Productive Articulation in the Automotive Sector, Cd.juarez-el Paso,tx, Updated Situation and Development Perspectives

Juan José Huerta Mata¹, Ruth María Zubillaga Alva² & Adriana Cordero Martín³

¹Phd in Administration for Universidad Autónoma de Querétaro, titular profesor, Department of Administration, Centro Universitario de Ciencias Económico Administrativas, Universidad de Guadalajara, independent consultor. Av. Periférico norte no. 799, Col. Los Belenes, Zapopan, Jalisco, CP.45130, Zapopan, Jalisco, México, email: juanj0718@gmail.com

²Master in Public Administration, Centro Universitario de Ciencias Económico Administrativas, Universidad de Guadalajara, independent consultor. Av. Periférico norte no. 799, Col. Los Belenes, Zapopan, Jalisco, CP.45130, Zapopan, Jalisco, México, email: rlava45@hotmail.com

³Master in Administration for Universidad de Guadalajara, Asociated professor, Department of Administration, Centro Universitario de Ciencias Económico Administrativas, Universidad de Guadalajara. Av. Periférico norte no. 799, Col. Los Belenes, Zapopan, Jalisco, CP.45130, Zapopan, Jalisco, México, email: martin_cordero@live.com.mx

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Abstract

In the state of Aguascalientes, Baja California, Chihuahua, Estado de Mexico, Guanajuato, Jalisco, San Luis Potosi, Nuevo Leon, Sonora among others, the automotive plants and autoparts companies that produce original T1 and T2 equipment, and its participation to the national PIB, otherwise the economic impact in the country is relevant for the indirect and direct employers generation and a variety of social benefits shown in an harmonious human development of the workers and their families.

One of the location with the mayor leadership in this sector is Cd. Juarez, Chihuahua, that has in its territory 41 companies connected to automotive manufactures providing the products to worldwide known brands that are in USA, Canada and in other continents, Europe, Africa, Asia and Oceania. The proximity to the border of El Paso, TX, the constantly commercial interchange of automotive parts has been facilitated, however just one of the companies, that belongs to Cd. Juarez, represents a terminal completed process of entertainment 4x4, that is why the other companies in some cases deliver products to manufactured factories in the center of the country and others, to a mayor process to the finishing in the origin countries, that is the reason why this research determines the type of relationship between companies and other organizations and if the productive associations work as clusters.

Precisely about a cluster and business networking, the productive articulation is the basic aspect to analyze reviewing the process of relationships with the members, according to Etzkowitz , Carvalho, Almeida (2005) where the interaction of the business sector, academic sector and government, permits a more effective interaction and a balanced synergy in order to realize projects to the productive development, innovation and transfer of technology; in the contemporary focus, now not only is the participation of the three main actors, business and social association have been incorporated that bring more effective efficiency and with economic and social results for the members of the sector and the benefit to the communities with a social impact.

Keywords: Automotive industry, productive articulation, Ciudad Juarez, cluster.

Introduction

The automotive sector is after the oil sector one of the most important branch of the economic development of Mexico, being the number 7 in the world and 4th in export of vehicles to different parts of the world and nowadays the automotive industry represents the 6% of the national PIB and 18% of the production of manufacture, it is obvious in the industrial and commercial activity of Mexico, it is reflected in all the economic regions of the country and the states of Aguascalientes, Baja California, Chihuahua, Coahuila, Estado de Mexico, Guanajuato, Jalisco, Puebla, San Luis Potosi, Nuevo Leon and Sonora with the presence of automotive manufactured plants and autoparts companies that produce
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strategy  of different companies, taking as a base the seeking

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1. Establishing relationships between Mexican provider
companies of the automotive sector and its equals in USA.

2. Determining the integration of the productive
association by the different actors and if its operation is
one of the cluster one or simply a business network.

3. Analyzing the economic and social benefits that has
brought to the different areas of Cd. Juarez the
companies of the automotive sector of Mexico and USA.

Methodology

This research is realized with a qualitative view because it is
led in its natural environments ,its design is the
ethnographic type, specially the case study, because it tries
to establish the operative characteristic of the companies,
public organization and academic participants; for the study
of population the unit shows the automotive companies and
autoparts along the border of the northern Mexican area,
specifically in Cd. Juarez. In order to to define the figure a
reviewing of the data base of companies or the Economy
Secretary of Chihuahua, manufactured association A.C./Index Juarez and the Universidad Autonoma de Ciudad
Juarez, determining that there are 41 companies settled. The
elements or unit of analysis of population are key actors of
the sector, considering among them government, federal,
state, county officers; association of the sector, automotive
businessmen ; researchers and members of educational
institutions, technologic institutes and research centers.

For the qualitative research with the study design of deep
case a representative proof is from 6 to 10 cases; the
strategy of the showing selection in chain, selecting
information networking.

