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Aerospace Industry in Queretaro, Mexico: A perspective of Regional Innovation System

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Abstract

Using the theoretical perspective of the Regional Innovation System (RIS), this paper analyzes the structure of the aerospace industry in Mexico, focusing on the region of Querétaro, Mexico. The objective of the research is to analyze the development, growth prospects , key agents and their interrelations of the aerospace industry in the Queretaro region from the perspective of the RIS. The aerospace industry in Querétaro has more than 40 companies, research centers and universities, intermediate and government agencies that focus on the aerospace industry, the region has presented rates of economic growth above the national average in the last 6 years, however to achieve the consolidation of the aerospace industry towards an RIS requires greater efforts of articulation and coordination among the agents that make up the system, it can be achieved through strategies and policies in joint collaboration for the consolidation of the industry in the region.

Keywords
Innovation Systems, Regional Innovation System, Aerospace Industry and Regional Development

1. Introduction

Mexico's aerospace industry has registered exponential growth over the last decade. Mexican exports of aerospace products have grown extraordinarily since 2010, the level of exports has increased to 14% on an annual average during the period 2010-2016 and in 2016 it reached an amount of $ 7,164 million dollars. Between 2003 and 2015, the Foreign Direct Investment (FDI) accumulated in the Mexican aerospace industry was of 2530.4 million dollars. (FEMIA-SE, 2016). Most studies about aerospace industry innovation in Mexico so far focused on the national scale, the region-level analysis is much needed to understand the growth and concentration of aerospace industry development in Mexico. The development of aerospace industry in the region of Queretaro has been maintained for the last 10 years, and has been consolidating as the region of Mexico that records the highest growth in terms of economic indicators, in the last five years the direct foreign investment accumulated in the aerospace sector of Queretaro amounted to 1,300 million dollars, making it the region with the highest index of FDI in the country (SEDESU, 2016). The region concentrates the largest number of public research centers related to R & D activities in the aerospace industry, which greatly contributes to the attraction of higher value-added projects and the generation of better paid jobs, as well as great support for part of the government of the region to boost the development of the industry. This research examines the growth of aerospace industry in Queretaro using the perspective of Regional Innovation Systems (RIS). The reminder of the paper is organized as follows. In the following section of the literature review (Territorial Agglomeration, Cluster and RIS) are reviewed. Second, methodology and the case are introduced. Third, the evolution of the aerospace industry in Queretaro in terms of socio-economic development, key agents and consolidation towards a RIS is discussed. Finally, the contribution is provided about the theoretical contribution of this research.

2. Literature Review: Territorial Agglomeration, Cluster and Regional Innovation System

2.1 Territorial Agglomeration

In the economic literature, the idea of the importance of the agglomeration of companies of the same industry within a specific territory has been developed, (Marshall, 1949; and Fombrum and Astley, 1983; Piore and Sabel, 1984; Porter, 1990) and it is mainly due to three mechanisms:

1. The agglomeration acts like a magnet, attracting specialized suppliers that promote and sell their products in a larger market and thus generate economies of scale. 2. There is a specialized human capital attraction within the agglomeration. The presence of a specialized labour market favours the reduction of costs that are generated by the training of new employees. 3. The agglomeration facilitates the sharing of knowledge through the concentration of companies and specialized human capital.

The first two mechanisms of agglomeration generate cost advantages for companies, which are also called static externalities; The third mechanism mainly generates knowledge gains for companies, also known as dynamic externalities. The agglomeration of companies and other agents in the same territory has emerged as a new form of organization based on cooperation and the mutual search for synergies in order to face the increasing turbulence and uncertainty of the environment (Krugman and Venables, 1995; Sexenian, 1994; Rabelloti and Scmitz, 1999).

