Needs Detection in Order to Increase Competitiveness on Regional Electronic Companies

Aguascalientes Electronics Industry

May, 2013

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Presentation

The electronics industry has a key role in Mexican economy, for its dynamism in international trade, integration into global value chains (bonds), high value relationship with other industries, employment generation, and its close association with innovation processes, research and technological development.

However, only a group of highly integrated regions and firms in global value chains have been strengthened after the dynamics of international commerce. The majority of the companies in the industry are small and median, which, under liberalization and globalization scenario, as well as growing support granted at other nations, requires a strategic plan to help improve the global competitiveness developed.

In this sense, this study called "Needs Detection in Order to Increase Competitiveness on Regional Electronic Companies", presents an analysis of the competitive situation being experienced by companies on the electronics sector in Aguascalientes. From the same, proposes specific terms and conditions for strategies aimed to:

I) The transition to activities within the global chain (bond) with more value added and technological content.
II) Strengthening productive chains with the rest of the local economy, increase local production of parts and components.
III) Closer links between businesses in the bounded (especially the leaders) with universities and local research centers. Thus (so, in this manner), it contributes to arrange a schedule for the implementation of joint actions, which allows not only give following to them, but also support the design and implementation of new programs and projects.

Aware of the reality being experienced Electronics Industry in the state of Aguascalientes, and the threat of increased international competition, this survey was requested and made technical representatives CELESA AC, effort headed by its President Mr. José Gabriel Suárez Delgado. This way, the work contributes to cover the shortfall of empirical literature on this strategic industry for local competitiveness, allowing publicizes and disseminate the potential in the state of Aguascalientes.

Introduction

Internationally, the electronic industry has undergone profound changes over the past two decades as a result of trade liberalization, rapid technological evolution, mainly from information and communications technologies development, and reducing logistics costs have changed the behavior of large firms sector, changing its organization and promoting the integration of global value chains (bonds).

The electronic industry in Mexico plays a highly important role in the national economy, mainly by high participation in the manufacturing sector, employment generation, exports and attracting foreign direct investment. Since the signing of the North American Free Trade Agreement (NAFTA), our country is consolidated as a leading electronic manufacturing countries exporting mainly to the United States.

Sector integration in global chains (bonds), the increasing complexity and sophistication of products, continuous pressure by decreasing costs and reducing the life cycles of products have generated a high competition in the international market for manufacturing, especially in emerging Asian economies, especially China, Philippines, Indonesia, Malaysia, Thailand and Vietnam. In this context, the major manufacturers (Original Equipment Manufacturers) have developed new ways of integration based on cost reduction, access to markets under better conditions and specialized resources, in which Mexico and the state of Aguascalientes be inserted successfully to consolidate its stake in the electronics industry in the international arena.

In this regard, the electronics industry state Aguascalientes requested the development of this study to identify the needs that will increase the competitiveness of companies in the region, by developing strategies and lines of action to resolve comprehensive and systemic structural problems, and to ensure the international competitiveness of the regional electronics.

Executive Summary

Global Macroeconomic Environment

In the last five years, the global macroeconomic environment has been affected by several economic crises. In 2011, the crisis on the Euro zone started product of the interaction with internal factors. On this economic environment, the International Monetary Fund (IMF) estimates that global economy may have moderate growth around 3.5% in 2013 and 4.1% in 2014, with an estimated growth of 1.4% in 2013 and 2.2% in 2014 for advanced economies, and an estimated 7.9% on 2013 for developing economies on Asia (China, India and the Association of Southeast Asian Nations (ASEAN - Philippines, Indonesia, Malaysia, Thailand and Vietnam).

For the United States there's a forecasted growth for about 2% in 2013. This estimated growth could be affected by federal budget cuts that will take effect decreasing the fiscal stimulus and also causing potential effects of contagion because of the European crisis. For Latin America the estimated growth is moderated, from 3.6% on 2013 and 3.9% on 2014.

About expectations for economic growth in Mexico, those are closely linked to the evolution of the U.S. economy, so the forecasted growth for 2013 is 3.5% and also for 2014, implying a slowdown compared to the final results obtained in 2012.

The Euro Zone continues to show a strong downside risk for the global economic growth, mainly because of the risks of prolonged stagnation, and also if they not follow and decisively maintain fiscal and financial reforms, as well as the implementation of actions to achieve greater integration of banking system and tax regimes.

International Electronics Sector Commerce

The world commerce volume registered a decrease in exports on advanced economies of 2.3% in 2012, mainly because of the crisis at the Euro zone, with moderate forecasted growth of 4.7% for 2013.

In 2012, manufacturing industry shows the highest growth on the non-pharmaceutical chemicals (20%), automotive and clothing (17%). Lower growth in exports was focused on integrated circuits and computers (1.9% and 1.3%, respectively).

Regarding exports of Office Equipment and Telecommunications (Computers, Telecommunications and Electronics) by certain economic regions, China stands out as the leading exporter with a share of 29.6% of total world exports, with a market size of $ 497 billion USD total, and positive percentage change of 11% compared with last year.

Mexico is ranked as the 9th exporter country of computers, telecommunication systems and electronics, with a share of 3.6% of world exports and a market value of 60 billion USD, ranked behind China, Europe, United States, Singapore, Taipei, Korea, Japan and Malaysia.

Summary of Exports and Imports of Mexico by General Classification, 2011.
(Billions of Dollars)

Classification	Exports	Imports	Destination	Percentage	Percentage Change 2011
Office Equipment and Telecommunications	60	60	U.S.	74.1	-1
Computers	19	16	U.S.	91.8	17
Telecommunications	38	29	U.S.	98.6	-9
Electronic Components	3	15	U.S.	7.3	23

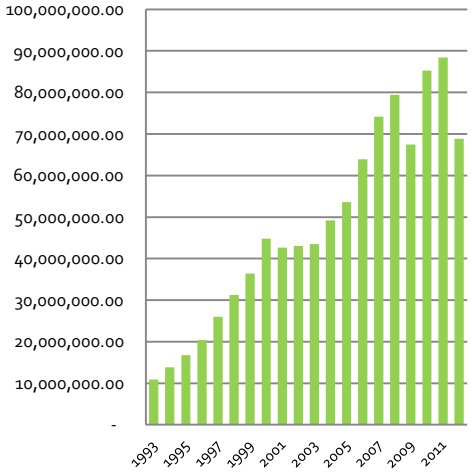
Source: Own elaboration with data from the World Trade Organization.

In terms of international commerce between regions and countries, Mexico has a significant participation in exports with 25% of telecommunication equipment and 22% of total computer imports requirement of the US.

International Electronic Industry Commerce

Broadly speaking, domestic electronics industry has presented a positive trend, mainly since NAFTA agreement, without being a confirmation that this exempts from recent international commerce fluctuations and recent economic recessions, mainly because it is a highly integrated industry to production and global consumption.

Production National Electronics Industry.



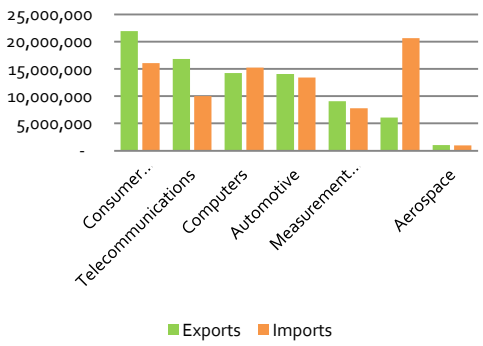
Source: Bank of Mexico, September 2012 data.

Our main exportation industry as a country is consumer electronics, mainly followed by telecommunications and computer industries.

In 2011, Mexico had an important participation on exports of televisions and computers. It is the biggest exporter on flat screens of the world, above Asian countries, and placed itself as the fourth largest exporter of computers worldwide.

In terms of trade balance, the electronic components industry shows a trade balance with a large deficit, importing a greater number of intermediate and capital goods for domestic production processes.

Exports and Imports by Sector Electronics Industries 2012.
(Thousands of dollars)

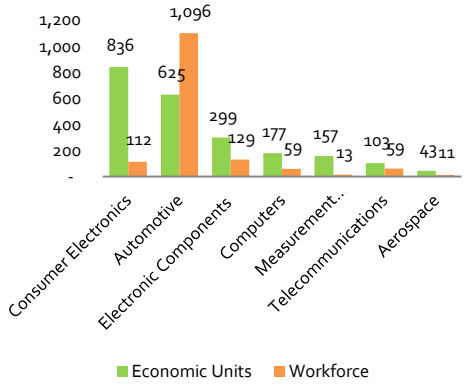


Source: Working Group Foreign Trade Statistics composed of the Bank of Mexico, INEGI, the Tax Administration and the Ministry of Economy.

Productivity Comparative

The consumer electronics industry has 836 nationwide economic units, generating more than 112,000 jobs, in second place is the automotive industry with 635 economic units, being a highly job generator industry, with more than 1 million. The aerospace industry has only 46 companies, generating more than 11,000 jobs (see Figure 1.54).

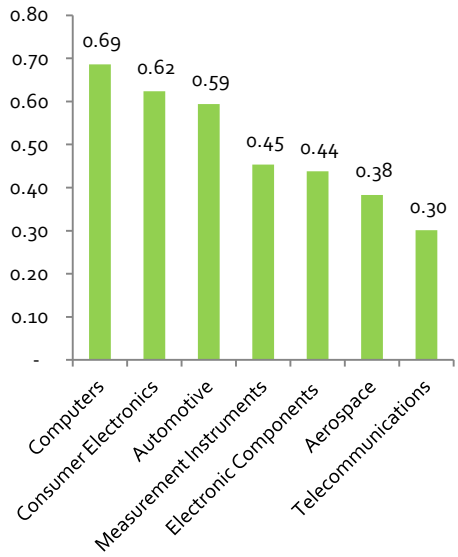
Economic Units – Worforce by industry.
(Economic Units - Thousands of Persons)



Source: 2009 Economic Census, INEGI.

The telecommunications industry has a better relation with intermediate consumption by industry; it requires less intermediate imported resources for their final production, followed by aerospace industry. Regarding industries with higher requirements of intermediate resources we found computing and consumer electronics.

Intermediate Consumption by Industry
(Relationship Intermediate Consumption / Production Total Brutal)



Source: 2009 Economic Census, INEGI.

The regional competitive pattern associated industries to electronics is characterized by higher productivity by the northern states of the country, along with some entities around center and west.

By the north of the country stands the state of Chihuahua, Nuevo Leon, Coahuila, Baja California and Tamaulipas. By the Western we can find the state of Jalisco, and by the

center the state of Aguascalientes, Mexico and Queretaro.

The remaining states present some lower level of productivity with a clear lag particularly at some southern and southeastern states.

The state of Baja California is a national leader in aerospace industry, electronics components, consumer electronics and measuring instruments. In automotive electronics we can mention the state of Chihuahua and Jalisco state in computer industry.

The competitive environment of the Electronic Industry from Aguascalientes State, recorded a pattern where we can find some outstanding industries as the electronic components industry, automotive electronics and computers.

Productivities Aguascalientes Electronics Industry

	Jobs	Productivity Jobs	Stock of Fixed Assets	Intermediate Consumption
Aerospace	-	-	-	-
Electronics - Automotive	3,981	560	535	0.67
Electronics	4,100	356	393	0.71
Computers	1,820	-	-	0-54
Consumer electronics	-	-	-	-
Measuring instruments	8	28	13	0.66

Source: Based on data from INEGI.

With information from the National Statistical Directory of Economic Units (DENUE) from INEGI, there were identified 11 companies in the state of Aguascalientes from electronics sector, also 8 electric sector companies, and 53 companies in the automotive sector.

Regarding the size of companies from the electronics sector, it is evident the preponderance of large companies in the industries of electronic components (2) and computers (1).

The rest of the companies have a smaller scale size, especially micro companies, with less than 10 employees, in the segments of transmission equipment, watches, measuring instruments, audio and video equipment.

A main conclusions of the local electronics industry is the high difference between the sizes of the companies, we can find large companies manufacturing computers and peripheral equipment and also electronic components (Contract Manufacturers), together with a small group of micro companies, which operate in isolation without a corporative strategy with a regional focus or also global, finding themselves immersed between cycles of a lack of fixed assets and also technological assets, low scale size and with a requirement for strategic alliances, adverse contexts in order to compete successfully in global markets.

Some relevant characteristics of the local electronics industry:

- 81% of the companies are micro, small and medium size.
- 7,854 jobs were created by the local electronics industry.
- 96% of jobs are generated by large companies.
- 49% are engaged in manufacturing processes and 29% on services.
- 16% is mainly involved in the electronic components industry
- 57% of companies reported Mexico as their main destination
- 21% of the production goes to the U.S., 8% to China and 3% to Europe.

SWOT Analysis

The main strengths that support the electronic industry of the state of Aguascalientes are those having to do with the availability of human resources.

The talent and creativity stands out as the main characteristic required on the human resource. Secondly, the growing market was defined and the actual infrastructure available in the industry. Contrasting, the weaknesses imply factors like insufficient quality of professionals, low organizational culture and the lack of companies (industry) disponibility in order to align their activities with academic institutions and research centers that can promote a high level of importations.

The main opportunities for the electronics industry are concentrated on the relationship between the horizontal integration of global capabilities and technological market globalization (off shoring trend).

Those opportunities, also, will be threatened by the increased international competition, mainly from emerging markets, adverse factors on the international economy and the low organizational level and the access of financing plans for businesses.

Strategic Plan Goals

- Move towards higher value and technological content in the global production chain;
- Strengthen productive links with the rest of the local economy;
- Achieve a stronger links between companies, Universities and local Research centers.

Strategies and Lines of Action

The strategies and action lines for the development of the electronics sector in Aguascalientes should focus on the following topics:

- Design and national product integration.
- Joining international networks.
- Strategic Plan for attracting Direct Foreign Investment (DFI).
- Companies Certification.

- Special Talent Management Systems.
- Consolidation of specialization opportunities.
- Supplier development.

1.1 Design product and national integration

Consolidate a local industry with design skills, develop and manufacture products and services of higher added value, registered in Mexico through the following procedures:

1.1.1 *Establish a Project Management Office*
1.1.2 *Acquire the technological infrastructure required*
1.1.3 *Access to commerce financing*
1.1.4 *Development of innovation projects*
1.1.5 *Registration of patents and trademarks*

1.2 Joining international networks

The electronics industry worldwide is characterized by its high integration into global value chains, that's why it is essential the execution of strategies and action plans in order to incorporate local industry into international networks.

1.2.1 *Business Networking Platform*
1.2.2 *Export Promotion*
1.2.3 *Marketing Channels*
1.2.4 *Efficiency in English Language Proficiency*

1.3 Strategic Plan for attracting Direct Foreign Investment (DFI)

Take advantage of opportunities beyond manufacturing, in order to attract in a selective way companies and/or projects, promote knowledge diffusion about technological topics, capacities and new products development.

1.3.1 *Procedures Simplification*
1.3.2 *Creation of Design Centers in Specialty Areas*
1.3.3 *Diagnostic of the investment costs of the state*

1.4 International Enterprises (Companies) Certification

Providing a positive environment in terms of regulations (in searching for harmonization with international standards), through adoption of international certifications on quality and environmental models.

1.4.1 *Certification on Quality and Environmental models*
1.4.2 *Creating a Center for Technology Standards*

1.5 Specialized Talent Management

Generate human resources into added value cycles as research and development, new product design, manufacturing strategic inputs, distribution and logistics, product customization, after-sale services and brand & market development.

1.5.1 *Training and certification of human resources*
1.5.2 *Development of Management Skills*
1.5.3 *Improve the link up with academic institutions and research centers*

1.6 Develop Local Specialty Areas

Develop the projects portfolio for vertical markets with a high priority for the local economy as automotive-electronics, agribusiness, robotic-mechatronics, as well nanoelectronics in emerging markets, aerospace and aeronautics.

1.6.1 *Create an Electronic Design Center for Automotive Sector*
1.6.2 *Project of a Product Marketing Channel*
1.6.3 *Project of Service Development for Manufacturing Processes (Electronics-Robotics)*
1.6.4 *Nanoelectronics Design Center*
1.6.5 *Electronic Design Center Aerospace / Aeronautical*

1.7 Supplier Development

Developing suppliers with high levels of expertise in areas of design, engineering, development and advanced manufacturing of higher value added.

1.7.1 *Vertical Integration: Global Value Chains.*
1.7.2 *Horizontal Integration: associations and strategic alliances*

Quantitative Goals

In order to estimate the investments needed for development of the electronics industry in the state of Aguascalientes, the budget requirements in order to implement strategies and action lines proposed in the previous section.

		Contributions			
Term	Projects	Federal	State	Industry	Total
Short Term	10	9.1	1.9	4.3	15.4
Medium Term	10	16.3	1.6	6.3	23.8
Totals	20	25.4	3.5	10.6	39.2
Percentage		65%	9%	27%	100%

Source: Based on average prices of inputs and assumptions.

In the short term (1 year) there's a proposal about the implementation of 10 projects for a total amount of $15.4 million pesos, with a contribution of $9.1 million pesos from the Federal Government, through selected programs, $1.9 million State Government and $4.3 million private sector. In the medium term (1 to 3 years) proposes the implementation of 10 projects with a total of $23.8 million dollars, $16.3 million Federal Government State Government $1.6 million and $6.3 million private initiative.

Qualitative Goals

Short-term (2013 - 2014)

- Rely on strategies to provide training programs for human capital and research and technological development,
- Initiate the development of specialization areas in agribusiness, automotive-electronics and robotics.

- Increased expenses for research and technological development, supported with federal government funds.
- Increased patent registration associated with the implementation of R&D.
- Capabilities are promoted on Aguascalientes companies into the international market.

Medium-term (2013 - 2014)

- 10 of the industry's leading companies have designing alliances, engineering and/or advanced manufacturing with international companies
- Investments are made into innovation projects.
- Industry and academic develop joint projects.
- Consolidation of the local industry as a leader in the quality and environmental models implementation.
- It strengthens the integration of different sectors of the electronics through a research network.
- There is a talent management system specialized for electronics sector, which integrates academia and research centers with industry.
- It has micro-clusters specialization on interest areas from foreign companies, internationally recognized for its innovation and advanced manufacturing processes.
- The increase in exports and supplier development program generate five thousand new jobs (better paid than the high national average).

Long term

Local industry design and develop advanced manufactures in Aguascalientes, with a high percentage of local integration and use of local technologies.

GLOBAL MACROECONOMIC ENVIRONMENT

Highlights

- In the last five years, the global macroeconomic environment has been affected by several economic crises. In 2011, the crisis on the Euro zone started product of the interaction with internal factors.

- On this economic environment, the International Monetary Fund (IMF) estimates that global economy may have moderate growth around 3.5% in 2013 and 4.1% in 2014, with an estimated growth of 1.4% in 2013 and 2.2% in 2014 for advanced economies, and an estimated 7.9% on 2013 for developing economies on Asia (China, India and the Association of Southeast Asian Nations (ASEAN - Philippines, Indonesia, Malaysia, Thailand and Vietnam).

- For the United States there is a forecasted growth of 2% for 2013. This estimated growth could be affected by federal budget cuts that will take effect because of decreasing the fiscal stimulus and also causing potential effects of contagion delivered from the European crisis.

- For Latin America the estimated growth is moderated, from 3.6% on 2013 and 3.9% on 2014.

- About economic growth expectations for Mexico, those are closely linked to the evolution of the U.S. economy, so the forecasted growth for 2013 is 3.5% and also for 2014, implying a slowdown compared to the final results obtained in 2012.

- The Euro Zone continues to show a strong downside risk for the global economic growth, mainly because of the risks of prolonged stagnation, and also if they not follow and decisively maintain fiscal and financial reforms, as well as the implementation of actions to achieve greater integration of banking system and tax regimes.

Global Macroeconomic Environment

This section generally explains the recent global economic context, with special emphasis on the causes of the current European crisis, the magnitude of this effect and the growth prospects for the various regional economic blocks. It examines the impact of the economic crisis in Mexico, its impact on different sectors (particularly on manufacturing) as well as the estimates of the national growth and recovery are the main international organizations. Finally, we also analyzed the fluctuations of the main electronics sector products internationally, identifying the main causes that determine its dynamics, with the aim of anticipating the evolution in the immediate future and make corresponding forecasts before recovery global demand for the same.

