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An Analysis of Resources, Capacities, and Institutions of the Aviation Industry in Mexico: Hydra Technologies Case

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This paper aboard the analysis of the aviation industry, indicating that it has high prospects for growth, specifically analyses the global situation to mention key aspects of the case of Mexico, analyzing the case of Hydra Technologies where elements found in their success are resources and capabilities such as innovation, human resources; institutions that also influence are the federal Government, school of mechanical engineering and electrical of the IPN (National Polytechnic Institute)

Keywords: *Aerospace industry; Institutions; Resources and capabilities*

Introduction

Aeronautics and space industry can be defined as all productive activities for the construction and design of airplanes, helicopters, launchers, missiles and satellites, as well as equipment from which it depends on besides engines and electronic equipment used on board (Carrincazeaux and Frigant, 2007: 264 Carrillo and Hugalde, 2009). The difference between aeronautics and aerospace is that the latter two products circulate outside the earth's atmosphere and aeronautical only in the atmosphere. Before focusing on the

analysis of the Mexican aerospace industry is important to contextualize the global environment, according to various consulting agencies at global level. The aerospace industry has high growth prospects in the future. In the case of commercial ships from 2013 to 2014 experimented a global growth in revenues of 5%. For defense ships, continue declining the revenues.

This is mainly due to the cessation of a prolonged period of armed conflict in Irak and Afghanistan (Deloitte, 2014). However, for the next 20 years announce an extraordinary growth in the global aviation industry, driven by the increase in the passenger traffic to and from emerging markets (Clearwater, 2014). Over the next decade through 2023, the annual production levels of commercial aircraft are expected to increase significantly in an estimated 25 percent (Deloitte, 2014).

Background

Currently, one fifth of the population in emerging markets take a flight every year, but by 2032 this will increase to two-thirds as overall number of passengers, more than doubled to 6.7 billion (Clearwater, 2014). Industry data indicate that the production of commercial aircraft from 1981 to 2013 showed an increase of 198% from 1993 to 2013 has increased production by 77% (Deloitte, 2014). Furthermore, this growth will be due to economic growth, a growing middle class, in addition to increasing tourism, increasing urbanization will result in megacities and migration to mention some of the factors that are ready to increase global connectivity (Clearwater, 2014).

Given this growth it is expected that the coming years will usher in an era of collaboration on products and services, R & D and market access that will fundamentally change the way organizations operate (KPMG, 2014). Specifically, talking about challenges facing it in the case of the aerospace supply chain is challenged to keep pace with its OEM customers (original equipment manufacturers) to dramatically increase the rate of production of components, systems and services. However, many aerospace suppliers have struggled to meet the new expectations and investment requirements (Deloitte, 2014).

But with these opportunities and great challenges for providers seeking to tap new markets as manufacturers demand more in their supply chains and only want to deal with suppliers that have the necessary scale and knowledge to invest heavily in technology (Clearwater, 2014). In the case of commercial aircraft producers face the challenge of producing efficient aircraft fuel use and lighter. It is therefore expected that at least one additional competitor can successfully enter this growing market in the next 20 years. This wait can impact the pace of technological innovation, replacement cycles, and prices of aircraft (Deloitte, 2014).

Table 1. Main companies of the industry at global level

Company	City/Country	Activity and Characteristics	Main activity (Revenue)
Airbus	Rotterdam/ Netherlands in Europe	Aerospatiale and defense	Commercial 95%
BAE system	London / United Kingdom in Europe	Aerospatiale, defense and security.	Platforms and Services 79%
Boeing	Chicago / United States	Aerospatiale, if defense, systems and security in the space.	Aerospatiale 61.2%
Bombardier	Montreal/ Canada	Aerospatiale and rail transport.	Aerospatiale 51.6%
Dassault Aviation	Paris/ France	Civil and military aviation.	Falcon (executive jets) 69.8%.
Finmeccanica	Rome / Italy	Aerospatiale and defense. Military aircraft and civilian applications.	Defense and electronic security 30.5%
General Electric	Connecticut / United States	General industries. Aircraft engines, power generation.	GE Capital (financing) 29.8%

General Dynamics	Virginia / United States	Aerospacial and defense.	Information and technology systems 32,9%
Honeywell	New Jersey / United States	General States, including Aerospatiale.	Automation and Control Solutions 42,4%
Lockheed Martin	Maryland/ United States	Aerospatiale and defense, information technology, space and emerging technologies.	Aerospace 31%

Source: Compiled from data report Clearwater international industrials team report

As shown in the above table the major players in the global industry are in developed countries, but the global trend to produce parts in underdeveloped countries like Mexico where it is considered one of the sectors with high competitiveness and high potential impact on the country. The value of exports grew from 2004 to 2009 an annual average of 22.4% (SE, 2010).

