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Clusters – A Strategy of Building Competitiveness of Companies of the Region in the Knowledge-based Economy

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Introduction

As the authors of *Granice konkurencji*[1] emphasise, competitiveness is the basic factor of organising social life. The bigger the company, the region or the country, the bigger is its chance for survival. The lack of competitiveness means the exclusion from the market, the loss of power over the future and the subjection to the domination of the more powerful.
Competitiveness in a new economy, the economy based on knowledge, needs to be understood as the ability to transform knowledge into innovative solutions to introduce new ideas, new products and services, modern technologies and organisational measures, the capability of continuous self-improvement of the organisation..
Every modern company, in particular an innovative company, in order to meet the demands of a developing knowledge-based economy, is more and more forced to function in the environment in which it can use knowledge (hidden and available), experience and possibilities of others, as well as share its own knowledge with others[2].
Thus the EU countries, as well as the countries associated in the *Organisation for Economic Co-operation and Development* (OECD) pay more and more attention to the local concentration of specific branches and the diffusion of innovations occurring in them. A lot of attention is paid to industrial clusters the concept of which refers to the Marshall-like industrial regions[2]. These countries prepare the governmental strategies to support the cluster development, particularly emphasizing the clusters in high-tech sectors[3].
In this article I would like to present and prove the following thesis: *company competitiveness significantly depends on the existence of regional environment.* The existence of the environment means that in the region there are co-operation processes taking place between companies, R&D institutions, universities and regional authorities[4]. They form a network, in which cooperation, competition, its participants' knowledge and business environment coexist.

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[1] Grupa Lizbońska [The Lisbon Group and the Gulbenkian Foundation], *Granice konkurencji [Limits of Competitiveness]*, Poltext, Warszawa 1996, pp. 132-139.
[2] See. J. Zeitlin, *Industrial Districts and Local Economic Regeneration: Overview and Comment*, (in.) F. Pyke, W. Sengenberger (eds.), *Industrial Districts and Local Economic Regeneration*, International Institute for Labour Studies, Geneva 1992, p. 280.
[3] According to the OECD methodology, high-tech includes those fields in which the R&D expenditure constitutes over 4% of the sales value. These industries include: aerospace, pharmaceuticals, computer and office equipment, radio, TV and telecommunications equipment, precision tools, medical and optical instruments. See OECD Science, Technology and Industry Scoreboard 2001 – Towards the Knowledge-based Economy, Paris 2001.
[4] R. Florida, *Toward the Learning Region*, “Futures” 1995, No. 5, Vol. 27, p. 534.

The development of cooperation network is not easy, because at the local and regional level various subjects, both social and economical ones, compete with each other in the area of diverse aims for which compromise is often difficult to find[5]. In case of Poland one should also add psychosocial factors, i.e. the lack of trust between partners and the unwillingness to share knowledge, understanding capitalistic culture as ruthless competition, preventing any cooperation between other market participants, as well as very low level of awareness of benefits coming from cooperation and its possible forms[6].
On the background of this rather pessimistic picture of the Polish reality, the Aviation Valley is shown as a case proving the thesis presented above.

A cluster as a form of knowledge sharing and mutual learning

„Today knowledge is the only significant resource" states Peter Drucker, creator of the concept of „knowledge-based society"[7]. Although traditional production factors (land, labour, capital) have not disappeared, they have become secondary to knowledge, as they can be acquired if one has knowledge. He also indicates that: „At present, knowledge is systematically and intentionally used to determine which knowledge is needed, whether it is available, and what needs to be done to make it effective. In other words, knowledge is used to introduce systematic innovations"[8].
Innovations, according to the latest theories, are the result of numerous, complex interactions between institutions, organisations and the environment in which these institutions and organisations operate, while a policy whose task is to stimulate innovative action, in order to reach its aim, should clearly go beyond focusing exclusively on research activities. This approach emphasizes the necessity of interactive learning, knowledge creating, knowledge distribution and practical usage, the role of infrastructure of creating and using knowledge, the need to create network relationships among knowledge-generating organisations, companies, customers and suppliers[9]. It is evident that the present stage in innovative system development is connected with knowledge management[10] and with self-learning systems, while the innovative environment of the region is created by: the R&D sector, the human capital, the SME innovative sector, big enterprises, business-environment institutions, the local government and the relations between them.
According to M. Porter, it is the cluster which is a perfect form of knowledge sharing and peer learning making use of the transfer of knowledge from various fields beyond the sector[11]. Clusters, according to Porter, are geographical regions, concentrations of interconnected