Territorial agglomeration can be defined as a geographically delimited area in which diverse companies are interdependent with each other (Rosenfeld, 1997) or as a non-random geographical agglomeration of similar companies and / or with close complementary capacities (Ellison and Glaeser, 1997). Therefore, the territorial agglomerations of companies, both belonging to the same industry and to related industries, make up a structural situation in which, in a relatively small geographical space and with clearly defined limits, a multiplicity of agents involved in a network interact of high contractual density and of formal and informal agreements for the coordination of productive complementarities. The proximity between the agents located in a certain region, and the repeated exchanges between them, encourage better coordination and greater confidence. In consequence, mitigate the problems inherent in random relationships, without imposing the inflexibility of vertical integration, or raise the challenges involved in the creation and preservation of formal ties, as in networks, alliances and partnerships (Giuliani and Bell, 2004), hence its great attraction, since, currently, the competitive advantage depends on a more productive use of inputs, which requires constant innovation. Because companies can access advanced technology and make intensive use of knowledge, the differentiating factor lies in the quality of the local business environment and the way in which those companies compete in that common place.

2.2 The Cluster Aproach

The proliferation in the world of these territorial agglomerations has popularized the “cluster” concept proposed by (Porter, 2000) as an agglutinating and generic denomination of the phenomenon, in this respect (Nadvi and Schmitz, 1999:15) argues that "the term cluster designates geographical concentrations of agents dedicated to the same type of productive activity”. The term encompasses several concepts traditionally used in different countries or areas of analysis such as: industrial districts, territorial agglomerations and local or regional production systems. This is the point at which they coincide (Martin and Sunley, 2003:12), when mentioning that "one of the most influential exponents of the emphasis on economic localization is Michael Porter, whose concept of industrial clusters has quickly become the standard of the concept in the field”.

The term cluster was introduced by (Porter, 1990:25), who defines it as "the geographical concentration of interconnected companies in a particular sector". It is, therefore, a geographically dense group of related agents, belonging to a specific industry or sector, united by common and complementary features. The cluster approach is constructed under three types of dimensions (Porter, 2003); the first refers to the geographical dimension, due to the externalities that come from proximity and concentration throughout a territory; the second depends on economic activity, which includes activities related to agents from different sectors that are in some way interconnected by goods and services; The third dimension is the business environment, referring to the specific conditions that are often the result of individual or collective actions between agents.

The evolution of the concept of cluster has meant a modification in relation to the traditional concept, whereas at the beginning the key element was basically the location of agents within a specially defined territory, now it is considered that the key element of a cluster is the transmission of knowledge among agents that share the territory, that is, there is an evolution of the concept towards innovation systems where the main input is knowledge (Audretsch, 1998; Bell and Abu, 1999; Boschma, 2005; Feldman, Francis and Bercovitz, 2005; Martin and Sunley, 2003; Giuliani and Bell, 2004; Tödtling and Trippl, 2005).

2.3 The Regional Innovation System Approach

In general terms, a system can be described as "any group of interacting, interrelated or interdependent parts that form a complex and unified whole that has a specific purpose" (Bertalanffy, 1969). The links or interdependencies between the components, in the form of positive or negative feedback, make it a system, instead of a collection of different parts (Bertalanffy, 1969). That is, the relationships between the different elements are considered vital for the configuration and behaviour of any system. In innovation studies, the use of systems approaches has been increasingly reviewed, such approaches allow analyzing the complexity, non-linearity and feedback loops of different types of innovations.

Several authors (Freeman, 1987; Nelson, 1993; Mowery, 1998), have developed the theory of Systems of Innovation (SI), which considers fundamental the understanding of the processes of generation and diffusion of knowledge, as well as its transformation into technology. In this sense, (Freeman, 1987:15) defines an innovation system as "a network of agents in the public and private sectors, whose activities and interactions initiate, import, modify and disseminate new technologies".

An Innovation System (SI) can be defined at a national, technological, regional, local or sectoral level. At all levels, it involves the creation, dissemination and use of knowledge as key elements, innovation systems are formed by agents and institutions and their relationships. Next, the approach of the Regional Innovation System is analyzed, as well as its main characteristics.