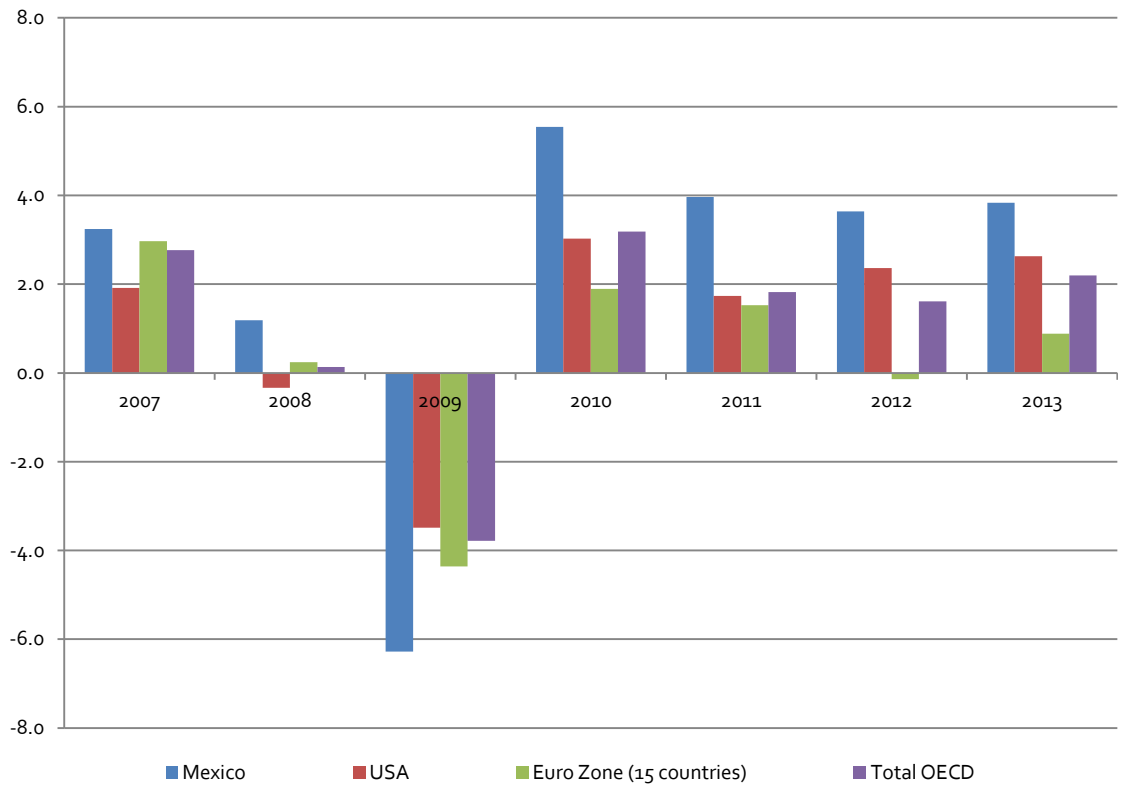
1.1 Current Global Economic Environment and Economic Outlook

Background

In the last five years, the global macroeconomic environment has been affected by various economic crises. Since 2007, the United States of America (USA) had serious financial problems, reflected in the bankruptcy of investment funds in the absence of mortgage payments. The financial crisis quickly spread worldwide, bankrupting many institutions and the need to implement government measures to rescue the financial systems of developed countries. The crisis quickly spread to the real economy, leading to a global recession, increasing unemployment and the contraction in consumption, production and international trade.

In this context, the U.S. financial crisis led to a contraction of 3.5% in gross domestic product (GDP), with a knock-on effect to other developed economies reflected in a contraction of -4.4% in the euro area and a high impact on Mexico on the order of -6.3%. In the international arena, the total GDP of the countries of the Organization for Economic Cooperation and Development (OECD) fell 3.8%, with the biggest drop since it started recording (see Figure 1.1).

Figure 1.1 Gross Domestic Product Selected Countries
(Annual Percentage Change)



Source: OECD Economic Outlook No. 91, OECD Economic Outlook: Statistics and Projections (database).

In 2011, the Euro zone economic crisis began product of the interaction of several underlying factors, among which are included: a risk assessment wrong done, lack of discipline on macroeconomic policies, weak frameworks and common policy. These factors accelerated the accumulation of excessive imbalances in the public and private sectors of economies in the Euro zone with a significant negative effect on estimates of global economy growth.

One of the main factors of the crisis was the high volume of cross-border bank loans, keeping a weak banking supervision and regulation restricted to national level. This impacted on an underestimation of sovereign credit risk, receiving negative evaluations, leading to discrepancies between fiscal balances and external current account in the various European countries. Under this scenario in 2011, the Euro zone showed an increase of 1.5% in GDP, with an estimation of 0.1%-growth in 2012.

Current Scenario

In the end of 2012 were renewed worries that the crisis at Euro zone is stressed and affect other nations, reviving uncertainty and increasing the risk -

country, which contributed to a dramatic slowdown in the Euro zone with significant contagion. One of the factors that drive the intensification of the European crisis was the increasing risks surrounding the outlook for growth, competitiveness and solvency of countries like Portugal, Spain, Italy and Greece.

Since the beginning of the European crisis, the European Central Bank has implemented support mechanisms for countries with higher levels of debt (Portugal, Spain, Italy and Greece), imposing severe fiscal austerity measures that have generated expressions of social rejection. Also it has been implementing economic policies to reduce the pressure of the banking sectors in countries most affected by operations, long-term financing,

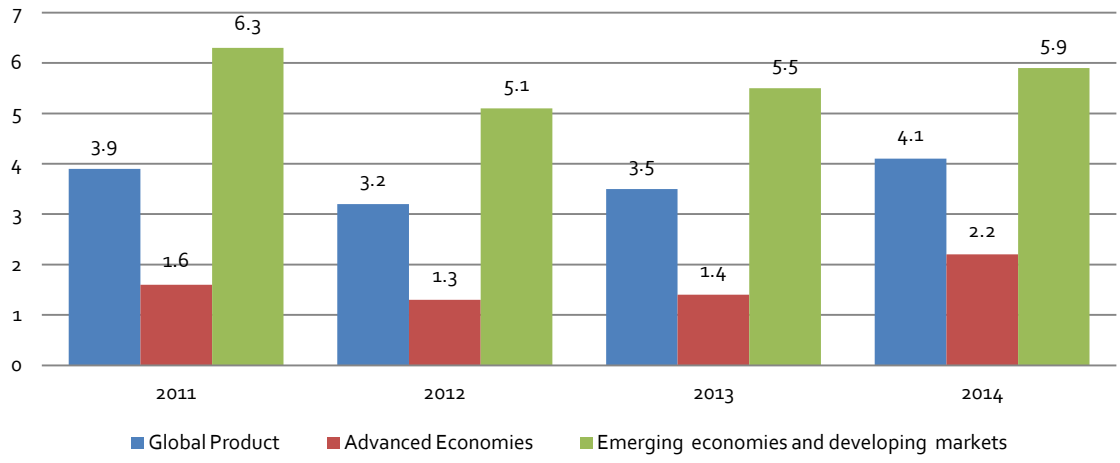
These measures, together with other aimed to strengthen the fiscal pact, have managed to partially stabilize the declining market confidence uncertainty, however, the possibility of re-intensify the crisis, remains a major risk to the stability of the financial sector and global economic growth.

Expected Economic Performance

On this global economic environment, the International Monetary Fund (IMF) estimates that the current European crisis will have a negative effect on the global economy with moderate growth of 3.5% in 2013 and 4.1% in 2014.

For advanced economies, same as recorded a decrease in their product by 1.3% in 2012 for the affected its financial sector and productive growth is expected in the short term skeptic on the order of 1.4% in 2013 and 2.2% in 2014 (see Figure 1.2).

Figure 1.2 Projections of World Economic Growth
(Annual Percentage Change)



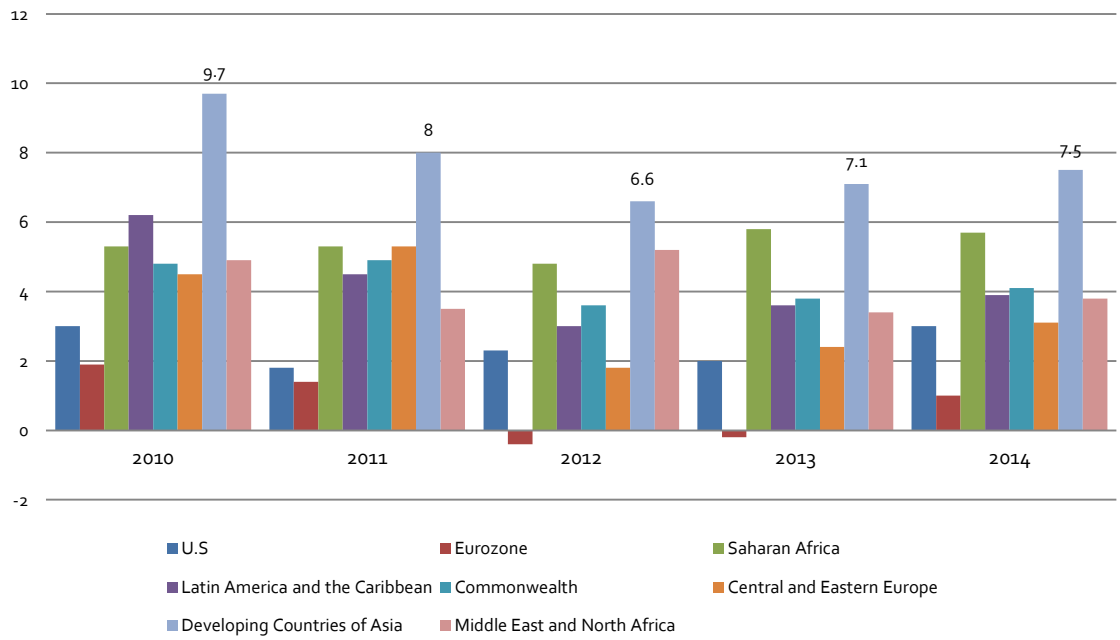
Source: International Monetary Fund [2013], World Growth Gradual Rebound in 2013, World Economic Outlook, January 2013.

The importance, the dynamism of emerging market economies and developing countries underpinning the global output growth of 5.1% growth in 2012, and estimates of 5.5% for 2013 and 5.9% in 2014.

Regarding growth perspectives for economic blocs, the IMF estimates that the Asia Developing Economies (China, India and ASEAN[1]) Show the most progress with a growth of 7.9% in 2013 (see Figure 1.3).

It should be noted that the Asian region showed a slowdown in the last quarter of 2011 as a result of internal and external factors. Among the external factors highlights a contagion effect caused by the crisis in Europe with weak exports from Asia to the European community, however, in economies like China, domestic demand has helped to offset the effect of declining of its exports, maintaining high investment and private consumption, given their business profits and growth in household income, due to their high growth rates in the last decade.

Figure 1.3 Growth Projections for Economic Blocs
(Annual Percentage Change)



Source: International Monetary Fund [2013], World Growth Gradual Rebound in 2013, World Economic Outlook, January 2013.

Regarding growth projections for regional economic blocs, the IMF forecasts growth of 2% in 2013 to U.S. because the enabling environment in the financial market has not been affected by the European crisis and the recovery of its mortgage market, which has helped improve the balance sheets of households and consumption growth.

[1] Philippines, Indonesia, Malaysia, Thailand and Vietnam.

The forecasted growth for the U.S. economy, however can be affected by automatic spending cuts that will take effect in decreasing the fiscal stimulus (at the level of general government) continues to 1 ¼% of GDP in 2013. In this sense, the U.S. priority is to avoid excessive fiscal consolidation in the short term, raising its public debt max and internal negotiations to agree a viable plan medium-term fiscal consolidation focused on the reform of its system of benefits and taxes of the tax system (IMF, 2013).

Growth prospects in the short term for Euro Zone have been adjusted downwards, despite the fiscal policy adjustments and improving financial conditions for the most indebted countries. In this sense, it is expected that the activity will contract -0.2% in 2013, due to a still high uncertainty about the final resolution of the crisis.

In general, the Euro Zone continues to show a strong downgrade risk for the global economic growth, mainly because of the risks of prolonged stagnation if not decisively maintain fiscal and financial reforms, and implementing measures to achieve greater integration of banking system and fiscal regimes.

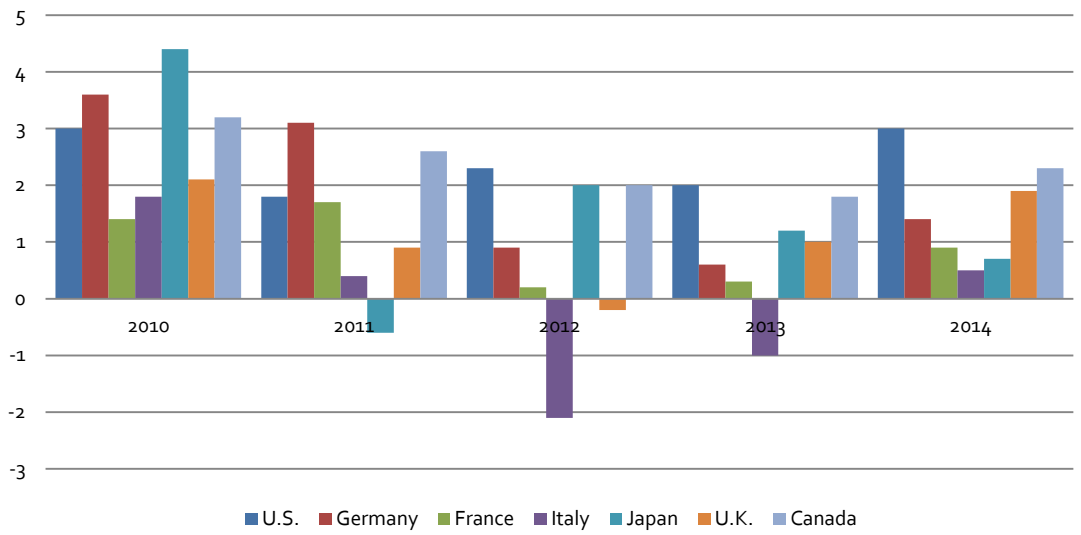
The region of Latin America and the Caribbean[2] grew by 3% in 2012, and is estimated moderate growth projections from 3.6% in 2013 and 3.9% in 2014, mainly because of its close link to economic performance of the United States. To the extent that the U.S. economy maintained its growth estimate Latin America may reach a stable behavior.

In the case of a worsening of the European crisis, the Latin America could cut its growth estimate - ¾%. However, there would be a drastic reduction given the limited trade with Europe (10% of exports from the region) and a moderate negative effect on the operations of European banks, especially Spanish, with a strong presence in the region. Where you could have a strong negative effect is a drastic reduction in prices of raw materials, if the European crisis causes a widespread slowdown, particularly in China and emerging Asia.

Regarding the estimates of growth in advanced economies (G-7) in 2013, the U.S. economy with an estimated growth rate of 2%, as mentioned has latent risks due to fiscal uncertainty and the possibility of contagion from the European crisis. It is important to note that their estimate of moderate growth will have significant impacts on the exports of Mexico, with little effect encouraging in manufacturing and supplier industries (see Figure 1.4).

[2] Includes Mexico and economies of the Caribbean, Central and South America.

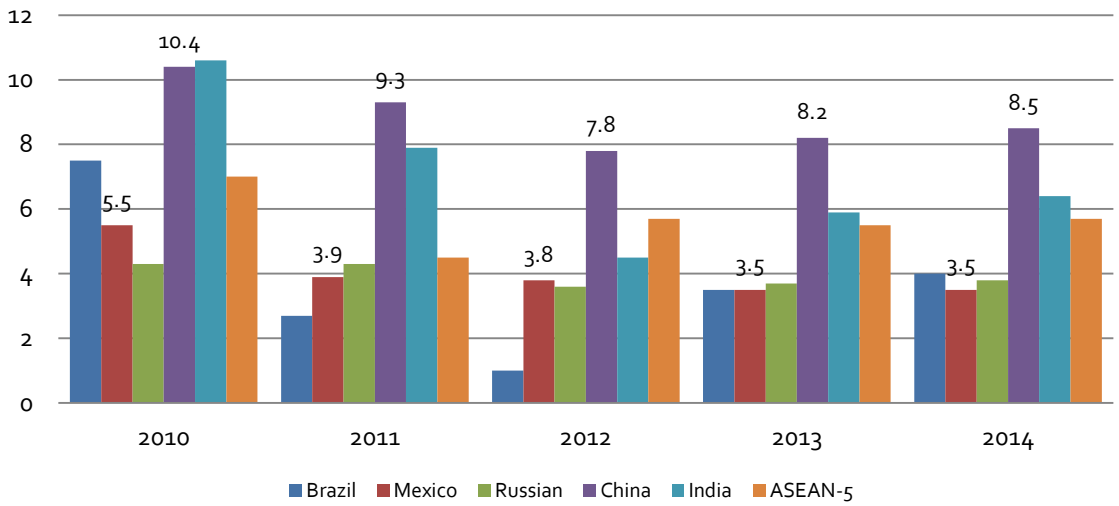
Figure 1.4 Growth Projections advanced economies (G-7)
(Annual Percentage Change)



Source: World Economic Outlook, Growth Resumption, persistent dangers. International Monetary Fund, April 2012.

The rest of the advanced economies, similar to the estimate for the United States, do not have better growth prospects. The leading countries of the Euro zone such as Germany and France begin to feel the contagion effects of the economies of the Mediterranean region, where restrictive fiscal measures have been implemented to improve countries' debt, generating severe adjustments to the welfare of the population.

Figure 1.5 Projected Growths of Certain Economies
Emerging Market and Developing
(Annual Percentage Change)



Source: World Economic Outlook, Growth Resumption, persistent dangers. International Monetary Fund, April 2012.

Regarding expectations for growth in emerging and developing economies, the IMF expects moderate growth to Mexico at 3.5% in 2013 and 2014, relative to other economies such as China, India and ASEAN have higher growth rates (see chart 1.5).

1.2 Macroeconomic Environment in Mexico: Economic Growth Forecasts

The prospects for economic growth in Mexico are closely linked to the evolution of the U.S. economy. Our country grow by 3.9% in 2012, showing an unexpected changes according to the original estimate and forecast of 3.5% growth in 2013 and 2014, implying a slowdown compared to the final results for 2012.

Using data from the National Institute of Statistics, Geography and Informatics (INEGI), Mexico registered a 3.9% growth in its total GDP in 2012, higher than the IMF growth estimate calculated in 3.8% (see Figure 1.6).

Figure 1.6 Mexico's gross domestic product.
(Rate of Change Quarterly)

Source: System of National Accounts, INEGI.

Domestic product growth was mainly due to the positive performance of the three main groups of activities. The product of the primary activities increased 7.2% as a result of the progress reported in agriculture, mainly. Just as there was a growth in the upper Tertiary Activities 3.4% in the fourth quarter versus the same period last year, highlighting the trade, transportation and warehousing, information services media, real estate and renting services and intangible personal property, and financial and insurance services, among others.

The product of Secondary Activities recorded the lower growth of about 1.8% in the last quarter of 2012, with growth in manufacturing, mining, electricity, water and gas supply, and a reduction in the growth of the construction sector (See Figure 1.7)[3].

