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Clusters in the system of region innovations

K e y w o r d s: regional system of innovations, cluster

S u m m a r y: Transformations in the world economy towards the economy based on know-how result in the situation where innovations are listed among the most important elements which give momentum to growth, especially in the age of sudden process changes and globalisation of competition which are noticeable. However, certain conducive conditions have to be present for innovations to come into existence. One of them is the region, its resources, including know-how and internal potential. The important role of the region in production of innovation and its spreading to other regions causes the need of strengthening its significance, as regions may faster and more effectively build mechanisms supporting growth, creating and diffusion and absorption of innovations. Effective implementation of innovative solutions is determined with fruitful cooperation of the entities operating in the region: producers of innovation (science, R&D), recipients of innovation (business) and institutions which determine the policy in the region (public administration). These entities and the system of interdependencies and connections between them are referred to as the Regional System of Innovations (RSI). The activities and interdependencies of the RSI entities should be developed in such a way that its functioning could affect the effective, long-term growth of the region.

The entities within RSI include a cluster structure in which transfer of know-how and technology is fastest and is achieved with geographical closeness of the entities representing both industry and science (networking and interpersonal contacts).

1. Introduction

The objective of the paper is presentation of the activities of the clusters in the regional system of innovations as factors highly affecting innovativeness in the region, at the same time ensuring the growth of the region. Apart from this, the benefits have been indicated which are related to functioning of companies in cluster structures, both for the region and for the companies operating there. The thesis of the article has

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been formulated as follows: clusters have major significance in building an efficiently functioning regional system of innovations and affect increasing competitiveness of the region by strengthening innovative activities in the region. Expanding the issues of general nature, special attention has been paid to the cluster operating in Tarnów.

Innovations are one of the significant objectives of business policy in the countries of the European Union, expressed in the Strategy Europe 2020. The proposed model of the European social market economy is to be based, to a degree higher than at present, on three interdependent and mutually supportive priorities (1, p. 3): intelligent growth, sustained growth and growth conducive to social inclusion.

Innovativeness of economy also means innovativeness of the regions. The regional dimension turns out to be important, as diffusion of information and know-how is accelerated when the networks of cooperating units are concentrated geographically. Innovativeness of the economy depends on innovativeness of its companies. The institutional infrastructure plays an important role in this respect, with the task of promoting and supporting innovative activities and transfer of technology to companies.

Clusters are one of the elements of the institutional infrastructure. They are perceived as the source of potential for effective increase of the level of competitiveness of economies in individual regions of the European Union. Clusters are often defined as innovative systems based on transfer of know-how, and they have certain features which ensure creation and transfer of innovations. These include: geographical closeness, relationships, interactions and a sufficiently large number of entities.

2. The essence of the term of innovations

One of the main features of modern economies, both developed and developing, is the increase of significance of innovations and innovativeness. Innovation constitutes the key factor of social and economic development (2, p. 3). Innovativeness is the basic factor which determines international competitiveness of the economy. Innovations constitute the heart of permanent competitiveness of modern companies. They are regarded as the critical factor of their development (3, p. 35). The company which does not introduce innovations inevitably ages and withers (4, p. 162).

The literature of the subject includes numerous definitions of innovation. However, there is no unanimity in understanding both the term and the scope of its application. As a result, there is a large number of interpretations of innovation. According to the dictionary of foreign phrases, "innovation" comes from the Latin word *innovare*, which means renewing. The term "innovativeness" was entered in the world economy literature by Joseph Schumpeter, paraphrasing it as "creative destruction" of the existing economic balance which constitutes the basis for economic progress.

The Central Statistical Office uses the definition proposed by the Oslo Manual (5), where innovativeness is understood as capacity of companies to develop and imple-

ment new or significantly improved products (goods, services) and processes, where these products and processes are new at least from the point of view of the company which introduces them. It includes a number of research (scientific), technical, organisational, financial and business activities. Innovativeness of the economy means capacity of business entities to continuously search for and use in practice new results of scientific research, of research and development work, new concepts, ideas and inventions. One could generalise that innovativeness of the economy is the combined result of innovativeness of individual business entities in the form of companies (6, p. 242).