The data collecting method is divided in three parts: a-
documental reviewing of secondary sources realizing a
content analysis starting from research publications related
to the national, domestic, and of other countries ; b-visits to
plants are taken and manufacturing factories of original
automotive equipment in order to know how it works, the
direct observation of the process of the companies and
automotive companies and with a guide to interview,
questions are divided in four steps: 1- genera information
of the plant 2-general information of the manager, 3-
development and relationship of the plant and 4- innovation
and technology , 32 questions.

As a part of the results maps of integration of production
association of the automotive sector are elaborated starting
from chains and managerial networks with other
associations and the interaction of the automotive industries
in other countries.

Theoretical Framework

The productive articulation is a concept used in the last years
in order to make reference to different models of business,
integration  in the agricultural, industrial, commercial and
services sectors. Fonseca (1999) defines it as a linking

strategy of different companies, taking as a base the seeking

of the specialization of each one of them and also the own
generation of positive externalities that for its relationship
permits to generate economy in the terminated products,
external economy and reinforcing of competitive advantages
inside and outside of each company, a term linked in a direct
way to this concept is the cluster, concept that from its
creation by Marshall (1890) has characterized the factories
located in a determined geographic area using its potencial
to make them more productive; otherwise the phenomenon
of the location of the companies for three reasons:

a- creating of a constant and good qualification of the
characteristic of the market

b-showing up of a huge quality of providers

c- empowerment of its specialization and transfer of
knowledge of the firms located in the cluster.

Some of the most important cluster in the world for the
economic development that have led in the areas where
some clusters are settled, for example health cluster in the
border between Germany and Switzerland; the electronic
cluster in the border of Mexico and USA and the wine cluster
in the central region in Chile ,Huerta 82013).

Porter (2001), on the other hand, has defined cluster as a
group of geographically close companies interconnected and
associated institutions in a particular areas related to
common and complementary aspects among them.

However according to Rosenfeld, (1997), the geographic
concentration is not enough to create a local industry or a
social system-regional cluster." No massive active channels
and related firms that are not in a local production or social
systems, do not operate as well as a cluster."

The characteristics that can identify a cluster an economic
contest are the following:

- Geographically proximity to organizations or limited
territories for the cluster.

- Organizations in a cluster that produce welfare to
different industries.

- Organizations proximity, interactions of cooperation
between organizations in a cluster.

- Legal independence of the organization in a cluster and
in the manufacture and technology.

For the importance of the cluster as the strategy of the
economic the development, different classifications are
emerged; Porter (1990), for example, talks about vertical
and across cluster; the first are made up of industries that
have relationship type purchase/ seller, and the second are
industries that can share a common market, human
resources and require similar natural resources.

According to Soto, et al. (2001), companies that can act as
cluster need the presence of relationship of cooperation on
a vertical way, across and the diagonal between companies
without the lost of competitive sense in a total successful
business unity, Table no. 1.

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1220-1232.
In the same way Rozhkov (2009), developed a typology that takes the peculiar characteristics of the companies:

- **Discrete cluster**, includes companies with products of manufacturing consisting in small components of a major project, for example, the automotive, airlines, shipping motors and other industries of machinery fabrication. These mentioned clusters are usually formed by small and medium companies of providers that process in a close way in order to facilitate the assemble and fabrication of the "worth" companies.

- **Process cluster**, formed by companies of industrial process as chemical, paper, tools, metalmechanic industries among others.

- **Innovation and creative cluster**, that are developed in new sectors as technology informatics, bio technology and in creative work companies as cinematographic. The innovation clusters include a large number of new companies that appears as a result of the technology and scientific research made by university and research institutes.

- **Tourist cluster** based on the characteristics of the region that integrates a company of different sectors related to tourist services as tour operation, hotels, food, beverage companies, souvenirs production, among others.

- **Transport and logistic cluster** that includes specialized companies in storing, delivery and carried services, they can included infrastructure of specialized providers services, in maritime transport in water, land an air as well logistic center, table no. 2.

<table>
<thead>
<tr>
<th>Characteristics of the Cluster</th>
<th>Horizontal</th>
<th>Vertical</th>
<th>Transversal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kind of vinculation</td>
<td>Relationship buyer- seller</td>
<td>Industries a sharing common market, capacities of human capital and similar natural resources</td>
<td>Activities in relationship buyer-seller need share resources and techniques capacities of support between others organizations all kind</td>
</tr>
</tbody>
</table>

**Source:** Own elaboration Porter (1990) and OECD (1994)

Porter, (2003). side in relation to the classification of the clusters, according to the characteristic, that all the industries can be divided in local, independent of resources and business industries.

- The local industries are usually distributed through the regions. The local companies provide primary services of the local market. Each industry competes only on a limited way with other regions.

