multi-criteria evaluation

Technical university in the Baltic Sea region has been chosen as an object for the empirical research. The aim of this empirical research is to assess networking of one particular HEI and to show the empirical usage of the suggested assessment tool. The data for the multi-criteria assessment was collected in 2014, using the QS ranking, SIR Global 2013 – Rank: Output 2007–2011, website information of HEIs, and Erasmus statistics for all data. Summarised results of multi-criteria assessment for networking in research and studies is presented in Table 2.

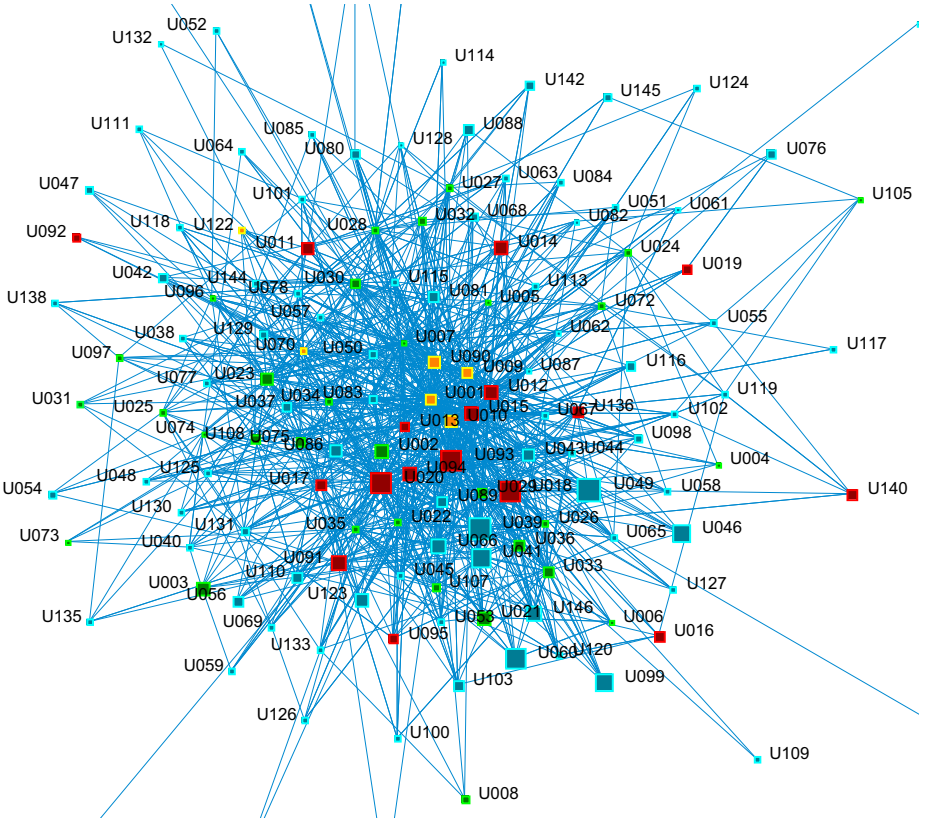

Figure 1. Network picture: centrality, university size by number of students, and countries by colours. [To view this figure in colour, please see the online version of this Journal].
Source: Created by the authors.

Networking in studies of this institution assessment indicates several factors of strategic importance. Firstly, despite the calculation in absolute or proportional way (taking into account to amount of students of institution) numbers indicates a very strong performance of the assessed institution and a weaker portfolio. The indicator of the personnel mobility is of an absolute value and equal to one. Taking into account that this reflects only partners from the QS ranking, it indicates a strong performance among elite universities. However, from the institution's point of view it should be understood that this portfolio of the partners is too weak, and strategies for developing relations with stronger partners should be built. Moreover, this assessment highlights that this institution could position itself as a strong performer in networking in studies.

Quite opposite results are found in the networking in research. The portfolio is much stronger than the performance of the assessed institution. From the strategic perspective it is also an indication that it should be moved from just having a good networking portfolio to using it more intensively. The shift from quantity to quality or from quantity to selective intensity could be the core in this institution's networking in the research strategy. Also, it might be worth developing or looking more carefully into the strategies for the most important relationships and strong performers in research.