3. Clusters in the regional system of innovations

Innovative processes are a significant factor affecting the strength of the economies. These appear within a specific system of connections, as they are less frequently closed within a single company, and require common internal and external actions. It follows from the fact that companies are innovative owing to their own organisational capacity, but also to external contacts with their suppliers and partners in business. Communication, cooperation and coordination between particular entities is thus the necessary condition for creating and diffusion of new products. Therefore, networks are developed which create Regional Systems of Innovations that are the manifestation of development of technological intervention. It features diversification of the tasks between local, regional and national structures. The tasks executed on individual levels are mutually supportive. The new attitude to innovative policy in a special way exhibits local effects which affect improvement of the general situation in the scale of the city, commune or region. The observation that regional factors may affect innovative capacity of companies has contributed to the increased interest in the analysis of innovations at the regional level (5, p. 41). Creating systems focused on finding safe and permanent grounds for growth inside the regions, with a broad use of commitment of local circles, constitutes support for such policy of economic growth.

The Regional System of Innovations is defined as a network of cooperation between organisations and institutions operating in the region, whose objective is growth of innovativeness of this region, by way of supporting the innovative potential of the companies. One could say that RSI is a flexible, creative and regional social and economic system with the broadest possible relationships, which uses local attributes and resources that determine production and product in the way corresponding with the specific nature of the local market (7). The innovative system consists of a number of mutually complementary and inter-dependent subsystems. The element common for the operation of individual subsystems comes in the form of regional and local authorities and their innovative policy. The well-organised and effective Regional System of Innovations constitutes at present the basis for building cooperation of science, business, and public authorities, which in turn is to lead to

building competitiveness of the region in the globalising economy, where innovativeness, know-how and the learning process are the key factors of economic success (8, pp. 302–303).

It is noteworthy that relationships between particular RSI participants are based on the principle of exchange and not subordination (RSI is a typical example of the network system). Therefore, the method of RSI management must be different from traditional methods. Solutions are necessary which support cooperation, openness and flexibility of relationships between different institutions, as, most often, none of the RSI participants has competencies or resources sufficient for individual and strategic management and coordination of the system. The conclusion is that building and functioning of RSI requires long, comprehensive and consistent actions on part of many regional and national institutions.

There are many challenges related to creating efficiently functioning RSIs. These may be met by cluster structures which are being developed in Poland, where the relationships between the company and the field of science and research and public institutions of technology transfer have the basic importance.

The most important argument in favour of supporting clusters comes in the form of prospective benefits from their functioning. Participation in a cluster allows gaining benefits in a regional economy. An effectively functioning cluster may result in increases productivity of local companies due to access to relatively cheap, specialised production factors and various expenditures used in production activities. Geographical closeness of business entities stimulates and supports their innovativeness. The developing cluster features a dynamic creation of new companies and translates into creating new work places (9, pp. 3–12).

The benefits from an effectively functioning cluster are not limited to its participants. A cluster generates also a number of positive external effects for the region where it is settled (10, p. 9), thus it may become a driving force for the regional growth (Austin, Cambridge, Penang) (11, p. 7). In the local cluster economy, it is not the concept of cluster alone that affects the internal and external growth, but dynamics of inter-connected objectives, cooperating people and co-participation. The cluster concept becomes an instrument supporting growth of individual groups of entrepreneurs, producer groups, and service groups, translating over an extended period of time into the growth of the local economy and improvement in quality of life of its residents (12, pp. 90–93).

An effectively functioning cluster results in, among others, increase of availability of specialised business-related services, infrastructural institutions, increasing income for the population, increase in export and profit, and, as a result, faster economic growth (9, pp. 3–12). The social results of functioning of clusters is reduction of unemployment and stimulation of local democracy.

As a result, a well-functioning cluster should contribute to increasing the rate of increase in employment and creating new work places, thus improving situation of the local (regional) labour market and increase in the degree of specialisation.