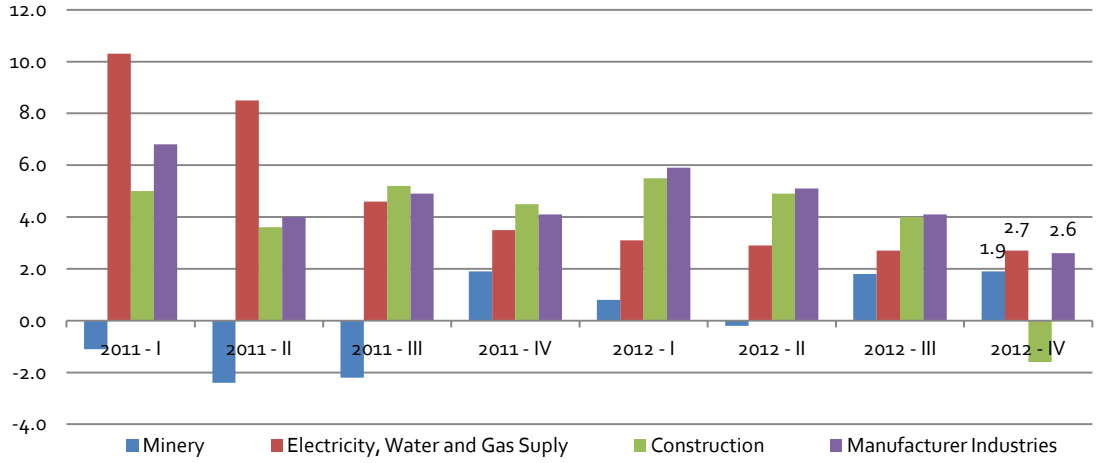
Figure 1.7 Mexico's gross domestic product by activities.
(Annual Percentage Change)

Source: INEGI. National Accounts of Mexico System

Importantly, growth reached 3.9% higher than the original estimates, mainly by the growth of agricultural products, but it shows a decreasing trend of the products of the three activities reflecting an imbalance in the behavior of the Mexican economy. This trend is more visible in the side activities; especially in manufacturing industries that have registered themselves with lower output in the different quarters of 2012 (see Figure 1.8).

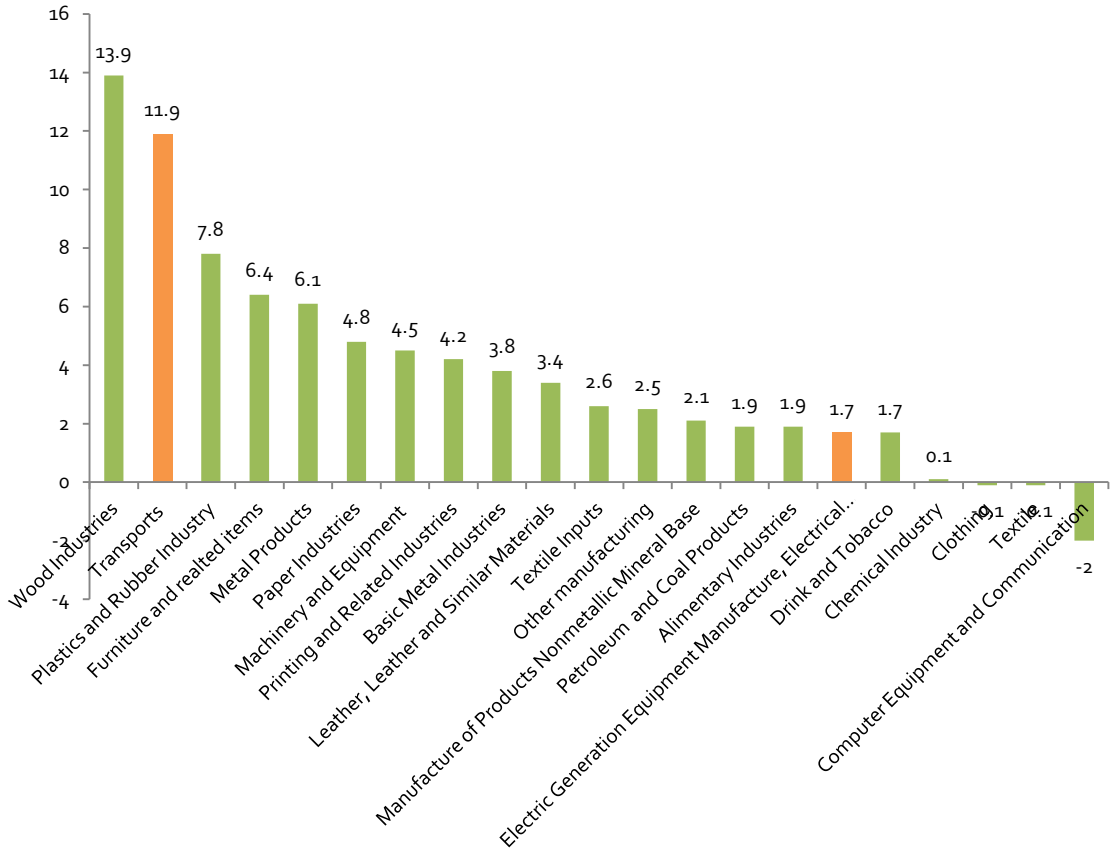
[3] The primary activities relate to the direct use of natural resources such as soil, water, flora and fauna, while in terms of the secondary activities are done processing all kinds of goods or products, whether these come from the primary sector or the same side. Finally, tertiary activities relate to trade and services.

Figure 1.8 Mexico's gross domestic product by Secondary Activities
(Annual Percentage Change)



Source: National Accounts System of Mexico, INEGI.

Figure 1.9 Gross Domestic Product Manufacturing Industries
(Quarterly Percentage Change 2012 - IV)

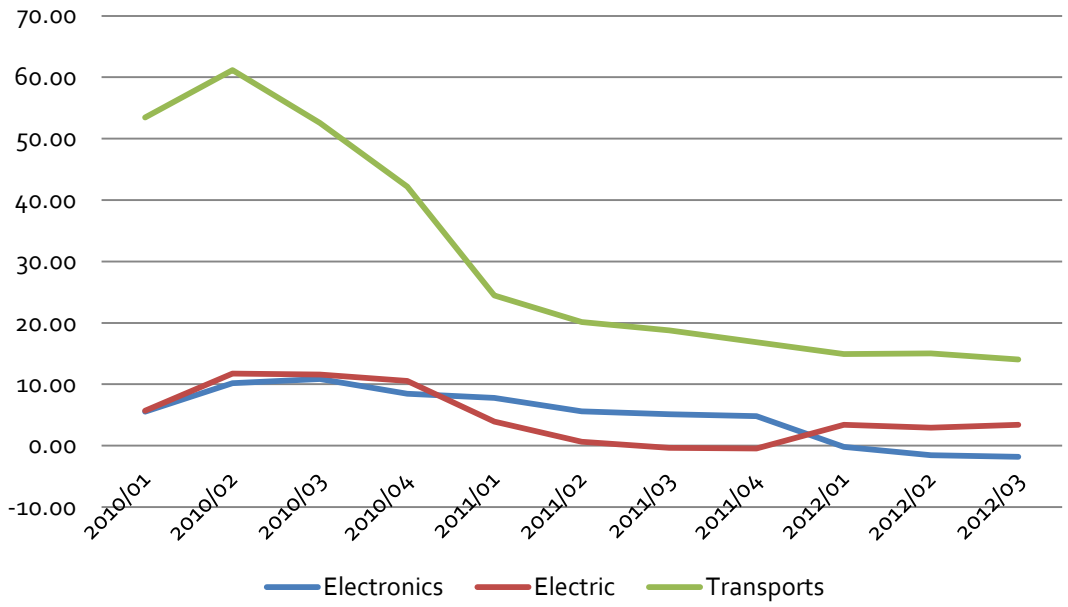


Source: National Accounts of Mexico, INEGI.

Regarding to economic subsectors of manufacturing related electronics sector, highlights 11.9% growth in the production of transport equipment, a moderate growth in the electricity sector, below average product manufacturing, and 2% growth in the electronics sector over the previous quarter (see Figure 1.9).

If we analyze the variations of the product of the three major sub-sectors related to the electronics industry, you can identify a trend of decrease from the second quarter of 2010 (see Figure 1.10).

Figure 1.10 Quarterly Gross Domestic Products by Manufacturing Industries
(Annual Percentage Change)



Source: National Accounts of Mexico, INEGI.

Despite this adverse of decline of the manufacturing industry, it is appropriate to examine the evolution of the indicators published Ahead Coincident with the aim of analyzing the behavior of the Mexican economic

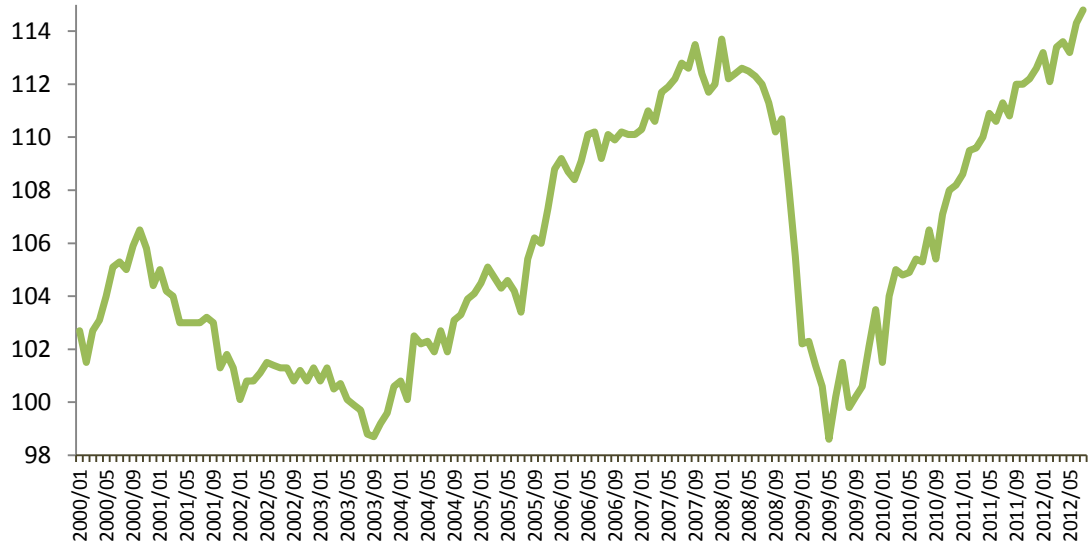
Coincident Indicator considers the Employment Rate and Unemployment Part, the Industrial Activity Indicator, the Indicator of Economic Activity Monthly; Veins Index Net Retail in Commercial Establishments, and Number of assured IMSS.

Meanwhile, advance indicator incorporates the Index of Worked hours in the Manufacturing Sector, Index Physical Volume of Production in Construction; Price of Crude Oil Export Mexican, Mexican Stock Exchange Index securities, Exchange Rates, and Interbank Interest Rate Balance.

In 2012, Indicator Coincident Index 114.8 reported. This behavior was due to the favorable performance in monthly and seasonally adjusted terms, the components that comprise it. It is important to note that this indicator to monitor the main peaks (onset of recessionary phase) and valleys (beginning of growth stage) that took place in recent years, information from which it can be said that the valley began in the second quarter of 2009 is growing steadily.

In this sense, one can say that moderate growth in Mexico could last longer, and even have more growth (see Figure 1.11)

Figure 1.11 Secondary Sector Coincident Indicator.
(Seasonally Adjusted Index 2000-212)

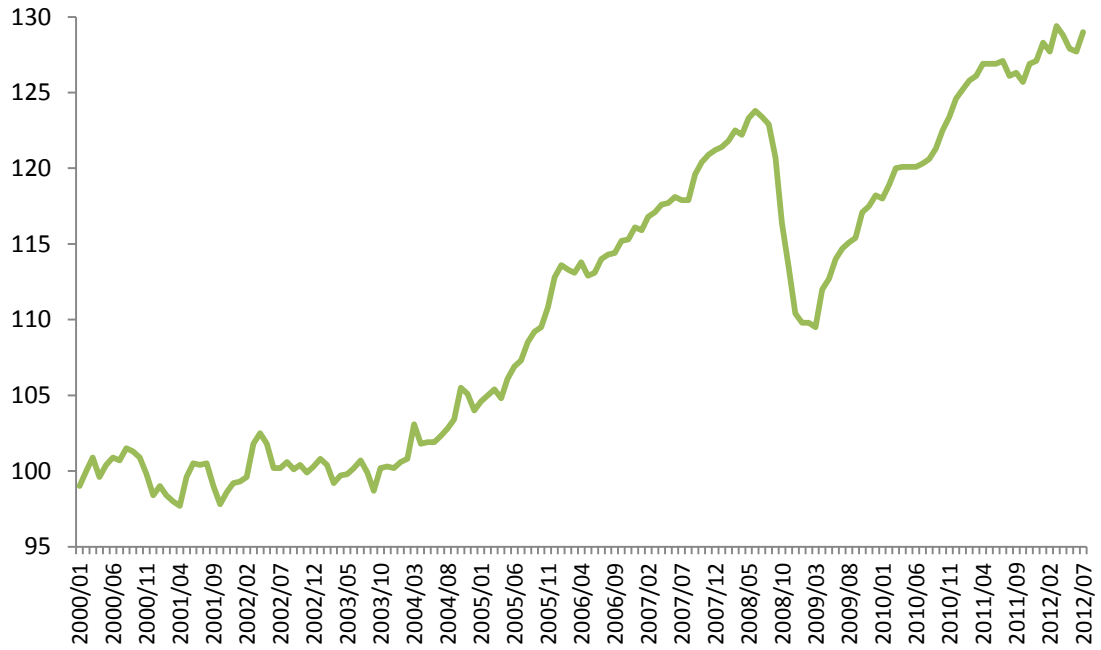


Source: 2009 Economic Census, INEGI.

For its part, the Leading Indicator, which aims to anticipate the likely trajectory of the Mexican economy, reached an index of 129 in 2012 as a result favorable: Index of Hours Worked in the Manufacturing Sector, Physical Volume Index Production Construction, and Exchange Rates.

Additionally, as can be seen, the turning point in the Leading Indicator showing the presence of a valley in April 2009, setting the pace of a growth cycle that showed signs of distress in October 2011, the date from which initiated a new growth cycle of growth (see Figure 1.12).

Figure 1.12 Secondary Sector Leading Indicator.
(Seasonally Adjusted Index 2000-2012)



Source: 2009 Economic Census, INEGI.

To date, the crisis in the Euro zone has not had a significant impact on the U.S. economy, with an estimated growth rate of 2% in 2013 and 3.5% in 2013 to Mexico. However, note that the estimated growth of the U.S. economy should not be constituted as a sufficient factor to drive the growth of our economy in the short term

1.3 International Trade Electronics Sector

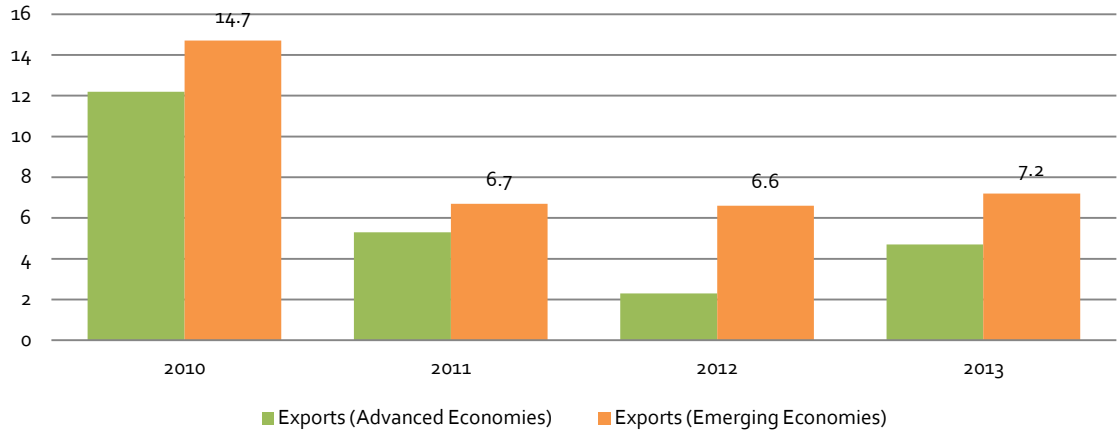
The emergence of global value chains has had a major impact on the reallocation of resources and activities in the electronics industry worldwide. In this sense, the reallocation does not occur only at the corporate level but also by country, as evidenced by examining the patterns of international trade in the last decade.

It is important to note that the volume of world trade recorded a decline in exports in advanced economies to 2.3% in 2012, mainly by the crisis in the Euro zone, with an estimated 4.7% moderate growth in 2013[4]. Importantly, the emerging

United States, Germany, France, the Euro Zone (17), Japan, UK, Canada and other advanced economies (13) and recently Industrialized Asian Economies (4 - Korea, Hong - Kong, Singapore and Taiwan).

and developing economies showed 6.6% growth in 2012 and an estimate of 7.2% for 2013 (see Figure 1.13)[5].

Figure 1.13 World Trade Volumes
(Annual Percentage Change 2012)

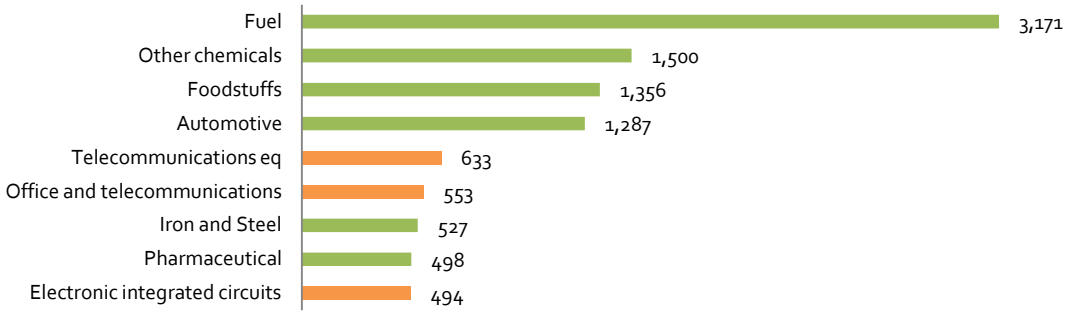


Source: World Economic Outlook, Growth Resumption, persistent dangers. International Monetary Fund, April 2012.

According to statistics from the World Trade Organization (WTO), exports with the largest increases were fuel (37%), agricultural raw materials (26%) and minerals (25%), reducing global manufactured exports in 65 % compared to 2011.

Manufactures with the largest increases were non-pharmaceutical chemicals (20%), automotive and clothing (17%). Growths with lower exports were integrated circuits and computers (1.9% and 1.3%, respectively) (see Figure 1.14).

Figure 1.14. World Exports of Goods by Product Group
(Billions of Dollars 2011)

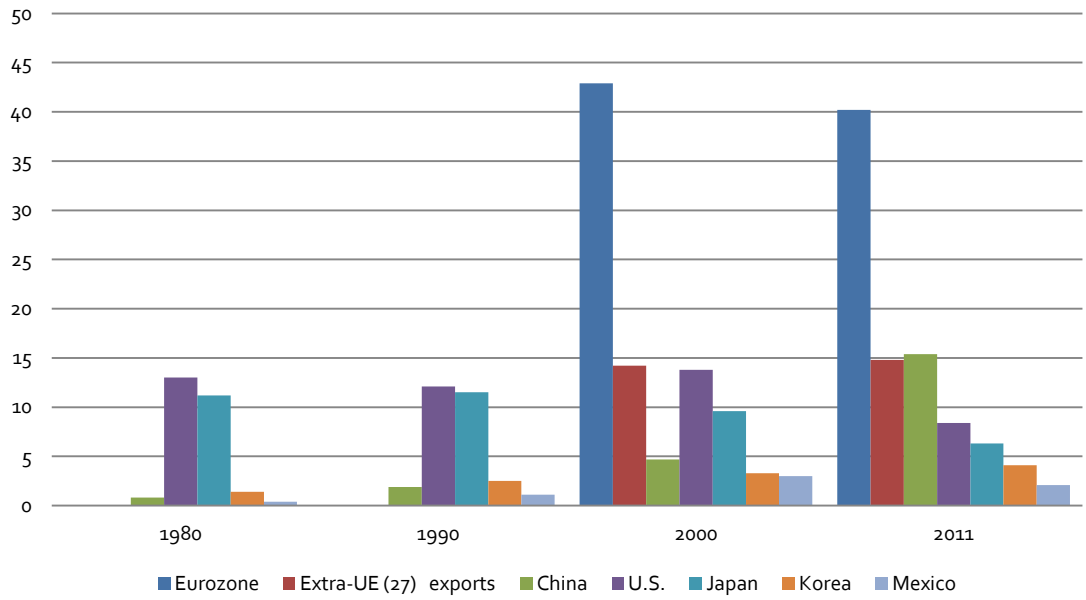


Source: "International Trade Statistics, 2012," World Trade Organization.

[5] Saharan Africa (44), Latin America and the Caribbean (32) (including Mexico and Brazil), CIS (13) (including Russia), Asia's developing economies (27) (including China and India), Central Europe and Eastern Europe (14) Middle East and North Africa (20).