6. Empirical research: assessment with network pictures

To illustrate the suggested assessment method with a network picture, the data of empirical research conducted in 2012 is used. The bigger population was more than 300 universities from the Baltic Sea region. As a smaller population (sample) of 144 technically-oriented universities and universities of applied sciences have been chosen. The data collection was based on a snowball method (Hanneman & Riddle, 2005): the snowball method started from the assessed institution's connections. The basis for the

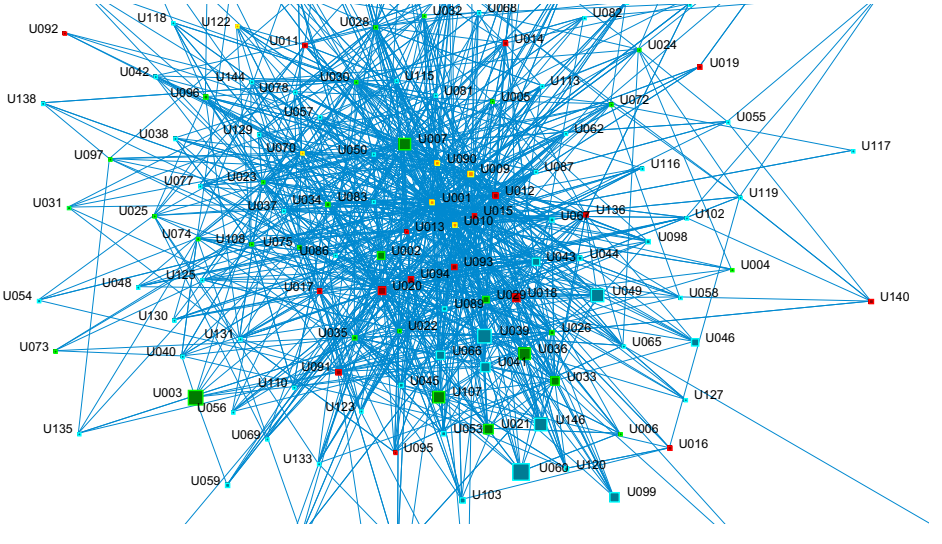

Figure 2. Network picture: Centrality by students' mobility, node size and colour, adjusted to research output. [To view this figure in colour, please see the online version of this Journal].
Source: Created by the authors.

indication of the nodes and links, and the 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. Also, from the results discussed above, a multi-criteria evaluation is clear that the networking in studies and exchange programmes is much stronger and better developed. The Baltic Sea region and institutions with high orientation to technological sciences have been chosen in line with the strategy of the assessed institution. The distribution of the institutions by countries are as follows: Baltic countries (Estonia, Latvia, Lithuania) – six institutions; Scandinavian countries (Finland, Sweden, Denmark) – 18; Germany – 86; and Poland – 18. For the data analysis and generation of pictures of networking assessment the 3.0.0.2 version of *Ora-netScenes system was used (Carley & Columbus, 2012; Carley, Pfeffer, Reminga, Storrick, & Columbus, 2013). The network consists of 144 nodes and 1260 links in it, with an average institution of 9007 students. This assessment with network pictures has not sought to formulate the strategy for the network development, but rather to show the possibilities of the suggested tool.

In Figure 1, a general overview of the network is generated. It indicates a very high centrality of the assessed institution U001. It correlates with the results got in the

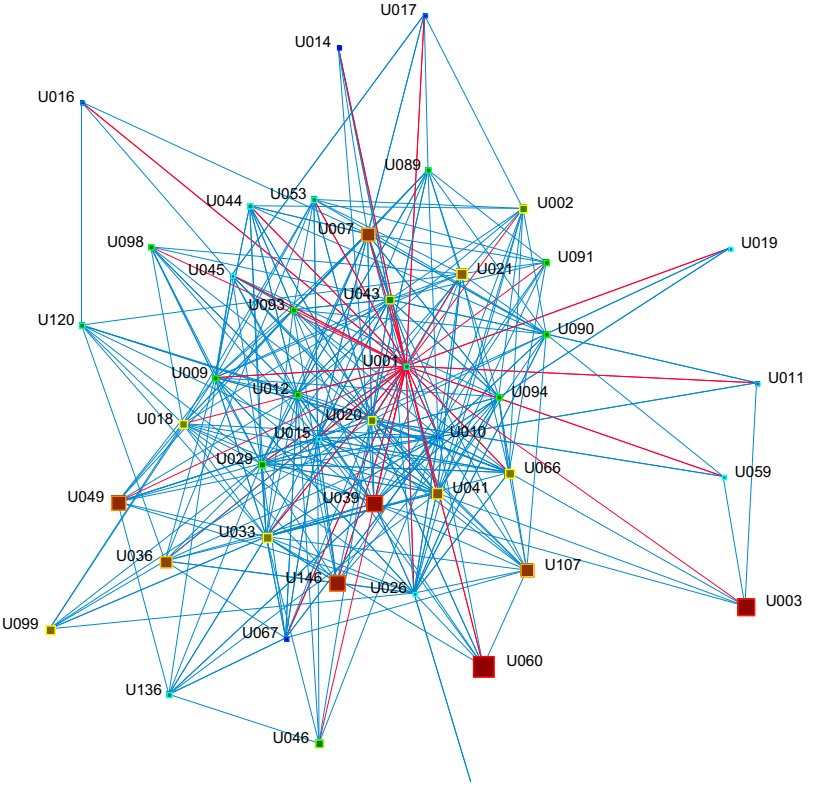

Figure 3. Network picture: Centrality by partnerships in students' mobility, node size adjusted to the research output, and number of the nodes reduced to ones with similar or bigger that assessed institution research output. [To view this figure in colour, please see the online version of this Journal].
Source: Created by the authors.