The Regional Innovation Systems (RIS) have had an important boom since the end of the nineties, motivated by the growing decentralization of the policy of innovation and technological development to the regional scope (Cooke et al., 1997; Asheim and Coenen, 2005), the boom can also be attributed to the successful experiences of some regions, as is the case of Silicon Valley in California, where it is demonstrated how the concentration of industries in specific territories promotes economic development and generates capacities of innovation (Castells, Hall and Geoffrey, 1994).

The RIS approach has been developed around the idea of approaching innovation as a systemic process (Lundvall, 2007) that benefits from the concentration of activities and geographical proximity (Asheim, 2007; Boschma, 2005, Carrincazeaux & Gaschet, 2015; Cooke et al., 1997). The central idea behind this approach is that innovative performance depends not only on the knowledge generated by companies and public sector organizations, but also the way in which these different types of agents interact with each other with respect to the production and dissemination of knowledge.

The first definition of RIS is attributed to (Cooke et al., 1997:4), who defines it as that framework constituted by "subsystems of generation and exploitation of knowledge that interact and are linked to other systems, for the commercialization of new knowledge". For their part (Doloreux & Parto, 2005:141) mention that the SRI is "a set of interactions between public and private interests, formal institutions and other types of organizations that work according to organizational and institutional arrangements and relationships that lead to the generation, use and dissemination of knowledge in a region."

From the RIS approach, the region is described as the dynamic territorial unit in which the different economic agents operate and from which the basic elements that allow the generation of knowledge and innovation necessary to guarantee the growth and economic development. The SRIs are composed of three spheres: a business network, an institutional infrastructure and the interactions that take place between the agents that compose it (Edquist, 2011;

Cooke et al., 1997; Doloreux, 2002; Asheim and Coenen, 2005). On the other hand, Cooke et al. (1997:8) mention that "a regional innovation system must have companies, centers of knowledge, a governance structure and financial capacity, all within a collective order based on micro-constitutional regulation conditioned by trust, exchange and cooperative interaction. " The agents that make up a regional innovation system are, among others, companies, government agencies, public and private research centers, universities, intermediate organizations, technical training institutions, development banks (Edquist, 2001; Niosi , 2003; Cooke et al., 1997).

The role of the companies is crucial since they are the agents that apply the scientific knowledge, both the knowledge developed by other companies, as well as the knowledge produced by the scientific community, in this way the RIS evolves when developing systemic interactions between the sources of knowledge (public and private research centers, universities, intermediate organizations and the business sector). In order to establish a regional innovation system, strong and constant interactions are required between public and private agents that are gathered in a certain region and that, interacting with each other, enable the generation, application and dissemination of knowledge that are translated into innovation processes. Table 1 shows the elements of the Regional Innovation System, the key agents that compose it, delimitation, concept and focus of analysis.

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Table 1. The Approach of RSI

CONCEPT	DELIMITATION	KEY AGENTS	FOCUS OF ANALYSIS
"Set of agents that contribute, interrelated to the generation and dissemination of knowledge in a specific region" (Cooke, 1997; Doloreux & Parto, 2005)	The "region" is the territorial unit in which the different economic agents operate and, from their interrelation, they allow the generation of knowledge and the necessary innovation to promote growth and economic development	Companies Universities Centers of R & D Government institutions Intermediate Organizations Training Centers Development Bank	- Localized learning -Heterogeneous agents -Knowledge exchange - Institutions

3. Methodology

For the development of the research, an in-depth analysis of the specialized literature on Regional Systems of Innovation, Territorial Agglomeration and the Cluster Approach was carried out. A literature review has proven to be a crucial step in structuring the field of research (Easterby-Smith, Thorpe, and Lowe, 2002) and aims to be the basis for creating and advancing knowledge, facilitating the development of theory, to solve problems in different areas of research and discover those that require more detailed research (Webster and Watson, 2002).