Regarding the major manufacture´s exporters, the European Union[6] is the largest exporter of manufactured goods to an amount close to 4,977 billion U.S. dollars, an increase of 15% in 2011. Secondly it highlights to Asian countries with exports of around 4,285 billion dollars and North America with 1,499 billion dollars (see Figure 1.15).

Graph 1.15 Top Manufacturing Exporting Countries
(Participation in World Exports)



Source: "International Trade Statistics, 2012," World Trade Organization.

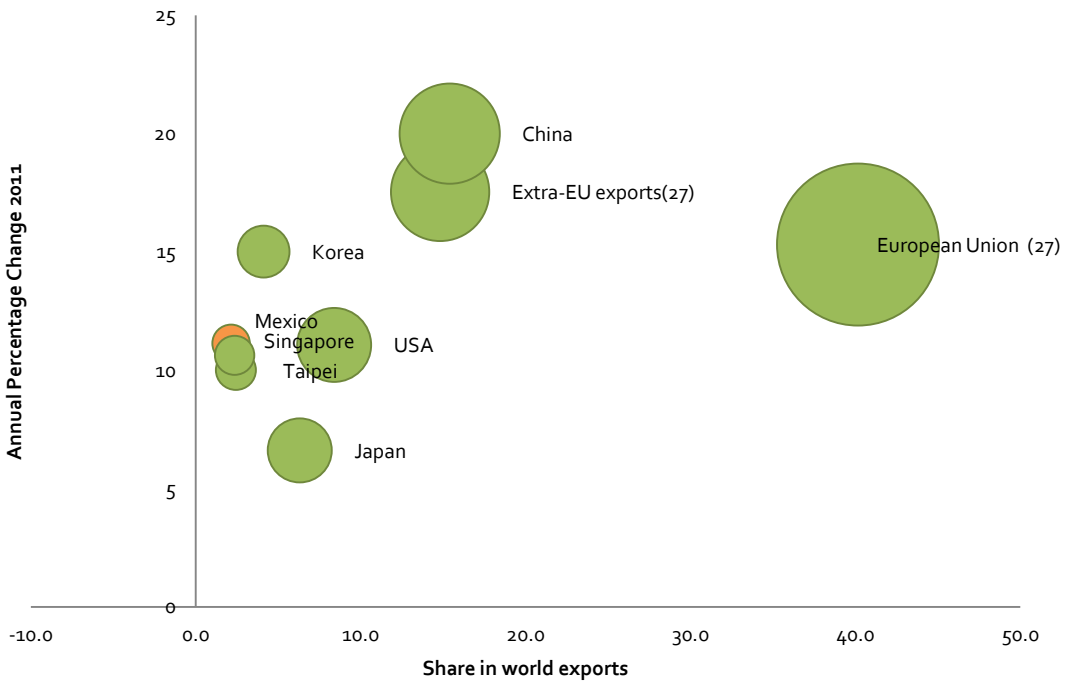
It is important to note that one of the biggest changes from the integration of global value chains is the fastest growth of China's exports. In the period 1980-2011, exports grew well above the growth in exports of industrialized economies: Japan, United States and the European Union. It is clear that in the short term much of the production in these countries has moved to China, being the location of production in other countries decisive in the consolidation of China as the leading supplier of manufactured exports, and goods of the electronics industry.

For example, in the year 2000, China participated in a 4.7% total exports moving toward a share of 15.4% in 2011, in contrast, Mexico participated a 3% total in 2000 and recorded a decrease to 2.1% in 2011. This is evidence of a loss of competitiveness of Mexico as a recipient of investment in manufacturing compared to other countries with aggressive strategies to attract projects. However, the decrease in total manufacturing exports, Mexico is located within 10 major exporting countries with a share of 2.1% and a positive variation of 11% in 2011. In the case of

[6] Exports Extra - EU (27) exports outside the European Union European Union (27), exports between European Union countries.

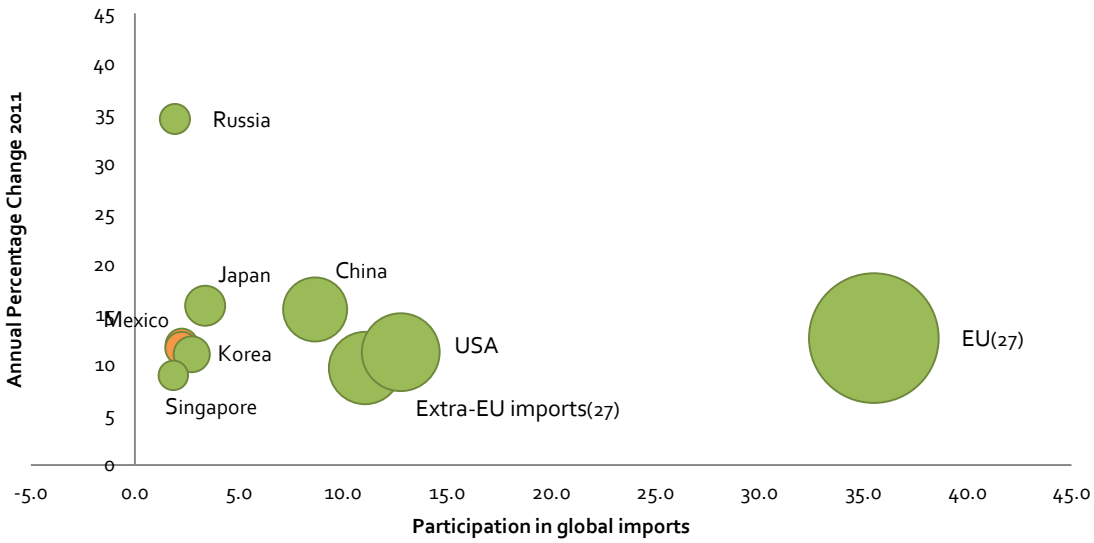
China, has a stake of 15.4% with a percentage change of 20% in 2011 (see Figure 1.16).

Figure 1.16 Main Exporting Countries Manufactures
(Participation / Annual Change Rate / Value - Thousands of Millions of Dollars)



Source: "International Trade Statistics, 2012," World Trade Organization.

1.17 Graph of Manufacturing Major Importing Countries
(Participation / Annual Change Rate / Value - Thousands of Millions of Dollars)



Source: "International Trade Statistics, 2012," World Trade Organization.

In terms of manufacturing imports, Mexico holds a 2.3 with a percentage change of 12% in 2011 (see Figure 1.17). It should be noted that imports of manufactures in China are lower performing exports, implying transit to an import substitution process local products, generating more and more added value in global production chain. In contrast, both the U.S. and Mexico exhibit behaviors deficit, importing more manufactured goods than they export.

There are several factors that have positioned China as the world's leading producer of manufactured goods, due to the uptake of large amounts of foreign direct investment: the size of its domestic market, infrastructure, production costs, especially in human resources, and support government. It is therefore very attractive for investment, especially the efficiency seeking to export to consumer markets. This is evident in the analysis of the correlation between exports and imports in the period analyzed, showing a growing trade surplus over the years, which may indicate the development of Chinese industry in the local production of components.

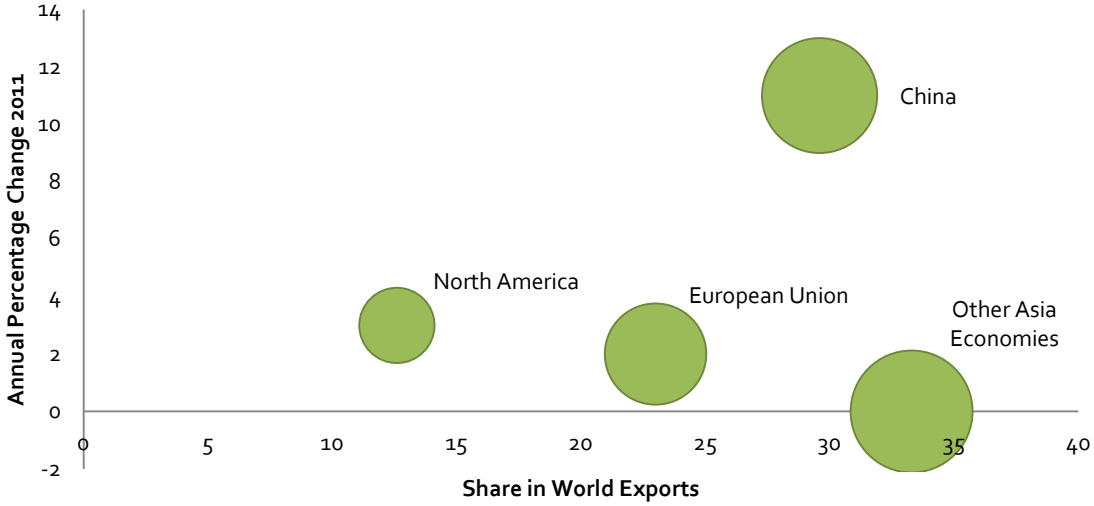
The case of Mexico, its position as one of the major exporting countries, is explained also by its intern domain size, market below China or even Brazil, and easy access to the U.S. market, which enables our country as a platform entry of goods into the United States, importing mainly intermediate goods for assembly, labor advantage over other developed economies for export to the United States. It should be noted that the costs of production, especially of human resources for manufacturing sectors have become less competitive compared to other Asian emerging countries.

The World Trade Organization Study "International Trade Stats" using the Standard International Trade Classification (SITC) to standardize international trade records. The classification used for Office Equipment and Telecommunications[7], Which includes the sectors of Computers, Telecommunications and Electronic Components.

With regard to exports of equipment and Telecommunications Office (Computers, Telecommunications and Electronics) by certain economic areas, China stands out as the main exporter of such products with a share of 29.6% of total exports, a market size of U.S. $ 497 billion total and positive percentage change of 11% over the previous year (see Figure 1.18).

[7] Standard International Trade Classification (SITC): Office machines and machines for automatic data processing (SITC division 75), telecommunications equipment (SITC division 75) and integrated circuits and electronic components (SITC group 776).

Figure 1.18 Export & Office Equipment Telecommunications certain Regions
(Participation / Annual Change Rate / Value - Thousands of Millions of Dollars)

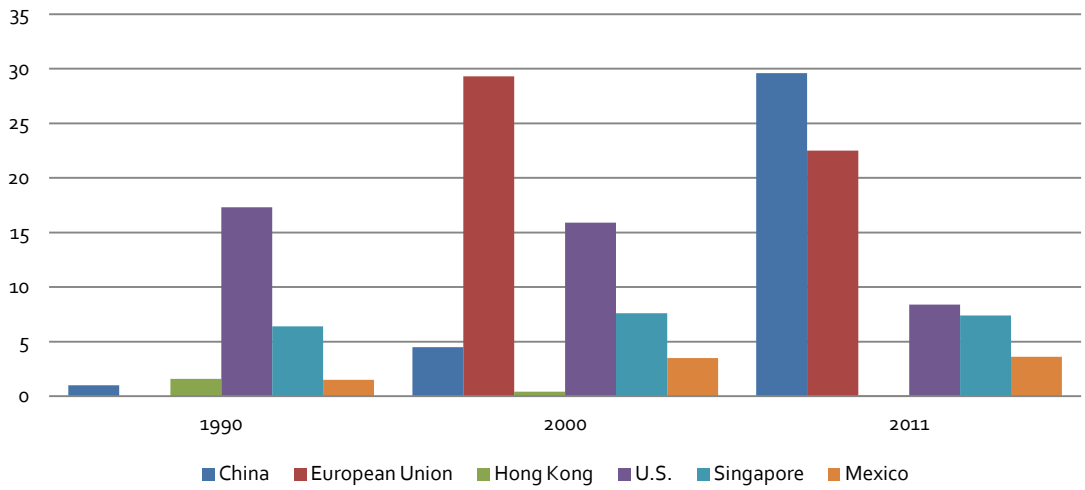


Source: "International Trade Statistics, 2012," World Trade Organization.

Other Asian economies occupy a total of 33.3% of total exports with a market value of 559 billion dollars, but recorded no growth in 2011, resulting from lower export growth integrated circuits and computers (1.9% and 1.3%, respectively). Notwithstanding the foregoing, the Asian region as a whole participates with 63% of exports of office and telecom equipment.

In this regard, it is important to note that Asian economies have sustained its international insertion process electronics industry in its ability to join the new global value chain; developing strategies to increase stakes in the electronics sector in the total of its economy (see Figure 1.19).

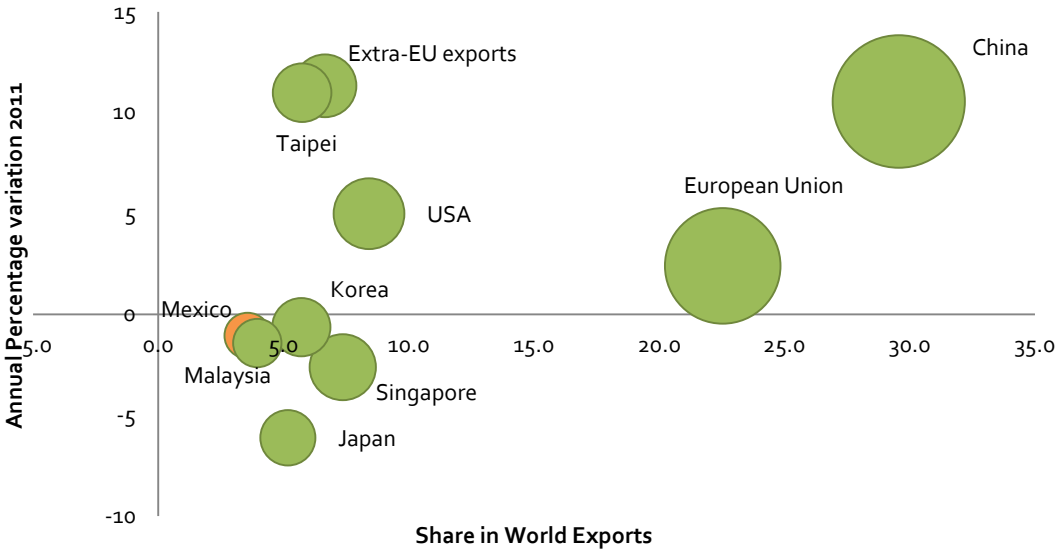
Figure 1.19 Main Exporting Countries Office Equipment and Telecommunications.
(Percentage of World Exports)



Source: "International Trade Statistics, 2012," World Trade Organization.

Mexico is located within the main exporting countries & Office Equipment Telecom with share of 3.6% in total exports and a market value of 60 billion dollars, showing a negative percent change in 2011 over the previous year (see Figure 1.20).

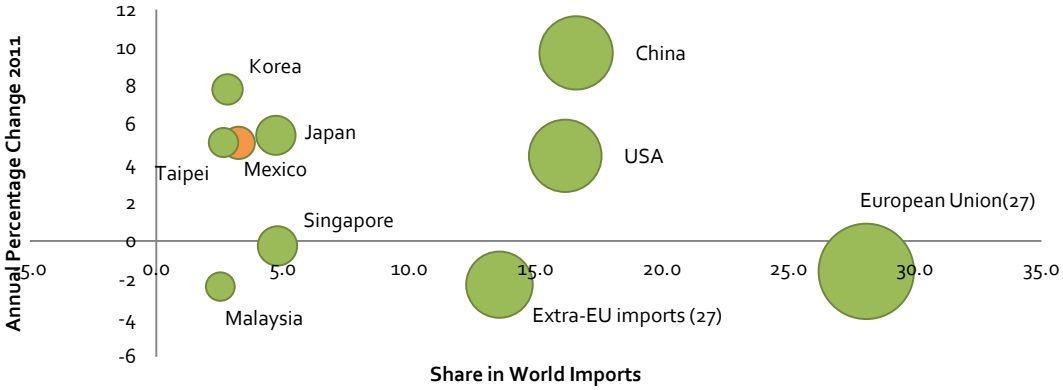
Figure 1.20 Main Exporting Countries Office Equipment and Telecommunications.
(Participation / Annual Change Rate / Value - Thousands of Millions of Dollars)



Source: "International Trade Statistics, 2012," World Trade Organization.

Regarding exports Office Equipment & Telecom, Mexico is located within the top 10 countries with a share of 3.3% in total imports and a market value of 60 billion dollars, the country showed a variation percentage greater than 5% in 2011 (see Figure 1.21). Note that Mexico has a balance of trade in terms of exports and imports.

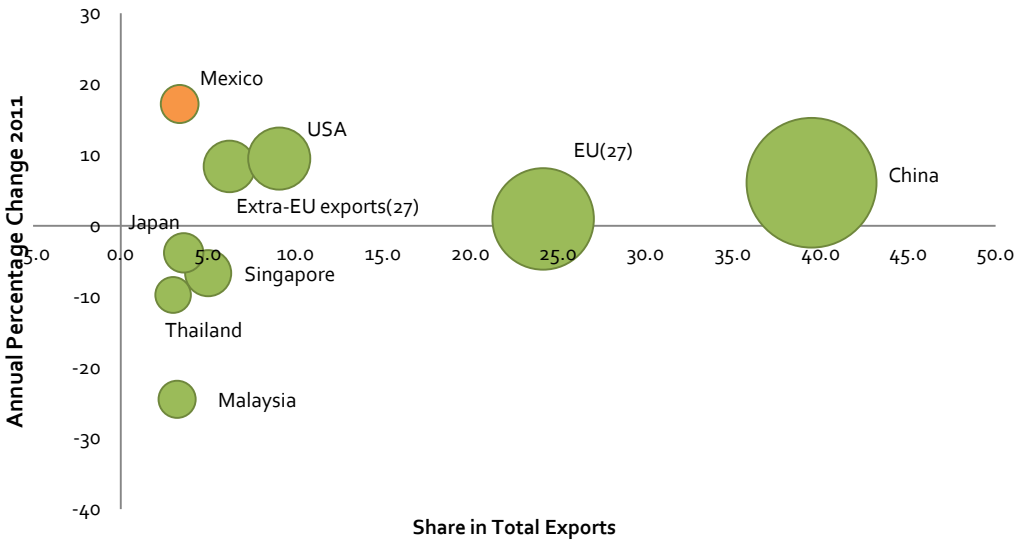
Figure 1.21 Countries Leaders Importers & Office Equipment Telecom.
(Participation / Annual Change Rate / Value - Thousands of Millions of Dollars)



Source: "International Trade Statistics, 2012," World Trade Organization.

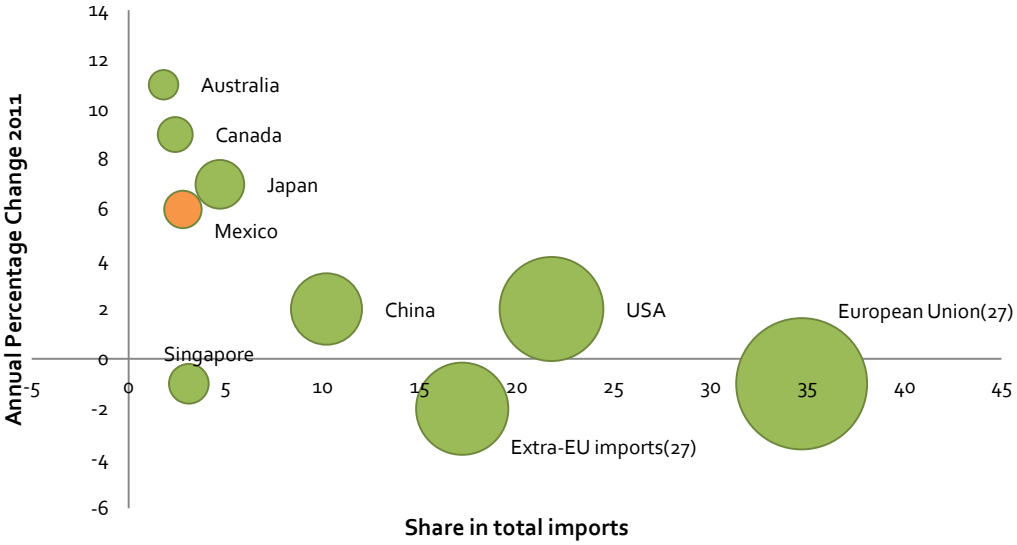
Regarding exports of Computers (machines EDP), Mexico recorded 2.5% of total exports in 2005, showing a light increase of 3.4% in 2011, highlighting the growth of China with share of 23.7% in 2005 to 39.5% in 2011. With regard to imports of computers, Mexico presented a 2.8% share of a 2011 Annual percentage change of 6%, and a value of 16 billion dollars, representing a trade surplus balance of such products (see graphs 1.22 and 1.23).