[5] J. Karwowski, *Partnerstwo w regionie – modny slogan czy determinanta rozwoju [Partnership in the Region – A fashionable slogan or development determinant]*, (in.), J. Karwowski (ed.), Partnerstwo w regionie [Partnership in the region], University of Szczecin, Polish Academy of Sciences, Gdańsk Division, Szczecin 2004, p. 134.
[6] Operational Programme – Innovative Economy 2007 – 2013, National Cohesion Strategy, Ministry of Regional Development, Warszawa 2006, p. 23.
[7] P. Drucker, *Społeczeństwo pokapitalistyczne [Post-Capitalist Society]*, Wydawnictwo Naukowe PWN, Warszawa 1999, p. 40.
[8] Ibidem, pp. 40–41.
[9] B. Piasny, *Innowacyjność jako warunek rozwoju gospodarki opartej na wiedzy [Innovativeness as a condition for Knowledge-Based Economy development),* (in.) C.F. Hales (ed.) *Społeczeństwo informacyjne. Stan i kierunki rozwoju w świetle uwarunkowań regionalnych [Information Socjety. The state and the directions of the development in the light of regional conditions]*, Rzeszów University Press, Rzeszów 2008, p. 244.
[10] See W. M. Grudzewski, I. K. Hejduk, *Zarządzanie wiedzą w przedsiębiorstwach [Knowledge Managment in enterprises]*, Difin, Warszawa 2004; B. Piasny., *Zarządzanie wiedzą w organizacjach gospodarczych [Knowledge Management in economic institutions]*, Oficyna Wydawnicza Fundacji Uniwersyteckiej w Stalowej Woli, Warszawa – Stalowa Wola 2007.
[11] M. Porter, *Clusters and the New Economics of Competition*, Harvard Business Review, November-December, 1998, pp. 77–90.

businesses, specialized suppliers, service-providing institutions, businesses operating in related sectors and institutions connected with them (e.g. universities, standardization institutions and industrial associations), competing with each other, yet cooperating in respective areas, as well. Clusters, reaching their critical mass, are a striking feature of almost every economy, both national and regional, or state and even agglomeration economy, particularly in economically-developed countries.[12].

In economic literature we can come across many other definitions of a cluster, which highlight its basic features. And thus, L. Mytelka and F. Farinelli[13], as well as M.J. Enright[14] point out to the concentration of enterprises cooperating in the same or related, industrial or service sectors in a given area. P.B. Doeringer and D.G. Terkla[15] isolate the interaction factor and functional connection between companies, as well as the transsector cluster dimension. S.A. Rosenfeld[16] , in turn, emphasises the role of social and cultural factors and their impact on information- and knowledge-flow in a cluster.

Although the literature offers many other definitions of literature cluster[17], it is also possible to indicate some of their common features, i.e. geographical concentration, high specialisation level, a great number of SMEs, the ease of entrance and exit, and high innovativeness[18].

Knowledge-based clusters are characterised by high concentration of entrepreneurs, investors and scientists in a limited area, as well as frequent formal and informal contacts existing between them. Industrial and regional associations also serve as the platform for these contacts. Thanks to this cluster cooperation which facilitates open discussion, knowledge and idea transfer inside a company, between companies and external participants, companies acquire internal ability to create new products, technologies, organisation methods, and the ability to absorb and apply the knowledge created outside the company[19].

The European experience shows that cluster emergence can be stimulated by a proper economic policy of the country, local governments and town authorities. It has also been noted that, in a knowledge-based economy, grouping innovative firms is a bottom-up, spontaneous and market-driven phenomenon. It often happens around an R&D centre which is a vital source of knowledge for them. Sometimes a big production plant becomes the leading centre of modern technology development and implementation.[20]. In such a case the stimulation of innovativeness occurs in subcontracting relationships, e.g.: licence agreements, outsourcing, franchising, R&D contracts or spinoffs[21].

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[12] M. Porter, *Porter o konkurencji [On Competition]*, PWE, Warszawa 2001, p. 246.

[13] L. Mytelka, F. Farinelli, *Local clusters, innovation systems and sustained competitiveness. Paper prepared for the meeting on Local Productive Clusters and Innovation Systems in Brazil: new industrial and technological policies for their development*, Rio de Janeiro, 2000, p. 42.

