

Entrepreneurship in the Area of Activity of Key ICT Clusters in Poland

Tomasz Żminda

Faculty of Management, Lublin University of Technology
Nadbystrzycka 38, 20-618 Lublin, Poland
t.zminda@pollub.pl



ABSTRACT

The article aims to answer the question whether a cluster, understood as a cluster organization operating in the ICT sector, stimulates entrepreneurship in this sector on the territory covered by its activity. On the basis of own study, based on data from the resources of public statistics the author verifies the hypothesis that key ICT clusters contribute to the growth of entrepreneurship in the area of their operation. In the conducted analysis the attention is focused on clusters in Poland, finally indicating three key Polish ICT clusters as the subject of research.

Key words— Cluster Organization, Entrepreneurship, ICT Clusters, ICT Sector, Entrepreneurial Process

1. INTRODUCTION

In the era of the growing importance of access to knowledge and the ability to create it, there is a growing need to intensify cooperation, interaction between businesses, the research and development sector and business environment institutions. As a result, on the one hand, what becomes more important is the concept of the creation and support for the development of clusters, the essence of which is to strengthen ties between these entities, on the other hand, it becomes prospective to stimulate the growth of the ICT sector, which supports the processes of transmission, processing and storing of information. In the modern economy a special role is attributed to cluster organizations. Perceived as entities with large potential for innovation, having real competences and resources, they are to be catalysts of development processes encompassing both companies they include and their immediate surroundings, and in the longer term even entire economies. Well-functioning clusters are expected to bring designated more than a decade ago results of their high efficiency – the increased efficiency of companies belonging to the cluster organizations, the increase of innovation capacity of the enterprises, as well as encouraging the creation of new business entities. These results are particularly desirable in industries that today seem to be promising, and undoubtedly the mentioned ICT industry is one of them. Thus, it is not surprisingly that numerous cluster organizations are created in the ICT sector.

The article aims to answer the question whether a cluster, understood as a cluster organization operating in the ICT sector, stimulates entrepreneurship in this sector on the territory covered by its operation.

The first part of the article discusses theoretical bases of the importance of the cluster for entrepreneurship, showing differences in the perception of the essence of the cluster. This is followed by the presentation of the development of cluster organizations in Poland, with a special focus on ICT clusters. In the next part of the article on the basis of own studies based on data from public statistics resources the author presents an analysis verifying the hypothesis that key ICT clusters contribute to the growth of entrepreneurship in the area of their operation.

2. THEORETICAL BASES OF THE IMPORTANCE OF THE CLUSTER FOR ENTREPRENEURSHIP

In the literature one can see three aspects of the perception of the cluster – localization, relational and organizational ones. The first mentioned aspect can also be called spatial, it has emerged as the earliest of all the three (it derives from the concept of industrial districts [1]), and refers to the geographical concentration of economic activity of enterprises operating in related sectors and institutions supporting them [2]. The aspect of geographical proximity and sector kinship of entities forming the cluster is stressed in numerous reference definitions of the cluster formulated, among others, in publications of the European Commission [3], UNIDO [4] and OECD [5]. Numerous, more or less formalized cooperative links are formed among entities of the cluster, and the specificity of these ties, manifesting itself in the simultaneous cooperation and competition, has led to the emergence of the second aspect of the perception of the essence of the cluster – the cooptation aspect [6]. In this perspective the cluster is treated as a network of relationships among different entities, conducive to achieving the effects of leverage and synergy, based on the increased frequency and growing importance of interactions [7]. The network nature of the links between entities creating the cluster is highlighted in the definition of the World Bank which defines the cluster as a production network consisting of interdependent companies and their specialized suppliers, knowledge centers, supporting organizations and their customers [8]. The cluster is often associated directly with a cooperation network, for example,