This research is mainly based on a qualitative case approach, which allows facilitates exploration of a phenomenon within its context using a variety of data sources. This ensures that the issue is not explored through one lens, but rather a variety of lenses which allows for multiple facets of the phenomenon to be revealed and understood. The information is gathered from statistical information, the government reports, and company reports. The process that was carried out with the literature review and the data obtained for the qualitative case consists of the following steps: selection, revision, analysis, and synthesis, according to what was established with (Levy & Ellis, 2006) this process guarantees a structured and effective review.

In terms of the research site, this study focuses on the region of the state of Queretaro,, based on data from the Government of the State of Querétaro, the aerospace industry in the state has the highest growth rates in the country's industry. The main factors that have contributed to the growth of the industry are: The Foreign Direct Investment accumulated in the industry in the last five years amounted to $ 1,300 million dollars (the state with the highest index in the aerospace industry in the country) (SEDESU , 2016)

4. Towards a Regional System of Innovation of Aerospace Industry in Queretaro, Mexico

4.1 Aerospace Industry in Mexico

Mexico's aerospace industry has registered exponential growth over the last decade. Mexican exports of aerospace products have grown extraordinarily despite the crisis of 2009 (when it had a fall of 18% compared to 2008), the level of exports has increased to 14% on an annual average during the period 2010-2016 and in 2016 it reached an amount of $ 7,164 million dollars. In the case of imports they reached an amount of $ 5,898 million dollars, maintaining a surplus of $ 1,266 million dollars in the trade balance of the sector at the end of 2016 (Figure 1) (FEMIA, 2016).

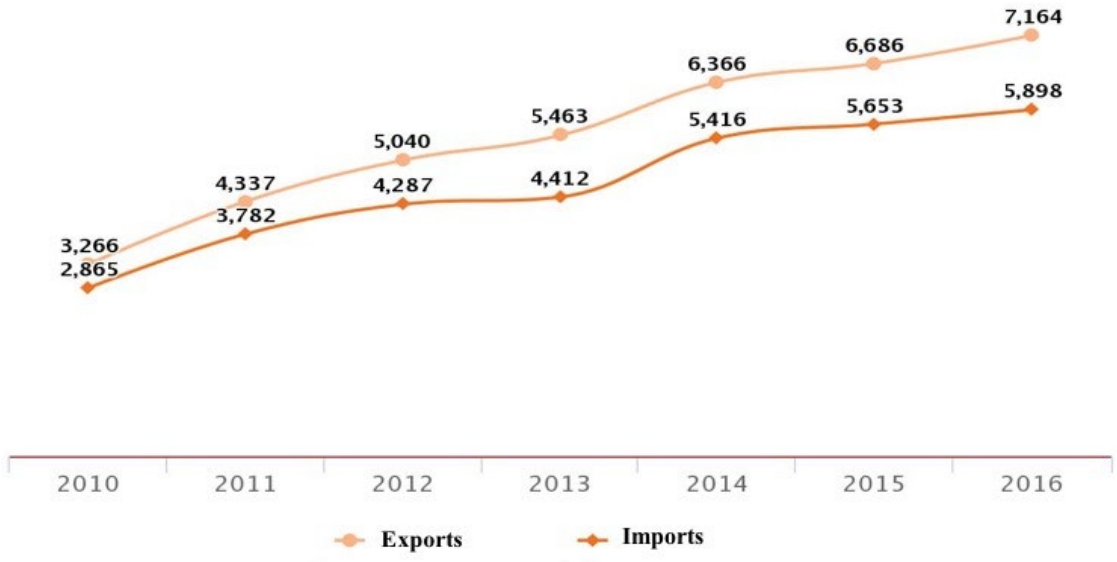

Figure 1. Mexican Aerospace Trade Balance, millions USD, 2010-2016.

