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APROACHES TOWARDS CLUSTER ANALYSIS

Abstract. The purpose of this study is to review cluster research and the methodology used to achieve the target. Specifically, this research explores the methods that are used in research papers aiming at cluster study. Bibliometrical analysis is used depending on an original database, created by the authors, selected after close review. 33 research papers were taken into consideration, published from 1999 to 2014 in international scientific journals. The findings indicate that case study is used in many articles refering to cluster research. Other methods, such as analysis, interview, survey, research, equation and others are used to support case study. By analyzing the specific methods used in cluster research it is aimed at giving clarity to further research on the concept of cluster. It is well known that rather few research papers were analysed from the methodological point of view. However, this research requires a further analysis with a wider scope of scientific literature and works related to clusters.

Keywords: cluster, methods, case study

JEL Classifications: L82, M20, P12, P26

Inroduction

Business clustering phenomena is associated with good practice of entrepreneurship leading to sustainable development of industries, regions and countries (Bonetto et al. 2014; Caurkubule, Rubanovskis 2014; Cuneo et al. 2014; Dudzevičiūtė 2013; Figurska 2014; Laužikas, Mokšeckienė 2013; Raudeliūnienė et al. 2014; Prause 2014; Tvaronavičienė et al. 2014).

The concept of cluster has born in the strategic literature and later it has spanned through a wide range of disciplines. The concept has been changed, adapted and gained theoretical power by finding application to different fields. There are several definitions of a cluster coexisting as well as several applications to different socio-economic contexts, stressing one or more of the particular features of cluster. The concept of cluster can be considered as a puzzle made of different pieces and elaborated from the original literature of clusters or borrowed from other fields of study.

Being an increasingly popular topic, cluster is strongly criticized by some authors as it is indistinct, lacking unique definition and has problems related to its measurability. The feature of being indistinct might be supported by the evolutionary nature of a cluster concept. It has spanned through a wide range of disciplines finding application to different fields (econom-

ics, management, organization studies, sociology, economic geography, regional studies, urban planning and innovation studies). After fully entering the political discourse, cluster concept leaded to the design of policy interventions in many countries. The cluster as a policy tool could be applied in many different socio-economic contents.

This work positions itself in the interest of the methlogy that is used in cluster research. Variety of authors has been analysing the impact of the cluster to the economics of the firms belonging to it. By analysing scientific literature and researches carried out in order to get a better knowledge of a cluster, this paper was designed and writen. The attempt was to explore in details how cluster research became successful.

The purpose of this study is to review cluster research and the methodology used to achieve the target. Specifically, this research explores the methods that are used in research papers aiming at cluster study. It is well known that rather few research papers were analysed from the methodological point of view. This research requires a further analysis with a wider scope of scientific literature and works related to clusters. Bibliometric analysis can also suffer from some biases which are generated by the personal opinion of the author as the articles were chosen from a number of scientific journals in the Emerald database. The concept is used in various disciplines, by different scientific communities and in different context.

At the beginning of the research the concept of a cluster was identified and the most relevant research papers disscussing the concept were chosen. The search was not limited to only one journal, articles from different fields, such as business, marketing, behaviour management, knowledge management and others, were taken. There was no attempt to give a specific theoretical explanation for the success and the evoliutionary trajectories of the cluster concept.

The article is structured as follows. Section 2 describes the research design and the method of data collection. Section 3 presents some descriptive statistics on the articles which were analysed in the research. Section 4 illustrates the results of methodology analysis of the cluster concept. Finally, Section 5 incorporates the conclusive remarks.

1. Data and methodology

The data that is used in the paper was taken from the Emerald Insight database (henceforth, Emerald). This database was chosen as the refering one for it contains numerous articles, research papers, chapter items and other scientific sources in many disciplines. Emerld manages a portfolio of nearly 300 journals and over 2350 books and book series volumes. The collection is continuously filled with new articles and other scientific data. On the other hand, there are some limitations of the database. There must be noted that the scientific items overviewed here were only ones written in English. Chapter items were also omited. There were collected 33 research papers that have been published from 1999 to 2014 in international scientific journals. Articles pivoting on the topic of clusters have been identified, and picked from the journals that are related to management. It was chosen to read the abstract of each article and if it was not sufficient, then to read the whole article. In this way, the articles where cluster analysis was adopted as a statistical procedure were omited.