R.E. Miles and Ch. C. Snow present such an approach, defining clusters as cooperation networks created by a group of companies or other specialized units, but in their interpretation operation in the cluster is coordinated by market mechanisms, not a delivery chain [9]. The perception of the cluster through the prism of a network is also present in the definition of M.P. van Dijk and A. Sverisson. They regard the cluster as a dense network of companies and organizations, the value chains of which are linked, and these links do not always result from transactions entered into [10]. Finally, the third aspect of the perception of the cluster, important from the point of view of management science, is the organizational aspect. It expresses an application dimension of the approach to clusters, which are treated as a tool to stimulate the processes of development of regions. In this aspect the cluster is understood as a cluster organization, that is an institutional entity, which in its present layer is oriented to improving the competitiveness of certain related sectors in the region [11]. We can agree with S. Olko who notices that modern studies adapt the definition of a cluster to the conditions of operation of this type of business environments [12]. An example of this practice is the definition used in Poland by the Polish Agency for Enterprise Development (PARP) according to which a cluster is a geographic aggregation of independent entities representing specific economic specialization, cooperating and competing with each other within a value chain. Cooperation within the cluster is formalized, realized both vertically and horizontally and focused on achieving set common goals. The cluster is a source of benefits and creates new value for all types of entities participating in it, such as enterprises, universities and other research institutions, business environment institutions, public administration and other supporting organizations [13]. Theoretical analyses and numerous case studies confirm that the existence of the cluster involves a number of phenomena (benefits) that positively affect productivity, innovativeness and competitiveness mainly of companies operating within such an economic aggregation, and thus the competitiveness of the territory in which it is located [14]. Creating an innovative environment, clusters encourage new entities to invest in the existing economic clusters. As open structures they create value chains, which largely merge the local business environment, develop it, increase the intensity of business relations and the quality of these relations, and most importantly, attract new actors to cooperate, or create proper conditions for the creation of new businesses. That is why, it is noted in the literature that the development of clusters is also a benefit for the development of local entrepreneurship [15]. The growth of entrepreneurship in the region is, on the one hand, in fact a derivative of attracting entities from outside to the given location, on the other hand, it becomes the result of the emergence of new entities resulting from the initiative of the local community. Authors of the Guide for Cluster Initiatives Animators note that in clusters achieving success a large amount of business failures can be seen, some of the new businesses collapse shortly after the start of operation. However, these events are often an inspiration to others [16], which, consequently, in the long term should lead to the improvement of entrepreneurship in the area. An important role in the creation of smaller, more specialized companies can be also played by large companies, which at the same time

increase the number of players in the cluster. It is large companies that, when their inventions or research results do not necessarily serve their main business, initiate the creation of new entities. In addition, through the activity of clusters, thanks to more dynamic and intense interactions between people favoring a regular flow of information, creative ideas can quickly transform into new products and services.

3. CLUSTER ORGANIZATIONS IN POLAND

In 2005, an OECD report on economic clusters in Europe pointed to the lack of such structures in Poland [17], while in 2006 as many as 43 cluster initiatives were identified [18]. Two years later, i.e. in 2008 a report on the development of clusters in Poland [19], showed that the population of identified and organized cluster initiatives in the country amounted to 56, and that number included only organized initiatives, by which the authors of the quoted report understood such an initiative which had been named and declared as a cluster, had an office, the entities composing it were identifiable, and it was possible contact to it [19]. Thus, we can suppose that the total number of cluster initiatives in the broad sense was higher than indicated in the cited paper. In 2010, PARP conducted the first Polish research on benchmarking of clusters. 178 organizations were verified then, but the final study covered only 47 of them [20]. In 2011, the European Cluster Observatory diagnosed the existence of as many as 246 clusters in the sense of statistically significant aggregations [21], [22], where as shown in M. Dzierżanowski's study more than half of the 170 existing, formalized clusters were created in isolation from these agglomerations [21]. In turn, till March 2012 PARP recorded the creation of a total of 212 cluster initiatives [23], it should be noted that as many as 28 of them represented the ICT sector, which already at that time was the most represented in the branch structure of the total number of cluster initiatives. It should be added that the tourism industry, in which 27 initiatives emerged, took second place, which indicates a large variation of the branch structure of cluster initiatives – from industries recognized as innovative to more traditional ones. At the end of 2014 on the basis of his own research S. Olko identified 162 clusters¹ in Poland [12], it is worth noting that 14.8% of them (i.e. 24) were ICT clusters. In 2016, PARP completed the inventory of clusters according to the status at the end of 2015. It revealed the existence of 134 “mature” clusters and 106 potential clusters in Poland [15]. The increase in the number of clusters which in 2016 met the standards of PARP and the clusters that were identified as potential is presented below (Figure. 1).

