ASSESSMENT OF DEFENSE INDUSTRY CLUSTERS IN TURKEY

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Abstract:
According to Stockholm International Peace Research Institute (SIPRI), the global military expenditure exceeded $1.7 trillion in 2014. Defense spendings are on the rise all over the world. The cost of developing defense sytems is increasing. Therefore, the defense industry attracts many big and small to medium-sized enterprizes (SMEs). While big companies have the necessary resources to take on big defense contracts, SMEs are in a disadvantage due to lack of resources. To overcome this handicap and be a part of the business, defense industry clusters are being established mostly consisting of SMEs. Since 2010, Turkey shows signs of improvement in defense industry clustering. In this study, we present an assessment of current defense clusters and point out some of the current challenges.

Key words: Clusters, Business Cluster, Defense Cluster. Defense and Aviation Cluster, Turkey.

1.Introduction

Achieving the goal of having a capable and independent defense industry is important for any country. Clustering of defense firms and supporting industries is an important tool in terms of increasing the capability of national defense industries. These clusters are also supported with related government agencies, public institutions and universities. Today, the significance of defense clusters to achieve a strong independent defense industry is strongly emphasized by both the practitioners and academicians. While developed countries have already established many clusters, the developing countries are in the process of establishing these clusters. In Turkey, the importance of defense clustering is also acknowledged and recently, there have been many initiatives both on the government and private sector side. In the last 5 years, clusters related to defense, security, aviation, and space have been established.

Currently, Turkey has achieved a certain level of national defense industrial capability. The development of MILGEM corvette, ATAK helicopter, ALTAY tank are among the main achievements of the defense investments over the years. While the Turkish defense industry has some notable success in recent years, the defense industry

clustering is still under development. Therefore, in this study, we aim to present the current status and a brief assessment on the defense industry clustering in Turkey.

2.Literature Review

2.1 Clustering

Today, even acquiring cheap labor is becoming ineffective in a comptetitive global economy. Therefore, more innovation, successful research and development (R&D), and high intellectual capital is needed to stay competitive. The small and medium-sized enterprizes (SMEs) have limited resources to invest in innovation, R&D, and intellectual capital. Clustering is seen as a solution for SMEs to stay competitive against large companies with more resources. Thus, clustering in various industries has gained an increasing attention.

The notion of clustering is introduced by Tyron in 1939 [10] and Porter introduced the term of business clustering with his famous work titled Competitive Advantage of Nations in 1990 [22]. According to Porter, business clustering is the geographic concentration of firms from a particular industry with the firms from supporting industries and related public and private institutions [9]. Porter states that "A cluster allows each member to benefit as if it had greater scale or as if it had joined with others without sacrificing its flexibility." [9]. The Porter's diamond model is used by many researchers to analyze the competitiveness of nations and clustering in various industries [11]. Clusters may be developed based on industrial similarity or interdependency [23]. According to Jacobs and De Man [13] three notions of clusters can be identified: Regionally concentrated industry, sectors or groups of sectors, and production chains.

The mature clusters, which are based on a good strategic plan, share certain common characteristics [12]:
- Common customers
- Common suppliers
- Shared infrastructure
- Shared pool of human resources
- Shared opportunities for educating and training of employees in the defense companies
- Shared access to research and development institutions, universities, and non-profit organizations playing a role in the defense industry
- Common risk, capital, and market structure.

2.2 The Phases of Cluster Development

Similar to biological systems, clusters go through various phases in their life cycle. According to Porter, these are (i) birth, (ii) evolution, and (iii) decline [9]. According to Rosenberg [18], the clusters have four phases in a life cycle. These are embryonic stage, growth stage, maturity, and decay. These two life cycle approaches are in fact similar.

Sometimes, the birth of a cluster occurs naturally based on market needs created by demanding consumers. The textile clustering in Denizli region of Turkey could be given as a prominent example to that kind of clusters [3]. Sometimes, the clusters in a region cause the birth of another cluster. The environmental cluster in Finland is developed due to the pollution created by other industries such as energy, forestry, metals, and chemicals [9]. During the second stage, the cluster starts to evolve. The cluster gains a momentum in creating and maintaining a competitive advantage. More firms are attracted to the clusters. The support to the cluster increases as the government, the institutions, and supporting industries show an increasing interest. In this stage, the competition within the cluster also

increases. In the last stage, the cluster starts to lose its competitiveness due to both internal and external factors.

According to Rosenfeld [18], the embryonic stage of a cluster may be the result of innovations, inventions, or inward investment. The growth stage follows the embryonic stage. The growth stage occurs with the development and restructuring of the related market attracting more entrepreneurs for new spin offs and startups. In the maturity phase, the processes and services become routine and costs become a key competitive advantage. At the last stage, the cluster is being challenged by alternative clusters and industries. In this decay stage, the cluster starts to lose its competitiveness and slowly decay in time.