The articles were taken from Emerald by aplying such restrictions: they must be dated from the beginning of 1999 to the end of 2014 and identyfied as a research paper. The stress was put on the methodology that was used in the papers as the methods used in the scientific sources interested the most. After a close examination, several articles were taken that are discussing clusters and the main interests were collected and taken into account. The rate of quotations in other texts of scientific nature was not considered for the most cited articles are not necessarily the best ones and show the best methods of cluster review and research.

Despite the fact that in the most cases of existing literature reviews there are considered articles published in a specific journal, it was chosen to group articles by subject categories. The concept of cluster is multidisciplinary and the chosen way allows to make a more objective research of methods used to discuss clusters. This decission can also be considered as inappropriate. The reason is that some articles might be assigned to other subject categories, although all of them are related to management and that would not make any dissagreement. It is strongly believed that the articles chosen are good representatives for the research.

There were collected research papers that Emerald manage from different international journals. Considering the main aim to be the usage of methodology, 33 research papers were selected, that can be seen as a relatively small group. These 33 articles show the most often used methods of cluster reserch. They are not the most popular but they are good enough to be viewed as representatives or examples for the scientific community.

The articles are viewed according to the methodology that is used. Starting from the methods that are used the most often, it is explored what else is used in the article in addition to the most popular methods in order to support them and give the best results in the research. To do so, the methods used in the 33 articles were identyfied and recorded. The analysis is started from the method that is used the most often and refering to the other methods that support or is supported by it.

To sum up, there were used 11 different methods in the articles and they were repeated in diferrent papers. There were several methods used in the same paper as there is a relation between various methods and they can support one another. It was detected that the most often method is supported by some others which help to make a cluster research. The methods were classified and the number of articles that uses them was recorded.

2. Descriptive statistics

The number of articles on clusters is growing over the years. The growth in interest on the topic indicates how hot is the topic and the degree to which the scientific community is invested in deepening it.

The cluster concept intermingled with different streams of literature, sometimes producing new topics and new fields of study. The increasing variety of journals interested in publishing on this issue supports the idea that this concept is very multidisciplinary, and able to cross different communities of scientists. There is a wide range of journals targeting to the topic but the most often the subject is considered in the area of economic geography.

As the articles were viewed from the most relevant, in the result we have the biggest concentration of the newest articles that were selected. Counting from 1999 to 2014 there were selected 33 research papers that considers clusters. The most relevant are the newest ones (Figure 1)
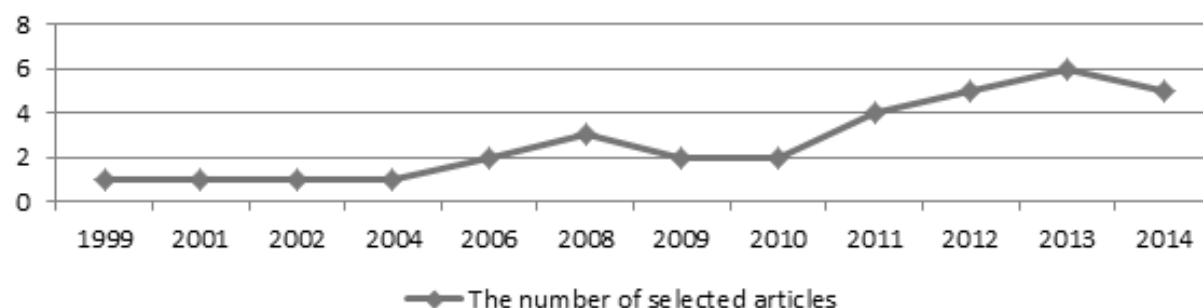

Figure 1. The number of selected articles by time frame

Source: own work

Most of the selected articles were written from 2012 to 2014. That shows how the newest data is the most efficient.