¹ The quoted author did not analyze the degree of maturity of the clusters or their structure, therefore, this number includes both mature and potential clusters.

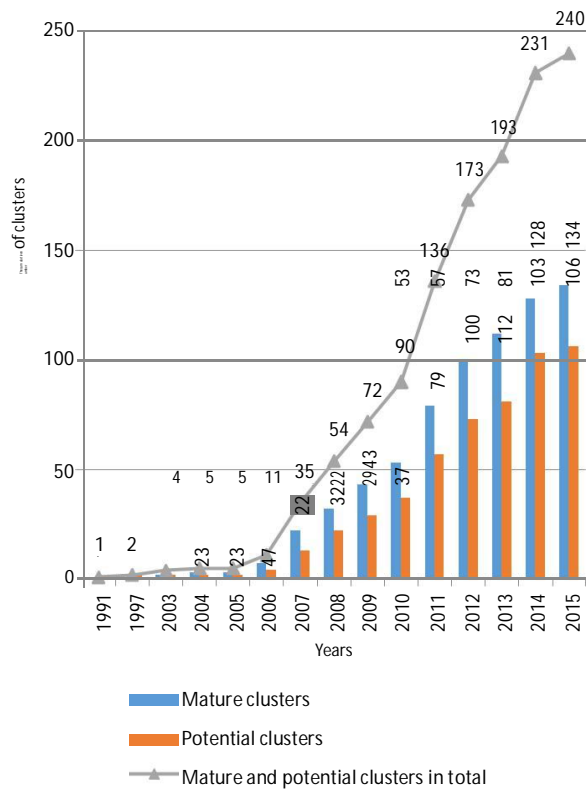


Figure 1: The cumulative number of clusters in Poland inventoried in 2016 by PARP

Source: Own study on the basis of Buczyńska G., Frączek D., Kryjom P., Raport z inwentaryzacji klastrów w Polsce 2015 [Cluster Inventory Report – Poland 2015], Warsaw, Poland: PARP, 2016,

On the basis of the presented data it can be concluded that the number of cluster organizations continues to grow. The level of maturity of these organizations also increases as indicated by the fact that more and more of them are able to meet the standards of PARP. However, there are still a lot of potential clusters, which means that in the near future the number of fully fledged clusters may increase.

According to the inventory made by PARP, 134 clusters (meeting the standards of the Agency) associate 5,868 entities (i.e. an average of 44 in each cluster), including 4,578 companies which accounted for 78%, of which 4,232 are micro, small and medium-sized enterprises – therefore an average of just over 34 companies operate in a statistical cluster [15].

In total, clusters represent 27 specializations. Most clusters were identified in the sectors of ICT, energy and renewable energy sources, construction, as well as in medical and tourist industries. A significant number of clusters operate in business services, metal industry and production technologies [15].

4. CLUSTERS IN POLAND

Almost since the beginning of the cluster concept in the Polish business practice, the ICT sector has gained the largest

representation in the population of cluster organizations. Already in the study from 2008, in which 56 clusters existing at that time in Poland were inventoried [19] as many as 6 were clusters for which the ICT sector was the leading branch. Recent official figures show that at the end of 2015 in Poland there were 19 ICT clusters that met the standards of PARP and they accounted for over 14% of the total population of clusters in the country. In addition, the previously cited inventory of Polish clusters revealed that out of 106 potential clusters in the country, the largest number represented the ICT industry – there were as many as 13, that is 12.3% of the total [15].

Analyzing the distribution of the number of ICT clusters in the years 2006-2015, which at the end of 2015 met the standards of PARP, it can be noticed that most of them were created in the years 2006-2011 (Figure 2).

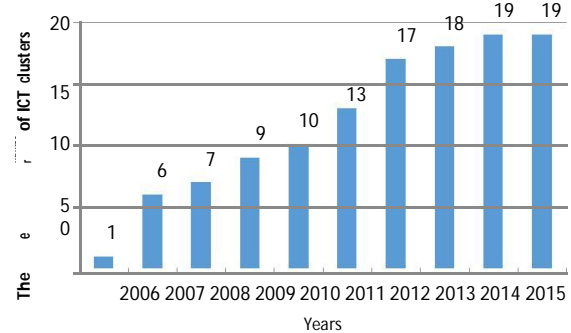


Figure 2: The cumulative number of ICT clusters of in the years 2006-2015 which at the end of 2015 met the standards of PARP

Source: Own study on the basis of the list of clusters in the publications of Buczyńska G., Frączek D., Kryjom P., Raport z inwentaryzacji klastrów w Polsce 2015 [Cluster Inventory Report – Poland 2015], Warsaw, Poland: PARP, 2016, pp. 13, 54.