- The depended industries of resources are located near natural resource area. These business companies usually compete with orders of domestic or international location, examples are uranio, mineral or wood.

- The business industries are not depended resources and sale production of other region or foreign countries are located in a particular region based not on resources but in working hand availability, providers and other factors. The business concentration may vary for region, the companies of tis industries are usually the aeroship industry, motor industry and assemble motors.
Porter (2003), found that independently of the activity of the regional economic this is strongly influenced by the strength of the local clusters. In this way the identification of the development of cluster in business industries is seen in a more appropriate way.

Combining the cluster classification of Rosenfelt and Markov one more can be presented depending on the stage of the cluster development:

- Meeting with representative responsible in a beginning cluster development.
- Potential cluster were it can be completely valid the cluster only under certain operative condition.
- rowing cluster were a challenge of high development does not exist.
- Mature cluster were the development is problematic.
- Transformation cluster when a cluster is not flexible an cannot adapt to the environmental changes.

Finally Marcusen (1996) according to his researches determined that other 4 types of cluster exist:

- Marshall cluster, where geographic proximity of a large number of small or medium companies exists the characteristic is the focus on specialization: in industrial, production and services process. For example in the furniture or pottery industry in Italy is characterized by the large amount of specialized workers from bachelor institutions concentrated in a small territory. "Talk cluster" consist in a number of main companies and a large number of small and medium supporting companies, for example there is a large number of manufactures as Boing in Seattle (USA), Toyota, Toyota City (Japan), with the large number of provides and service companies.
- Satellite cluster is characterized by an association of multinational brand corporation. This structure can consist of branches of high technology or branches formed by low tax or low cost of human resources or other reason. There are several examples all around the world, the triangle park of research in North Carolina (USA) which consist in centers of research of multinational corporation and in the province of Qimi, in South Korea, mainly specialized in textile manufacturing industry.
- State anchored type cluster, is specific because the main participant is the government. The government can be in this case a military technology purchaser in an institution of social research. For example in Brazil the institutions of higher education of Campinas, promote the growth of the suburb areas of the city. Another example is San Jose de Campus (Brazil), were the spacecraft complex is located and belongs to the government, table no. 3.

<table>
<thead>
<tr>
<th>Marshalliano Cluster</th>
<th>Agitation and Speech Cluster</th>
<th>Satellite Cluster</th>
<th>Types Estate Anchor Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is geographic proximity, big number of small and medium business. His focus is specialization: industrial processes, production, or service. Furniture industry and ceramics</td>
<td>Consist in a different number of major companies in some industry and a large number of small and medium-sized enterprises of support. Aeronautics and Automotive industry</td>
<td>Characterized by a congregation of multinational corporate branches with high technology areas or the low taxes and costs of human resources. research centers</td>
<td>The main participant is the government. Military Technology</td>
</tr>
</tbody>
</table>

Source: Own elaboration starting Bareev (2014)

In particular in relation to the automotive sector, there are many associations besides those of Mexico in other countries as Russia (Bareev’s issue) and Thailand, Kohpaaboon and Jongwa Nich (2013), were the co work has facilitated the integration of this industry and it has permitted to focus from an international competitive perspective. In the first characteristics of the four existing clusters in Russia are established: cluster of North East in Petersburg (Nwc), Lening grad Region, Novgorod Region and Pskov Region, industrial developed that has a large territory with research institutions and Russian higher education, there are manufactures of original equipment belonging to General Motors, Nissan Hyundai, Scania were light vehicles and heavy duty trucks.

Central Cluster (CC) includes the region of Kaluga, City and Moscow region, the main characteristic is the scientific high level potential, in this region there are key producers of light and heavy duty trucks: Volkswagen, Volvo, Peugeot, Citroen and Mitsubishi Motors, in 2012 especial economic Moglino area was created.

The innovation territorial industrial cluster in Kamskiy (Kitic), is located in Tatarstan Republic. The main companies are Kamz, that produce heavy duty trucks from 1976 and Sollers that is "young" producer of light commercial vehicles, that is located in the A la Buga economic area. Both companies are locate manufactures and the producers.

Povolzsiqy automotive cluster (PAC), includes cities of three regions, Samara, Ulyanovsk and Saratov. The main companies are Avto Vaz Uaz build during the Soviet period and co producer of General Motors and GM-AVTOVAZ. AVTOVAZ is the main producer of light vehicles. UAZ, GM-AVTOVAZ, are sport vehicles producers. In 2010 a special Togliatti area was created.

In Thailand, Kohpaaboon and Jongwa Nich (2013) propose the meaningful change of the automotive industry from 1996
from a domestic orientation to a high concentration of export. The figure of export vehicles has increased from 14,000 units in 1996 to 500,000 and 1’000,000 units in 2006 and 2010.

