CLUSTER-TYPE COLLABORATIVE MODELS SPECIFIC TO THE FIELD OF DEFENSE

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ABSTRACT
Achieving capacities and capabilities that meet the real needs of the national defense, public order and national security system cannot be done without the involvement of all decision-makers from all the structures with attributions in this field. From this perspective, clusters are the collaborative model that can integrate the efforts of these structures. The article presents comparatively the stage of cluster development at European and national level, the international classification of clusters and the context in which they were formed. Moreover, the Defense-Related Clusters are presented at the level of the EU Member States, their particularities are highlighted, and some examples of Defense-Related Clusters are presented. Last but not least, the paper highlights the stage in which the cluster initiatives that are specific to the domain of defense in our country are presented.

KEYWORDS: *Clusters, Collaborative Model, Defense, Defense Industry, Innovation.*

1. INTRODUCTION

In a competitive environment where, under the pressure of accelerated globalization, the struggle for survival and market supremacy has taken on the most aggressive forms, organizations and especially their management face a wide array of problems that need to be resolved in a timely manner and in optimum conditions. Under these circumstances, in order to achieve the objectives, the management of organizations finds itself in a position to give a series of answers to questions such as: when? with what forces? under what conditions? In most cases, a problem has more than one solution, and therefore management is always struggling to choose the most advantageous option for the organization.

These issues are specific to the military organization, with emphasis in the fact that the effects of environmental stimuli are amplified precisely because of the specificity of this institution. It is the duty of the military institution to adequately respond to all situations that call for its engagement, but this engagement cannot be achieved without providing the resources that enable it to achieve its specific action capabilities.

From this perspective, the defense industry has a particularly important role in creating those material resources (products, technique, technology and why not, scientific resources) through which the institutions of the national system of defense, public order and national security are able to fulfill as many of the undertaken objectives as possible, and, in the end, to achieve their actional capacity in accordance with national programs, as well as from the perspective of achieving interoperability with the NATO partners.

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2. CLUSTERS – COLLABORATIVE MODELS FOR ECONOMIC AND INOVATIVE DEVELPOMENT

Clusters became known in the early 1990s, although the first associations of this type had been reported many years before. Currently, the most commonly used definition of the cluster is given by the one who made this concept popular, Professor Michael Porter (1998): "Clusters are geographic concentrations of interconnected companies and institutions that manifest themselves in a particular field of activity. Clusters include a group of related industries and other organizational entities that are important from a competition point of view. These include, for example, specialized input providers such as components, machines and services, or specialized infrastructure providers. Clusters often extend downstream to various distribution channels and customers and later to complementary product manufacturers and related industries through common skills, technologies, or inputs". Clusters are characterized by a flexible organization, in which each member performs certain activities, has a defined role according to cluster strategy and market requirements. Clusters have been perceived as a tool to promote and support competitiveness, innovation, and growth at all levels (local, regional and national).

In order to support these entities, the European Commission has created a body called *the European Cluster Observatory,* which provides the necessary access to statistics, analysis and mapping of clusters and cluster policy in Europe, targeted at the national, regional and European decision-makers, as well as at cluster managers and representatives of SME intermediaries. Its aim is to promote the development of several global clusters across Europe in order to increase competitiveness and entrepreneurship in emerging industries and to facilitate the access of access SMEs to clusters and cluster internationalization activities. The ultimate objective is *"to help Member States and regions in designing smart specialization and cluster strategies to assist companies in developing new, globally competitive advantages in emerging industries through clusters, and thus strengthen the role of cluster policies for the rejuvenation of Europe's industry as part of the Europe 2020 Strategy"* (EC, 2018).

The first edition of *The European Cluster Panorama*, the official publication of *the European Cluster Observatory*, covered the period 2006-2013 and provided statistical data on clusters in no less than 28 sectors of activity in the 27 EU Member States (except for Croatia, which joined the EU on July 1, 2013).

The second edition (2014-2016), provides a new perspective on the tendencies, peculiarities and regional significance of these entities. The provided reports and analyzes are based on studies and economic evidence that offer an overview of the possible changes of direction in the industry and beyond, mapping the economic performance and geography of ten emerging industries across Europe.

According to the data included in the two previous editions of the above-mentioned publication, in 2015, at the level of the EU member states, the European body recorded a number of 3043 clusters, an increase of 168% compared to 2013 (Figure 1), while the number of sectors covered by these clusters increased from 36 in 2013 to 51 in 2015.