Since 2012 the growth in the number of cluster organizations specializing in the ICT industry and able to meet the standards of PARP has slowed down. This may be evidence for certain saturation of the sector with cluster organizations. However, it should be noted that there is still quite a large group of potential clusters in this sector, which currently consists of 13 organizations, which may in the near future become fully-fledged clusters.

ICT clusters are located in as many as 10 of 16 Polish provinces. In particular these are the following provinces: Lower Silesia, Lublin province, Lubus, Masovia, Subcarpathia, Pomerania, Silesia, Greater Poland, Łódź and Kuyavia-Pomerania, but in the last mentioned provinces the cluster do not represent the ICT sector in the broad sense, but the IT sector.² Moreover, in the remaining 6 provinces potential ICT clusters are located. This reveals a certain absurdity of the location of the operation of these organizations, which are

² The quoted report of the Polish Agency for Enterprise Development presenting the economic specialization of regions, however, does not highlight this difference and both IT and ICT clusters are in one and the same category.

practically³ in every region. This suggests that in every region there is a geographical concentration of entities from the ICT sector and conditions for the development of this sector better than in other regions, while from a logical point of view, such a phenomenon cannot take place. In particular, the density of entities representing the industry under consideration cannot be greater in every region than the average density of entities in this sector in other regions. Therefore, the sense and legitimacy of the activities of Polish ICT clusters should be found at the local level, where the criterion of the geographical aggregation of ICT industry entities and greater concentration of these entities against the surroundings can be actually met.

A special role of ICT clusters in the general population of cluster organizations in Poland is also emphasized by the fact that as many as 3 out of 16 clusters which have been given the status of National Key Clusters⁴ represent the ICT industry⁵. In particular, the following clusters have achieved this status:

- Masovia ICT Cluster, founded in 2007, located in Warsaw, Masovia province
- Eastern ICT Cluster, founded in 2007, located in Lublin, Lublin province
- Interizon Pomeranian ICT Cluster, founded in 2009, located in Pomerania province

These three clusters will be the subject of further study, because taking into account their importance for the economy, their confirmed by the Polish Agency for Enterprise Development level of maturity entitling them to obtain the status of key clusters, it can be assumed that positive effects of their operation, including those in terms of changes in the dynamics of the entrepreneurial process, should be best observable in the area of their influence.

5. RESEARCH RESULTS

According to the definition of the ICT sector adopted by the OECD working group on information society indicators, this sector includes [24]:

- enterprises producing goods which enable electronic processing of information and communication (including transmission and display),
- enterprises providing services which enable electronic data processing and communications.

According to the Statistical classification of economic activities in the European Community NACE Rev. 2, the ICT sector covers groups listed in Table 1.

Table 1: ECONOMIC ACTIVITY CLASSES OF THE ICT SECTOR

EA Class	Group name
<i>ICT manufacturing sector</i>	
2611	Manufacture of electronic components
2612	Manufacture of loaded electronic boards
2620	Manufacture of computers and peripheral equipment
2630	Manufacture of communication equipment
2640	Manufacture of consumer electronics
2680	Manufacture of magnetic and optical media
<i>ICT service sector</i>	
4651	Wholesale of computers, computer peripheral equipment and software
4652	Wholesale of electronic and telecommunications equipment and parts
5821	Publishing of computer games
5829	Other software publishing
6110	Wired telecommunications activities
6120	Wireless telecommunications activities, excluding of satellite telecommunications
6130	Satellite telecommunications activities
6190	Other telecommunications activities
6201	Computer programming activities
6202	Computer consultancy activities
6203	Computer facilities management activities
6209	Other information technology and computer service activities
6311	Data processing, hosting and related activities
6312	Web portals
9511	Repair of computers and peripheral equipment (not included in the publication)
9512	Repair of communication equipment (not included in the publication)

Source: Statistical Office in Szczecin, *Działalność innowacyjna przedsiębiorstw przemysłowych w latach 2012-2014 [Innovation activity of industrial enterprises in 2012-2014]*, CSO, Warszawa 2015, pp. 23-24.