**Research Results**

Cd. Juarez is important to the economic development of Mexico. Through the years it has been consolidated as the Federative Entity with the higher number of assembly plans of the country, the most representative sectors are the automotive electronic ones and start to impulse the consolidation of the aerospace. According to the issue "Asi somos Juarez (2015)", in October 2014, 314 assembly plans were registered with a total of 221,369 direct jobs (INEGI 2014). That contribute the 58.5 % - 378,100 of the formal jobs of Cd. Juarez; however in the data base of AMAC/INDEX, (2014), only a total of 164 are registered in the automotive, electric and other sectors, table no. 4.

These companies are located in the 23 parks and 15 industrial areas of Cd. Juarez, Table 5a and 5b.

<table>
<thead>
<tr>
<th>Sector</th>
<th>No. Enterprises</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace</td>
<td>1</td>
</tr>
<tr>
<td>Automotive</td>
<td>42</td>
</tr>
<tr>
<td>Call Centers</td>
<td>3</td>
</tr>
<tr>
<td>Sewing</td>
<td>6</td>
</tr>
<tr>
<td>Electric</td>
<td>28</td>
</tr>
<tr>
<td>Electronic</td>
<td>24</td>
</tr>
<tr>
<td>Packaging</td>
<td>9</td>
</tr>
<tr>
<td>Medic</td>
<td>11</td>
</tr>
<tr>
<td>Metal Mechanic</td>
<td>9</td>
</tr>
<tr>
<td>Others</td>
<td>31</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>164</strong></td>
</tr>
</tbody>
</table>

**Source:** directory AMAC-Index 2014

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**Table 4: Assembly plants by sector Cd. Juarez**

<table>
<thead>
<tr>
<th>Sector</th>
<th>Name</th>
<th>Superful Total (Ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poniente Norte</td>
<td>Park industrial Omega</td>
<td>199.1</td>
</tr>
<tr>
<td></td>
<td>Park industrial Aztecas</td>
<td>51.9</td>
</tr>
<tr>
<td></td>
<td>Park industrial Fernandez</td>
<td>43.1</td>
</tr>
<tr>
<td></td>
<td>Park industrial Gema</td>
<td>40.6</td>
</tr>
<tr>
<td></td>
<td>Park industrial Gema II</td>
<td>11.3</td>
</tr>
<tr>
<td></td>
<td>Park industrial Juarez</td>
<td>72.5</td>
</tr>
<tr>
<td>Poniente Centro</td>
<td>Park industrial Aeropuerto</td>
<td>53.7</td>
</tr>
<tr>
<td></td>
<td>Park industrial North Gato</td>
<td>40.1</td>
</tr>
<tr>
<td></td>
<td>Park industrial Panamericano</td>
<td>48.8</td>
</tr>
<tr>
<td></td>
<td>Park industrial Zaragoza</td>
<td>93.2</td>
</tr>
<tr>
<td>Poniente Sur</td>
<td>Park industrial Antonio J Bermudez</td>
<td>207.2</td>
</tr>
<tr>
<td></td>
<td>Park industrial Los Fuente</td>
<td>78.9</td>
</tr>
<tr>
<td>Oriente Norte</td>
<td>Park industrial Rio Bravo</td>
<td>122.7</td>
</tr>
<tr>
<td></td>
<td>Park industrial Aerojuarez</td>
<td>81.9</td>
</tr>
<tr>
<td></td>
<td>Park industrial Las Americas</td>
<td>32.6</td>
</tr>
<tr>
<td></td>
<td>Park industrial Axial</td>
<td>45.0</td>
</tr>
<tr>
<td></td>
<td>Park industrial Juarez</td>
<td>125.1</td>
</tr>
<tr>
<td></td>
<td>Park industrial Intermex</td>
<td>77.2</td>
</tr>
<tr>
<td></td>
<td>Park industrial Salvarcar</td>
<td>41.6</td>
</tr>
<tr>
<td></td>
<td>Park industrial American industries Kimco Juarez</td>
<td>16.7</td>
</tr>
<tr>
<td></td>
<td>Park industrial Las Torres</td>
<td>12.6</td>
</tr>
<tr>
<td>Oriente Sur</td>
<td>Park industrial Intermex Oriente</td>
<td>23.3</td>
</tr>
<tr>
<td>Oriente Sur</td>
<td>Park industrial Surs</td>
<td>94-0</td>
</tr>
</tbody>
</table>

**Source:** AMAC-INDEX 2015
For purposes of conducting this investigation and facilitate access to companies for interviewing key informants, were taken from the 42 of automotive sector registered in AMAC-INDEX, to 19 assembly plans with which there are agreements of academic exchange in the Universidad Autónoma of Ciudad Juárez.