Figure 1.22 Top Computers Exporting Countries
(Participation / Annual Change Rate / Value - Thousands of Millions of Dollars)



Source: "International Trade Statistics, 2012," World Trade Organization.

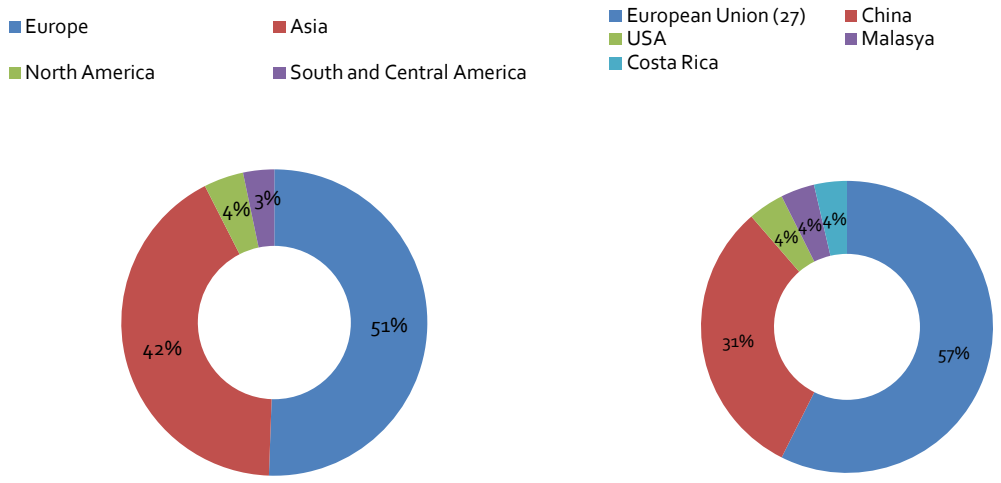
Figure 1.23 Computer Main Importing Countries.
(Participation / Annual Change Rate / Value - Thousands of Millions of Dollars)



Source: "International Trade Statistics, 2012," World Trade Organization.

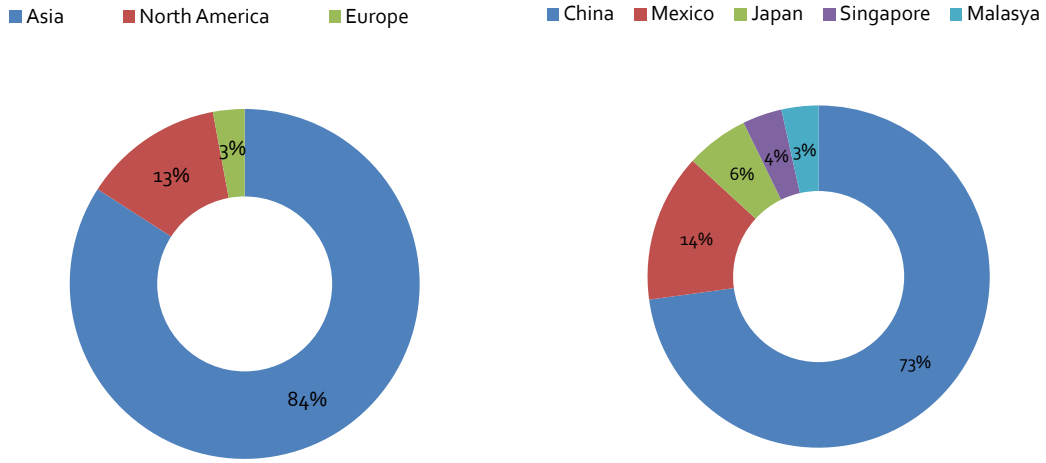
If we analyze the international trade between major regions and countries can show trade flows from the integration of the global production chain. For imports of computers, the European Union imports mainly from European countries (51%) and China (31%), and the United States imports 73% of China mainly and 14% of Mexico's exports of our country reach 14 , 475 million, representing over 90% of our total imports in these products (see graphs 1.25 and 1.26)

Figure 1.25 Imports Computer European Union by Region and Economy, 2011.
(Percentages)



Source: "International Trade Statistics, 2012," World Trade Organization.

Figure 1.26 Imports Computer U.S. by Region and Economy, 2011.
(Percentages)

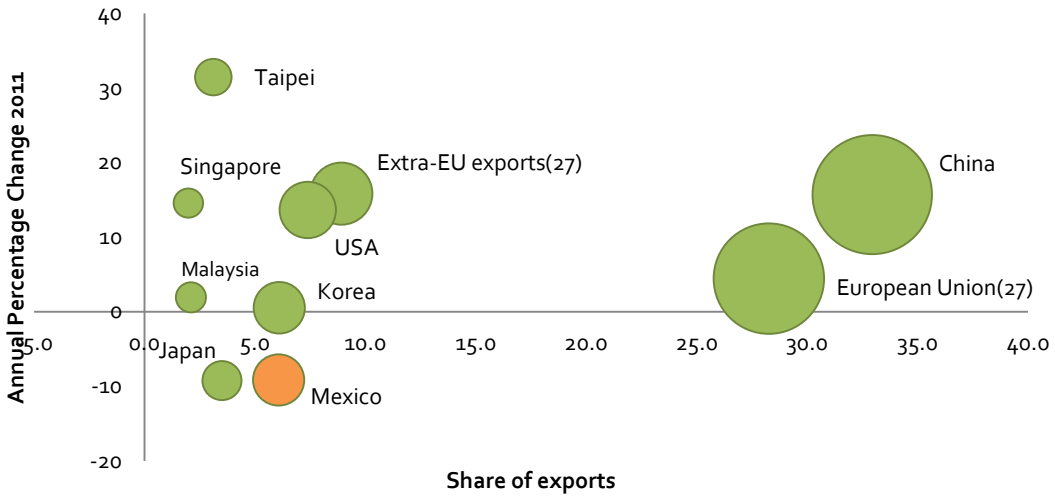


Source: "International Trade Statistics, 2012," World Trade Organization.

In segment Telecommunications Equipment exports, Mexico participated with 5.3% of total exports in 2005, showing a slight increase to 6.1% in 2011, despite a negative percentage change relative to other economies such as China, Singapore

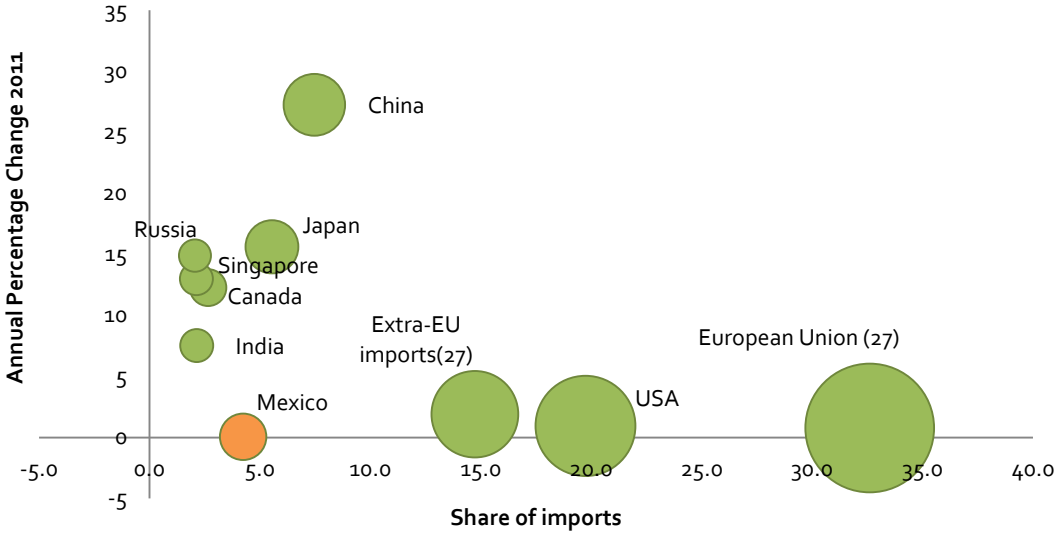
and Malaysia From Just as international trade in computer equipment, China increased its share from 20.7% in 2005 to 33% in 2011 in telecommunications, mainly at the expense of European Union exports which rose from 35.1% to 28.3% in the same period time (see graphs 1.27 and 1.28).

Figure 1.27 Main Exporting Countries Telecommunication Equipment, 2011.
(Participation / Annual Change Rate / Value - Thousands of Millions of Dollars)



Source: "International Trade Statistics, 2012," World Trade Organization.

Figure 1.28 Main Countries Telecommunications Equipment Importers, 2011
(Participation / Annual Change Rate / Value - Thousands of Millions of Dollars)

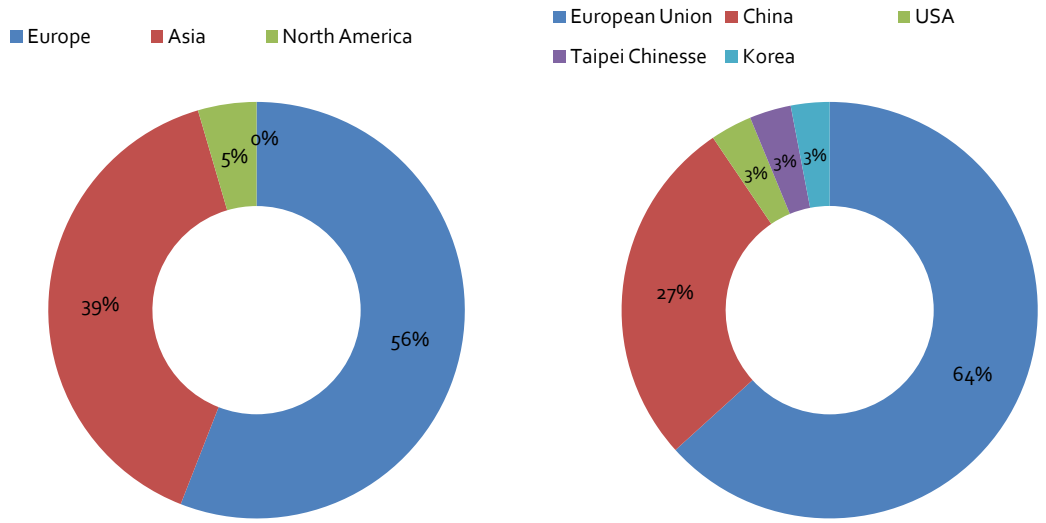


Source: "International Trade Statistics, 2012," World Trade Organization.

The EU imports 64% of telecommunications equipment European economies themselves and 17% in China. The U.S. imports 52% of China and 25% in Mexico,

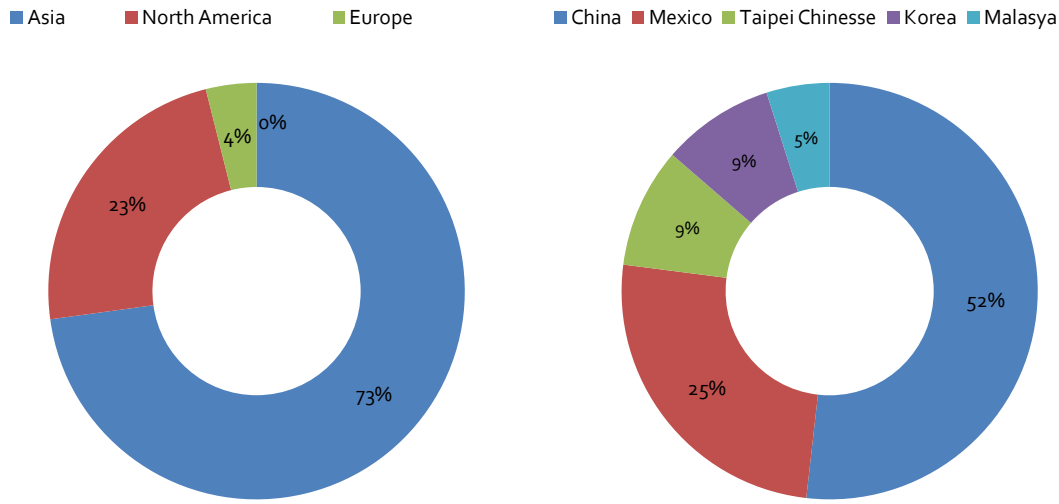
represents $ 28.614 million U.S. or 98% of our exports in these products (see graphs 1.29 and 1.30).

Graph 1.29 Telecommunications Equipment Imports European Union by Region and Economy, 2011. (Percentages)



Source: "International Trade Statistics, 2012," World Trade Organization.

Graph 1.30 Telecommunications Equipment Imports U.S. by Region and Economy, 2011. (Percentages)



Source: "International Trade Statistics, 2012," World Trade Organization.

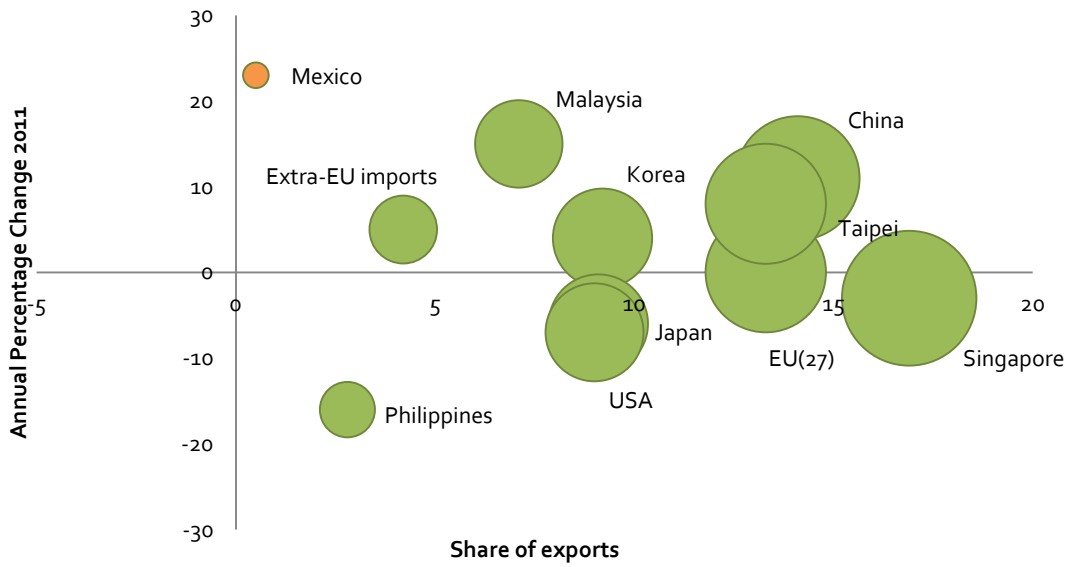
The drastic reduction in the international market shares of telecommunications equipment in Japan, as evidenced by a decrease in U.S. exports around 35% in 1990 to less than 5% in 2012. However, four countries have

significantly increased their share of imports and telephony networks: China, Republic of Korea, Taipei and Mexico, which is explained by the location of Japanese companies, mainly in the first three countries.

Regarding the export of Integrated Circuits and micro - Electronic sets, Mexico participated in 2005 with 0.6% of total exports, a decrease to 0.5% in 2011. In the same way that the areas of computers and telecommunications equipment, highlights the growth of China with share of 5.9% in 2005 to 14.1% in 2011 and Taipei 8.7% in 2005 to 13.3% in 2011, to the detriment exports of those products to the European Union increased from 18.1% to 13.3% in the same period of time.

In 2011, Mexico introduced a share of 0.5% with a 2011 annual percentage change of 23%, and a value of 3 billion dollars (see Figure 1.31)

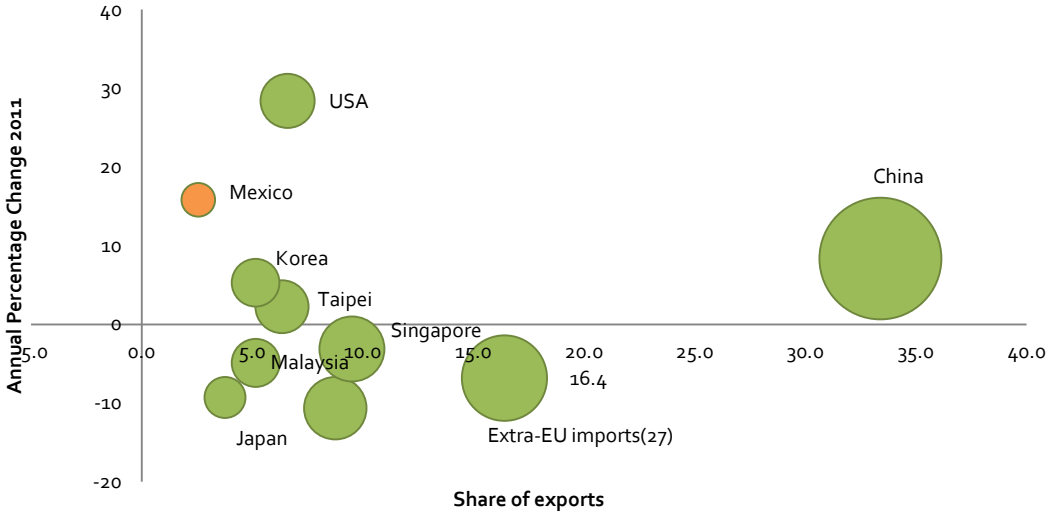
Figure 1.31 Top Electronic Components Exporting Countries, 2011
(Participation / Annual Change Rate / Value - Thousands of Millions of Dollars)



Source: "International Trade Statistics, 2012," World Trade Organization.

With regard to imports, Mexico filed a participation of 2.6% with annual change of 16% in 2011, and a value of 15 billion dollars, representing a trade deficit in Integrated Circuits and Micro assemblies Electronic (see Figure 1.32).

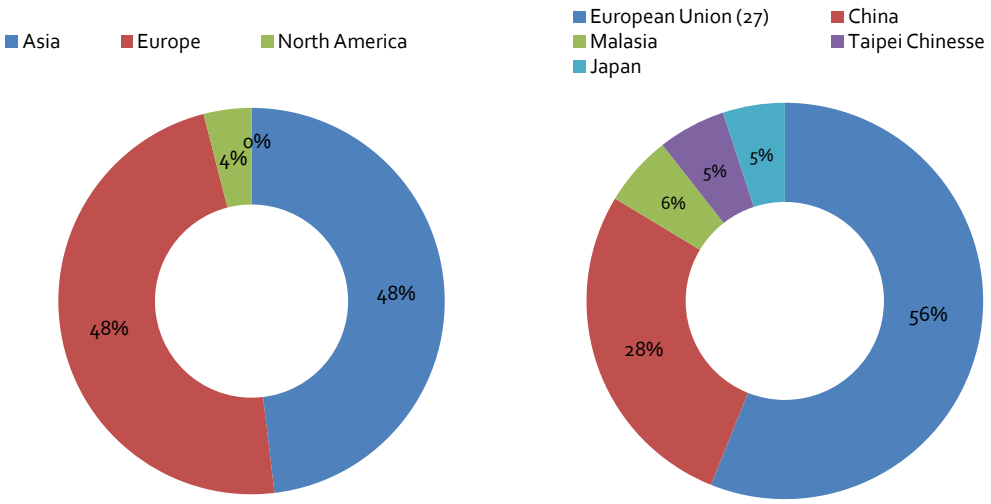
Figure 1.32 Main Countries Electronic Component Importers, 2011
(Participation / Annual Change Rate / Value - Thousands of Millions of Dollars)



Source: "International Trade Statistics, 2012," World Trade Organization.