It is practically impossible to obtain detailed data about individual classes of Polish activity classification from the resources of public statistics of the Central Statistical Office from the interactive Local Data Bank database, but it is possible to obtain these data at the level of economic activity divisions. Therefore, in this article certain simplifications were made in the way of perceiving the sectoral area of ICT cluster activity, assuming that it covers these divisions of Polish activity classification which cover classes of Polish activity classification defining the ICT sector. As a consequence of this assumption, the sectoral area of ICT clusters activity is contained in Table 2.

³ That is, if we skip the question of the maturity of the organization and the resulting division into clusters that meet the standards of the Polish Agency for Enterprise Development and potential clusters.

⁴ National Key Cluster – a cluster of significant importance for the country's economy and of high international competitiveness. Key national clusters are identified at the national level, among others on the basis of the following criteria: critical mass, development and innovative potential, the existing and planned cooperation, coordinator experience and potential. Source: Innovation Portal, National Key Clusters, www.pi.gov.pl/ (accessed 28.02.2017).

⁵ Only the medical industry has been equally highly distinguished.

Table 2: SECTORAL AREA OF ICT CLUSTERS ACTIVITY^A

Section	Division	Group name
C – Manufacturing	26	Manufacture of computer, electronic and optical products
J – Information and communication	58	Publishing activities
	61	Telecommunications
	62	Computer programming, consultancy and related activities
	63	Information service activities
S – Other services activities	95	Repair of computers and personal and household goods

a. Division 46 of section H was deliberately omitted because it includes 9 classes and dozens of sub-classes, while only 2 sub-classes of this division belong to the ICT sector. Thus, the inclusion of the whole division to the sectoral area of ITC clusters operation would distort the results of the conducted analysis.

Source: Own study

The adopted definition of the ICT sector was the basis for determining the sectoral area of the impact of key ICT clusters, for which the ICT sector is the dominant sector of activity. In the spatial dimension the main area of activity was determined through the prism of the territory of the local unit in which the cluster organization has its headquarters, while the territory of the province in which the cluster organization is located was assumed as the extended spatial area.

The basic measure of entrepreneurship evaluation in the given area is the indicator of entrepreneurship [25] expressed as a number of economic entities per 10 thousand working age residents⁶. In order to assess entrepreneurship in the area of the impact of the analyzed clusters, this ratio was calculated for the defined ICT sector covering entities from sections and divisions listed in Table 2 in the local units in which the headquarters of the surveyed clusters are located⁷, as well as in provinces to which the local unit belongs. The same indicator calculated for the whole country was adopted as a reference point. Given the specificity of the location of the analyzed cluster organizations in large urban areas, which in the nomenclature of public statistics have the status of cities with county rights, the rates of entrepreneurship in the ICT sector calculated for all cities with county rights and for urban municipalities were assumed as additional “benchmarks”. The results of the estimate are shown in Table 3.

The presented data show that in the period 2009-2015 the saturation with entrepreneurship in the local area of the impact of the key ICT clusters was significantly higher than the national average (in relation to benchmark 1) – it applies to each cluster and each year of the indicated period. At the same time in the regional area of influence of each of the studied cluster organization the indicator of entrepreneurship is significantly lower than the national average. If entrepreneurship in cities with county rights is a reference point (benchmark 2), then only entrepreneurship in the impact

⁶ It is sometimes expressed as the number of entities per 1000 working age residents. Occasionally, instead of working age residents, the total number of inhabitants of the area, regardless of age, is taken into account.