2.3   Objectives of Clustering

Kuah states that starting a business in a cluster has many benefits for the startup [5]. According to Porter [9], being in a cluster has many benefits for companies such as:

- Better access to employees and suppliers
- Access to specialized information
- Complementaries
- Access to institutions and public goods
- Better motivation and measurement

Arıç [7] states that there are four main reasons why a group of firms start or join a cluster:

- Networking
- Political and social benefits
- Commercial and strategic alliances
- Innovation

Clusters are also effective environments for information gathering and sharing [14]. Conferences, seminars, invited talks, expositions are good opportunities for networking and information/expertise/lessons learned sharing. Therefore, effective clusters place a special emphasis on such events. Effective clusters are also the sources of innovation. Today, clusters and innovation have become the terms which are commonly used together. The Silicon Valley located in San Jose, USA, is a good example of a cluster as a source of innovation.

3. Defense Industry Clusters in Turkey

The firms serving the defense industry have certain roles depending on their size, products, and services. There are three main roles: Main contractor, subcontractor, and suppliers of various devices and components. There are also some firms that conduct analysis, design, testing specialized in certain areas. Figure 1 shows the hierarchical structure of the defense industry firms and institutions depending on their roles [1].

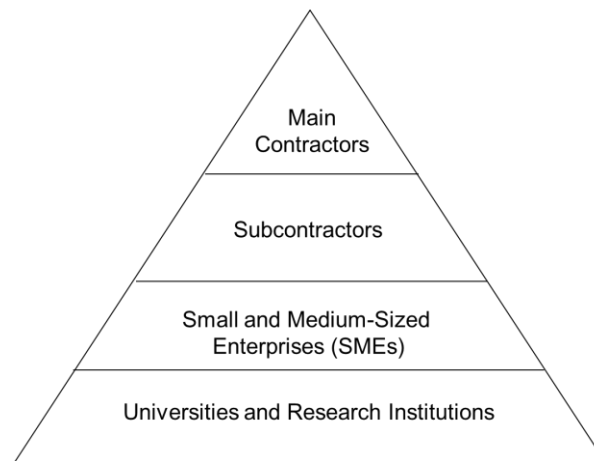# ASSESSMENT OF DEFENSE INDUSTRY CLUSTERS IN TURKEY

Fig.1 Hierarchy of Dependence in Defense Industry

Due to security and confidentiality of the defense technology in defense systems, the need to develop these systems, at least the critical portions of them within the country is obvious. Many countries place limitations on the use of exported defense systems. For example, in the USA, the export of defense systems is subject to the approval of the congress. Furthermore, the maintenance costs of exported defense systems are considerably high. Therefore, independence in defense systems has many advantages for the countries.

Defense systems are generally complex, large-scale, and software-intensive systems [19]. Generally, the defense contract is won by a main contractor. This main contractor has many subcontractors to develop various parts of the system. The main contractor may also get services for design, testing, and certification of specialized components. In some cases experts from consultancy firms or scientists from universities may be hired for consultancy. As a result, defense system projects have many stakeholders [19]. Defense systems are generally developed for governments and stakeholder involvement is especially challenging in government-contract software projects [16]. Therefore, clustering has many benefits in developing defense systems by bringing these stakeholders together. In order to achieve competitiveness, the firms in the cluster are required to form effective collaboration circles both within the cluster and outside the cluster. The success of firms in the cluster is higher than the firms outside the cluster due to fact that no firm can overcome the challenges related to development of defense systems. Since defense systems are large-scale and complex, it is quite unlikely that the expertise and resources needed to successfully develop a defense system will be possessed by only one firm. Thus, clustering is one of the best solutions for this problem. Porter emphasizes that clusters are formed by industrial firms that share common benefits and firms from different industries supporting the industrial focus of the cluster. The common benefits are shared pool of resources, institutions, a shared culture, common opportunities, and similar threats [6]. The strategic alliances between defense industry firms are affected by the conditions due to political, social, economic, and security climate in the country.

The defense firms are not the only players in creating a competitive defense industry. Therefore, there are other actors playing significant roles in achieving a strong defense industry. Ministry of Defenses, government acquisition agencies, public and private research and development institutions, universities, non-profit organizations are among these other actors. According to Ziylan, a large defense project cannot be achieved by a single main contractor without having government support [2]. Having adequate qualified human resources in the Turkish defense industry is also important [4]. Therefore,

universities and research institutions should be in close contact with the defense industry and be able to offer programs and courses needed by the defense industry. Creating a synergy between all these actors will help to achieve a strong defense industry. Consequently, the defense clusters would create communication channels between all these actors.

The fast growing defense industry started to realize the importance of clusters in terms of achieving a competitive industry. The national policies and reports (for instance [17]) also state that creating effective defense clusters is a necessity. Furthermore, having a strong technological base and a sustainable growth in variety and depth of defense industry is crucial for competitiveness.