In our opinion, this is mainly due to the implementation of viable national programs, which support businesses and entrepreneurs, and which stimulate initiatives of forming clusters as entities that may significantly contribute to local and especially to regional development. Of course, all of these national programs are strongly stimulated by EU framework programs, which are consistent with the Europe 2020 Strategy.
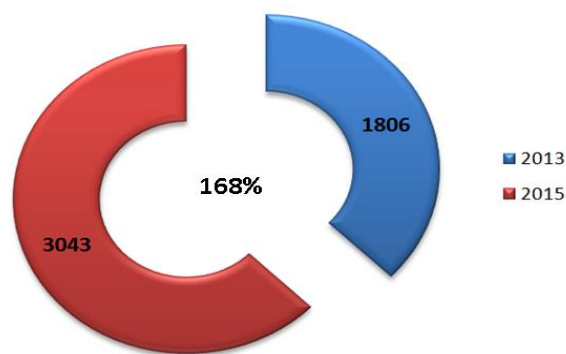
Figure 1. Numbers of clusters in EU
Source: adapted from www.clustercollaboration.eu (2014) and
The European Cluster Panorama (2016*)*

2.1 The situation of clusters in Romania

As in many other cases in various fields of activity, trying to analyze the cluster situation in our country proves to be a particularly difficult thing, due to the lack of information from official channels. In the last years, the website of the Ministry of Economy (the national body that should coordinate these entities) presented information regarding the situation of clusters as well as national and European policies in the field. Today, such information lacks completely.

The scarce information (somehow up-to-date) about clusters can only be obtained from the website of the Romanian Cluster Association – CLUSTERO.

Founded in 2011, the CLUSTERO is *"the representative body of Romanian clusters and the main platform of cooperation, exchange of information and support towards the development of the national cluster landscape based on innovation and internationalization"* (Clustero, 2018).

According to Clustero (2018), there are 70 initiatives to form clusters in Romania, of which 42 are active clusters. Approximately the same number of clusters, 46, is presented on the European Cluster Collaboration Platform (ECCP) which is "*an action of the Cluster Internationalisation Programme for SMEs funded under COSME launched by DG GROW of the European Commission in 2016. The ECCP provides networking and information support for clusters and their members aiming to improve their performance and increase their competitiveness through trans-national and international cooperation*" (ECCP, 2018).

Their distribution according to regions of development is shown in Figure 2.

Figure 2. Total number of clusters in Romania by development regions
Source: European Cluster Collaboration Platform (2018)

284

A completely different situation is presented by the Ministry of Economy, which, in a study entitled *Cluster Policy - a component of industrial policy*, shows a list of no less than 88 active clusters at national level, although the charts indicate 46 clusters, the same as on the European Cluster Collaboration Platform (Figure 3), the only differences being their geographical location.

Figure 3. Clusters in Romania
Source: Ministry of economy, (n.d.)

As far as we are concerned, we tend to think that the specialized platform of the European Union presents more accurately the situation of the clusters in our country, due to the reports of the national institutions that are corroborated with the individual applications of the clusters for joining the European association, as a guarantee of the quality of the management they have. Regarding this last aspect, it is worth mentioning that the ESCA (European Secretariat for Cluster Analysis) experts have assessed the quality of management for the clusters that have requested it and that a number of 30 clusters are currently certified in the Bronze, Silver or Gold categories (see Figure 4). This demonstrates that these entities have the potential to develop services and projects that contribute both to the development of the entity itself and, very importantly, to the economic development of the region with a high impact on the level the welfare of the community and of the society as a whole.

BRONZE Cluster Management Excellence	SILVER Cluster Management Excellence	GOLD Cluster Management Excellence
26	3	Cluster Mobilier Transilvan

Figure 4. Labeling of Romanian clusters
Source: adapted from the European Secretariat for Cluster Analysis (ESCA), (2018).

By studying the web pages found on this platform with the clusters in our country, it can be easily noticed that the majority appeared after 2008 as a result of the programs adopted and implemented at European and national level. The table below presents cluster evolution at national level numerically.