⁷ That is, a municipality in which the headquarters of the cluster organization is situated.

area of the Masovia and Pomerania clusters scores higher than the national average. On the other hand, in Lublin, where the Eastern ICT Cluster operates, entrepreneurship is lower not only than the average for all cities with county rights but also than when from these cities the ones with key ICT cluster⁸ are excluded (benchmark 2b). The situation is similar when we compare entrepreneurship in the area of activity of the analyzed clusters with entrepreneurship in urban municipalities. Here also the Masovia ICT Cluster and the Interizon Pomeranian ICT Cluster come off very well, the Eastern ICT Cluster comes off worse. In a direct comparison of areas of impact of the clusters we can clearly see that the greatest saturation with entrepreneurship in the ICT sector at the local level is characteristic for the local environment of the Masovia ICT Cluster. It is over twice as high as in the local environment of the Interizon ICT Cluster and three times as high as in the local surrounding of the Eastern ICT Cluster. It should be noted here, however, that the Masovia Cluster is located in the capital city, which is the most developed area of Poland, and that is why such big saturation with entrepreneurship in the local environment of the key Masovia ICT Cluster can result from the historically shaped density of economic operators in this area. This remark also applies to the other clusters that operate in the capitals of regions (respectively the Interizon cluster in the capital of Pomerania province and the Eastern ICT Cluster in the capital of Lublin province).

Table 3: ENTITIES FROM ICT SECTOR ENTERED IN THE REGON REGISTER PER 10 THOUS. POPULATION OF WORKAGE IN THE YEARS 2009-2015

Specification	2009	2010	2011	2012	2013	2014	2015
Lublin (Eastern ICT Cluster)	58.2	65.1	66.1	71.9	78.1	82.0	90.0
Lublin province	25.8	28.0	29.1	31.2	33.5	36.6	38.7
Warszawa (Masovia ICT Cluster)	175.1	198.8	205.9	223.8	245.4	263.7	287.5
Masovia province	26.7	29.8	31.4	33.9	36.0	37.9	41.1
Gdańsk (Interizon Pomeranian ICT Cluster)	85.3	93.3	98.3	106.4	115.5	123.3	132.5
Pomerania province	16.1	17.4	17.2	18.1	18.9	19.1	19.8
Benchmark 1 Poland	43.5	47.4	49.0	52.2	55.9	58.9	62.8
Benchmark 2 cities with county rights	79.2	87.9	91.5	98.6	105.9	113.3	122.2
Benchmark 2b – excluding the cities in which the key ICT clusters are	64.0	70.5	73.4	78.7	83.6	88.9	95.3
Benchmark 3 urban municipalities	66.5	73.0	75.6	81.2	87.2	92.5	99.3
Benchmark 3b - excluding the municipalities in which the key ICT clusters are	55.1	60.0	62.1	66.2	70.4	74.2	78.9

Source: Own study on the basis of data from the CSO Local Data Bank (<https://bdl.stat.gov.pl> accessed 27.02.2017)

⁸ That is, Warsaw, Gdańsk and Lublin.

Therefore, in assessing the impact of the key ICT clusters on entrepreneurship in the area of this influence, the size of the ratio of the saturation with entrepreneurship in subsequent years is less important than the dynamics of its changes over time. That is why, the conducted analysis was completed with the estimate and assessment of the dynamics of change of the entrepreneurship rate in the years 2009-2015, taking the year 2009 as the base, as shown in Table 4.

Table 4: DYNAMICS OF THE ENTREPRENEURSHIP INDICATOR IN THE ICT SECTOR (2009 AS THE BASE YEAR)

Specification	2009	2010	2011	2012	2013	2014	2015
Lublin (Eastern ICT Cluster)	100.0	111.8	113.7	123.6	134.2	140.9	154.7
Lublin province	100.0	108.5	112.6	120.7	129.5	141.7	149.6
Warszawa (Masovia ICT Cluster)	100.0	113.6	117.6	127.8	140.2	150.6	164.2
Masovia province	100.0	111.3	117.3	126.9	134.6	141.8	153.5
Gdańsk (Interizon Pomeranian ICT Cluster)	100.0	109.5	115.3	124.8	135.5	144.6	155.5
Pomerania province	100.0	107.9	106.7	112.6	117.5	118.6	123.1
Benchmark 1	100.0	109.0	112.6	120.0	128.6	135.4	144.3
Benchmark 2	100.0	111.1	115.6	124.6	133.8	143.1	154.4
Benchmark 2b	100.0	110.3	114.8	123.0	130.7	139.1	149.0
Benchmark 3	100.0	109.7	113.7	122.0	131.0	139.1	149.2
Benchmark 3b	100.0	108.8	112.6	120.0	127.7	134.5	143.1

Source: Own study on the basis of data from the CSO Local Data Bank (<https://bdl.stat.gov.pl> accessed 27.02.2017)