In Mexico, there are 241 industrial plants in 17 states, generating about 34,000 direct jobs, and foreign direct investment in the sector is increasing, where the trend is increasing. The Ministry of Economy (Secretaria de Economía) indicates to climb towards higher value-added and technological content specifically reach aircraft assembly, engineering and design, development of new products and materials (S. E, 2010). 80% of these companies are engaged in manufacturing, 10% to research and development, and the remaining 10% to maintenance and repair of aircraft (Salieri & Santibañez, 2010) sector.

Within the state with more companies related to the aerospace industry are Baja California, Sonora, Queretaro and Nuevo Leon. The main states where research is done on this industry are the Federal District, Baja California, Sonora and Jalisco. Another variable that is worth mentioning is that states with better infrastructure for the industry are the Federal

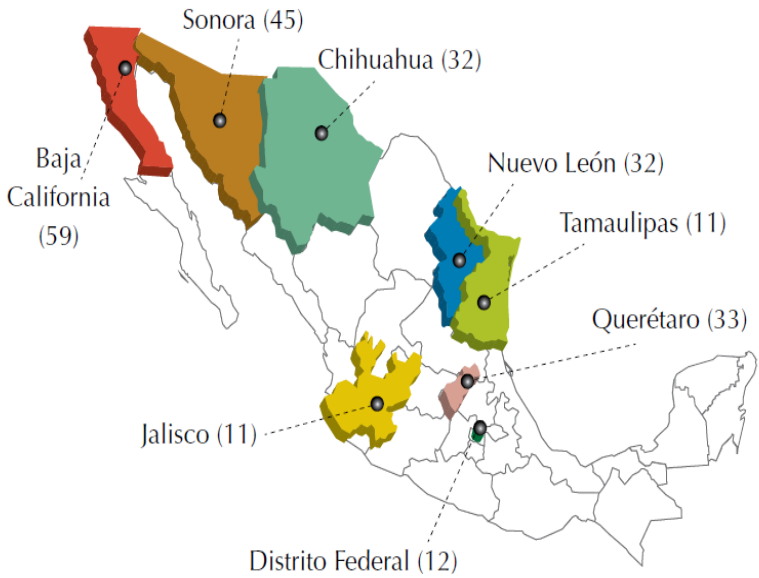
District, Baja California and Puebla (Pacheco, Orozco, Torres Vasquez, Cabrera and Virginia, 2014).

Problem

The Mexican aerospace industry is an emerging high-tech sector, which, like others, is not forming enough human capital (especially when the place of Mexico with regard to the international space sector was revised), which is required a policy aimed to train more specialists at three levels: technical, undergraduate and graduate (Pacheco et al 2014).

Furthermore, the countries with the highest investment in the area of science and technology are listed in order of hierarchy: United States, Germany, Australia, France and the European Union, with a percentage of GDP dedicated more than 2%, in contrast to Mexico, who has devoted 0.5% of GDP for the maximum value in 2012 (Pacheco et at 2014).

Figure 1. Aerospace industry in Mexico



Source: *"Dirección General de Industrias Pesadas y de Alta Tecnología" on Pacheco et al (2014).*

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Added to this problem that the country faces to become competitive industry and not just be a country that only manufacture but also research and develop new models or parts that are important in the value chain of companies. It is important to analyze a particular case like Hydra Technologies, which is located in the state of Jalisco. Particularly, it answers the following question. What role do institutions, resources and capabilities for a company Hydra Technologies as successful?

Justification

The leading manufacturers of aircraft and parts in the world that perform manufacturing operations and / or engineering companies in Mexico are: Bombardier, Honeywell, Safran Group, Eaton Aerospace, Goodrich, ITR, among others (SE, 2011). However, there are other companies that are entering a segment on building drones UAS or RPAS or (Unmanned Aircraft Systems or Remotely Piloted Aircraft Systems) As Hydra Technologies is a SME and has survived to the expectations of mortality average by INEGI (2009) is 7.7 years, in the case of manufacturing companies 9.5 years. It is therefore particularly important to analyze and see those resources and institutional elements that have enabled their survival.