Table 1. Annual numerical evolution of clusters

Year	1996	2004	2008	2010	2011	2012	2013	2014	2015	2016	2017	n.d
No. of clusters	1	1	2	3	3	6	4	3	5	4	1	9

Source: own research

Most clusters emerged after 2010, benefitting from financial support through the *Sectorial Operational Program Increase of Economic Competitiveness (SOP IEC),* one of the seven instruments (Operational Programs) which contributed extensively to the fulfillment of the priorities assumed under the National Strategic Framework (NSRF) and the National Development Plan 2007-2013 (PN II). Furthermore, cluster cooperation was also promoted and supported through *The Seventh Framework Program* (FP7), the *CAPACITIES* program, the *Regions of Knowledge* section. The overall objective of the sub-program was *"to strengthen the research potential of European regions by supporting the development of research-driven clusters based on partnerships between universities, research institutes, businesses and authorities"* (CORDIS, 2014). All these measures have contributed to the achievement of the objectives of the Economic and Social Cohesion Policy and Regional Policy on the Romanian territory, in direct connection with the European policies and the Lisbon Strategy, which focuses on solid, long-term growth and on the creation of more numerous and more attractive work places.
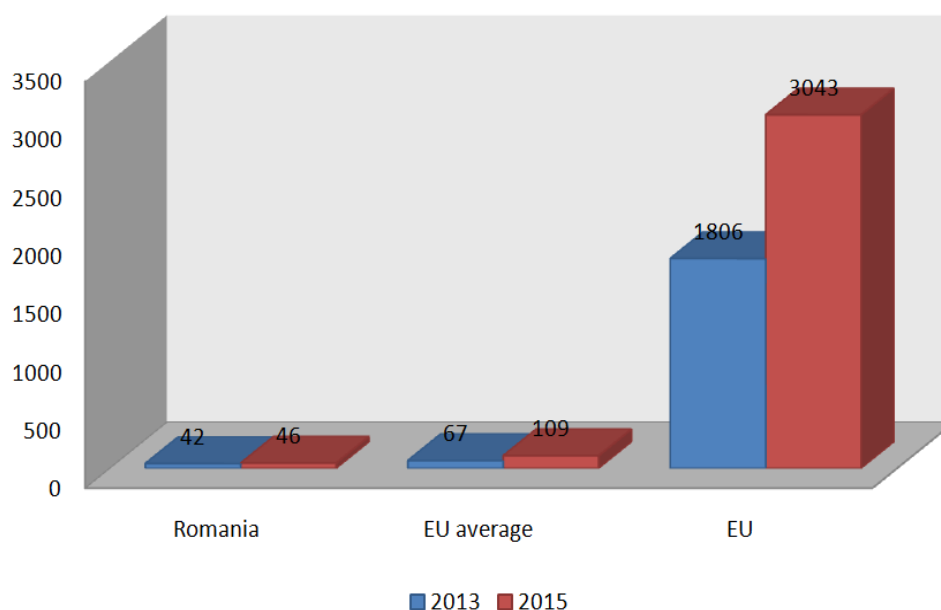

Figure 5. Comparison between total numbers of clusters in Romania, from EU members and EU average
Source: own interpretation

However, the number of clusters in our country remains rather low compared to the European average, which in 2015 was close to 110 clusters (Figure 5), a situation which can only be explained by the lack of knowledge about the benefits of collaboration and not by lack of support measures.
In fact, some ambiguities regarding the public-private partnership have also contributed to this situation, ambiguities that have been corrected / eliminated by Government Ordinance this year.

3. CLUSTERS SPECIFIC TO THE DEFENSE DOMAIN

Identifying clusters in the field of defense, security and public order is a very difficult task because defense is considered to be the aptitude of the armed forces, security is perceived as a field with applicability in all spheres of the social and economic life of any state or entity, public or private, and public order is considered to be the attribute of the institutions with responsibilities in ensuring and maintaining the climate of internal order and security within a state.

The only data on the status of clusters in this area appear in *Defence-Related Clusters List*, published by the European Defence Agency (EDA) in early 2017.

According to the aforementioned document, there are 116 European clusters working in the field of defense, which represents 3.8% of the total clusters at European level.