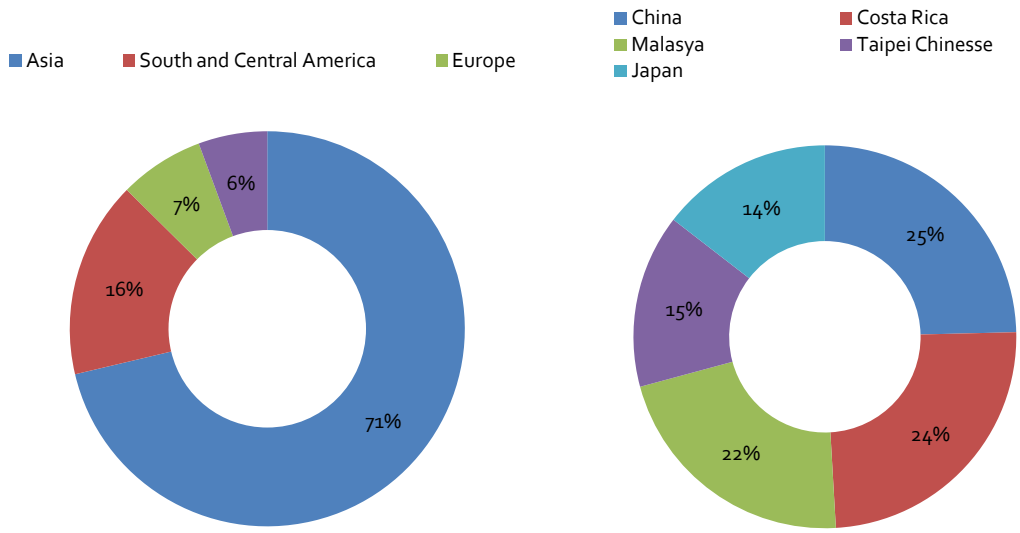
The European Union imports electronic components on the order of 56% using inter - countries and 28% in China (see 1.33 graphs).

Graph 1.33 Electronic Components Imports European Union
by Region and Economy, 2011.
(Percentages)



Source: "International Trade Statistics, 2012," World Trade Organization.

Graph 1.34 Electronic Components Imports United States
by Region and Economy, 2011.
(Percentages)



Source: "International Trade Statistics, 2012," World Trade Organization.

The United States imports electronic components on the order 25% of China and 24% of Costa Rica (see 1.34 graphs). Mexico exported U.S. Electronic Components totaling 1.111 billion, representing more than 7.4% of our total imports in these products.

Below is a summary of exports and imports between countries according to the classification used in Office Equipment and Telecommunications: Computers, Telecommunications and Electronic Components by main countries (see Table 1.35):

Table 1.35 Summary of Imports by Countries, 2011.
(Percentage)

Classification	Exports	EU	China	Mexico	Costa Rica	Taipei	Korea
Computers	EU	57%	31%				
	USA		73%	14%			
	China		48%	22%			
Telecommunications	EU	54%	27%				
	USA		52%	25%			
	China	55%					19%
Electronic Components	EU	56%	28%				
	USA		25%		24%		
	China					29%	23%

Source: Own elaboration with data from the World Trade Organization.

As shown in the table above, Mexico telecommunications equipment exports mainly to the U.S. (25%), the second international supplier, and exports by 22% of computers to China and 14% to the United States.

Latin America and Caribbean, despite the low presence on international trade. Exports of electronic goods, mainly those related to computers, telecommunications equipment and electronic components has increased, the main benefit Mexico and, to a lesser extent than Costa Rica.

These countries accounted for high percentage exports, however there are differences between them. The correlation between imports and exports in the cases of Mexico and Costa Rica show the export orientation of the two countries, based on imported inputs, appearing attractive to efficiency-seeking investment, so China is their major competitor. Below is a summary table of exports and imports under the WTO statistics:

Table 1.36. Summary of Exports and Imports of Mexico by General Classification, 2011.
(Billions of Dollars)

Classification	Exports	Imports	Destination	Percentage	Percentage Change 2011
Office Equipment and Telecommunications	60	60	U.S.	74.1	-1
Computers	19	16	U.S.	91.8	17
Telecommunications	38	29	U.S.	98.6	-9
Electronic Components	3	15	U.S.	7.3	23

Source: Own elaboration with data from the World Trade Organization.

Mexico currently ranks within top 10 countries producing computers, telecommunications equipment and electronic components; the geographical position has enabled us as a platform for entry into the United States products, leveraging our geographic proximity, regulatory framework and human resource availability. It is important to note the slight trade surpluses in computers and telecommunications, and high trade deficit in electronic components, which primarily an export-oriented shows sustained in imported inputs, which shows you need to strengthen the coordination of local productive chains to initiate a process of substitution of intermediate goods imports, supported by strategic expertise in innovation activities and technological development.

1.4 Global Value chains in the Electronics Industry

The electronics industry has experienced big changes over the past two decades. Trade liberalization, fast technological evolution, the development of information and communications technologies, and reducing logistic cost have changed the behavior of large firms in the electronics industry and, therefore, its industrial and business organization. One of the most significant changes has been the emergence of global value chains.

Global value chains consist of the division of the links in production chains between different subsidiaries, affiliates or plants of the same company located in different geographical locations.

Thereby, leading enterprises of the global chains focus on critical activities as build and strengthen their competitive advantages, such as product development, marketing and brand management, establish also monitor technical and quality standards. Leading companies "*unverticalizing*" internal activities, basically abandoning manufacturing processes and subcontracting them to others, being this way a notable trend in the electronics industry.

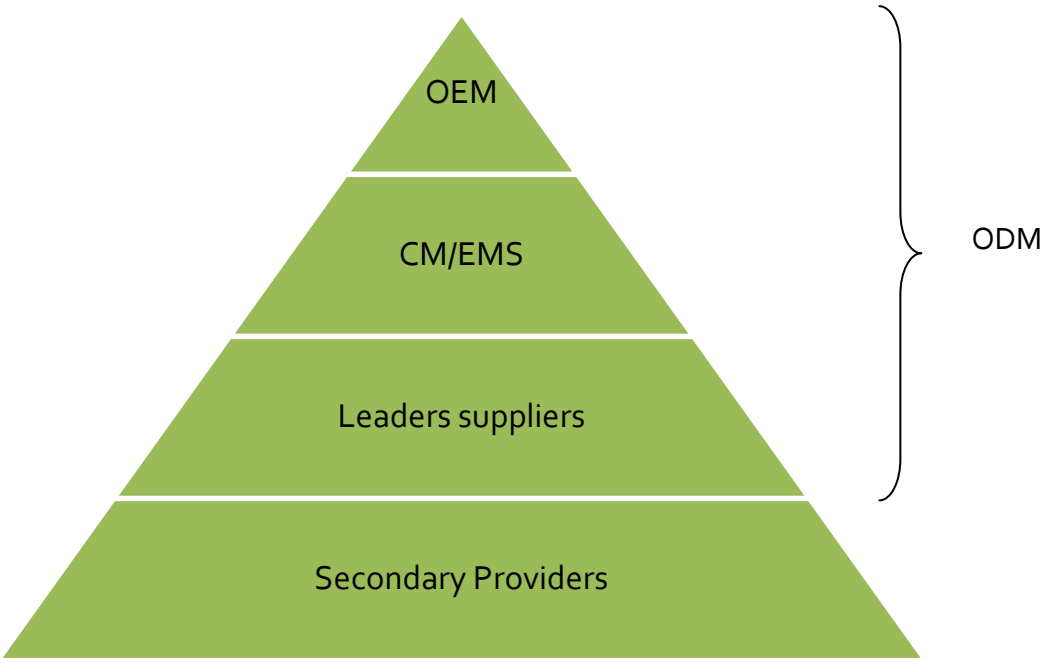
In this sense, the value chain of electronics industry is characterized by their high fragment ability or divisibility, the different links or activities have different characteristics and scale, knowledge and technology needs, and its production can be located in different geographic locations.

The impulse for the international value chain has been developed mainly three factors. First, trade liberalization has opened markets and led to the expansion of foreign direct investment, second, fast technological change through the development of information and communication technologies has dramatically reduced costs of exchanging information; third, the competition in the international manufacturing market, which has led to search for new forms of industrial organization that enable cost reduction (efficiency seeking), access to markets under better conditions (market research) and specialized resources (search for strategic assets).

In this sense, increasing international competition in electronics industry, complexity and sophistication of the products, and pressures on reducing costs and reducing life cycle of products have generated a growing demand for advanced manufacturing capabilities and services related.

Global value chain of the electronics industry has four main players: OEM (Original Equipment Manufacturer-OEM), Contract Manufacturers (Contract Manufacturer-CM *or Electronic Manufacturing Suppliers - EMS)* providers and design houses (Original Design Manufacturers).

Value chain Global Electronics Industry



OEMs, also known as global leaders, are at the center of the value chain and provide strategic and organizational leadership. Its major advantages are based on resources and skills to innovate and coordinate transactions and the exchange of knowledge among network elements.

The under contract manufacturing (CM) differs from traditional outsourcing manufacturing or manufacturing assembly scheme, which is characterized by intensive processes of highly controlled labor by the contractor. In contrast, the CM have the ability to develop and carry out complex processes of production globally, establishing their own production systems to provide components and OEM products.

In recent years, reducing profit margins in traditional manufacturing activities given the increasing international competition from countries and companies, have caused the CM to participate more in higher value-added activities such as prototyping, testing of components and products, purchase of materials and services including product design and management of the supply chain.

CM Outsourcing allows OEMs benefit themselves from the experience and expertise of the first to design, manufacture and management of the supply chain, OEM keeping control over strategic aspects of managing the supply chain, customer interaction, quality assurance, customer service and the introduction of new products. Among the main benefits obtained by OEMs with this strategy are: the operating costs reduction and capital investment, access to world class manufacturing, manufacturing process of the same product globally plants using the CM located in several countries and the ability to focus on their core competencies.

Among the suppliers (third type of participant in the value chain) can be differentiated leaders and secondary suppliers. The leaders have an intermediary role between the CM and secondary suppliers and they own valuable assets, including technology. In contrast, secondary providers base their

Global Electronic Companies in Aguascalientes

Flextronics

International company dedicated to the design, manufacture, assembly and testing of printed circuit products, metals, plastics, among others, the fields of the computer industry, industrial, automotive and medical.

In Aguascalientes has more than 2,200 jobs principally engaged in process design, assembly and products manufacture.

Sensata

International company producer sensors and controllers for automotive manufacturers, appliances, aerospace and industrial markets with presence in Dominican Republic, United States, China, Korea and Malaysia, among others.

At local level has a manufacturing plant dedicated to the production of sensors, closed circuit monitoring for the automotive and aerospace industries, among others, generating more than 4,300 local jobs.

Texas Instrument

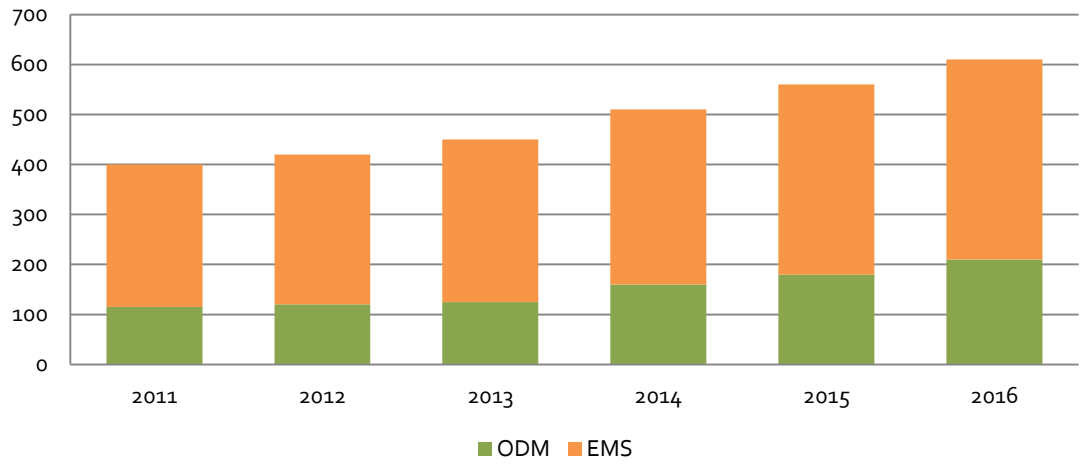
A global designer and manufacturer of semiconductors for computers as well as integrated circuits for mobile phones, digital signal processors, analog semiconductors, peripherals devices, and digital devices, among others. Aguascalientes plant generates more than 1,000 jobs.

comparative advantages in low cost, speed and flexibility.

The fourth participant in the global value chain of the electronics industry is designing houses. These companies offer highly specialized services and knowledge-intensive first three participants in the network (OEM, CM and leading suppliers). Recently, there has been a sharp rise of design houses to the increasing vertical specialization of research and development activities. For example, in systems such as integrated circuits or software development product technology is becoming increasingly modular, that is, certain activities in the design and development process (mainly routine) performed by standard procedures and can be outsourced to specialized companies such as design houses.

The study Electronic Worldwide Manufacturing Services Market forecast or extraordinary growth in CM and ODM markets in the period 2012 - 2016, mainly the CM market will show rapid growth from 2013, as well as ODM market. It is important to note that the expansion in both markets have been highly promoted (37% in the period 2010-2011), by the demand for telecommunications equipment - Smartphone and mobile devices (iPhones, iPads, etc.) - (See chart 1.37)

Figure 1.37 Estimated Growth ODM and EMS Markets ($ M)



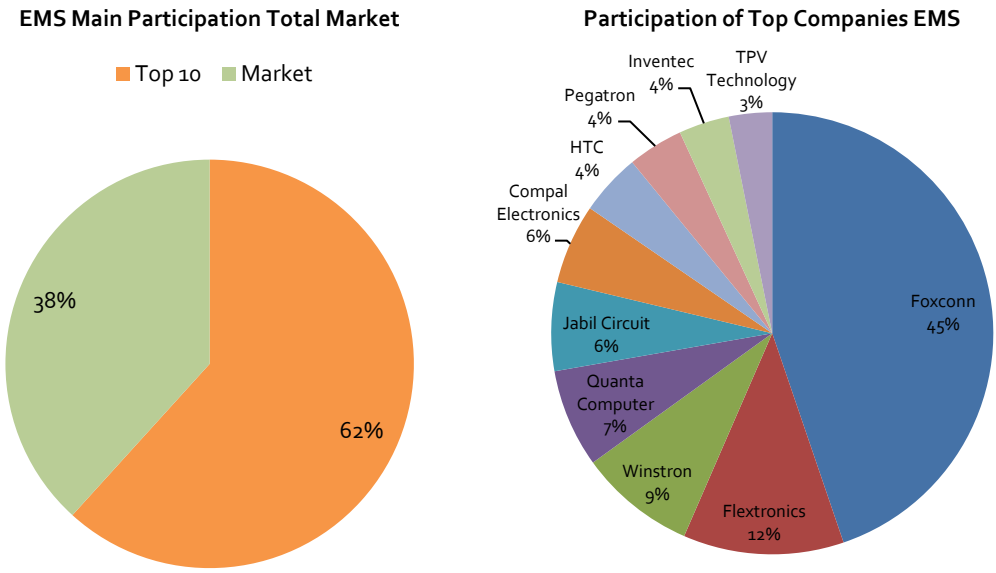
Source: The Worldwide Electronic Manufacturing Services Market, 2012 Edition.

As evidenced in international trade statistics, the shift of production inexpensive regions mainly China, has been a common practice in recent years. Currently, OEMs are requiring companies CM to manufacture products at locations near final sales countries, opening up significant opportunities for Mexico because of the proximity to U.S. (market research), never the less the Attraction effort should sustained not only in reducing costs (search efficiency), but by providing specialized resources (search for strategic assets).

These decisions are closely linked on the type of product, for example in the case of high volume products such as mobile phones and computers, OEMs take advantage of lower manufacturing costs, but other products as larger TVs, labor cost differences are becoming less significant compared to the total cost of production (including transport and logistics).

Note that the further development of global value chain has occurred in the telecommunications and computers equipment sectors. For example, the company Foxconn continues to be CM industry leader, given the rapid growth of Apple (OEM), earning three times more than its main rival. The company Flextronics continues in the second position, followed by Wistron Quanta Computer (MDG's) and Jabil Circuit (see graph 1.38)

Figure 1.38 Major CM and ODM Companies ($ M)



Source: The Worldwide Electronic Manufacturing Services Market, 2012 Edition.

Finally, it is important to note the participation or integration into global chains offer great potential benefits to developing countries, such as the transfer of advanced knowledge in manufacturing, engineering and product design process and access to international markets, increasing complexity and scale of the value chain, creating spaces for the participation of specialized local suppliers.

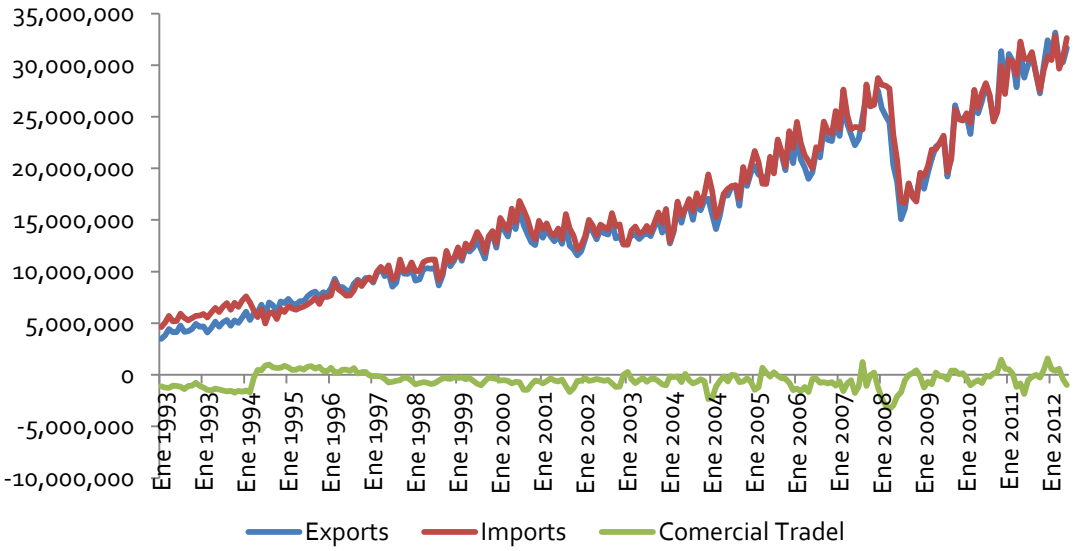
The participation of local companies may be at first assembly or manufacturing activities, but there are growing spaces to also participate in design activities, research and development. In this line, the vertical specialization of research and development input opens up new possibilities for developing countries, however, the benefits for developing countries are not automatic, nor the

participation of companies and countries activities more intensive use of knowledge of the value chain. As discussed in more detail in the following sections, it is necessary to develop local capacity through investment in human capital formation and in science and technology, in which public policy plays a central role.

1.5 International Trade Mexico Electronics industry

The Bank of Mexico publishes information Mexico's trade balance that expresses the log of total imports and exports in a given period of time (see Figure 1.39).

Figure 1.39 Mexico's Trade Balance.
(Thousands of Dollars)

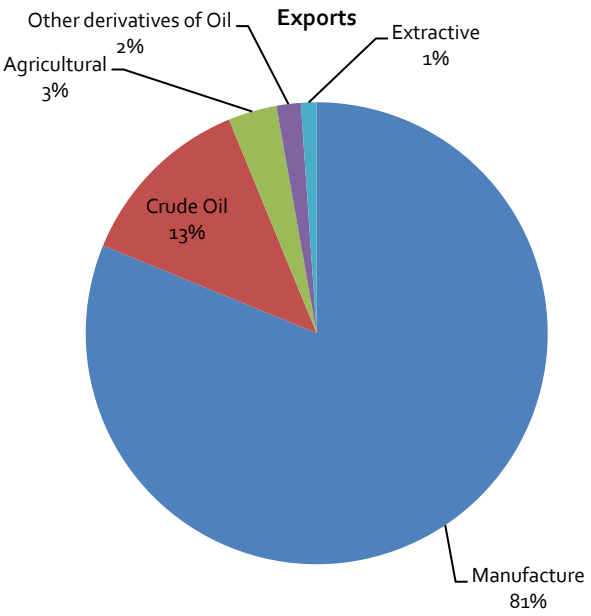


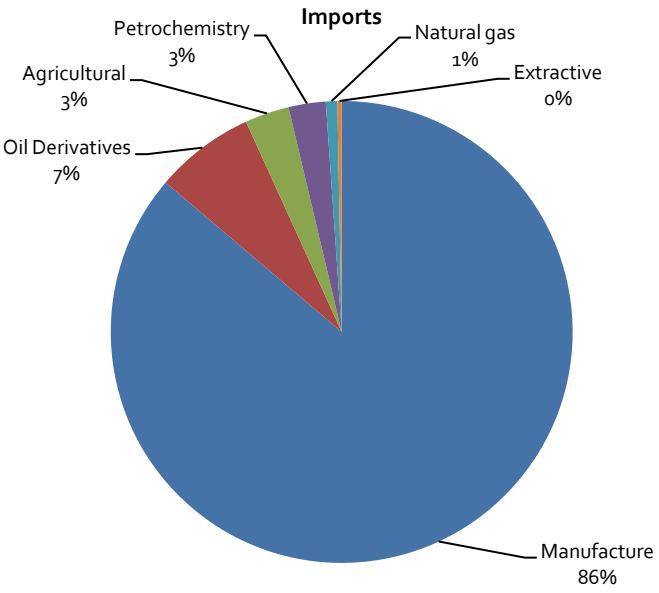
Source: Bank of Mexico.