The research papers were grouped according to the field that they are published in. There were 6 fields identyfied that are considering clusters and has a nature that of management. The fields are: behaviour management, business, intelectual capital, knowledge management, management science, marketing (Figure 2).
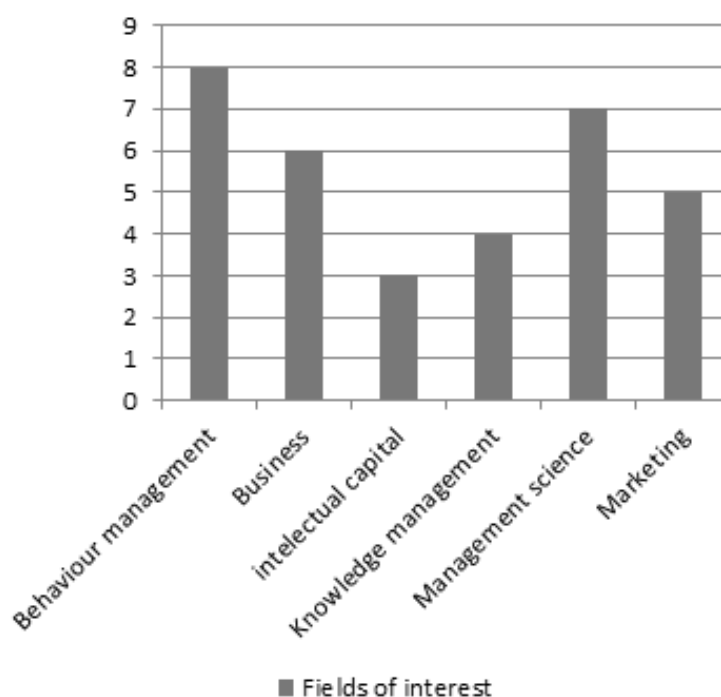

Figure 2 Fields that consist cluster researches

Source: own work

The most articles are taken from the field of behaviour management. That is human resources, public sector management, productivity and performance. The field considers how clusters affect human behaviour and what responces can be expected. In the management science field the performance of the cluster is concerned. The main interest is how the cluster is organized and works. Business field seeks to investigate how clustered firms can benefit from their possition. In the marketing field, mostly the articles of wine clusters are positioned and the case studies are applied. Knowledge management attempts to analyse the network structure and the ways firms share information in clusters. Intelectual capital field analyse relationships among components of intellectual capital within a model of competitive advantages in emerging clusters.

The articles use 11 diferent research methods that help to convey the information of the field that is attempted to represent. The most used is case study, helping to overview the inside of the clustered firms behaviour (Figure 3).
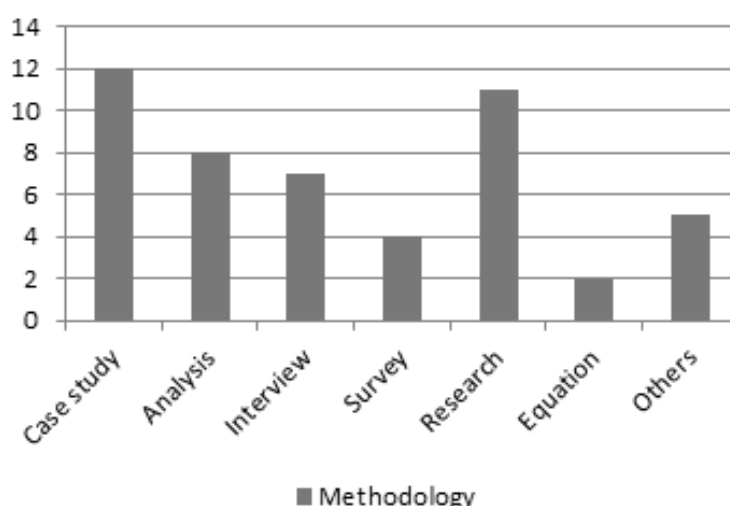
Figure 3 Methodology used in clusters research

Source: own work

There are different kinds of case studies applied in the cluster research papers. They are used to explore industry clusters in various areas. The industry clusters that are studied are: furniture, textile and clothing, IT, wine, petrochemical firms. Besides case study, in order to support it other methods, such as analysis, interview, survey, research, equation and others are used.