In addition to this industry according to various analyzes of different government institutions could mean to Mexico an axis of development. Since as (Secretaría de Economía, 2011) the country has various advantages such as geographic location with the proximity of the most important market, experience and competitiveness in sectors such as automotive electronics and finally the various free trade agreements.

Hypothesis

The relationship between resources and the company's own capacities that have value, rarity, imitability, manage to combine organization with the support of institutions such as the government, and research institutes achieve successful companies with sustainable competitive advantage.

Objective

Determine which elements of resources and capabilities, institutional aspects that influenced the success of Hydra Technologies are.

Theoretical conceptual framework - Review of Literature

Resources and capabilities

The theory of resources and capabilities initially considers a company as a collection of productive resources in the choice of the different uses of these resources over time is determined by administrative decision (Penrose, 1959, cited by Mahoney, 2003). Beginning to describe the importance of the resources, it is believed that they are the strengths that companies can use to design and implement their strategies (Learned, Christensen, Andrews, and Guth, 1969; Porter, 1981 cited by Barney, 1991).

Meanwhile Wernerfelt (1995) mentions that the strategies that are not based on resources have little chance of success. Wernerfelt (1984) indicates that the resources and products are two sides of the same coin that most products require the services of several resources and most resources can be used in various products. Therefore, it can be said that resources are suppliers of tools for companies to generate strategies but subject to that companies have different resource endowments and need time and money to change (Wernerfelt, 1995).

Besides adequate resources, strategies generate sustained competitive advantage. Barney (1991) argues that the sources of sustained competitive advantage, the first conceived with the assumption that the company resources may be heterogeneous and immobile. Therefore, the resource to generate or has the potential to establish sustained competitive advantage

should have four attributes: it must be valuable, in that it takes advantage of opportunities and / or neutralizes threats in the business environment. It should be rare among the current company and potential competition must be imperfectly imitable, and cannot be strategically equivalent substitutes for this resource that is valuable, but not rare or imperfectly imitable, finally the organization.

This argument is important because sets the standard for recognizing that resources are ultimately sources of strategies that achieve sustained competitive advantage, therefore of utmost importance if it is wanted to remain on the market. Itami and Roehl (1987) cited by Mahoney (2003) mention that resources have a setting that exists between the environment and resources. They emphasize the role of invisible assets of a company, based on information besides that invisible assets include: intellectual property patents and trademarks, trade secrets, proprietary data files, personal and organizational networks, reputation and culture.

It is argued that these invisible assets are often only real source of a company a sustainable competitive advantage. This is where you begin to recognize that the dynamic part is now crucial to maintain a sustainable competitive advantage in the case of SMEs that are in open markets susceptible of being absorbed by international companies where you have to recognize and reconfiguring properly implement their strategies according to the circumstances of the environment.

Meanwhile Simon (2010) indicates that capabilities allow a company to create new products and processes and respond to changing market circumstances. When referring to respond coincides with the idea of reconfiguring strategies since this is one of the main ideas the concept of reconfiguring. Also Carattoli (2013) indicates that some researchers believe that the capabilities necessarily improve performance by increasing the strategic agility and flexibility of companies.

Moreover Teece (2007) classifies capabilities to include the integration and coordination of organizational processes, learning management and reconfiguration. In general, the integration and coordination of organizational processes comprising the ability of a company that has to create, adjust, refine and, if necessary, replace business models. Learning management can he understood as the ability to integrate and combine assets including knowledge, the combination of expertise within the company and between the company and outside it (e.g., other

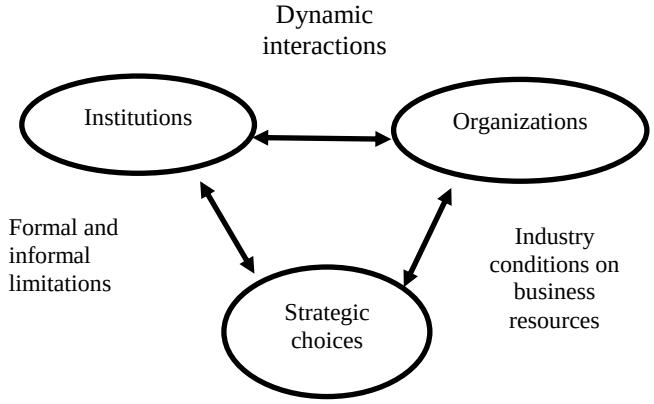
companies, universities) organizations. It is important a good design incentives and the creation of learning, knowledge sharing; reconfiguration is to adapt to the new market conditions, opportunities, and modify routines.