The main assembly plant companies belonging to the automotive sector in Cd. Juarez are Delphi Lear Bosch, Continental, Automotive lighting, Johnson, Tyco, Valeo, Visteon, among others.

At the moment it has been possible to realize four interviews to the competitive responsible area of the Economy Department of Chihuahua, to the relationship director with Delphi and to the Oelav and Leggett and Platt human resources chief, the obtained information at the moment will be presented underneath.

**Figure 1:** Automotive Industry and Autoparts in Chihuahua

For the automotive sector in Cd. Juarez are Delphi Lear Bosch, Continental, Automotive lighting, Johnson, Tyco, Valeo, Visteon, among others.

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<table>
<thead>
<tr>
<th>Sector</th>
<th>Name</th>
<th>Superful Total (Ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poniente Norte</td>
<td>High view</td>
<td>4.2</td>
</tr>
<tr>
<td></td>
<td>Road Axis Juan Gabriel</td>
<td>53.5</td>
</tr>
<tr>
<td></td>
<td>Ramon Rivera Lara</td>
<td>37.9</td>
</tr>
<tr>
<td>Poniente Sur</td>
<td>Panamericana and Oscar Flores Sanchez</td>
<td>109.4</td>
</tr>
<tr>
<td>Oriente Norte</td>
<td>Satelite</td>
<td>26.0</td>
</tr>
<tr>
<td></td>
<td>America</td>
<td>6.6</td>
</tr>
<tr>
<td>Oriente Centro</td>
<td>Teofilo Borunda</td>
<td>28.8</td>
</tr>
<tr>
<td></td>
<td>Boulevard Zaragoza and Sonora</td>
<td>10.6</td>
</tr>
<tr>
<td></td>
<td>Las Lomas</td>
<td>40.4</td>
</tr>
<tr>
<td>Oriente Sur</td>
<td>Independencia</td>
<td>17.7</td>
</tr>
<tr>
<td></td>
<td>los Bravos</td>
<td>119.8</td>
</tr>
<tr>
<td></td>
<td>Henequen</td>
<td>30.7</td>
</tr>
<tr>
<td></td>
<td>Zona Industrial Thomson</td>
<td>33.0</td>
</tr>
<tr>
<td>Oriente Sur</td>
<td>Electrolux</td>
<td>213.0</td>
</tr>
<tr>
<td>Oriente</td>
<td>Independencia and Santiago Troncoso</td>
<td>24.2</td>
</tr>
</tbody>
</table>

Source: AMAC-INDEX 2015
Chihuahua is one of the states that supports its economic development model in industrial clusters, the principle of geographic approach described by the authors as Marshall (1890, Rosenfeld 1997 and Porter 2001) has been fundamental in order to integrate sectors as aerospace, automotive, electric, electronic science of life renewable energy information technology, agroindustry, nourishing products furniture, clothing, construction materials, mining and tourism.

The automotive and automotive auto parts industry in Chihuahua are more than 150 manufacturing and providing companies; this employs more than 128,000 workers, it is that brings the mayor number of jobs in the country. The production of automotive auto parts is classified in 6th position of all over the world with $76.8 billion dollar (2013). Chihuahua state produces 14.3 of the total auto parts production of the country, including motors and transmission.

One of the strategies followed by the Chihuahua Government in order to impulse the industry competitiveness in Cd. Juarez is to support the companies with taxes support and no taxes, for example through the training center in high technology subsidized by the federal and state government, training the technicians of the new production lines in CENALTEC, then they are send to the origin companies in USA and lately the technicians are back to their plans in order to transmit knowledge to the order workers; and example is the proximity that exists with the company BRP (entertainment vehicles 4x4 ) in order to train in motorcycles soldering.

The interrelation of the original autoparts equipment manufacturers with educational institutions is permanent through agreement for the professional practice realization to those who being graduated and according to the performance, a job offer can be presented, the institutions with agreements are ITESM Campus Cd. Juarez, Universidad Autonoma de Cd.Juarez (U.A.C.J.), Instituto Tecnologico de Cd.Juarez, CONALEP,CEBETIS, also a permanent labor exchange exists in order to incorporate Young people of different educational institutions to the automotive sector; 290,000 jobs approximately 30% belong to the automotive sector.

However in spite of the industrial orientation of Chihuahua and Cd. Juarez is not considered in the national automotive cluster by the A.M.I.A. I.N.A and A.M.D.A, because there is no automotive assembly plant, only the Canadian Bombardier Recreational Products (BRP) company, cuatrimotors manufactures that composes the resources providers in order to elaborate its products except the Rotax Engine coming from Austria. Besides CENALTEC, belonging to the state government, some companies have research and technical development and proof center in Cd. Juarez, among then, Delphi automotive systems, Nidek, Oelav*, Visteon and Lear.