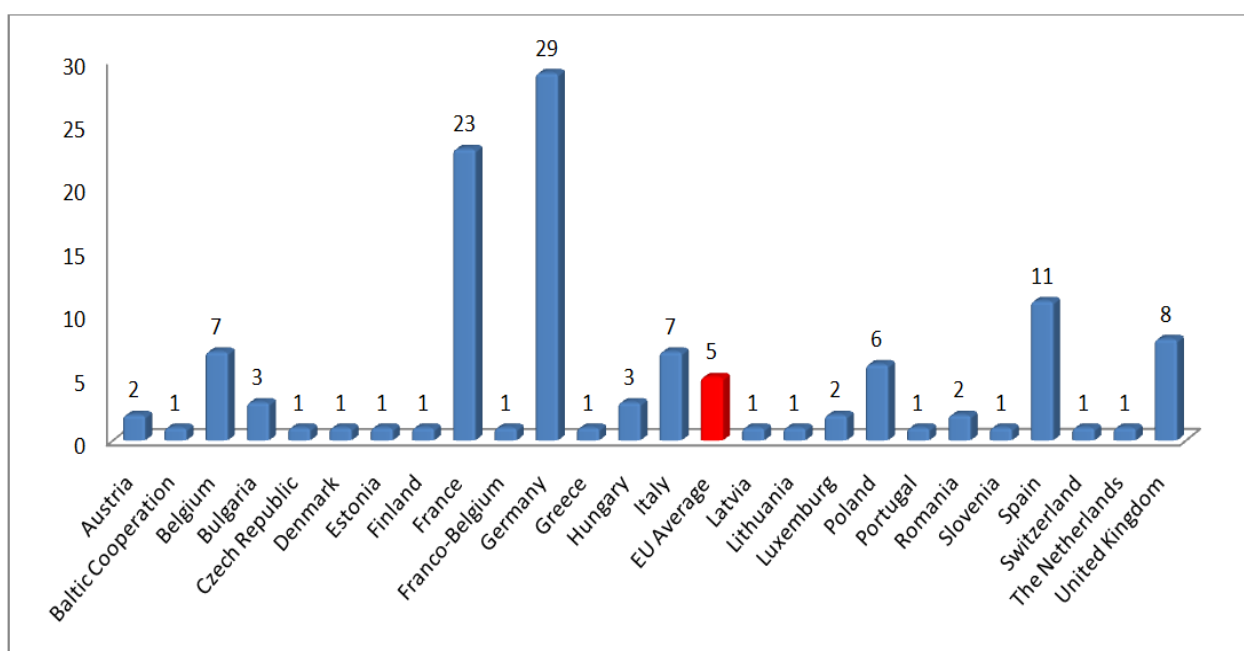Their distribution by country is shown in the figure 6.

Figure 6. Distribution of Defense-Related Clusters in the EU
Source: adapted from EDA (2017)

As it can easily be seen, most defense-specific clusters are found in Germany, followed by France, with 29 and 23 clusters respectively, at a great distance from Spain, with 8 clusters.

A peculiarity of these clusters is that there are situations in which the size of these entities exceeds national boundaries. This is the case for the *Digital Signal Processing Valley (DSP)* cluster, a French-Belgian cluster located in Leuven, Belgium which has a branch office in Eindhoven, The Netherlands. Also, *Hanse - Parlament* is a cluster that "*has a non-profit structure and no commercial goal of its own. Members of the association are more than 45 Chambers of Commerce and Industry, Chambers of Skilled Crafts and other institutions who promote small and medium-sized businesses from all Baltic Sea Countries*" (Hanse - Parliament, 2018). Our country is not represented in this association, which currently brings together no less than 52 *Chambers of Commerce and Industry* and SME's from 11 European countries (Figure 7).
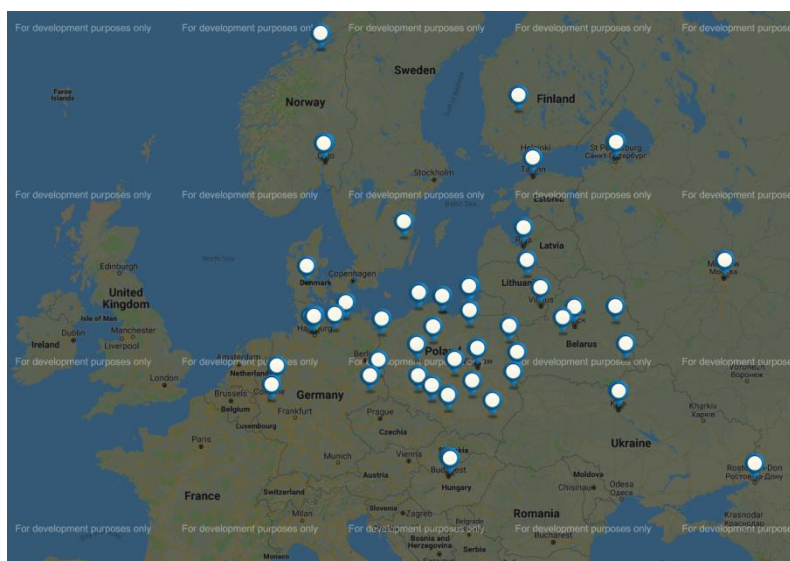
Figure 7. Hanse - Parlament
Source: Hanse - Parlament Homepage (2018)