Institutional theory

The proposed argument is about the dynamic interaction between institutions and organizations and considers the strategic options as a result of the interaction (Peng, 2002). These strategic choices are not only borne by industry conditions and capabilities of the company, they are also a reflection of the formal and informal constraints of a particular institutional framework that managers face (Jarzabkowski, 2008).

A company with sustainable competitive advantage depends on its ability to manage the institutional context (Oliver, 1997). By having a competitive advantage, companies have higher yields. North (1990) classifies formal institutions (laws, regulations, rules) and informal (norms, culture, ethics).

Figure 2. Dynamic interactions



Source: Institutions, organizations and strategic choices, p. 3: (2002).

North defines institutions (1990) as "the rules of the game". The dynamics is described between institutions and the company according to Peng (2002) who looks at the pattern of institutions, organization and strategic choices. Indicating the previous model is that institutions and organization have dynamic aspects beyond explaining the industrial environment and resources of the company; since influences the strategic choices of companies.

Case Hydra Technologies

Hydra-Technologies is a company that is located in the state of Jalisco. It is dedicated to the design and sale of drones since 2005. Thanks to a project that was born together with CONACYT-NAFIN Entrepreneurs Fund. A company committed to safety that made bar codes and inks, had the pure inventive to develop technology to the level of the most important innovations in the area (Expansion, 2011) countries.

Currently, according to the DENUE (Directorio Estadístico Nacional de Unidades Económicas - National Statistics Directory of Economic Units) have from 51 to 100 employees, the company has capabilities that Moran and Mayo (2013) relate to communication systems and other equipment. Also, it has the ISO 9001: 2000. This company Hydra Technologies in 2008 was presented for the first time Mexican aircraft in the Farnborough Air Show in England. In July of the same year, the company is recognized for its contributions to the aviation industry.

Developed products

S4 Ehécatl and E1 Sparrow hawk. The S4 Ehécatl measures 3.7 meters wide and weighs just 55 kilograms, as it is built with lightweight materials like carbon fiber, s-glass and kevlar. The aircraft uses conventional gasoline, it can fly at 90 knots, reaching a height of 15 000 feet above mean, sea level and is able to stay aloft for up to eight hours (Aviation, 2009).

The S4 Ehécatl aircraft technology is 100 percent Mexican, which has previously been recognized by organizations such as the International Association for Unmanned Vehicle Systems (Asociación Internacional de Sistemas para Vehículos no Tripulados, AUVSI, for its acronym in English). The company declares that has developed the aircraft in its all: control systems, navigation, autopilot, internal electronics, information protocols of the ship, the navigation system 3D, everything (Aviation, 2009).

The aircraft is equipped with heat sensors Flir type that capture heat released by the -tool objects useful when performed night-flights and an electro-optic video camera to day missions. Both are encapsulated in a stabilized area and rotate 360 degrees. Likewise, it has a high-resolution camera fixed. Ehécatl S4 is designed to conduct surveillance and monitoring. The aircraft is used by the Federal Preventive Police (PFP), which depends on the Ministry of Federal Public Security and the state government of Jalisco (Aviation, 2009).

Institutional support.

To develop the S4 Ehécatl, the company Hydra-Technologies was advised in the validation of the financial aspects of its aviation project by the National Council of Science and Technology (CONACYT), through the Advance Program. It has also received capital investment by the Fund CONACYT-NAFIN Entrepreneurs (Aviation, 2009). The company partnered with the federal government, the IPN (National Polytechnic Institute) for the project it had in mind the company. Development of the aircraft began in 2003, and in 2007 was ready the first operational version. It should be noted that throughout the process with the participation of specialists from the Higher School of Mechanical and Electrical Engineering at the National Polytechnic Institute (IPN).

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