About the matter, it is important to emphasize that the development and technology policies contained in the Chihuahua state development plan, agreed with what CODERCH established and the vocation per sectors in all the state is analyzed and according to this the guide the lines of state plan are adopted, the principal vocation is found in Chihuahua state and in Cd. Juarez, were the automotive, electronic industry is identified.

Delphi Automotive System

It is a corporate of multinational companies based in Troy ,Michigan USA, its business activities are focused on design, manufacture, distribution and mechanic and electronic systems for the industrial sector, fundamentally for the automotive and transport. It was created at the end of 1990 as a separation of the activities of General Motors Company. It is one of the most important assembly plants in the world, it employs 170,000 workers, 156 production centers, being in Mexico since 37 years and 61,000 employers, it is the

*The original name was modified to respect the confidentiality of the company
In spite of the importance of this company, its business policy is not to participate in the clusters, for size and growing speed, its vision is integral and it is not connected to a particular region for the possibility to establish a plant in every part in Mexico, the clusters that work at the moment facilitate the operation and are present in 25 cities in the country, Juarez has 8 sites, each one of them can have many plants, there is an interaction with groups or associations of the automotive sectors, as AMIA, INA or AMAC-INDEX, table no. 5.

Delphi has followed logistic processes of international impact and they integrate in a direct way the products in Mexico, USA and Canada, 17 of 20 the most important automotive assembly plants are Mercedes Benz, GMC, Ford, BMW, Volkswagen and Toyota among others; all the product elaborated in Mexico is exported and operated under the INDEX scheme; 100% of the raw material or productions supplies are imported. Also it delivers its products to the plants in Mexico through the joint venture, Grupo Carso.

The company follows of the scheme of the assembly plant industry that arose 50 years ago in Mexico, were the raw material is imported, they make the transformation and export, practically it does not have local provides, only 3% is national and 97% foreign raw material; this has to see with the development of provides from the point of view of operation, quality systems supplies and material quality, financial capacity, there are many variables that avoid that national provides integrate them selves to the supplies chain, even in the case of Cd. Juarez, the purchases have as metric.

The organic structure of Delphi implies the experience of operation directors for each division in Mexico, cluster director for each division in region per customer from national territory, it is based on the scheme and business volume. For example the cluster of Tamaulipas includes 2 plants in Cd. Victoria and Nuevo Laredo and 1 in Nuevo Leon, Linares, all of them elaborate products for Ford, but also, it can have cluster that repeat customers and the sale volumes for GENERAL MOTORS is not big that 2 clusters Chihuahua and Zacatecas provide to this brand.

There is also an operation director, human resource director and cluster engineering director, they at the same time have a plant manager and the director of the areas in each plants. All are coordinated by North American Delphi, with general offices in Ohio, there is a regional executive director, who coordinates all the regions in Mexico, South America and above this position there is general director of the Americas, there is a general director of Europe, E.M.A., Europe, Middle East, Africa and other regional director for Asia, they report to the president of the division.

For the administrative, maintaining, environmental services, corporative security and communication there is a facilities director, who manages all the structure to make operable the buildings in Mexico and this permits to have
The intellectual property about patenting is very important, the company has received recognitions by de Chihuahua government and the Technology National Award for the manner in which the technology management and new products development are realized, and this has generated more than 325 patents that have been registered in USA and Europe, and there is no registration in Mexico due to that a patent is an instrument of business of investment return and register it in Mexico made involve that a competitor copies the design and sells it to Delphi customers.

The relationship of the company with government is given by the Economic Secretary, FINANCE AND HEALTH, EDUCATION SECRETARY with the intention to let them know that situations let them lose competitiveness or decrease attractiveness to the country, the structural reforms that are implemented in Mexico in the last years, Delphi was lobbying with the Chamber Of Deputies and Senators; with CONACYD, for the engineering projects that receive economic support; similarly with state governments when the decision is made to open a plant in a specific place because they try to adjust to the local development plans, as employment policy, the possibility to integrate students in the planning and opening of the plant; and with municipal government for the operation about security, sewer system, among other things.

Table 5: Basic information sheet Delphi, Inc.