3. The results of methodology analysis

From the analysis of the methodology used in cluster research, the most often used methods are found. Overall, the 33 articles use 11 diferent research methods, in total 49 cases in the articles.

On the top of the list of the most used research methods case study is found. Starting from this research method, all of them will be reviewed, showing how other methods can support a case study.

The first article (Andersen, P., Bøllingtoft, A. 2011), using case study to get the desired result, aims at getting information on how globalization affects cluster-based firm's use of local knowledge resources and the combination of local and global knowledge. Qualitative case studies of nine firms in three clusters were chosen to be made. The clusters that are strongly affected by increasing global division of labour are furniture, textile and clothing and IT. The study is made in a small and mature economy and the paper takes a micro-oriented perspective. What else could be done to get more precise results is triangulation with quantitative studies, as the study made is exploratory.

Another exploratory case study is made by three authors (Florence, C., Karine, G., François, S. 2013).The authors aim at better understanding how a socio-economic proximity can be organised and investigates the role of third parties in this process. The method used in the paper is an exploratory case of successful open innovation between a software editor and a systems integrator located in the same IT cluster. To support the study, 50 face-to-face in-depth interviews, documentation and analysis of physical artifacts was used. Exploratory design limits the author's research in terms of generalization. In order to analyse the relationships between various forms of proximity and other results of the study, further research is needed.

An empirical analysis was adapted to analyse the relationship between different kinds of networking and the performance of firms in industry clusters (Giuliani, E. 2013). Two wine clusters in Chile and Italy were chosen to study the importance of local embeddedness and external openness for product success. Econometric analysis was employed for case study and the original firm-level data was used. The empirical analysis helped to find out that local embeddedness positively influences the development of successful products. It also helped for even more significant outcome to be resolved, which is that external openness is even more important for successful firms. The case analysis of two wine clusters showed wether and how network influence the performance of firms.

The extant cluster literature was the source helping to identify potentially strategic cluster resources in the next article (Jaime, E.F., Jean-Louis, R. 2013). They were adapted to the specificities of the wine industry by having in-depth interviews with experts and after that classified in five categories. The typology that was suggested after the research was tested with institutional actors of Brazil wine cluster. Moreover, the paper suggests a means for resource value assessment through the mediating role of a value creation system. It is worth noting that the typology was tested in one cluster, further empirical validation is needed in different wine clusters for assessing its inter-cluster validity. As well as that, some theoretical refinement is needed additionally.

Case study was employed to investigate the internationalization of international new ventures in the ways in which a formal cluster can facilitate the internationalization process (Colovic, A., Lamotte, O. 2014). Four international new ventures were studied in two clusters in France. Semi-structured interviews were conducted with CEOs and other representatives of the international new ventures and the members of the cluster management teams. The study has shown that internationalization can be facilitated by providing resources, networking opportunities and legitimacy to help them reach global markets by the clusters.

Porter's cluster model and the innovative milieu approach were drawn back in the research (Schiele, H. 2008). A combination of action research and semi-structured interviews conbined in a case study which is applied to four cases, seeking to show the managerial implications of firm membership in industry clusters. The main aim of the paper is to explore the implications of regional-sectoral agglomerations – clusters – for the strategic management of firms. It is important to note that an additional broad empirical analysis should be made in order to supplement the study. The author also notes that it is necessary to concider any company's entire value-creating system from a geografical point of view.