4. Clusters in the Tarnów system of innovation

The Tarnów region is building the Regional System of Innovations based on "The Regional Strategy of Innovations in the Lesser Poland Voivodeship 2008–2013". It is a system-based project executed by the Department of Economic Growth of the Speaker's Office in the Lesser Poland Voivodeship within the Human Resources Development Operational Programme. The superior objective of the project is supporting the implementation of "The Regional Strategy of Innovations in the Lesser Poland Voivodeship 2008–2013" by creating a system of monitoring and evaluating strategy, which would allow assessment of the activities undertaken in the region which are related to implementation of a broadly understood innovativeness and indicating new activities. The project has the task of creating a "platform" for cooperation between various institutions in the voivodeship area: companies, college facilities, research and development units, institutions of the business environment and regional authorities.

The final result is to be increasing awareness and making entrepreneurs more open to the idea of innovation by showing that innovations mean not only expensive, modern technologies, but also other changes and improvements, e.g. in management, flow of information, etc., with which a company may be more competitive.

Implementation of the regional strategies of innovations may provide an opportunity for developing a system capable of effective supporting companies in the innovative activities undertaken by them. For the system of innovations to come into existence, creating strong, continued connections between particular actors in the process of innovations is of key importance.

Clusters constitute an important factor which contributes to the proper development of the regional system of innovations, as their characteristic feature is that the companies in them are mutually competitive, but at the same time cooperate in these areas where triggering synergy effects from shared activities is possible (joint research and development works, diffusion of know-how, rotation of personnel within the cluster, concentration of resources, openness to innovations and capacity of their absorption, attracting new resources and companies, reduction of risk). Competition does not exclude mutual, positive interactions with other companies, and it may become a driving force in their development. This situation is called by the name of *coopetition* (from *cooperation* and *competition*) (13).

Industrial Cluster SA is functioning in the Tarnów region, for the establishment of which the basis came in the form of specific local resources from the raw material base (Zakłady Azotowe SA [Nitrogen Plants]) and local entrepreneurs. The local tools and mechanical facilities was also used from Zakłady Mechaniczne SA (Mechanical Plants) in Tarnów.

Apart from the raw materials base and machine facilities, the resources of local know-how and skills in the form of specialised knowledge in the field of heavy chemistry was used. This combination of all local resources, as well as close co-operation

with authorities and institutions, contributed to the concept of the innovative environment.

Table 1 shows that companies in various industries located their activities in the Cluster and most of them already manage commercial operations. The policy of the units of local government and organs of government administration have immense significance for strengthening the position of the Cluster and its growth. In June 2004, an agreement was signed between the Commune of the City of Tarnów, Zakłady Azotowe SA, Tarnowska Grupowa Oczyszczalnia Ścieków (Tarnów Group Water Waste Treatment Plant) and the Tarnów Industrial Cluster SA on establishing the industrial park (Tarnowski Regionalny Park Przemysłowy [Tarnów Regional Industrial Park]). Thus, the formula of the Cluster's activities was expanded with the optimum use of the area and infrastructure in the area of the city.

Table 1

The companies which purchased undeveloped estate properties and/or obtained permits for managing business operations in the area of the Special Economic Zone in Krakow, the sub-zone in Tarnów, Industrial Park "Czysta I" and "Czysta II" (as at 10 June 2011)

Investor	Activities conducted	Investment progress	Investment volume (m)	Employment
Becker Farby Przemysłowe sp. z o.o.	Production of industrial paints and lacquers, including specialised paints dedicated for use on plastics	Production activities opened: September 2006	20	42
ELMARK–TARNÓW	Processing of plastics	Production activities opened: November 2006	2	8
Becker Farby Proszkowe sp. z o.o.	Production of high-durability powdered paints and innovative decoration effects, such as very realistic WoodGrain finishing (with wood fibre structure)	Assignment of ownership rights for the estate properties—Becker Farby Przemysłowe sp. z o.o.: 29 October 2008	Permit expired	–
Cestor sp. z o.o.	Production of building elements of broad use	Investment in progress	0.75	8
ABM Solid SA	Activities in the building industry, R&D and implementation	The investor has not initiated execution of the investment project	Permit expired	–
Fabryka Styropianu "ARBET" Bartosik, Czernicki, Funke, Kuncer, Muzyczuk sp.j.	Production of foamed polystyrene	Investment not started	Permit expired	–
UNIPRESS Mariusz Dobrzański, Marcin Węgrzynek s.c.	Printing facility, printing	Production activities opened: December 2006	4.2	15