| Presence in México: Aguascalientes, Cd. Juárez, Cd. Victoria, Chihuahua, Distrito Federal, Durango, Guadalupe, Guanajuato, Linares, Matamoros, Nuevo Laredo, Puebla, Reynosa, Saltillo, San Luis Potosí, Sinaloa, Sonora, Tlaxcala, Torreón, Querétaro, Zacatecas. | Presence in world: Germany, Argentina, Australia, Brasil, Canadá, China, U.S.A., France, Honduras, Hungary, India, Italy, Japan, Luxemburgo, Marocco, México, Poland, Portugal, Romania, Russia, Saudi Arabia, Singapur, Slovakia, South Korea, Spain, Switzerland, Thailand, Taiwán, Turkey, United Kingdom |
| + 61,000 employees in México + 170,000 all world | All plants certified in clean industry |
| 2,000 engineers | Business areas: electronics and security, architecture-electronics, powertrain, thermal systems |
| 3 Engineering centers in México, Cd. Juárez, Saltillo and Querétaro. | 15 Innovation and Technology centers in the world |
| 15 Innovation and Technology centers in the world | Main technical centers in the world, U.S.A., Germany, Luxemburgo, China, Japan. |
| Automotive Brands customers Delphi: Mercedes Benz, Ford, Chrysler, BMW, Renault, General Motors, Volkswagen, Toyota, Nissan, Honda, Kia, Hyundai | |

Source: Own elaboration starting field investigation, 2015

The interaction is with the 3 levels of government during the different stages, in the strategic decision, in the new project implementation and in the project operation and for this the relationship is direct with the executive.

There is a permanent relationship of Delphi con education institutions, specially for the creation of specific careers in order to from engineers, it pioneered the Mechatronic Engineering careers in Cd. Juarez and Monterrey, and they were the first program in Mexico funded by the company and participation of ITESM; also there is a program of academic stays for engineering students of 7th / 8th semester at MTC, they work 40 hours per week in the company, they work with the project and supervised by engineer who qualifies, grades in Kardex, of these projects the recruitment is 75 % of those who are in the program; also there are formal agreements with Universidad Autonoma de Cd. Juarez, Universidad Autonoma de Coahuila, Universidad Tecnologica de Cd. Juarez, Instituto Tecnologico de Cd. Madero, Instituto Tecnologico de Saltillo, among others; also they are members of CONREDES, that is a business initiative in order to that the universities participating in this consortium, as UACJ, ITESM, ITCJ, CECATI, COLECHBUACH, UTCJ, and others, adjust the technical career and engineering bachelor’s degree to the necessity of the industry.

Oelav*

It is an independent group focused on the design, production and sales components, integrated systems and modules for
the automotive industry. It is born in France in 1923 in Cd. Juarez, it begins in 1996 as a corporate in 1998.

Its mayor production is windshield wipers, in other plants cooling system controllers ignition system, clutch system, lamp lit, access controls, electronic and electric parts. In San Luis Potosi there are other four plants, in Queretaro two, in Toluca one and in Rio Bravo one. The corporate offices are in France, present in 29 countries, as Germany, Afghanistan, Argentina, Brazil, Korea, China, Slovenia, Spain, USA, France, Indonesia, Ireland, Japan, Mexico, Norway, Pakistan, Portugal, United Kingdom, Rumania, South Africa, Sweden, Thailand, it has 16 research centers, 34 development centers, and 136 production sites with 81,800 employers in the world, it works in a very close way with the mayor manufacturers of the automobiles in the world.

Figure 4: Plant Distribution Oelav in the world

![Plant Distribution Map](image)


* The original name was modified to respect the confidentiality of the company

The organizational structure of this company is integrated in Cd. Juarez by a manager, chief of production systems, logistics, industrial, human resources, financial, sales and manufacture equipment. The plant has 1102 employers, 810 operative staff, 180 trusted staff, 90 temporary staff and other persons who have administrative functions. There is a training program for the staff from a tabulator that defines the levels where the workers are situated in order to train them, there are three levels and as the workers go up the position, they receive an economical reward and a certification about learning validated by the manufactured areas, they offer the workers a continuing education, primary, high school; in the administrative part, to whom have not finished the professional career there are scholarships or specific technical training. The company elaborate windshield wipers, assemble the 90% of the products, one of the most important component is rubber, that is bought by local providers in Mexico and other places abroad, and send the final product to the company in El Paso, Texas, and from there they distribute to the automotive plants of GM, Ford, Chrysler, Volkswagen, Toyota, Mercedes Benz, Hyundai, Tesla and to retail distribution centers as Walmart in USA.

Oelav has five strategic axes, innovation, quality, production system and providers development, based on long term agreement with providers, 11% supplies for the production are bought in the country, 37% in Asia, 46% in North America. Mexico, USA and Canada and 17% in Europe; there is also an insurance department in provider quality, that inspect the components and then the engineers of the specific area if it is necessary are in touch with the providers in a direct way, so they are in charge with the new providers that comply with the specifications of the company and the standards and the technical support to the purchase department to monitor the providers action plans. The company has many agreements with education institutions with the Universidad Autonoma de Ciudad Juarez U.A.C.J. for the practices of the students that have more than 50% of the credits, they stay three semesters, but they can have the option to be recruit, each four students, almost one starts to work permanently in the company.