The growth in investments and exports generates very favourable conditions for development and a positive outlook in the industry. It is estimated that by 2021, exports worth 12 thousand 267 million dollars could be reached in an optimistic scenario. In 2016, 330 companies in the aerospace industry registered in Mexico, most of them with NADCAP and AS9100 certifications and employing more than 45,000 highly trained professionals. (PROMEXICO, 2016).

The figure 2 shows the growth in the number of companies in Mexico from 2010 to 2016, this represents an annual growth rate of 18%.

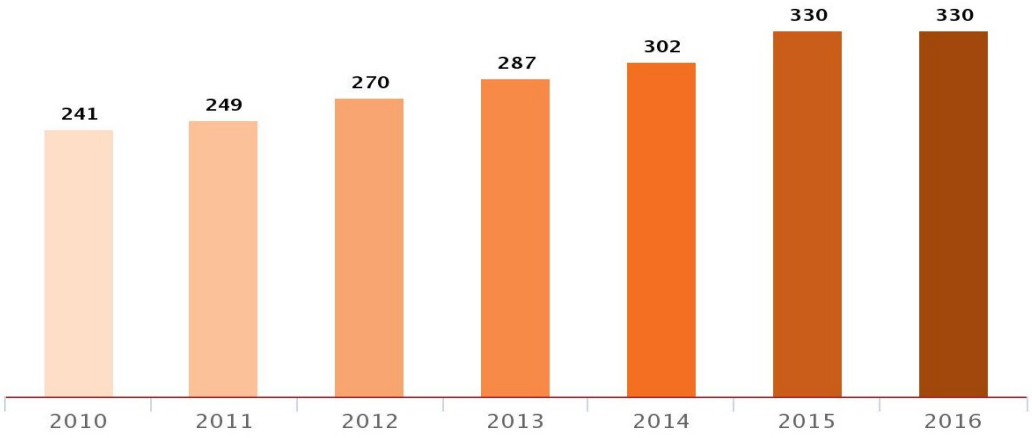

Figure 2. Number of Aerospace Industry Companies in México, 2010-2016.

Most of Mexico's aerospace industry is located in the states of Baja California (Mexicali), Chihuahua, Nuevo León, Querétaro, and Sonora (Guaymas), in primarily the central and northern states (PROMEXICO, 2016). This makes sense because these states are some of the most industrialized, they are close to the US market, and on average, they possess good communications infrastructures and support from the regional government to the industry. The figure 3 shows the number of companies in the aerospace industry by region.

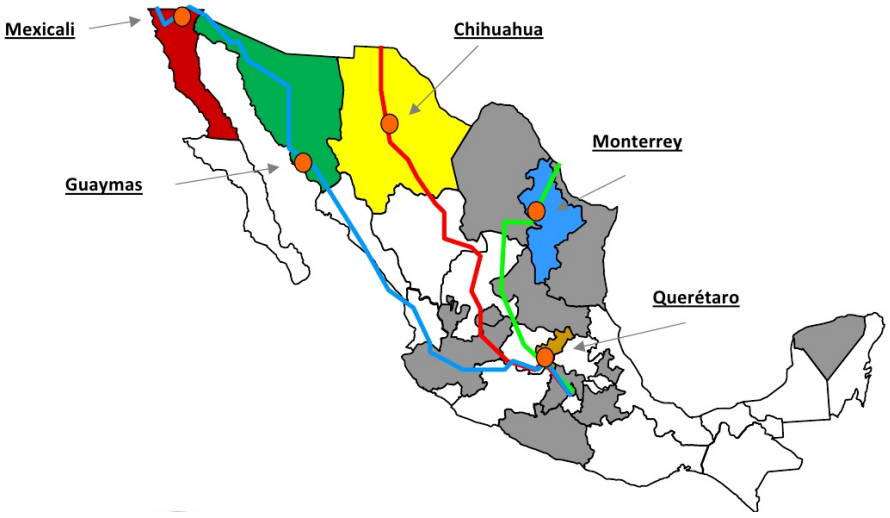

Figure 3. Number of Aerospace Industry Companies by Region.