[14] M. J. Enright, Regional Clusters: *What we know and what should we know, paper prepared for the Kiel Institute International Competition*, Kiel 12–13 Nov. 2001, p. 17.

[15] P. B. Doeringer, D. G. Terkla, *Business strategy and cross-industry clusters*, "Economic Development Quarterly", 1995, p. 51.

[16] S. A. Rosenfeld, *Bringing Business Clusters into the Mainstream of Economic Development*, "European Planning Studies", 1997, p. 22.

[17] See M. Gray, E. Golob, A. Markusen, *Big firms, Long Arms, wide Shoulders, The Hub – and Spoke Industrial District in the Seattle Region*, "Regional Studies" No. 30 (7), pp. 651-666.

[18] D. Smith, *Exploring Innovation*, McGraw – Hill Education, Berkshire 2006, pp. 271–272; See also E. Bojar, M. Bojar, T. Żminda, *Klastry a bezpośrednie inwestycje zagraniczne [Clusters and direct foreign investments]*, "Ekonomika i Organizacja Przedsiębiorstwa" [Economics and Organization of Enterprise], No. 10, Warszawa 2007.

[19] A. Adamik, *Więzi partnerskie a proces kształtowania nowoczesnej architektury biznesu [Partner relationships and the process of forming modern business architecture]*, [in.] A. Potocki (ed.), *Mechanizmy i obszary przeobrażeń w organizacjach [Mechanisms and areas of transformations in organisations],* Difin, Warszawa 2007, pp. 386-387.

[20] See W. M. Grudzewski, I. K. Hejduk, *Przedsiębiorstwo wirtualne [A virtual enterprise]*, Difin, Warszawa 2002, pp. 33-39.

[21] *Spin-offs*, this concept means creating a new firm by the employees of an existing firm, academic institution or public research institute. See E. Stawasz, *Innowacje, a mała firma [Innovations and a small enterprise]*, Łódź University Press, Łódź 1999, p. 111

To conclude this part of my reflections, one must emphasise that in a contemporary knowledge-based economy, the formation of a cluster institution and organisation determines the achievement and maintenance of the competitive advantage at the international and global level.
In Poland, on the basis of research carried out, there are a number of cluster-like concentrations. The best-known are: the Industrial Automatics Cluster in Gdansk, the Tarnów "Plastic Valley" Industrial Cluster S.A., the Poligraphic Cluster of Warsaw Agglomeration, the Świętokrzyski Industrial Park. The example of Podkarpackie Aviation Valley is considered a model cluster, with real chance for success[22].

The Podkarpackie "Aviation Valley" – Case Study

Podkarpackie is an agricultural and industrial region. Historically, it is associated with the Central Industrial Region created partly on the territory of the voivodeship, and with a high concentration of industry.
Basic socio-economical indicators (GDP per capita, unemployment rate, wage average, foreign capital partnerships, per 1000 inhabitants) position the Podkarpackie Voivodeship among those less developed voivodeships. Crucial barriers to development is a low income level, still low level of the development of teleinformation infrastructure, poor state of technical infrastructure, inadequate communication infrastructure and too low competitiveness of regional economy in comparison with the most highly developed regions in the country which, among others, results from insufficient cooperation between science and economy in the region, and low R&D expenditure.
From the point of view of knowledge-based economy, the key development potential of the Podkarpackie Voivodeship lies in its potential of managerial and technical staff particularly in aerospace, chemical, electromechanical and wood industry, as well as in the long-lasting tradition of those branches of industry in the region. Particularly important is the potential of the Rzeszów academic centre and other state and non-state universities and schools of higher education operating in the region.

In order to raise the level of competitiveness in the region and growth in company innovativeness, in April leading aeronautic entrepreneurs set up the Association of Entrepreneurs in Aerospace Industry called the "Aviation Valley"[23].
The factors which determined the location of this cluster in the Podkarpackie Region are[24]:
– 100-years of aviation history,
– 70-years of history in aerospace industry,
– 90% of aerospace industry in Poland,
– low labour and production costs,
– over 16,000 qualified workers,

[22] S. Szultka, *Regionalne systemy wsparcia działalności innowacyjnej [Regional systems for innovative activity support]* – parts in a discussion, (in.) *Innowacyjność polskiej gospodarki [Innovativeness of the Polish economy]*, Zeszyty Innowacyjne 2, Centrum Analiz Społeczno-Ekonomicznych, Warszawa 2004, p. 41.