multi-criteria evolution, as high results for students' mobility require a big network and wide relations. Also, it shows that Baltic countries (Baltic HEIs – squares in yellow; Scandinavian – green, Poland in blue, and German in blue green) are the most central and have the biggest network. This might be explained by the latecomers' behaviour approach (Girdzijauskaite & Radzevičienė, 2013), as institutions have blended in the European market of Higher Education only in late 1990s together with the end of Soviet Union. These institutions have been very open to any collaboration with low selection criteria. Also, it might be highly visible that the most central are middle-size HEIs, as the squares are adjusted to the number of students of the institution.

In Figure 2 the node size and colour have been adjusted to the research output of the institutions. The results also correlate with ones in the multi-criteria evaluations: even this picture is not covering all partners in the QS ranking, but it is clear that the position of the assessed institution is far from more productive in research HEIs; also it proves that stronger institutions are more selective, concentrating on more important relations, or are more central in some other parts of the bigger network.

As multi-criteria assessment indicated the need for the development of the existing relations, it is also worth looking deeper into the structure of the relations in connection to the research output. In Figure 3 we filtered only similar or bigger institution according to the output of the research. The Picture indicates that the most productive institutions are not that well connected to each other and are very well connected to the assessed institution. This factor could be highly used in the strategy of the assessed institution, for example being the 'glue' – the mediator in strengthening and building new strategic alliances/clusters, and gaining a better performance in research from the partners. Universities from the Baltic States (U001, U009, U010, and U090) have a very

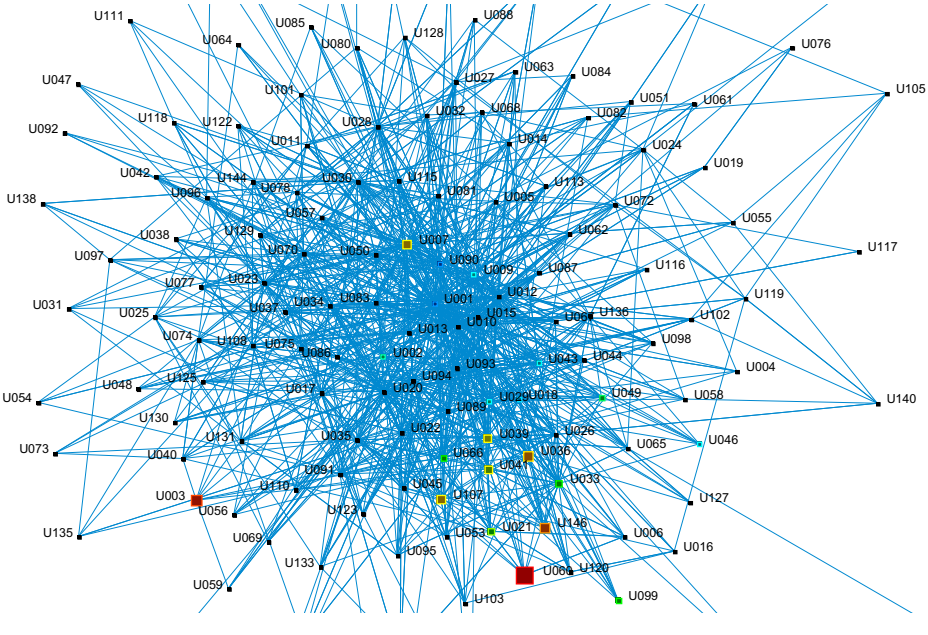

Figure 4. Network picture: Centrality by students' mobility, and nodes inversely proportional to the place in QS ranking. [To view this figure in colour, please see the online version of this Journal].
Source: Created by the authors.

similar research output but the assessed institution is better connected to the leaders in the research output.