Investor	Activities conducted	Investment progress	Investment volume (m)	Employment
Zakład Elementów Konstrukcyjnych sp. z o.o.	Production of structural elements of steel (rim shapes) for use in the building industry	Investment in progress	15	54
Summit Packaging Polska sp. z o.o.	Production of valves for aerosol packages, processing of plastics	Production activities opened: January 2007	15	11
PPH MOSKITO Marek Jeleń	Production of elements for mosquito screens for window and door frame assembly	Production activities opened: March 2010	2.5	20
"ZEGAR" Wojciech Dzikowski i Alicja Zyder sp.j.	Precision engineering: production of curtain rods of stainless steel and brass	Investment in progress: preparation of the project documentation, obtaining the required decisions and permits	3	50
DHL Express Poland sp. z o.o.	The reloading and warehouse centre for support for road transport of goods	Activities opened: April 2010	5	51
BERENDSEN Textile Service sp. z o.o.	Services for working clothing, door mats and hygiene equipment	Investment in progress: preparation of the project documentation, obtaining the required decisions and permits	12.5	33
KON-INS-BUD MONTAŻ sp. z o.o.	Production of steel structures	Investment in progress	4	40
UNI-TARPIN sp. z o.o.	Production of chemical products	Investment in progress: preparation of the project documentation, obtaining the required decisions and permits	5.5	77

S o u r c e: Author's own study on the basis of the data made available by Tarnów Industrial Cluster SA.

In 2011, the offer of Tarnów Industrial Cluster SA, including attractive production and warehousing areas at preferential rates, located in Industrial Park "Mechaniczne" serves 21 entrepreneurs (Table 2).

T a b l e 2

The companies which conduct business operations in the area of Park Przemysłowy "Mechaniczne" in Tarnów (as at 10 June 2011)

Item	Company	Type of contract	Industry	Employment (persons)
1.	FHUP "POINTS" Grzegorz Mazur	lease	Printing facility	3
2.	ELBO Projekty sp. z o.o.	lease	Furniture design	1
3.	KRESKA sp. z o.o.	lease	Tailoring	74
4.	GPL PROJEKTY sp. z o.o.	lease	Furniture production	61

Item	Company	Type of contract	Industry	Employment (persons)
5.	GLOBUS sp. z o.o.	lease	Steel structures	5
6.	Alien Inspired Technologies "AIT" sp. z o.o.	lease	Production of photovoltaic modules	21
7.	Firma Usługowo-Remontowa "ALEX" Przemysław Bazia	lease	Repair services	4
8.	GALECO sp. z o.o.	lease	Production of gutter systems and a logistic centre	4
9.	FHUP "BLACHODACH" Janusz i Bartosz Bochnak sp.j.	lease	Production of gutter systems and sheet plate accessories	22
10.	Autoryzowany Serwis Wózków Widłowych REM-WÓZ	lease	Servicing fork lifts	5
11.	Green House sp. z o.o.	lease	Production of arbours	18
12.	Ośrodek Szkolenia Kierowców "KRAMEX"	lease	A maneouvering yard	46
13.	Firma Usługowa Remontowo Budowlana "REMCAT" Adam Rymanowski	lease	Repair and construction services	5
14.	HUT Technika Środowiska sp. z o.o.	lease	Process units for utilisation	8
15.	Pośrednictwo Ubezpieczeniowe "GAMBIT" Monika Kucajda	lease	Insurance intermediation services	2
16.	Usługi Remontowo-Budowlane Dziedzic Grzegorz	lease	Repair and construction services	15
17.	FHU "FLOMARK" Import Eksport	lease	Wholesale and retail trading	2
18.	Zakład Usługowo-Handlowy "PASADYN"	lease	Jet-stream and abrasive cleaning: equipment, services	5
19.	Przedsiębiorstwo Budowlane "EKO-BUD" Janusz Koziara	lease	Construction services	20
20.	Firma Handlowa Wiesław Hebda	lease	Chemicals for the building industry	3
21.	Ośrodek Szkolenia Kierowców MX Bartłomiej Mitera	lease	A maneouvering yard	4

S o u r c e: Author's own study on the basis of the data made available by Tarnów Industrial Cluster SA.