The comparison of the cumulative dynamics of growth of entrepreneurship in the local area of the impact of the key ICT clusters with each benchmark points to the advantage of the cluster organizations. In each city in which the key ICT clusters operate the increase in economic entities in the ICT sector in the period 2009-2015 was greater than the average in the country, regardless of whether the point of reference was the whole country, cities with county rights or urban municipalities. It should be also noted that in the regional area of impact of ICT clusters, understood as an area of provinces where these clusters function, there is a relatively high rate of entrepreneurship in the area of the Masovia cluster (153.5 for Masovia province) and of the Lublin cluster (149.6 for Lublin province) in relation to the national average (it amounted in Poland to 144.3), and relatively low in the area of impact of the Pomeranian cluster (123.1 for Pomerania province). Thus, it can be concluded that all studied clusters stimulate entrepreneurship at the local level, while the Masovia ICT Cluster and the Eastern ICT Cluster stimulate entrepreneurship in the regional dimension, which cannot be said about the operation of the Interizon Pomeranian ICT Cluster. This thesis is confirmed by the comparison of the dynamics of the entrepreneurship indicator before the creation of the cluster organization and after its foundation, as shown in Table 5.

Table 5: AVERAGE ANNUAL DYNAMICS OF THE ENTREPRENEURSHIP INDICATOR IN THE AREA OF THE OPERATION OF THE KEY ICT CLUSTERS BEFORE AND AFTER THE CLUSTER CREATION IN THE YEARS 2005-2015

Specification	Cluster foundation year	Average annual dynamics of the entrepreneurship indicator before the first full year of activity of the cluster ^a from 2005 ^b	Average annual dynamics of the entrepreneurship indicator 1 year after the creation of the cluster to 2015
Lublin (Eastern ICT Cluster)	2007	101.8	108.4
Lublin province		104.0	107.5
Warszawa (Masovia ICT Cluster)	2007	105.4	108.5
Masovia province		104.9	107.4
Benchmark 1 - Poland		104.0	107.4
Gdańsk (Interizon Pomeranian ICT Cluster)	2009	106.5	107.6
Pomerania province		105.7	103.6
Benchmark 1		105.2	106.3

a. It was assumed that before the first full year of activity of the cluster organization, it usually organizes its activity and builds up its resource potential, and the activity of the organization and its efficiency is usually too small to attribute changes taking place even in the immediate (local) environment of the organization to the effects of its activity.

b. Archival CSO data contained in the Local Data Bank do not allow you to obtain information on the number of entities registered in the Register of National Economy before the year 2005. In addition, 2005 was the first full year of operation of Poland in the new economic environment marked by the presence of Poland in the European Union. That is why, this year was adopted as the beginning of the analyzed period.

Own study on the basis of data from the CSO Local Data Bank (<https://bdl.stat.gov.pl> accessed 27.02.2017)

The data presented in the above table show that after the analyzed cluster organizations stated their activity, the average annual dynamics of the entrepreneurship indicator clearly increased in their local environment. At the regional level this phenomenon also appeared in the vicinity of the Eastern ICT Cluster and the Masovia ICT Cluster. Undoubtedly it was partially favored by improving conditions for doing business in Poland and the generally good nationwide economic climate for the growth of the ICT sector, which is evidenced by the growth of dynamics of entrepreneurship indicators in the ICT sector also at the level of the whole country (benchmark 1). It should be noted, however, that the growth of entrepreneurship at the national level was slower than that in the area of activity of the analyzed clusters.

6. CONCLUSION

The conducted research showed that entrepreneurship in the area of key ICT clusters is above average, especially in the local range of the impact of these clusters. On the one hand, it results from the fact that these clusters located their activity in areas characterized by a high level of entrepreneurship, on the

other hand, also from the fact that the appearance of the cluster organizations was followed by the growth of the dynamics of the entrepreneurial process in the immediate vicinity of these organizations. The hypothesis put forward in the introduction of the study was positively verified.