No innovation and technology projects are realized, the research centers in France and USA realize this activity, but the engineers move to these centers to develop new concepts and products. There is no registered patent in Mexico; the last innovation is that the windshield wiper has integrated a drilling that directly the water goes out. Also other improvements are made by the logistic department with the other departments in order to save time and money and cut costs in transport in order to move material.

Legget &Platt

It is a diversified manufacture that designs and produces a wide variety of components and products in all the world, orientated to the automotive, aerospace, furniture,
mattresses sector and a remote control and electronic applications. It was funded as a society in 1883 in Carthage, MO, USA, where the corporate headquarters is located. Legget is a global provider with plants in 18 countries, 18 business units, 19,000 workers and 187 sites of production in all over the world; in Mexico with sites in Aguascalientes, Atapoca Nuevo Leon, Cuatitlan Izcalli, Ciudad Juarez, Distrito Federal, San Luis Potosi and Tlaquepaque, Jalisco.

The acquired patent has permitted to grow as a furniture plant, then the automotive plant part, the most important than can be operated by wireless support systems for the automotive seats and it works directly with Lear, Johnson Controls and VW.

The industrial complex of the company or site includes 3 plants, mechanic plant I, Tire plant II, plant III is the support for the furniture one that designs the wireless for beds with remote control through a cellphone or a tablet.

The company structure is integrate by a permanent manager and 9 area managers, quality, production, new projects, engineering, maintenance, human resources.

The company has 547 direct and indirect (security cleaning) workers and 57 trust administrative. Legget delivers the products to the automotive industry, all the products are sent to the El Paso distribution center and from there to other parts of the world, 90% supplies for the manufacture of the automotive seats are imported from China, Canada and USA; 10 % local wood, paper, packaging material providers. There is a constant evaluation of the domestic providers twice a year. There are agreements with Universidad Tecnologica de Cd. Juarez and ITESM Campus Cd. Juarez in order to train the staff and professional practices.

Conclusions

As Marshall conceived (1890) there is a geographical proximity with a companies of the automotive sector, however the results found until the moment let establish that the integration of the companies of the automotive sector in Cd. Juarez works as a geographical grouping were the main relationship is of an across buyer-seller cluster (Porter 1990); however in spite of the communication and interchange, relationship are only for business interchanges between companies in the border with distribution centers or warehouse in El Paso Texas, in order to, later, interchange of products or supplies of a mayor process with the assembly plants Ford, GMC, BMW, Mercedes Benz, Toyota, among others, and later to be sent to others plants around the continents. In the same way final products are deliver to retail shops as Walmart, Auto Zone for the distribution in all over the world;

The manufactured system in the assembly plants in Cd. Juarez in the automotive sector operates with a scheme integrated in 1 place, called site, where can be many plants working simultaneously and this permits to work the creasing production costs and facilitating logistic and the products distribution. The distribution strategy used by Delphi implies the celebration of join venture with the development of Carso Group in Mexico in order to realize the delivery of plants of vehicles of the country and the international plants to El Paso Texas and the assembly plants to the continents.

The administrative structure of the operation of the interviewed companies considers division, in particular Delphi has regional managers of clusters based on the communication with costumers and so there is a manager who can supervise in the north part of the country, there are permanent managers with chief area in engineering, also a facilities manager who supports maintenance, security to all the companies in Mexico; the structure includes regional executive managers in areas in 5 continents.

The structures of the plants of Oelav and Legget and Platt have a permanent manager and areas managers that facilitated the products that are offered in the market it this important the interrelation that exists between the companies and the educative sector as in the curricula design in the engineering areas of realization practices where 25 % of students finally are hired by the companies, and there are agreements of academic interchange, training, human resources to get better the conditions of the operative staff supporting the educational preparation in the case of the administrative staff.

About the relationship of the companies with the governments are relative due to only in the case of Delphi for the impact, involve in strategic decisions that can reflect in the productivity in crease of the assembly plants in the country and how can be reflected in public policies of the federal and state government.

The research until the moment permits describe the general operation conditions of the automotive sector in order to exploit the proximity of the companies to the border with Cd. Juarez- El Paso, Texas, to collocate the products in USA, Canada, and from there send to the world, however Rosenfelt says (1997) it is not enough.

The integration of automotive sector in this geographic region identifies a macro automotive cluster where 41 companies provides supplies and raw materials that later are used in manufactured process for the production in all around the world.

The general map considers the interaction of the companies with bigger companies and relationship between the organizations and associations of the private sector with the academic sector and the government sector; the innovation and technology is important to generate projects that allow to be up dated in the tendency of saving gasoline and with
the environment; the academic and research institutions promote the actions that benefit all the members of the sector and that stimulate the definition of public policies by the government bodies that favor a greater dynamism in the great conglomerate of the automotive sector, figure no. 5.

**Figure 5:** Map of articulated productive automotive sector Cd. Juarez-El Paso, TX

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**References**