According to data from (SEDESU, 2016), the aerospace industry in Queretaro has the highest growth in the sector in the country, the factors that have contributed to this growth are education focused on competencies and internationalization; development of local suppliers; joint ventures, and promotion of innovation and technological development.

4.2 Aerospace Industry in Queretaro

Located in the central region of Mexico, with an area of 11,699 km2 and 2.03 million inhabitants make it one of the most densely populated states, with 157 inhabitants / km2. In the last 20 years, the population growth rate is 2.7% higher than the national average, driven by internal migration, mainly from Mexico City and the State of Mexico attracted by the installation of a large number of companies and infrastructure development, (SEDESU, 2016).

The privileged position of the state, an obligatory route between Mexico City and the United States, ensures immediate access to the major national markets, which is why it attracted companies from all productive sectors from the process of industrialization. The installation of national and international companies has allowed that in recent years the state has presented rates of economic growth above the national average. The table 3 shows the principal socioeconomic data of Queretaro.

Table 2. Socioeconomic data of Queretaro

Indicator	Region Value	Average Country	Place in the Country
Population (millions)	2,038	1,62	22
Area (km2)	11699	0,60	27
Population density (hab / km2)	174	61	8
GDP per capita (thousands of pesos / year)	$249,000	$160,000	3
Economically Active Population (EAP) (%)	55.3	60.4	6

The background of the industry in Queretaro is focused on sectors such as textiles, agro-industries, food and beverages, metal-mechanics and auto parts, electrical appliances, electrical / electronics, chemicals, rubber and plastics. Currently, sectors such as aerospace, information technologies, and automobile assemblers are being promoted; the aerospace industry is a strategic sector for the state, various actions have been taken for the development of the industry.

The region of Querétaro has some of the key players in the aerospace sector worldwide: Bombardier, Airbus, GE, Safran, ITP and PCC Aerostructures, it is noted that the state has the first and only specialized university in the aerospace industry in Mexico , the University of Aeronautics of Querétaro (UNAQ). Table 3 shows the number of registered companies that develop productive activities related to the aerospace industry.

Table 3. Companies of the Aerospace Industry installed in the region of Queretaro

	Companies related to the Aerospace Industry	Core Business
1	Aernnova Aerospace Mexico, S. A.	Aerostructures and Interiors
2	ITP Ingeniería y Fabricación	
3	Bombardier Aerospace Mexico	
4	Airbus Helicopters Mexico	
5	Aernnova Compenents Mexico, S. A.	
6	PCC Aerostructures Mexico	
7	Curtiss Wright Controls Flight Systems	
8	Quetzal Aeroespacial (UAV-UAS)	
9	SIASA Air	
10	GKN Aerospace	
11	General Electric Infraestructure Queretaro	Engines and Components
12	SNECMA Mexico (SAFRAN Group)	
13	ITA México	
14	Messier Bugatti-Dowty Mexico	Linked to Landing Trains and Braking Systems
15	Meggitt Aircraft Braking Systems Queretaro	
16	Tech Ops (MRO)	Linked to Maintenance and Repair Aerospace
17	ITR Turborreactores de Mexico	
18	SAMES (Snecma America Engine Services)	
19	Messier Services Americas, (SAFRAN Group)	

20	RedWings (MRO)	
21	Regent Aerospace Corporation , S. A. de C. V.	Linked to Electrical-Electronic Systems
22	Prettl Electric de México, S. A. de C. V.	
23	AXON Interconex S.A.	
24	CRIO S. A.	Special Processes
25	Southwest United de Mexico	
26	NDT Expert Mexico	
27	Aeroprocess TTT	
28	Dishon Queretaro, Mexico	Precision Machines, Materials, Equipment and Tools
29	Especialistas en Turbopartes	
30	Hyrsa Aerospace CNC	
31	Cormer Aerospace	
32	Tighitco Latinoamerica S. A.	
33	Especialistas en Turbopartes	
34	Gonzalez Aerospace	
35	Global Composites Manufacturing	
36	TechFab Mexico	
37	Elastómeros de Queretaro S.A.	
38	Carpenter Aceros Fortuna	Raw Materials
39	Serviacero Especiales	
40	Thyssenkrupp Aerospace Mexico, S.A.	