REFERENCES

1. A. Marshall, *Principles of Economics*, Macmillan, London, 1920.
2. M. E. Porter, *Porter o konkurencji*, Warsaw, Poland: PWE, 2001.
3. EC, *European Trend Chart on Innovation, Thematic Report Cluster Policies*, Covering period up to March 2003, European Commission Enterprise Directorate General, 2003.
4. UNIDO, *SME Cluster and Network Development Branch*, "Working Paper" no. 2, UNIDO 1999.
5. OECD, *Innovative Clusters*, [in:] OECD, *Drivers of National System, Proceeding*, Paris 2001.
6. W. Czekon, *Istota relacji sieciowych przedsiębiorstwa*, „Przegląd Organizacji”, 2015, no. 9/2015.
7. B. Pławgo, Ed., *Raport z badań. Rozwój struktur klastrów w Polsce Wschodniej*, Warsaw, Poland: Ministry of Regional Development, 2007.
9. World Investment Report, *Transnational Corporation and Export Competitiveness*, UCTAD, New York-Geneva, 2002.
10. R. E. Miles, Ch. C. Snow, *Causes of Failure in Network Organizations*, "California Management Review", 1992, vol. 34, no. 3.
<https://doi.org/10.2307/41166703>
11. M. P. van Dijk and A. Sverrisson, *Enterprise clusters in developing countries: mechanism of transition and stagnation*, "Entrepreneurship & Regional Development", 2003, vol. 15. nr July-September.
12. O. Sölvell, G. Lindqvist and Ch. Ketels, *The Cluster Initiative Greenbook*, Sztokholm, Sweden: Ivory Tower, 2003.
13. S. Olko, *Ekspertyza Obserwatorium ICT Przegląd istniejących/działających klastrów ICT w województwie śląskim*, Gliwice, Poland: Sieć Regionalnych Obserwatorów Specjalistycznych, 2015.
14. J. Hołub-Iwan and Ł. Wielec, *Opracowanie systemu wyboru Krajowych Klastrów Kluczowych. Raport I Charakterystyka krajowego klastra kluczowego w oparciu o analizę źródeł wtórnych*, Warsaw, Poland: PARP, 2014.
15. M. Dzierżanowski, Ed., *Kierunki i założenia polityki klastrów w Polsce do 2020 roku. Rekomendacje Grupy roboczej ds. polityki klastrów*, Warsaw, Poland: PARP, 2012.
16. G. Buczyńska, D. Frączek and P. Kryjom, *Raport z inwentaryzacji klastrów w Polsce 2015*, Warsaw, Poland: PARP, 2016.
17. L. Palmén and M. Baron, *Przewodnik dla animatorów klastrów w Polsce*, Warsaw, Poland: PARP, 2011.
18. OECD, *Business clusters: Promoting Enterprise in Central and Eastern Europe. Summary in Polish*, OECD Local Economic and Employment Development Programme, 2005.
19. T. Żminda., *Management the innovative activity of enterprises affiliated to formal structure of cluster*, [in:] M. K. Szpakowski and B. Kolbus, Ed., *Management of organization in the age of globalization*, Zamość, Poland: Knowledge Innovation Center Ltd., 2012.
20. J. Hołub-Iwan and M. Małachowska, *Rozwój klastrów w Polsce. Raport z badań*, Szczecin, Poland: Fundacja Talent-Promocja, 2008.
21. PARP, *Benchmarking klastrów w Polsce 2010. Raport badania*, Polska Agencja Rozwoju Przedsiębiorczości, Warsaw, Poland: PARP, 2010.
22. M. Dzierżanowski, *Raport otwarcia nt. polskiej polityki klastrów*, Warsaw, Poland: PARP, 2011.
23. K. Kamiński, *Klasy a konkurencyjność przedsiębiorstw*, Rynek-Społeczeństwo-Kultura”, 2013, no. 1/2013.
24. PARP, *Klasy w Polsce. Katalog*, ed. I, Polska Agencja Rozwoju Przedsiębiorczości, Warsaw, Poland: PARP, 2012.
25. Urząd Statystyczny w Szczecinie, *Działalność innowacyjna przedsiębiorstw przemysłowych w latach 2012-2014*, Warsaw, Poland: GUS, 2015.
26. J. Salomon, *Przestrzenne zróżnicowanie wartości wskaźnika przedsiębiorczości na obszarach wiejskich województwa świętokrzyskiego*, Infrastruktura i Ekologia Terenów Wiejskich”, Cracow, Poland: PAN, no. 5/2009.