Authors claim that cluster management is very important and it can give positive results from member firm collaboration, knowledge sharing and innovation if these are appropriately exploited (Connell, J., Kriz, A., Thorpe, M. 2014). Such an outcome was found by employing case study together with community based participatory research and interviews within four industry clusters. A knowledge sharing relational framework was used to rank the findings. Knowledge sharing and innovation exchange was examined by using top-down, hybrid and bottom-up clustering from a variety of sectors. This research has conducted case studies which should be followed by broader, more internationally generalizable research in order to get more precise results.

Porter's economic cluster theory is discussed together with a case study of a petrochemical firm (Patti, A. L. 2006). The paper aims at illustrating the advantages for firms who build local supplier and customer relationships whenever possible. It is noted that generalization of the findings must be minded when case study is employed. The article seeks to support Porter's economic cluster theory by providing empirical evidence. The research has helped to prove that despite the age of the global business environment, building local supply chains is still of value.

In the research paper authors examine how the institutional context of a country can inhibit enterpreneurial activity in clusters (Saka-Helmhout, A., Karabulut, E. 2006). Exploratory survey questionaire and interviews administered to 78 firms were employed for the case study to obtain the results. It was found out that only some features of an industrial district were effectively nurtured by firms in clusters. These features are flexibility, participative managerial structure and trust. However, the author claims that particular systems of organizing, such as cluster formation should be taken without consideration for industrial efforts of developing countries.

A case study as the field research methodology for theory testing and refinement was chosen in the article (Carpinetti, L. C. R., Galdámez, E. V. C., Gerolamo, M. C. 2008). The authors aim at presenting and disscussing a conceptual model for performance measurement and management of a cluster based on the concepts of the Balanced Scorecard and other models. The author admits that the model still needs to be applied in further researches as to be reviewed and validated. Research has shown that the model adequately captures the perspectives of performance management of a cluster, emphasizing the importance of measuring leading and lagging dimensions of performance such as collective efficiency and economic/social results.

Analysis built on Harts model of natural resource-based view of the firm was made and Brown framework was used for analysing contextual resources in order to examine the competitive advantage of the environmental behaviour at a firm level and micro-cluster level (Grimstad, S., Burgess, J. 2014). The case study was employed to examine the drivers and the obstacles to environmental action and demonstrates how clustering has been important in progressing a sustainability agenda. Other mixed methods were used in order to promote a case study of a single wine tourism cluster. Further research is needed as only one cluster in one country was studied. By the research the authors have found out that small business can benefit from the clustering as they can share resources, access specialists and share information.

The input-output analysis was used in the article in order to estimate the economic impact of the wine cluster and its role in regional economy (Larreina, M., Aguado, R. 2008). A case study was made in a region where wine is the driving economic force. The author claims that the increase in wine sales in the region is simultaneous to the spread of welfare among the local population.

Conclusions

The main aim of this paper is to give a picture of the methodology used in cluster research. The most usually used method was detected and the supporting ones were identyfied. The cluster concept is used in various disciplines by different scholars in many countries. Although the concept sometimes might be seen as indistinct, it has achieved its international and interdisciplinary success. It may be claimed as evolutionary.

This work presents some limitations. The results are undoubtedly influenced by the choice of the database, key words and subject categories. Moreover, this methodology does not take into account other phenomena that may have played a role in the choise of methods that were used by authors seeking to analyse the operation of the firms in clusters.

In general, the most focus was put on case study and other methods, such as interview, literature analysis, survey, classification, used to support the main method. It is highly believed that the suggested method of case study is the most appropriate in order to make cluster analysis. By employing additional methods, case analysis can help to realise how cluster works.

The understanding of the methods used in researches trying to explain the success of clusters can help the future analysis to be made. The concept still needs explanation and further researches. Clusters are helpful for firms to adapt in local and global surroundings by providing

the information that is not easily accessible for smaller firms. In order to help them to get this information researches must be carried out and the results would encourage further development.

References

Akoorie, M. E. M. (2011), A challenge to Marshallian orthodoxy on industrial clustering, *Journal of Management History*, 17 (4): 451 – 470.