Murad Bayar, the Head of Turkish Undersecretariat of Defense Industries (SSM) between 2004 and 2014, drew attention to the importance of defense industry clustering during his appointment. According to Bayar, currently, the defense industry in Turkey has yet to reach the capability to create innovative and critical defense technologies. He states that the development of capable main and subcontractors and the creation of necessary culture in defense industry would take time. Therefore, SSM is trying to lead the SMEs and other firms in defense industry to establish defense project management practices and increasing the technology development capability. He also highlights that clustering is an important tool in guiding these firms and achieving these goals. Bayar, signifies the example of OSSA as a successful implementation of defense clustering [8].

The first defense industry cluster in Turkey is OSTIM Defense and Aviation Cluster (OSSA) established in 2008 [20]. Two more clusters followed OSSA. Teknokent (Technology Park) Defence Industry Cluster (TSSK) [21] located in Middle East Technical University in Ankara is established at the end of 2010. Aerospace Clustering Association (ACA) [24] located in Izmir started in 2010 as the first cluster specializing in Aviation and Space technologies. Eskişehir Aviation Cluster (ESAC) [25] followed ACA in aviation and established in 2011 in Eskişehir, one of the cities hosting a large Air Force base in Turkey. Another cluster focusing on Space, Aviation, and Defense is established in 2014 in Bursa. Currently, this cluster is in early stages. 55 firms applied for memberships. Table 1 shows an overview of the defense clusters in Turkey.

Table 1 Industry Clusters related to Defense in Turkey

Cluster Name	OSTIM Defense and Aviation	Teknokent Defence Industry Cluster	Aerospace Clustering Association	Defence, Aviation, Space Clustering Association	Eskişehir Aviation Cluster
Cluster Abbreviation	OSSA	TSSK	ACA	SAHA Istanbul	ESAC
Cluster Focus	Defense and Aviation	Defense and Security	Aviation and Space	Defence, Aviation and Space	Aviation
Location	Ankara	Ankara	Izmir	Istanbul	Eskişehir
Year Established	2008	2010	2010	2015	2011

Number of Companies and Corporates	160 (7500 personnel)	70	37 Corporate 14 Academic 31 Companies (Over 60 members)	30+	32

4. Conclusion

The clusters consisting of defense firms have similar characteristics. We believe this is due to the inherent characteristics of defense industry. The main characteristic of the first three defense industry clusters in Turkey is that they mostly consist of SMEs and they are located in the same geographic area. However, Aviation and Space Valley of France, consists of not just SMEs but also main defense contractors. The Teknokent Defense Industry cluster located in Middle East Technical University in Ankara and Aviation and Space cluster located in İzmir, have strategic alliances with the universities located nearby. The universities offer related graduate programs and courses to educate the practitioners of the firms in the clusters. The OSTIM Defense and Aviation Industry cluster is different in the sense that the main focus is on manufacturing rather than research and development. Therefore, the cluster consists of SME manufacturing firms and the cluster facilitates the coordination.

The lack of guidance and determination of roles in defense clustering presents a challenge in Turkey. Without an in-depth analysis and planning, there are various attempts from different government agencies for clustering initiatives. As a result, the optimal use of resources may not be achieved. One of the first steps in finding a solution to the current set of problems is to fill the gaps in the industry regulations related to clustering and cluster development.

The defense industry clusters in Turkey are in their early phases and they are not developed to the point of fully functioning clusters. The slow pace in the development may be attributed to the deficiencies in the cluster formation during early phases. Currently, the defense clusters in Turkey are only able to bring the SMEs together to increase coordination and the governing body of these clusters solely function as an association providing a list of subcontractors to the main contractors. The main reason is the limited perspective of the SMEs forming the clusters. Rather than cooperation and forming strategic alliances with other SMEs to increase their capabilities, they only try get a piece from business and benefit from government subsidiaries such as tax relieves. One of solution to this problem may be establishing processes to benefit from experts and academicians as consultants along the way. However, these strategies and solutions should not be perceived as items in some strategy papers but they should be considered as actually functioning and effective processes.

The defense industry clusters in Turkey have not specialized in a particular defense area or a technology. Specialization in certain defense areas may produce better results. For example, the French aviation and space industry clustering established in Midi-Pyrenees and Aquitaine region of south-eastern France is specialized in structural aviation engineering. The French aviation and space industry clustering established in Ile De France region of northern France is specialized in aviation electronics and aircraft engines. Another cluster located in Cote D'azue region of south-eastern France develops projects related to helicopters.

While the firms in the defense clusters has achieved a certain level of synergy, information sharing, and collective R&D, the outside links of clusters is currently weak. Especially the links between the defense firms in clusters and the universities need to be

improved. The universities should be more engaged to defense industry clusters and they should actively participate in defense project development.

Even though, there are still many problems, the defense industry clustering in Turkey has been successful in achieving the intended goals in the last 5 years. The current trend shows signs of improvement and will likely to increase the national defense industry capability.

Acknowledgements and Disclaimers:

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