In order to have a better idea of the characteristics of the defense clusters operating at the level of the EU member states, we thought of making a brief presentation of three of them, focusing on clusters from Denmark, France and Slovenia. We chose to present these because they are among the only ones that provide detailed and up-to-date information about them, on their own sites, through presentation materials, or ministerial reports in the countries of origin.

➢ **CenSec** is an industrial group and, at the same time, a network center for small and medium enterprises that are or wish to become suppliers for the defense, security and / or space industry. CenSec came into being following the development of two major projects for Denmark, namely:

- ***The Network Center for Aircraft and Defense,*** established in 2004, which was built on the idea of disseminating defense knowledge to industrial companies and research institutions.

-***Network Defense Supply***, set up in 2006, is based on business interests aimed at providing defense equipment and services and therefore is an integral part of industrial cooperation and of offset agreements. In 2007, the two projects merged into one, under the name of CenSec. Nowadays, CenSec has over 60 members.

➢ **EDEN** (European Defense Economic Network), is the first French cluster in the field of defense, safety and security. It was founded in 2008 at the initiative of six businessmen from the Rhône-Alpes region and benefitted from the support of the Chamber of Commerce and Industry of Lyon and of the General Directorate for Armaments (GDA). In 2011, EDEN became a French national federation as a result of the merging of four regional associations: Rhône-Alpes, Brittany, Central France and Provence-Alpes-Cote d'Azur (PACA). EDEN is a unique model at European level, not only due to fact that the geographical concentration of the cluster does not respect the pattern, but also because it constitutes a model in terms of innovative and complementary high-performance solutions, with the common goal of fully satisfying customers. Currently, EDEN has around 130 members, and this cluster model tends to be implemented internationally, mainly because of partnership agreements with similar bodies outside France.

➢ **GOIS**, the Slovenian Defense Industry Cluster is a business associative model based on the economic interest of cluster members. It is an association of Slovenian suppliers of defense, security and protection of products and services. GOIS counts about 27 members whose activity profile covers the full range of defense-specific products and services. The main data about the three clusters are shown in the following table:

Table 2. Main features of defense clusters

	CenSec	EDEN	GOIS
Size:	**88**	**81**	**27**
Universities	3	-	1
Research centers	2	-	-
Military enterprises	3	10	6
Civilian enterprises	52	62	18
Distributors	2	-	-
Associations	3	-	-
Management authorities/agencies	18	8	2
Law firms	3	-	-
Cluster	1	-	-
NGO	1	-	-
Testing Center	-	1	-
Geographical concentration	National	Inter-regional	National
R&D	yes	-	yes
Work force	yes	yes	yes
Cooperation	yes	yes	yes
Catalyst institutions	yes	yes	yes
Internationalization	yes	yes	yes
Employees	n/a	6.500	n/a
Turnover - 2013	n/a	650.000.000 €	n/a

Source: http://www.censec.dk/; http://sdic.gzs.si/slo/;
http://www.eden-defense-cluster.com/accueil_us.php.

Some observations can made about the structure of these clusters, namely:

➢ The **EDEN** cluster is part of the *Marshallian* cluster (network) model because it is made up of small businesses in the same field of activity or related fields, able to adapt rapidly to changes on the market and to the differentiated demand through collaboration and the use of new technologies.

➢ The **GOIS** cluster is part of the *Triple Helix* model, representing the three types of basic entities of a classical cluster, namely: industry, universities and authorities.

➢ The **CenSec** cluster is part of the *Four clover* model, also adopted in our country, with representatives from industry, academia, authorities and consultancy agencies. A particular feature of this cluster is given by the presence of a cluster within another cluster. This comes to strengthen its position and importance in the area of regional development.