[23] The idea of creating the Aviation Valley was born in WSK „PZL-Rzeszów" (Communication Equipment Manufacturing Plant "PZL-Rzeszów"), whose beginnings go back to 1937 when within the central Industrial Region the construction of the Engine Plant No. 2 was launched. The entrance of Pratt & Whitney a few years ago, the world leader, into WSK "PZL-Rzeszów" caused dynamic development of the company and the industry in the region., See also B. Piasny, *Podkarpacka Dolina Lotnicza – strategia budowania konkurencyjności regionu* {*Podkarpacka Aviation Valley – strategy of building competitiveness of the region*], (in.) J. Konefał (ed..), *COP. Przeszłość - Teraźniejszość – Przyszłość [Central Industrial Region – Past – Present – Future]*, Off-Campus Faculty of Social Sciences, The John Paul II University of Lublin, Stalowa Wola 2007.

[24] http://www.dolinalotnicza.pl (as of 28 June 2008)

– Rzeszów Technical University with its highly developed Faculty of Machine Construction and Aviation,
– investor-friendly environment,
– a centrally located international airport,
– the main highway linking south-eastern Poland to its south-western part.

The Aviation Valley Association set the following objectives[25]:
– The organisation and development of cost-effective chain of suppliers,
– The creation of favourable conditions to enhance the development of aerospace enterprises in the region,
– Further development of aerospace research, skills and qualifications,
– Cooperation and development of aerospace industry and universities which will promote new ideas and develop the R&D sector in aerospace industry,
– Promotion of Polish aerospace industry,
– The support of businesses in the aerospace industry,
– The influence on the policy of the Polish government in relation to the aerospace industry.

The main objective of the Aviation Valley is to transform south-eastern Poland into one of the Europe's leading aerospace regions, which will provide diverse products and services in the aerospace industry for the most demanding customers[26].
The worldwide promotion of the Aviation Valley made international aerospace concerns interested in the region. TW Metals from Pennsylvania, one of the main distributors of metal products for aerospace industry, established its branch in Rzeszów. Snecma Poland (now Hispano Suiza Poland), a producer of cog wheels and rollers, located its factory in Sędziszów Małopolski. A German company Remog Polska launched their production of aerospace parts in Mielec, RD Precision Polska, producing parts for the Canadian Bombardier, opened its factory in the Mielec Economic Zone. In Stalowa Wola another American company, Metallum Corporation, part of the Ladish Group, bought out ZKM Forging of Stalowa Wola Steelworks[27].
In 2006 the Podkarpackie Aviation Valley started their cooperation with similar clusters in Spain, Germany and France. In March 2007 Sikorsky Aircraft Corporation took over "Polskie Zakłady Lotnicze – Mielec", to launch helicopter production there. Such world leaders in aviation as Pratt&Whitney, EADS, British Aerospace, Lockheed Martin, R&D Precision are also interested in investing there further[28].
This initiative to create technological clusters is supported by creating a technological platform. These are national organizations associating aerospace companies, representatives of science and research institutions, and universities, whose main objective is R&D of technologies in a given field[29].
A huge success of the Aviation Valley is, undoubtedly, Aeronet, the organization including Aviation Valley companies, 5 technical universities of: Rzeszów, Lublin, Łódź, Silesia and

[25] Ibidem...
[26] Interview with M. Darecki, Chairman of the Aviation Valley Association, Head of WSK "PZL-Rzeszów" S.A., "Sprawy nauki" [Matters of Science], Biuletyn Ministra Nauki i Szkolnictwa Wyższego, No. 1/2006.
[27] http://www.ulc.gov.pl (Rzeczpospolita, 2 Jan. 2006 .)
[28] http://www.paiz.gov.pl (as of 6 June 2007)
[29] M. Darecki, *Klastry Doliny Lotniczej [Clusters of the Aviation Halley]*, "Przegląd Techniczny. Gazeta inżynierska", No. 23-24/2005.

Warsaw, and Rzeszów University. One of the effects of cooperation between industry and science is the best materials laboratory created at the Technical University of Rzeszów, financed from the national budget and the EU funds. This laboratory works on improving materials used in aerospace industry (they must be light and extremely durable, and resistant to high temperatures of covers)[30].