Bonetto, P., Hoffmann, B., Prause, G. (2014), Rise and fall of the Lyon silk cluster: a case study about entrepreneurial sustainability, *Entrepreneurship and Sustainability Issues* 2(1): 1-11. DOI: http://dx.doi.org/10.9770/jesi.2014.2(1)

Andersen, P., Bøllingtoft, A. (2011), Cluster-based global firms' use of local capabilities, *Management Research Review*, 34 (10): 1087 – 1106.

Colovic, A., Lamotte, O. (2014), The role of formal industry clusters in the internationalization of new ventures, *European Business Review*, 26 (5): 449 – 470.

Connell, J., Kriz, A., Thorpe, M. (2014), Industry clusters: an antidote for knowledge sharing and collaborative innovation?, *Journal of Knowledge Management*, 18 (1): 137 – 151.

Connell, J., Voola, R. (2013), Knowledge integration and competitiveness: a longitudinal study of an industry cluster, *Journal of Knowledge Management*, 17 (2): 208 – 225.

Carrie, A. (1999), Integrated clusters – the future basis of competition, *International Journal of Agile Management Systems*, 1 (1): 45 – 50.

Carpinetti, L. C. R., Galdámez, E. V. C., Gerolamo, M. C. (2008), A measurement system for managing performance of industrial clusters: A conceptual model and research cases, *International Journal of Productivity and Performance Management*, 57 (5): 405 – 419.

Cuneo, A., Ferrari, M.L., Traverso, A., Massardo, A.F. (2014), Sustainable district development: a case of thermoeconomic optimization of an energy hub, *Entrepreneurship and Sustainability Issues* 2(2): 74–85. DOI: http://dx.doi.org/10.9770/jesi.2014.2.2(3)

Caurkubule, Ž., Rubanovskis, A. (2014), Sustainable entrepreneurship through motivation: case of Latvian companies, *Entrepreneurship and Sustainability Issues* 2(1):43-48 DOI: http://dx.doi.org/10.9770/jesi.2.1(6)

Danson, M. (2009), New regions and regionalisation through clusters: City-regions and new problems for the periphery, *International Journal of Public Sector Management*, 22 (3): 260 – 271.

Dudzevičiūtė, G. (2013), Lithuanian manufacturing trends in the context of developed and developing countries, *Entrepreneurship and Sustainability Issues* 1(1): 55-66http://dx.doi.org/10.9770/jesi.2013.1.1(6)

Felzensztein, C., Deans, K. R. (2013), Marketing practices in wine clusters: insights from Chile, *Journal of Business & Industrial Marketing*, 28 (4): 357 – 367.

Felzensztein, C., Gimmon, E., Aqueveque, C. (2012), Clusters or un-clustered industries? Where inter-firm marketing cooperation matters, *Journal of Business & Industrial Marketing,* 27 (5): 392 – 402.

Figurska, I. (2014), Sustainable entrepreneurship: localization, acquiring and use of knowledge sources in competitive organization, *Entrepreneurship and Sustainability Issues* 1(4): 210–222. DOI: http://dx.doi.org/10.9770/jesi.2014.1.4(3)

Fiol, L. J. C., Tena, M. A. M., García, J. S. (2011), Multidimensional perspective of perceived value in industrial clusters, *Journal of Business & Industrial Marketing*, 26 (2): 132 – 145.

Florence, C., Karine, G., François, S. (2013), Open innovation processes within clusters – the role of tertius iugens, *Management Decision,* 51 (8): 1701 – 1715.

Grimstad, S., Burgess, J. (2014), Environmental sustainability and competitive advantage in a wine tourism micro-cluster, *Management Research Review*, 37 (6): 553 – 573.

Giuliani, E. (2013), Clusters, networks and firms' product success: an empirical study, *Management Decision*, 51 (6): 1135 – 1160.

Hsu, M., Lai, Y., Lin, F. (2014), The impact of industrial clusters on human resource and firms performance, *Journal of Modelling in Management*, 9 (2): 141 – 159.

