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Assessment of an emerging aerospace manufacturing cluster and its dependence on the mature global clusters

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Abstract

This study assesses the aerospace manufacturing industry of an emerging cluster by using Porter's Diamond model. The assessment is used to identify its dependence from mature global markets and the elements that are behind its dependence. In the first part of the paper, an introduction to the current landscape, the market trends and challenges of the aerospace industry is presented. Then, a case study of an emerging aerospace manufacturing cluster is undertaken: the case of Mexico. The results indicated that the aerospace industry in this country has positively developed, however, it is still highly dependent on mature global markets. Recently launched strategies and programs from the government, evidence that it is aiming to impulse the growth of the aerospace industry and to reduce its dependence on foreign markets.

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Keywords: Manufacturing network; Evaluation; Reconfiguration.

1. Introduction

The aerospace industry is predicted for continued future growth. By 2035, it is estimated that the number of passengers will increase up to 7.2 billion, compared with the 3.5 billion passengers in 2015 [1]. The largest market demand will swing to the Asia-Pacific region, where China is expected to turn into the major aviation market, taking

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the United States (US) position [1]. The backlog for the aeroplanes' manufacturers has maintained its upward trend. By 2004, the commercial aeroplanes' arrears consisted of about 2,500 aeroplanes from 2 Prime Manufacturers (PM), representing more than 4 years of production. By 2015, the backlog raised up to more than 13,000 aeroplanes from 5 PM, representing more than 9 years of work [2]. New entrants to the aerospace manufacturing industry, like the Commercial Aircraft Corporation of China (Comac) and emerging aerospace manufacturing clusters, are poisoning the current aerospace manufacturing supply chain configuration to adapt to challenges never faced before.

After evidencing that the current aerospace manufacturing supply chain configuration needs to adapt to cope with the foreseen challenges, the question now turns towards the needed reconfiguration. To answer that question, a deep analysis covering all the different aspects of a supply chain should be undertaken. The intention of this work is to try to answer part of that question, by evaluating an emerging aerospace manufacturing cluster and its dependence on mature global clusters. In the first part of the paper, a brief introduction to the current landscape, the market trends and challenges of the aerospace industry is presented. Then, a case study of an emerging aerospace manufacturing cluster will be undertaken: the assessment of the current supply chain configuration of the Mexican aerospace manufacturing industry using Porter's Diamond model.

2. Methodology and data

In the literature, there are many approaches available for assessing a single manufacturing plant, an entire organisation's supply chain and industrial clusters. One of the most used models for cluster's assessment is the Porter's Diamond model, which was developed by the Harvard Business School economist Michael Porter in his work 'The Competitive Advantage of Nations' [3]. This model is based on the statement that the competitiveness of a nation or an industrial sector is determined and can be evaluated by the interaction of four elements: *factor conditions, demand conditions, related and supporting industries, and firm strategy, structure and rivalry*. *Chance and government* are considered also as determining factors for the competitiveness, but extrinsic to business [4]. *Factor conditions* refer to the position of a nation in regards necessary attributes for production, such as infrastructure or labour force. *Demand conditions* refer to the nature of the market demand. The *related and supporting industries* element makes reference to the presence in the nation of industries related to the one subject to evaluation and the availability of suppliers. Finally, the element *firm strategy, structure and rivalry* is related to the conditions about how companies are created, organised and managed, and the nature of the competition within domestic firms. Although Porter's diamond has some flaws, it has been widely used to analyse the competitiveness of a nation and many different types of industrial clusters [4]–[8]. For instance, Kuchiki (2007) used Porter's model as a base to analyse China's automobile industry; Paone and Sasanelli (2016) used the model to compare aerospace clusters around the world in order to identify elements that could be applied for the development of an aerospace cluster in South Australia. For the sake of this study, Porter's Diamond model will be used as a base to assess the Aerospace Industries agglomerated in Mexico, with the special focus of identifying its dependence from mature aerospace clusters.

There are limitations to this study regarding the data gathered. Firstly, data were obtained from sources available to the public. Most of the information was gathered from recognised organisations such as consultancy firms and states agencies. In addition, data were gathered from February to July 2017. Hence, considering also the changing aspects of a supply chain, it can be assumed that data are not exhaustive. As a consequence, conclusions from this study should be taken as suggestive and not absolute. Although the mentioned limitations, the data gathered is a complete data set reported to date and noteworthy conclusions can be obtained.

3. Current landscape

Nowadays, the aerospace industry is dominated by 20 companies that hold around 80% of the civil and defence market. According to PwC (2014) and Thisdell (2013), North America owns 60% of the market, with the American companies Boeing for Civil and Lockheed Martin for Defence as major contributors. Europe possesses around 30% of the market, with France, United Kingdom and Netherlands as key players. Asia currently owns only 4% of the market, where Japan has the first place, followed by China and India [9], [10].

Regarding the Civil Aerospace, Boeing and Airbus are the biggest players owning half of the market. In the Defense sector, the American companies Lockheed Martin, Boeing and Northrop Grumman are the major providers.

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