The Aviation Valley offers services of experts connected with the Technical University of Rzeszów and also 20 other firms and institutions. Here are some of them[31]:

– WSK Reshow (engine producer),
– PZL Widnes (helicopter producer),
– PZL Mielec (producer of light transport airplanes, planes for special purposes, agricultural planes and fire-fighting airplanes, training planes, as well as a supplier of aerospace components in international programs of industrial cooperation,
– Pratt & Whitney Kalisz (engine part producer),
– Wytwórnia Zespołów Kooperacyjnych (sub-supplier of doors for Boeings),
– Zakłady Narzędziowe in Mielec (producer of technological lines for aerospace industry),
– Stamet Zakład Mechaniczny S. Stachura (aircraft parts producer).

The Aviation Valley also initiated the establishment of the Operators Training Centre CEKSO, the organisation including 6 technical schools of the region. Its purpose is to offer secondary education to future employees of industrial companies of Podkarpackie region, particularly, numerically-controlled machine operators. CEKSO acquires significant financial support from local authorities.

The next important initiative is to build together with the Rzeszów Regional Development Agency, the Aeropolis – the Science and Technology Park in the Rzeszów area. It is to attract further high-tech investors..

Now the cluster consists of 65 companies and businesses (employing over 18,000 people) and the above mentioned universities and secondary schools the aim of which is to educate the personnel to meet the needs of the companies operating in the region, and to prepare the latest production technologies[32].

In the nearest future the aviation cluster is to develop in two lines. One is the further increase in the number of businesses both thanks to the investments of international corporations and incorporation of small family businesses into the association. The other line of development is to build construction and engineering offices and laboratories so that airplanes could come into being here from the very beginning[33].

Many Polish firms want to enter the Podkarpackie cluster, but its founders insist that it is a regional association. A company which wants to enter it must have its seat in the region in which the Aviation Halley exists, must operate in the aerospace industry and must have the recommendation of two association members[34].

According to the ranking „Development Success of Polish Voivodeship" prepared by the Market Economy Research Institute including the years 1999-2004, the Podkarpackie Voivodeship

[30] G. Budzik, S. Stec, *Dolina Lotnicza szansą na rozwój Podkarpacia [Aviation Valley as an opportunity of Podkarpackie Development]*, a paper for the conference *Polska Wschodnia – perspektywy rozwoju [Eastern Poland – prospects for development]*, Białystok-Goniądz, 8-9 May 2008.

[31] http://www.paiz.gov.pl (as of 6 June 2007)

[32] XII Podkarpackie Forum of Innovativeness "Technological Initiative – Science, Industry, Administration" Rzeszów 29 June 2007 r.; List of the Aviation Valley Association, see http://www.dolinalotnicza.pl.

[33] http://www.paiz.gov.pl (as of 6 June 2007)

[34] M. Darecki, *Podkarpacie – drugą Bawarią [Podkarpackie – the second Bavaria]*, http://www.coi.rzeszow.pl (as of 28 June 2008)

was the second best as regards GDP dynamics. It also achieved the highest dynamics in the inflow of foreign investments. It was also the area of dynamic changes in the infrastructure development, especially network development and environmental protection. This dramatic growth in production was achieved thanks to the cooperation with the greatest aerospace companies worldwide. The Aviation Valley played the key role in the increase in the investment potential and competitiveness of the Podkarpackie companies. Both economic zones of Tarnobrzeg and Mielec played an important part in attracting investors.

Conclusion

In the lines of knowledge-based economy, a reliable way to support business development is to create industrial clusters, using the knowledge and the resources of the region.
The Podkarpackie Aviation Valley is the first and the biggest modern cluster in Poland, which successfully linked industry and science. Thanks to it, Podkarpackie acquired a favourable environment and is slowly emerging as one of the European centres of aerospace industry.
The necessity to support the development of clusters in Poland was highlighted in a strategic document „The lines of increasing innovativeness of economy for the years 2007-2013"[35]. Adopting the recommendations presented in "The Lines" constitutes the Innovative Economy Operational Program (PO IG)[36], in which the priority axis 5 is to strengthen the competitive advantage of businesses through the development of cooperative links (clusters).

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[36] See Ministry of Regional Development, Operational Programme Innovative Economy, 2007-2013. National Cohesion Strategy 2007-2013, Warszawa, 24 July 2007.

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Abstract (Summary)

This article presents and justifies the following thesis: competitiveness of businesses depends considerably on the existence of a regional environment. As an example to prove the set thesis, the author shows the Podkarpackie Aviation Valley, the first and the biggest modern cluster in Poland, which successfully linked industry and science. In other words, this work brings up theoretical and practical aspects of cluster operations, based on the available scientific literature and the case study.