Jaime, E.F., Jean-Louis, R. (2013), Cluster resources and competitive advantage: A typology of potentially strategic wine cluster resources, *International Journal of Wine Business Research*, 25 (4): 267 – 284.

Jardon, C. M., Martos, M. S. (2012), Intellectual capital as competitive advantage in emerging clusters in Latin America, *Journal of Intellectual Capital*, 13 (4): 462 – 481.

Jensen, S., Johannessen, J., Olsen, B. (2009), Aspects of a cluster research strategy: systemics applied to the study of clusters, *Kybernetes*, 38 (1/2): 201 – 216.

Larreina, M., Aguado, R. (2008), Beyond the cluster: how wine drives regional economy to success: "Oenopolis", the case of Rioja, *International Journal of Wine Business Research*, 20 (2):.153 – 170.

Laužikas, M., Mokšeckienė. (2013), The role of creativity in sustainable business, *Entrepreneurship and Sustainability Issues* 1(1): 10-22. http://dx.doi.org/10.9770/jesi.2013.1(2)

Lei, H., Huang, C. (2014), Geographic clustering, network relationships and competitive advantage: Two industrial clusters in Taiwan, *Management Decision*, 52 (5): 852 – 871.

Lund-Thomsen, P., Pillay, R. G. (2012), CSR in industrial clusters: an overview of the literature, Corporate Governance: *The international journal of business in society*, 12 (4): 568 – 578.

Niu, K. (2010), Organizational trust and knowledge obtaining in industrial clusters, *Journal of Knowledge Management*, 14 (1), 141 – 155.

Patti, A. L. (2006), Economic clusters and the supply chain: a case study, *Supply Chain Management: An International Journal*, 11 (3): 266 – 270.

Pöyhönen, A., Smedlund, A. (2004), Assessing intellectual capital creation in regional clusters, *Journal of Intellectual Capital*, 5 (3): 351 – 365.

Prause, G. (2014), Sustainable development of logistics clusters in Green transport corridors, *Journal of Security and Sustainability Issues* 4(1): 59-68. DOI: http://dx.doi.org/10.9770/jssi.2014.4.1(5)

Raudeliūnienė, J., Tvaronavičienė, M., Dzemyda, I., Sepehri, M. (2014), Sustainable entrepreneurship through energy stewardship: role of values and behavioral patterns, *Entrepreneurship and Sustainability Issues* 2(2): 107–117. DOI: http://dx.doi.org/10.9770/jesi.2014.2.2(6)

Saka-Helmhout, A., Karabulut, E. (2006), Institutional barriers to entrepreneurship in clusters: Evidence from the Turkish textile sector, *International Journal of Emerging Markets*, 1 (2): 128 – 146.

Scheel, C. (2002), Knowledge clusters of technological innovation systems, *Journal of Knowledge Management*, 6 (4): 356 – 367.

Schiele, H. (2008), Location, location: the geography of industry clusters, *Journal of Business Strategy*, 29 (3): 29 – 36.

Steenhuis, T. (1986), The Thornthwaite-Mather procedure as a simple engineering method to predict recharge, *Journal of Hydrology* 84 (3–4): 221–229.

Tvaronavičienė, M., Šimelytė, A., Lace, N. (2014), Sustainable development facets: e industrial sectors from inside, *Journal of Security and Sustainability Issues* 3(4): 37–44. DOI: http://dx.doi.org/10.9770/jssi.2014.3.4(4)

Varga, S., Vujisic, D., Zdravkovic, M. (2013), State aid for innovation clusters in the Republic of Serbia, *International Journal of Public Sector Management*, 26 (2): 102 – 110.

Wang, W., Huang, X., Xie, J. (2012), Study on optimizing resources configuration of value activity network of manufacturing clusters, *Kybernetes*, 41 (7/8): 953 – 962.

Zamparini, A., Lurati, F. (2012), Communicated identities of regional cluster firms: Evidence from the Franciacorta wine cluster, *Corporate Communications: An International Journal*, 17 (4): 498 – 513.