Due to the geopolitical situation, the migrants' crisis, the diplomatic, economic and / or military tensions between states, many European countries have reconsidered their defense and security options by adopting a wide range of measures that counterbalance present and future threats. From this perspective, it is not surprising that many entities operating in the sphere of defense have ceased to make public their achievements or performances. Clusters have also embraced this trend. The only defense cluster that has made public some of its relatively recent achievements is the EDEN cluster, which presented its products, expertise and forward-looking projects in Paris at the *Milipol Exhibition 2015*.
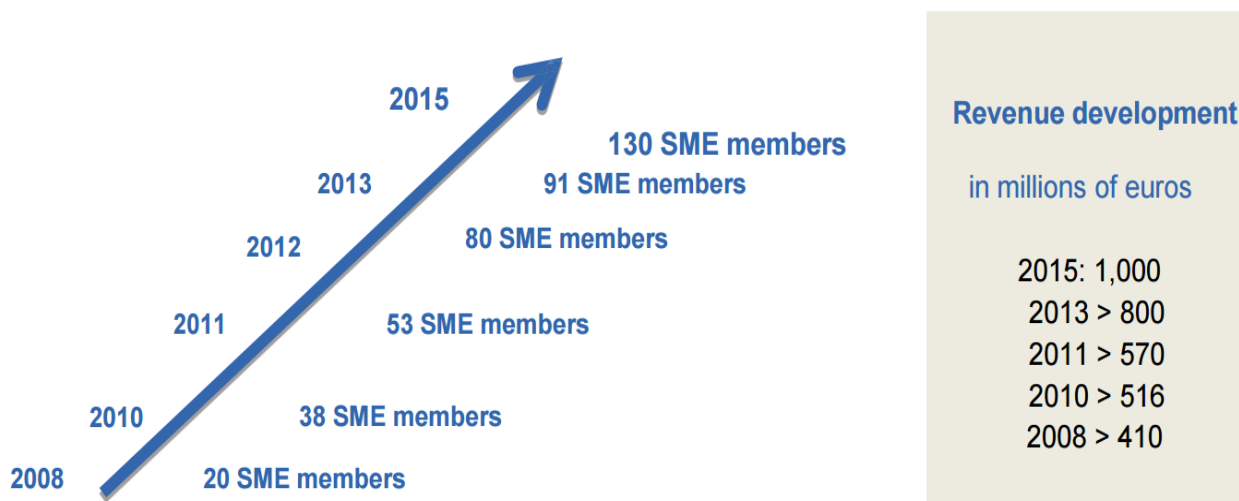
Figure 8. Statistical facts about the EDEN cluster
Source: EDEN (2015)

As can be seen in the figure above, it is worth noting that in less than 10 years of existence, the number of members of the EDEN cluster has increased from 20 in the year of its establishment to no less than 130 members in 2015, which is an increase of 6.5 times. Income has also increased nearly 2.5 times, and the number of employees has grown by 50%, from 6100 employees in 2013 to over 9000 in 2015.

3.1. The situation of defense clusters in Romania.

As we have previously mentioned, the only information regarding the two defense clusters in our country on the EDA list is scarce and is often limited to a few press releases.

This is the case of the Transylvania Aerospace Cluster, set up around SONACA Aerospace Transilvania in Braşov, which brings together mainly aviation companies, but also the Transylvania University of Braşov. According to a press release from 2012, we find out that this cluster has established its Strategic Council, a body comprising mainly people at the forefront of the national political flagship (Dan, 2012). The cluster was registered with the Trade Register on 11.04.2014 and the financial indicators according to the balance sheet submitted for 2017 indicated a deficit of 119 lei. The Cluster is not affiliated to the Cluster Association in Romania nor to any European body. According to the limited information available and the reports to the Finance Ministry, we believe that the Transylvania Aerospace Cluster has remained at the stage of cluster formation initiative.

The second cluster on the EDA list is **ALT Braşov - Innovation and Technology Cluster.** This *"was founded in 2013 with the objectives of developing, promoting and supporting innovating industries. These objectives and initiatives will bring added value and generate economic development for Brasov County, the Central Region and Romania"* (ALT, 2018).

A simple reference to the European average of defense clusters (see Figure 6) shows that we are somewhere in the middle of Europe but a little better positioned than some states with a tradition in the defense industry (see the case of Switzerland).