The aerospace industry is a complex model of organization in relation to production, where the network of local suppliers is linked to an assembler that operates as a leading company. The spillovers of knowledge that are generated between companies are important, and play a central role for the efficient development of the Regional Innovation System.

Although in Querétaro the manufacturing processes for industry predominate, the region concentrates the largest number of Public Research Centers related to R & D activities and contributes to the attraction of higher added value projects. Table 4 shows the main Research Centers and Universities that focus on the Aerospace Industry in the region.

Table 4. Research Centers and Universities that focus on the Aerospace Industry in the region of Queretaro

RESEARCH CENTERS AND UNIVERSITIES	
Research Centers	**R & D**
Centro de Ingeniería y Desarrollo Industrial (CIDESI)	Metrology and Calibration. Analysis of materials. Modeling, simulation and instrumentation
Centro de Investigación y Asistencia Técnica del estado de Querétaro (CIATEQ)	Measurement systems. Telecommunications and information technologies. Process engineering. Advanced manufacturing
Centro de Investigación y Desarrollo en Electroquímica (CIDETEQ)	Corrosion, functional materials, characterization and analysis of materials.
Centro Nacional de Metrología (CENAM)	Calibration, reference materials, material traceability.
Centro de Investigación y de Estudios Avanzados (CINVESTAV)	Multifunctional materials, nanomaterials. Materials for applications in energy and environment. Bio-organic materials.
Centro de Ingeniería Avanzada en Turbo maquinaria (CIAT)	Development of aerospace propulsion systems and power generation.
Centro de Alta Tecnología (CAT-UNAM)	Engineering design, composite materials, aeromodelling tests.
Universities	**Programs of Study**
Universidad Autónoma de Querétaro	Industrial, electrical and electronic engineering, mechanical engineering, design and innovation, structures, nanotechnology, sustainable energy

Instituto Tecnológico de Querétaro (ITQ)	Industrial, electrical and electronic engineering, mechanical engineering, materials development, advanced technology, business management, logistics
Universidad Nacional Aeronáutica de Querétaro	Training of technicians, university technicians, engineers and masters in aeronautics, aeronautical engineering in manufacturing, aeronautical mechanical design, control of aircraft systems
Universidad Politécnica de Querétaro (UPQ)	Mechatronic engineering, manufacturing technologies, networks and telecommunications, international business
Instituto Tecnológico y de Estudios Superiores Monterrey Campus Querétaro	Engineering in innovation and development, industrial and systems, mechatronics, digital systems and robotics, creation and development of companies

Universities and research centers oriented to research in engineering and technology generate synergy within the Regional Innovation System through the link between companies in the aerospace industry. For its part, the interest of the intermediate agencies is to strengthen the capacities and attract funds, articulating actions with national and international centers linked to the theme to form networks of excellence that ensure the formation of a critical mass of human resources for the aerospace industry in the state of Querétaro (Casalet, 2010).