The offer of Zielony Park Przemysłowy "Kryształowy" within the Cluster was accepted in 2011 by the company Polski Asfalt Technic sp. z o.o., which initiated the investment with the value of PLN 6.5 m and created new work places for 50 employees.

It follows from the information presented in the paper that the cluster concept constitutes a new way of thinking about creating international competitiveness and innovativeness of economy. Clusters are a specific spatial form of organisation of industry sectors and services which is regarded as the most mature form of organisation of production (under conditions of post-industrial economy) from the point of view

of the capacity to maintain growth. At the same time, their characteristic feature is the capacity to generate and keep competitive edge (14; 15).

Clusters also find a significant place in the concept of the innovative system, which perceives economy as a network of mutually connected business entities and institutions which determine obtaining the synergy effects in cooperation. Therefore, apart from the institutions which generate know-how and innovations (companies, the R&D area or institutions intermediating in transfer of innovations), it recognises the significance of various interactions between them. The innovative system should be thus understood as a complex of institutions and their connections, with which the given economy constitutes an effective mechanism of generation and diffusion of know-how.

5. Conclusions

The paper presents the issues of efficient functioning of systems of innovations in the region. The provided information allowed the conclusion that effective origination and implementation of innovative solutions in the region is determined with fruitful cooperation of the entities operating in it. This may be secured with cooperation within the Regional System of Innovations, which is a significant factor to support the process of building an innovative, competitive region. Innovations in the global economy are the very factor which is decisive for growth. It is important to create them and implement in the areas crucial for the region, the ones which offer rich own resources which may form competitive edge. Co-operation of entities in the Regional System of Innovations allows continuous and stable growth of the region, which translates into the growth of the country.

Clusters are one of the RSI entities for which innovativeness has crucial significance and determines their international competitiveness. Unlike other regional or national structures, they feature the fastest transfer of know-how and technology, which is achieved due to geographical closeness of the entities representing both industry and science (networking and interpersonal contacts). Innovative clusters differ from traditional local production systems in that partnership and cooperation are of significance there. Research institutes and universities are major entities in clusters that fall within the network of connections and interactions with the cooperating companies of the given production system. Such clusters are often referred to as local innovative systems.

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Klastry w systemie innowacji regionu

S t r e s z c z e n i e: Przemiany w gospodarce światowej zmierzające w kierunku gospodarki opartej na wiedzy powodują, że innowacje wymienia się wśród najważniejszych elementów napędzających wzrost, szczególnie w epoce gwałtownych zmian technologicznych i globalizacji konkurencji, które obserwujemy. Niemniej aby innowacje powstały, muszą zaistnieć pewne sprzyjające warunki. Jednym z nich jest region, jego zasoby, w tym wiedza i wewnętrzny potencjał. Istotna rola regionu w wytwarzaniu innowacji i transmisji jej do innych regionów powoduje potrzebę wzmocnienia jego znaczenia, gdyż regiony mogą w sposób szybszy, bardziej efektywny budować mechanizmy wspierające rozwój, tworzenie i dyfuzję oraz absorpcję innowacji. Skuteczne wdrażanie innowacyjnych rozwiązań determinowane jest efektywną współpracą podmiotów działających w regionie – wytwórców innowacji (sfera nauki, B+R), odbiorców innowacji (biznes) oraz instytucji kształtujących politykę w regionie (administracja publiczna). Podmioty te – system współzależności i powiązań zachodzących między nimi – określane są jako Regionalny

System Innowacji (RSI). Ważne jest takie ukształtowanie działań i współzależności podmiotów RSI, aby jego funkcjonowanie wpływało na efektywny, długotrwały rozwój regionu.

Wśród podmiotów znajdujących się w RSI jest struktura klastrowa, w której ma miejsce najszybszy transfer wiedzy i technologii, osiągany dzięki geograficznej bliskości podmiotów reprezentujących zarówno przemysł, jak i naukę (sieciowanie i kontakty międzyludzkie).

S ł o w a k l u c z o w e: regionalny system innowacji, klaster