According to INEGI data on March 2013, the country's trade balance showed surplus of U.S. $ 1.714 million. The value of merchandise exports was U.S. $ 31.834 million, an amount that was integrated in non-oil exports by U.S. $ 27.633 million (86%) and petroleum products by U.S. $ 4.201 million (14%).

The structure of the value of merchandise exports in the first quarter of 2013 was as follows: manufactured goods 81%, petroleum products 13%, and 3% agricultural goods. The structure of the value of imports of manufactured goods 86%, petroleum products 7% and imports for agricultural and petrochemical industries 3% (see Figure 1.40-a).

Figure 1.40-a. Percentage Share of Oil and Non-Oil Exports.
(Percentages)





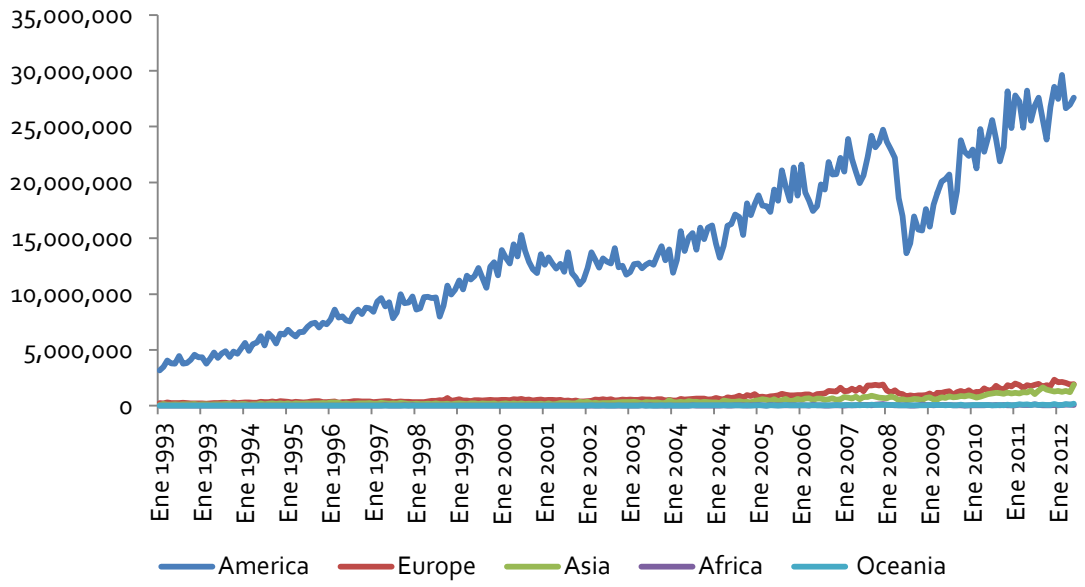
Source: National Institute of Statistics, Geography and Informatics (INEGI), [2013], Merchandise Trade Balance of Mexico, Information Revised, January-February 2013.

This evidence that imports exceed exports of manufactured items, within included electronic products sector and related industries, maintaining a high import of intermediate goods for domestic manufacturing processes, which implies a high dependence on imported inputs and low generation of value added in domestic

manufacturing, mainly engaged in assembly processes for export to the United States.

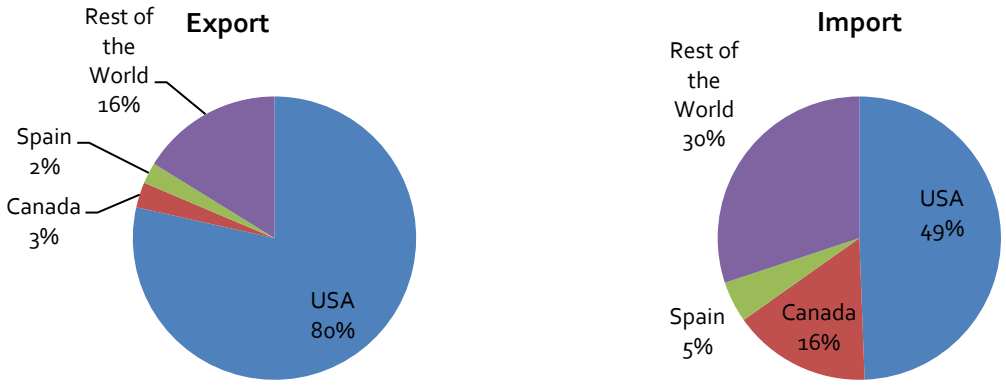
In this regard, it is noteworthy that since the mid-nineties, Mexico and the United States have developed close business relationship since the signing of NAFTA, with the North American region, and especially the United States the principal Mexico trading partner, allocating 80% of our exports to that country (see graphs 1.40-b. and 1.41).

Figure 1.40-b. Exports by Regional Economic.
(Thousands of Dollars)



Source: Bank of Mexico.

Figure 1.41. Percentage Share of Exports and Imports of Goods by Principal Countries.
(Percentages)



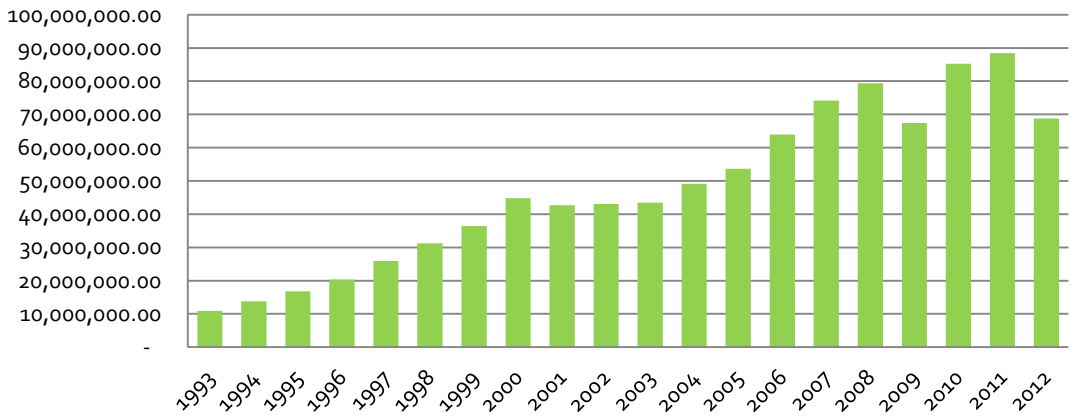
Source: National Institute of Statistics, Geography and Informatics (INEGI), [2013], Merchandise Trade Balance of Mexico, Information Revised, January-February 2013.

Analogous to the manufacturing industry, the electronics industry in Mexico is strongly benefit from the signing of NAFTA, increasing total exports, settling in our country leading global OEMs and CMs that sought to reduce manufacturing costs for export to the U.S. market later .

The period between 2001 and 2002 was outright contraction due to lower global demand and strong competition from other countries - mainly Asian. The 2003 figures show a significant recovery in the electronics industry, but still below the levels reached in 2000. In contrast, the period 2004-2008 was of great expansion, due to the U.S. economic recovery and growth in the production of goods with higher unit values, such as digital televisions.

In 2009, the electronics industry exports reached a similar amount of 2005 global financial crisis and the contraction of the U.S. market, reducing exports. However, in 2010 and 2011, exports sector totaled amounts above, which shows that the electronics sector in Mexico recovered gradually, however it is evident that the manufacturing industry has a close correlation with global economic downturns (see Figure 1.42).

Figure 1.42. Exports of Mexican Electronics Industry.
(Thousands of dollars)



Source: Bank of Mexico, September 2012 data.

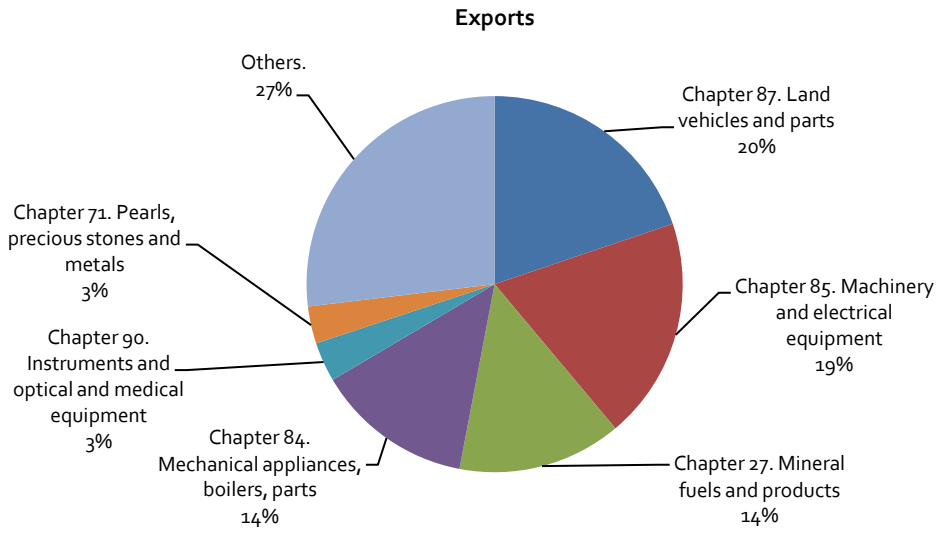
The Bank of Mexico ranks products export and import using the Harmonized Commodity Description and Coding System (HS) main classification which records with the customs authority. This classification facilitates international comparison of trade statistics of Mexico and contributes to the detailed presentation of data related to trade flows made with the rest of the world.

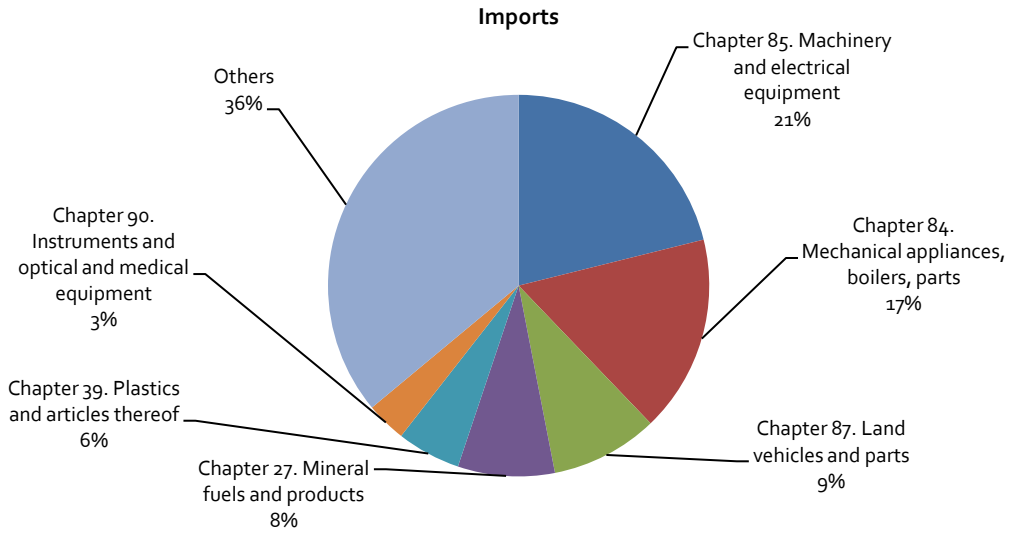
The SA establishes classification by chapter and headings related electronic products sector: Chapter 84 Mechanical, Boilers and Parts; Chapter 85 Electrical Machinery, and Chapter 90 Optics and Medical Devices. It is noteworthy that the chapters handle a variety of items that may not be related to products electronics

sector, but their analysis is useful to identify the processes of international trade at the aggregate level.

In terms of the percentage share the exports and imports of goods by main chapters, Chapter 87 generates 20% of national exports, followed by Chapter 85 with 20% of exports (see Figure 1.43).

Figure 1.43 Percentage Share of Exports and Imports of Goods by Main chapters of the Harmonized System
(Percentages)





Source: National Institute of Statistics, Geography and Informatics (INEGI), [2013], Merchandise Trade Balance of Mexico, Information Revised, January-February 2013.

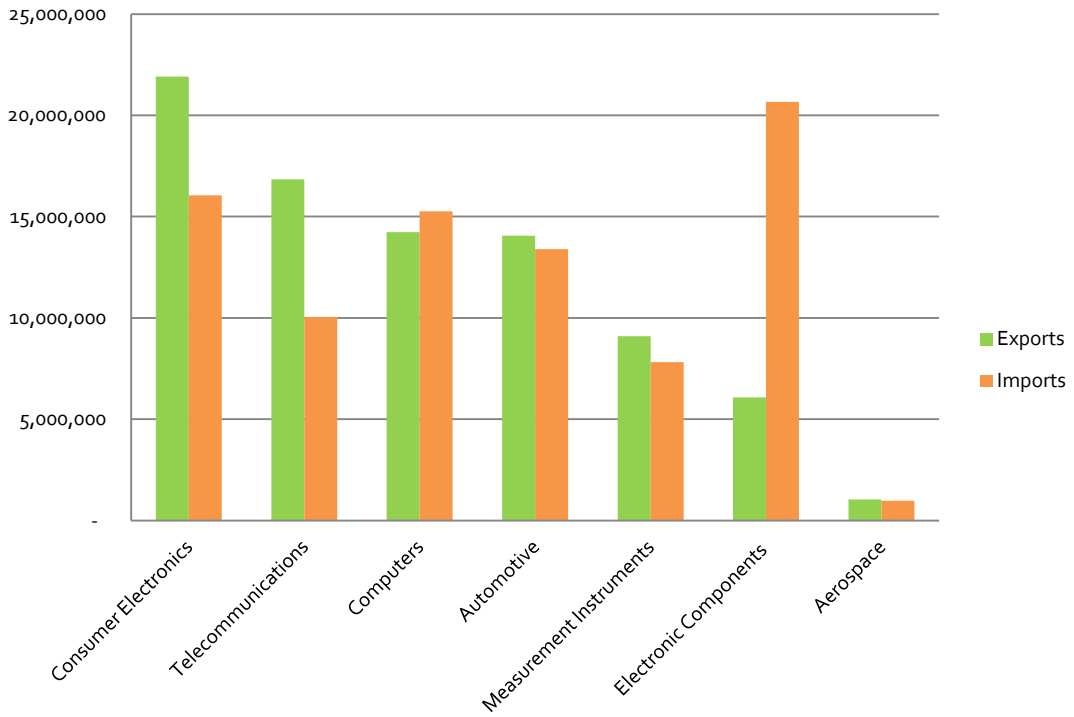
Having a better analysis of related electronics industries sector, classification was made by associating itself with major industries, generating information for industries: Automotive Electronics, Consumer Electronics, Computers, Telecommunications, Measurement instruments, Electronic Components and Aerospace.

No.	Industries	Harmonized System
1	**Automotive**	87 Land vehicles and parts (8708 Vehicle Parts and Accessories) 90 Instruments and optical and medical devices (9104 panel clocks for vehicles).
2	**Telecommunications**	85: Machinery and electrical equipment (8517 Electrical apparatus for line telephony or line telegraphy).
3	**Computing**	84 Mechanical appliances, boilers, parts (for 8471 and 8473 data processing parts and accessories for office machinery) 90 Instruments and optical and medical equipment (projectors 9008 and 9009 still image photocopying and thermo-copying apparatus).
4	**Consumption**	85 Machinery and electrical equipment (microphones and stands 8518, 8519 turntables and plays cassettes, camcorders and VCRs 8521, 8523 media for sound recording, 8527 Radios, TVs 8528, 8529 Parts for television recorders and transmitters), 92 Musical instruments (9207 Electrically amplified musical instruments)
5	**Electronic Components**	88 Aircraft and parts 90 Instruments and optical and medical devices (9014 Compasses and navigation devices)
6	**Measuring Instruments**	90 Instruments and optical and medical devices (9018 or veterinary medical devices, 9022 X-ray apparatus, alpha, beta, gamma, 9026 for Fluid Control Instruments, 9027 Instruments and apparatus for physical or chemical analysis, 9030 Instruments and apparatus for measuring electrical quantities, 9031 Instruments and appliances for measuring not specified elsewhere, 9032 Instruments for automatic regulation Other 90 Other optical instruments and appliances and medical) 91 Clocks and watches and parts thereof.
7	**Aerospace**	88 Aircraft and parts 90 Instruments and optical and medical devices (9014 Compasses and navigation devices).

For example, to integrate international trade statistics in the electronics industry - automotive Chapters 87 were considered. *Land vehicles and its parts, the part* 8708. Parts and Accessories of Motor Vehicles; the Chapter 90, optical and medical equipment; *part* 9104 panel clocks for vehicles. Worth mentioning that the classification itself due to have a higher level of analysis disaggregated by industry for purposes of statistical analysis.

National level, the main export industry is consumer electronics, followed by telecommunications and computer industries. In terms of trade balance, electronic components industries and computer show a trade deficit, imported a greater number of intermediate and capital goods for domestic production processes.