Table 5. Research Centers and Universities that focus on the Aerospace Industry in the region of Queretaro

INTERMEDIATE AND GOVERMENT AGENCIES	
INTERMEDIATE AGENCIES	**MISSION**
AeroCluster Queretaro A. C.	The AeroCluster of Queretaro, is an association recognized for providing a high value to its members and allies, which promotes and strengthens the sustainable development of the aeronautical and space industry of the State of Queretaro nationally and internationally.
Centro para el Desarrollo de la Industria Aeronáutica (CEDIA)	Promote the development of the aeronautical industry, training students and technological solutions for the aerospace industry of the state of Querétaro
El Laboratorio de Pruebas y Tecnologías Aeronáuticas (LABTA)	The laboratory organized by the three centers of the National Council of Science and Technology (CONACyT) in the state (CIDETEQ, CIDESI and CIATEQ) will allow to evaluate the durability that the components and materials that are used in an aircraft must have by means of tests that reproduce their operating conditions on the flight.
Aeroconsulteck Mexico	The Company's core expertise is the training for quality management system certifications, the optimization of the effectiveness of processes, the training of internal auditors, as well as workshops and related training services in accordance with international aerospace standards.
GOVERMENT AGENCIES	**MISSION**
Consejo de Ciencia y Tecnología del Estado de Querétaro (CONCYTEQ)	Integrate research centers and higher education institutions, with specialty lines of interest for the aerospace sector, in order to promote high-level research, and the training of specialists and certified facilities.
Red Temática Nacional de Aeronáutica (CONACyT)	Group of researchers, entrepreneurs and students with common interests, willing to contribute knowledge, train specialized human resources and collaborate in the development of projects in the field of aeronautics supported by CONACyT.

Secretaría de Desarrollo Sustentable (SEDESU)	To promote the sustainable human development of the inhabitants of the State of Querétaro, to present and future generations, through the rational and equitable use of natural, economic and social resources; thus achieving access to better living conditions.

The rol of government agencies is highlighted to encourage innovation processes in the region of Queretaro through public policies, subsidies and infrastructure, government support is essential to generate knowledge spillovers and strengthen the economic and social development. Table 5 shows the main intermediate organizations, as well as their mission, it should be noted that these organizations help to promote and develop the aerospace industry.

Figure 3. Regional Innovation System of the Aerospace Industry in Queretaro

When analyzing the theoretical approach of the Regional Innovation Systems in relation to the development of the aerospace industry in Queretaro, we note that it has the main elements to consider the region from this approach, however, its consolidation is under development and the relevance of the exchange of knowledge between agents is crucial, as well as support to local companies through government institutions to develop innovation capacities that generate greater added value and strengthen the industry in the region. Figure 1 shows the relationship between agents in relation to the exchange of knowledge to develop innovation capacities and form a Regional Innovation System.

5. Conclusion

Generating and developing innovation capabilities requires diversity and feedback from various agents that make up a Regional Innovation System. In the case of the Queretaro region, there is a growing generation of capabilities in the aerospace industry in the last decade, however to achieve the consolidation of this industry in the state, greater efforts of articulation and coordination among the agents that make up the system, can be achieved through strategies and policies in joint collaboration.

For example, nowadays, in some very special cases, companies make agreements with educational institutions to carry out training programs for their employees tailored to their needs, the experience seems to indicate that these tailored courses are more successful than the standardized ones, at least in the case of relatively short trainings for basic technicians, a course to cover the common needs of the companies of the industry offered by the UNAQ (Universidad Nacional Aeronáutica de Querétaro) are a success for the companies because the institution has the capabilities and infrastructure to offer tailor-made courses for companies and are highly valued by them.

In recent years several aerospace engineering programs have been created, there is still doubt about whether the level of teachers and investments in laboratories are going to be sufficient to guarantee the level demanded by the industry in the region. In order to make more efficient the development of relevant training courses and of common interest for the

industry, it is necessary to establish mechanisms for linking academia-industry and define the main occupations and capacities that need to be covered to strengthen the Regional Innovation System, as well as the minimum levels of training to achieve them, in this case it is interesting to analyze the experiences of other countries where the industry has a greater development, such as the cases of regions in Canada and Brazil. From the support of government agencies via public policy it is essential to take a more active campaign to induce foreign companies to integrate local suppliers, additionally different types of support to local companies to achieve the certifications and competitiveness that is requires to be integrated into the value chains of the aerospace industry on a global scale.

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