In Defense Institutions, more precisely at the "Nicolae Bălcescu" Land Forces Academy, a project included in the *Sectoral Research Plan of the Ministry of National Defense* for 2018, called "*Innovative Technology Cluster*" is in full progress. The research and development project is entitled *"Prospective study on the development of a conceptual model of innovative cluster specific to the field of defense"*. So far, the studies have identified the phases (shown in Figure 9) that the future entity must undergo, namely: *the exploratory phase; the activation phase; the structuring*

phase; the growth phase; the integration phase; the restructuring phase. Each stage is associated with a series of objectives and activities leading to the materialization of this project.
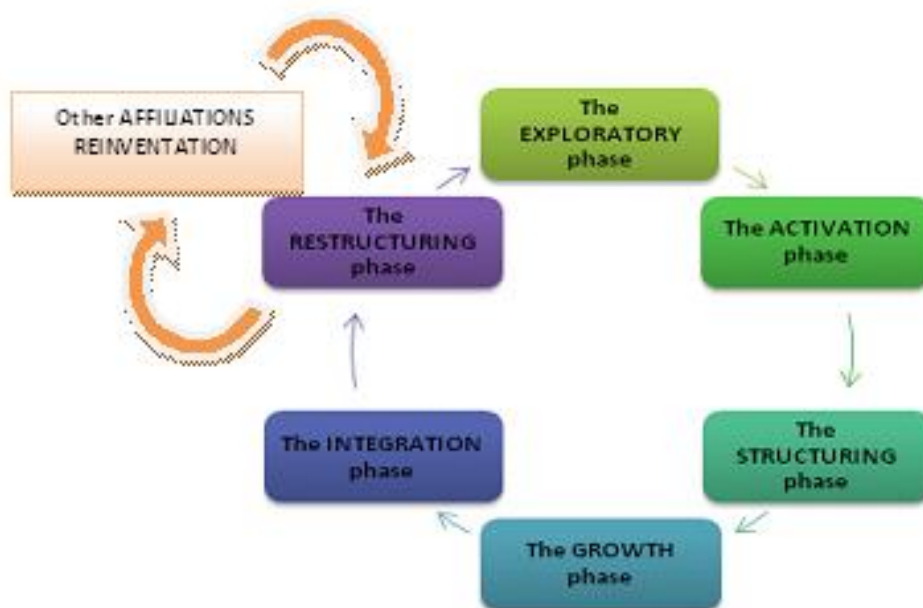

Figure 9. The model of the life cicle of clusters
Source: adapted from Sonderegger & Taube, 2010

Also, the main features of the future entity suggestively called the ***Romanian Defense Cluster*** have been identified:

Table 3. Main features of a defense cluster

	Romanian Defense Cluster
Size	12
Defense industry enterprises	7
Management authorities/agencies	2
Universities	3
Employees	approx. 6500
Turnover for the 1st year	1,000,000 €
Level of representation	national

Source: own research

Of course, this project falls within the first stage of establishing a defense cluster but to the extent that the results obtained in this first stage will convince decision-makers of the necessity and especially of the utility of such an entity, the project can continue to run.

4. CONCLUSIONS

At the level of EU Member States, especially at the level of highly industrialized states, clusters are considered to be one of the engines supporting SMEs, generating substantial revenues to the state budget, and, at the same time, the means by which these companies survive under the conditions of a more and more fierce competition for markets, raw materials, and last but not least, for resources. In what defense clusters are concerned, although relatively few are numerically active, they operate on a market that generates a revenue of billions of euro yearly.

Recent developments in the security environment in the wider Black Sea region call for immediate action to be taken by all institutions in the national defense, public order and national security systems. The defense industry is one of the elements that has a determining role in ensuring the capabilities and capacities of the action forces.

The recent agreements concluded by national defense industry companies with foreign companies, with reputation in the industry, can contribute to their economic recovery. Moreover, the development of specific clusters of defense at this time and the creation of new entities of this kind would contribute to the coagulation of the technical and scientific efforts of the entities that traditionally form a cluster and not only.

It would also be beneficial for organizational development and the application of good practice examples of successful clusters, mainly those from abroad as well as the national ones.

From this perspective, we believe that cluster models are the instrument that best meets the challenges of the current economic, social and political-military environments, all the more so as the achievement of the future defense industry at European level must either be based on the adoption of intelligent policies and solutions for the implementation of weapons systems in strict accordance with the resizing of national defense structures.

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