The other important factor to assess is the position of the highly ranked institutions. In Figure 4 the position in the QS ranking is reflected. From the assessment is clear that the majority of institutions are not listed, but more importantly it is clear that those institutions are more clustered in the bottom of the generated picture. This picture confirms the factor that prestigious institutions are more selective and clustering together, forming elite networks. As institutions are less central, it means that they have less but more effective connections. This cluster also indicates a very clear aim for a further positioning in the network – the assessed institution should formulate its strategy in a way that enables strengthening relations with the mentioned institutions.

In order to better understand the structure of the relations of the ranked institutions Figure 5 is generated. It reflects only the relations between the QS ranked institutions. As the research output is one of the core criteria, the QS picture has similarity with the research output picture and indicates even less interconnected HEIs that have a higher ranking. This set of partners might be considered as the core network, or the most important partners – the most intensive relations should be developed with these partners. It is also clear from this picture that the assessed institution has very good possibilities to approach all the strategic partners and to develop access to new collaborative structures and networks of higher importance.

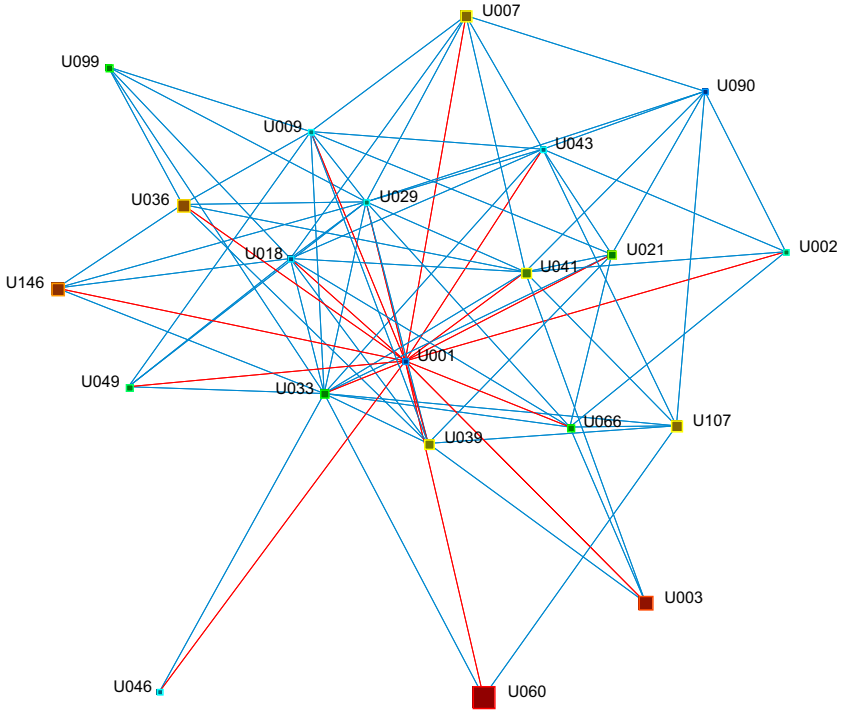

Figure 5. Network picture: Centrality by students mobility, selected only the QS rank listed nodes, inversely proportional to the place in QS ranking. [To view this figure in colour, please see the online version of this Journal].
Source: Created by the authors.

Several strategic actions to take might be developed from this assessment: (1) identification of the possibilities to connect with not connected institutions (might be in conflict or competing relations); (2) identification of the existing patterns of collaboration with all the connected institutions (how deep, how often, what are key persons in both sides, what are common interests, what are conflicting interests); (3) identification of the exact strategy with each partner (to expand, to keep the same status, to decrease intensity); (4) to analyse existing formalised networks and possibilities to create such networks in order to join the most important relationships.

7. Conclusions

- Networking theory is highly applicable in the strategic management of HEIs: it is mostly recognised by institutions in internationalisation activities.
- The usage of benefits of collaboration and participation in the networks could be expanding by incorporating networking perspective into the strategic management of institutions.
- In order to mange networking process and incorporate it in the strategy it should have a measurement system reflecting not only the performance of the institution, but also indicating a networking portfolio and its performance. This assessment is needed for both strategy formulation and performance measurement.
- Suggested dual system of networking assessment consisting of multi-criteria and network picture assessment addresses the networking assessment of the HEI problem. Conducted empirical research indicates that the features of suggested methods are complementary and help to understand a bigger surrounding network. Also, results and trends of both methods are consisted.
- The assessed HEI has a strong portfolio and week results in research networking and strong networking results and weaker portfolio in studies. In the research field the institution should make a strategy for developing more activities with partners and to use the partners' capacity to strengthen the performance. In the networking in studies the institution should strategise how to switch from the large quantity of relations to more effective ones; also the review of the portfolio seeking of stronger partners would be beneficial.
- The suggested assessment method is useful to better understand the networking and could be used in strategic higher education management.

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