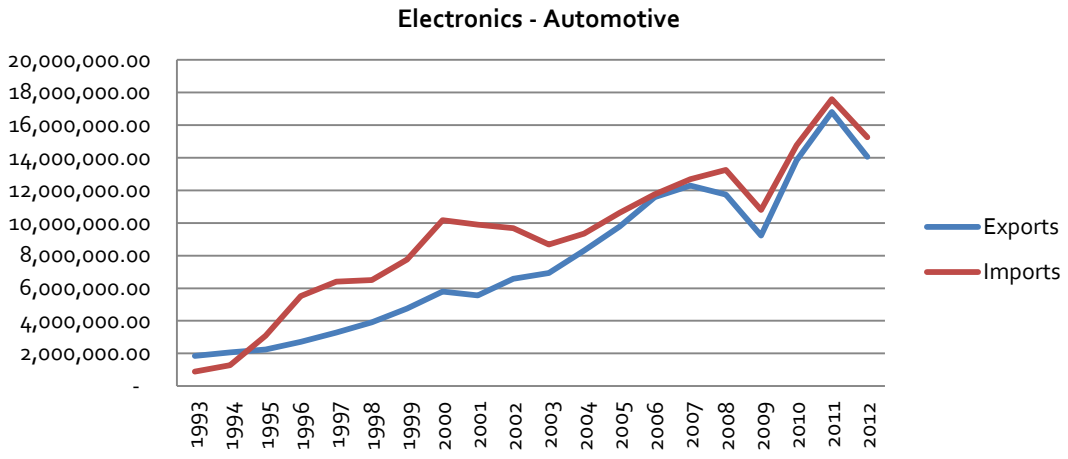
Figure 1.44 Exports and Imports by Sector Industries Electronics January-September 2012.
(Thousands of dollars)

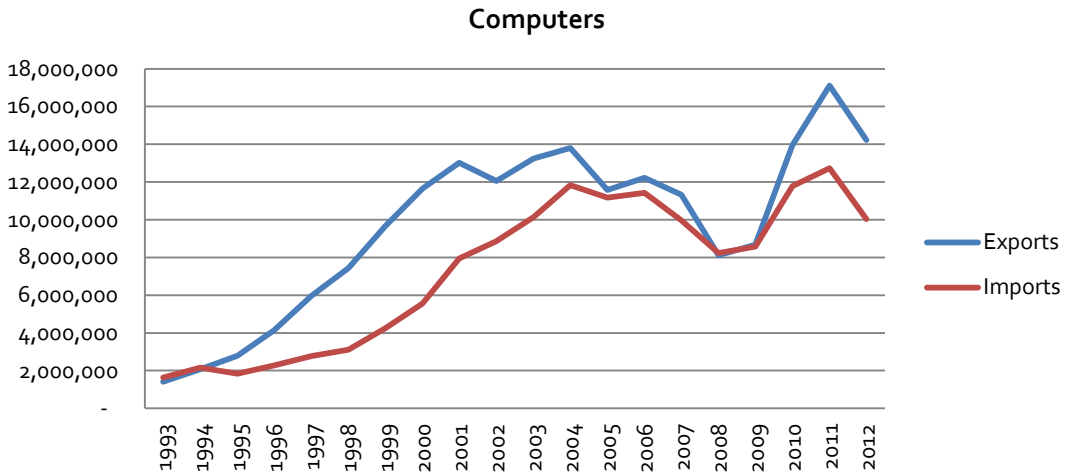


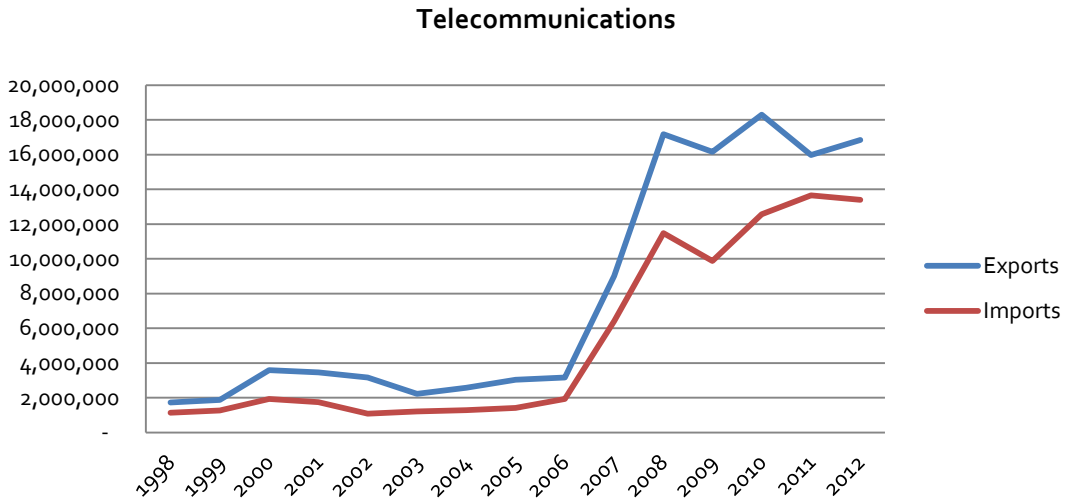
Source: Working Group Foreign Trade Statistics, composed of the Bank of Mexico, INEGI, the Tax Administration and the Ministry of Economy.

If behaviors are analyzed by industry in the period 1993 - 2012, most industries have a turning point after the signing of NAFTA, modifying their commercial behavior. The industries that drove its exports from NAFTA were mainly the computer industry and consumer electronics, same that were highly benefited by the entry of transnational companies, in contrast, electronic industries - automotive, measuring instruments and electronic components recorded strong growth in imports, mainly of intermediate goods for their production, imports have increased mainly in the electronics industry (see Figure 1.45).

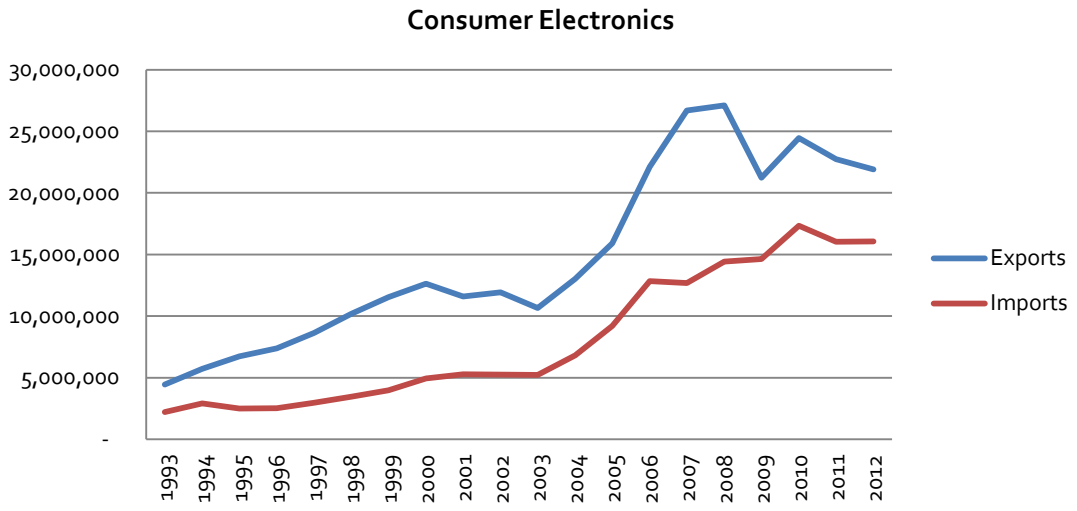
Figure 1.45. Exports and Imports by Industries 1993 - 2012
(Thousands of dollars)

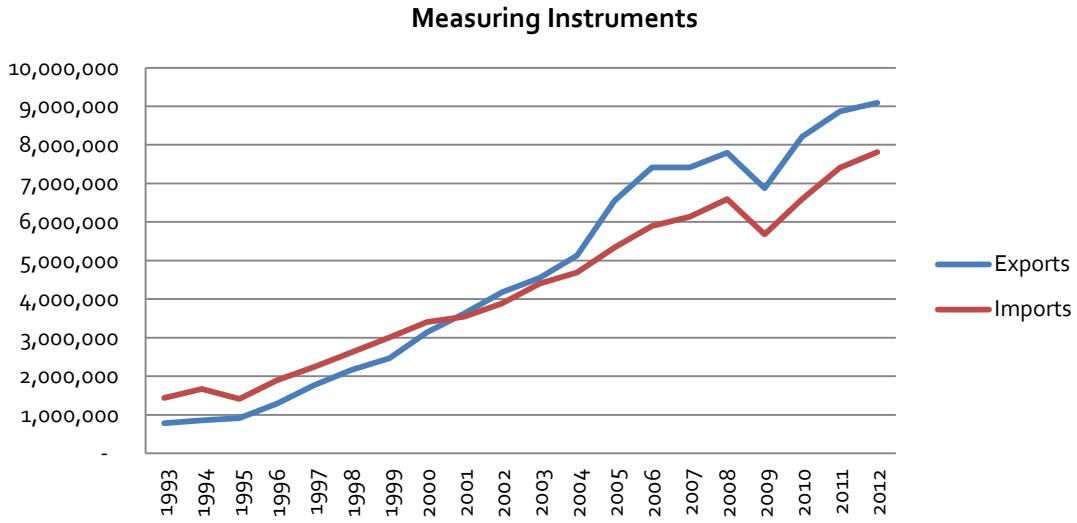


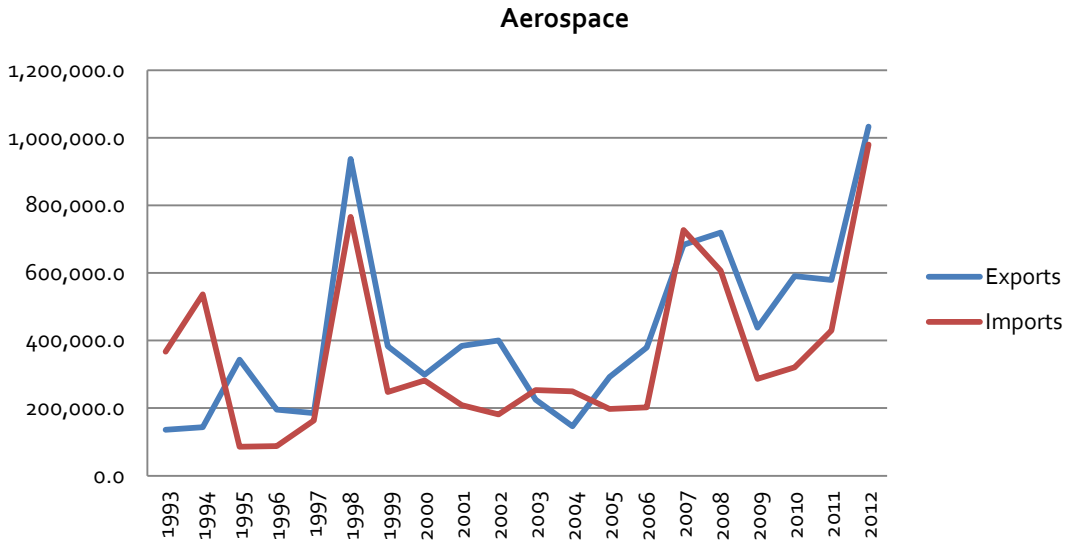




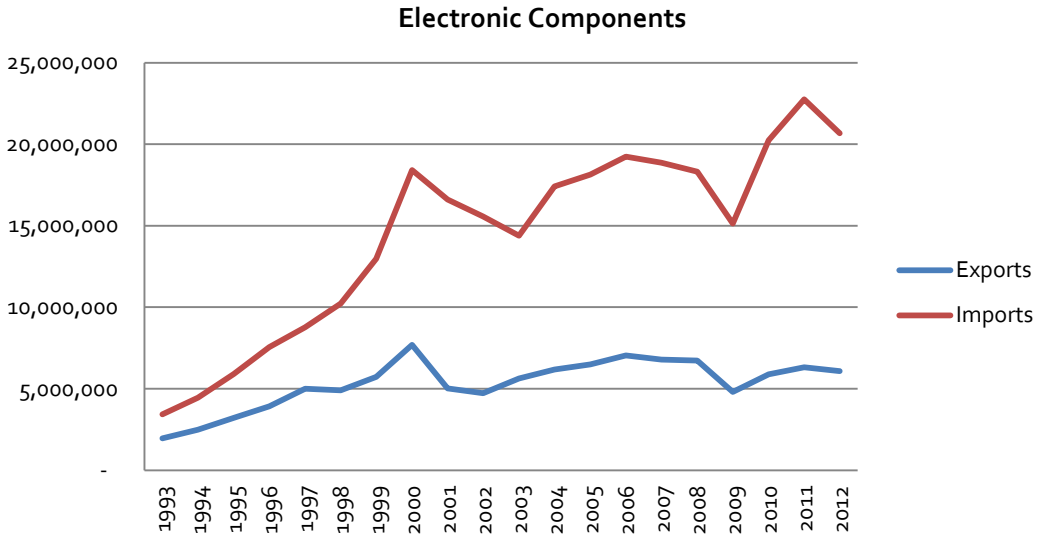
Source: Working Group Foreign Trade Statistics, composed of the Bank of Mexico, INEGI, the Tax Administration and the Ministry of Economy







Source: Working Group Foreign Trade Statistics, composed of the Bank of Mexico, INEGI, the Tax Administration and the Ministry of Economy.



Source: Working Group Foreign Trade Statistics, composed of the Bank of Mexico, INEGI, the Tax Administration and the Ministry of Economy.

Below a table is summarizing the behavior of the trade balance of major industries related to electronics sector (see Table 1.46).

Table 1.46. Summary of Exports - Imports for Electronics Industry Sector (Thousands of Dollars)

Industries	Exports	Imports	Balance
Electronics - Automotive	14,062,710	15,254,948	Deficit
Computing	14,232,245	10,038,722	Surplus
Telecommunications	16,840,876	13,400,809	Surplus
Consumer Electronics	21,913,599	16,050,457	Surplus
Measuring Instruments	9092543	7811324	Surplus
Aerospace	1032790	980.200	Surplus
Electronic Components	6074151	20,663,842	Deficit

Source: Own elaboration with data from the Bank of Mexico.

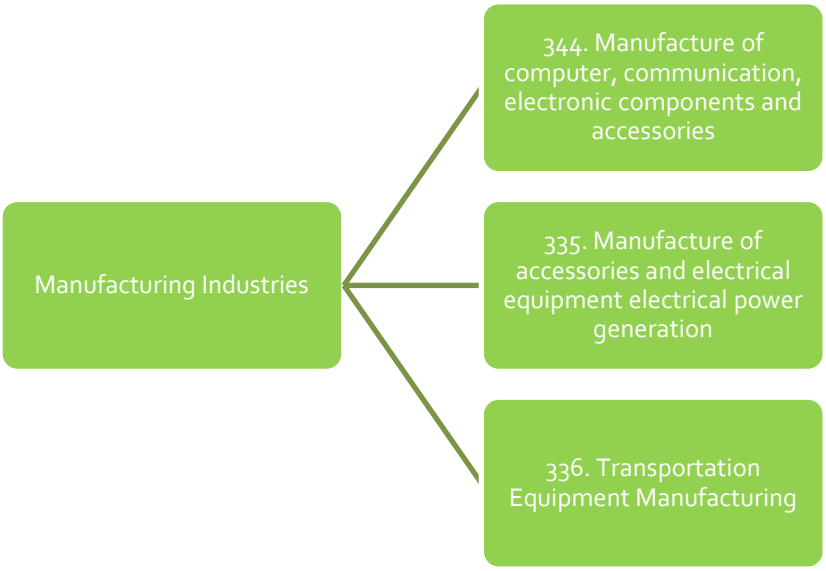
1.6 Introduction of the Electronics Industry in Mexico

This paragraph of electronics industry in Mexico was drafted with the 2009 Economic Census data from INEGI, same given the date of release information can lead to inconsistencies in the data, however, is the official information currently available to perform the statistical analysis. The economic census data is classified by the Classification System North American Industry (NAICS)[8]Grouping the main groups of activities in sectors and subsectors.

[8] In Mexico, the official classifier NAICS economic activities is built alongside the United States and Canada, designed to allow comparison of common bases and economic statistics among the three countries of North America. Thus, the aim of NAICS is to provide a unique, consistent and updated for the collection, analysis and presentation of statistics, which reflects the structure of the Mexican economy.

Under NAICS definitions, there are three related sub-sectors of the electronics industry, for purposes of this study analyzed the situation of the following subsectors: 334 Manufacture of computer, communication, electronic components and accessories, 335 Manufacture of accessories, electrical equipment and power generation and 336 Transportation Equipment Manufacturing (see Table 1.47).

Table I.47 Related Subsectors of Electronics Industry.



Analogously to the analysis of international trade related electronics industry, own classification was associating classes' industries economic activity relationship, as these industries, according to the following definitions (see Table 1.48).

Table 1.48 Industry Classification Under NAICS

No.	Industries	Produce	NAICS
1	**Automotive**	Engine Control Units (Engine Control units), instrumentation, security, entertainment systems.	33632 Manufacture of electrical and electronic equipment and parts for motor vehicles
			33639 Manufacture of other parts for automotive vehicles
2	**Telecommunications**	Cell phones, cellular infrastructure, LAN's, Wireless Networks LAN, DSL Modems / Cable, PBX / Other Switches / Routers, SONET / fiber, Other Phones, Other communications systems (radio, satellite, network management, traffic systems , etc.).	33421 Manufacture of telephone equipment
			33422 Manufacture of transmission and reception of radio and television, and wireless communications equipment
			33429 Manufacture of other communication equipment
3	**Computing**	PCs, Laptops, Tablets, Servers, Workstations, enterprise storage systems, monitors, printers, PDAs / Tablet / Readers, Other computers	33411 Manufacture of computers and peripheral equipment

		(copiers, fax machines, calculators, cash registers, etc..)	
			33331 Manufacture of machinery and equipment for trade and services
4	**Consumption**	Analog TVs, Digital / HDTVs, MP3 Players, Other audio systems, gaming consoles, Set-Top Boxes, Camcorders, DVD Players, digital cameras, personal navigation equipment, Other consumer products (appliances, etc..)	33431 Manufacture of audio and video
			33461 Manufacturing and reproducing magnetic and optical media
			33521 Manufacture of household appliances under
			33522 Manufacture of white goods
			339991 Manufacture of musical instruments
5	**Electronic Components**	Tests and measurements (inspection, metrology, semiconductor equipment, other equipment), other industries (renewable energy, airport scanners, lighting, security, tools, ATM's)	33441 Manufacture of electronic components
6	**Measuring Instruments**	Medical diagnoses (in vitro, MRI / CT Images, measures blood / glucose, oncology, respiratory), Therapeutic (dialysis, anesthesia, etc..) Monitoring and surgical (heart disease, dental, endoscopy, orthopedics, ophthalmology, etc..) , Process Control (PLCs, automation, fluid energy, chemical / petrochemical, mining / hydraulic, environmental, elevators, robotics, etc..)	33451 Manufacture of measuring, testing, navigating, and electronic medical equipment
7	**Aerospace**	Entertainment in Flight, navigation (commercial / military), weapons / combat, C3, Another aviation, Other transport (off-road, marine, rail)	33641 Manufacture of aerospace

DIAGNOSIS AND ANALYSIS OF THE NATIONAL ELECTRONICS INDUSTRY

Highlights

- It is very important to follow a strategy that can allow us to replace the importation of important intermediate goods, for local manufactured products by national companies.

- The 334 subsector of Computer Equipment Manufacturing, Communications, Measurement Equipment, Components and Electronic Accessories, the 65% of its production is forward chained to the same subsector.

- The Electric Industry, regarding their backward chaining is integrated on areas of the same electric industry on 25.8%; 15.8% with the Basic Metals Industry; and 10.9% with the Electronics Industry.

- On the automotive Industry, the 35.4% of their production is backwards chained with areas of the same automotive industry; 14.2% with Aerial Transportation Industry; and 7.5% with the plastic and rubber industries.

- The Electronic Consumer Industry has 836 economic units all around the nation, generating more than 112 thousand jobs.

- On second place, we can find the Automotive Industry with 635 economic units, and more than 1 million jobs.

- The Automotive Industry has a 1,754 workers average on each company, while Measurement Equipments Industry has 83.

- The Electronic Consumer Industry has a productivity of 257 thousand pesos per year by worker, being the national leader on labor productivity.

- Electronic Automotive Industry has the lowest productivity on labor in the country, with 61 thousand pesos by worker per year.

Diagnosis and Analysis of the National Electronics Industry

This section analyzes the value chain and integrating forward and backward of the Subsector 334 Manufacture of computer equipment, communication, measurement and other equipment, electronic components and accessories; 335 Manufacture of accessories, electrical and computer generation of electricity, and 336 Transportation Equipment Manufacturing. The productivity comparative, operational and competitiveness of related electronics industries sector in order to identify activities that have shown the best performance, in good shape, reflecting a greater ability to be inserted into the current scheme of globalization, industrial disaggregation (at branch level) and size strata establishments provides very useful information for understanding the overall results more relevant industry and size the main challenges they face in the coming years.

2.1 Sector Value Chains Electronics

Matrix Input - Output

One of the consequences of trade liberalization since the signing of NAFTA has been increasing imports of intermediate goods[9] and capital[10], increasing the trade deficit of the trade balance, especially in the international market for manufactured products.

In the case of intermediate goods used as inputs in other production processes, there has been a shift from domestic suppliers for imported goods, which has resulted in the dismantling of the chains in the country.

In this sense, it is crucial outline a strategy to aloud the substitution of such goods for products manufactured by domestic companies. This requires a comprehensive, systemic intervention, policy-based mechanisms of various kinds,

[9] Resources are those materials, goods and services that are used as intermediates in the production process, such as raw materials, fuel, office supplies, etc.. Are purchased for resale or used as inputs or raw materials for the production and sale of other goods

[10] (1) Machinery and equipment that are part of the fixed assets of companies and are used for the production of other goods. (2) Any property that is used in a production process, enabling the production of other goods, services or wealth

such as the commercial, fiscal, industrial and regional; to name a few. This context is particularly relevant when considering that the electronics industry can be strategic for national development, providing components used directly in different economic activities.

To identify the importance of the industry in the economic fabric of Mexico, in the analysis that proceeds are used as the matrix tool input - output 2003 published by INEGI, being the only tool available to analyze the relationship between economic subsectors related to the electronics industry.

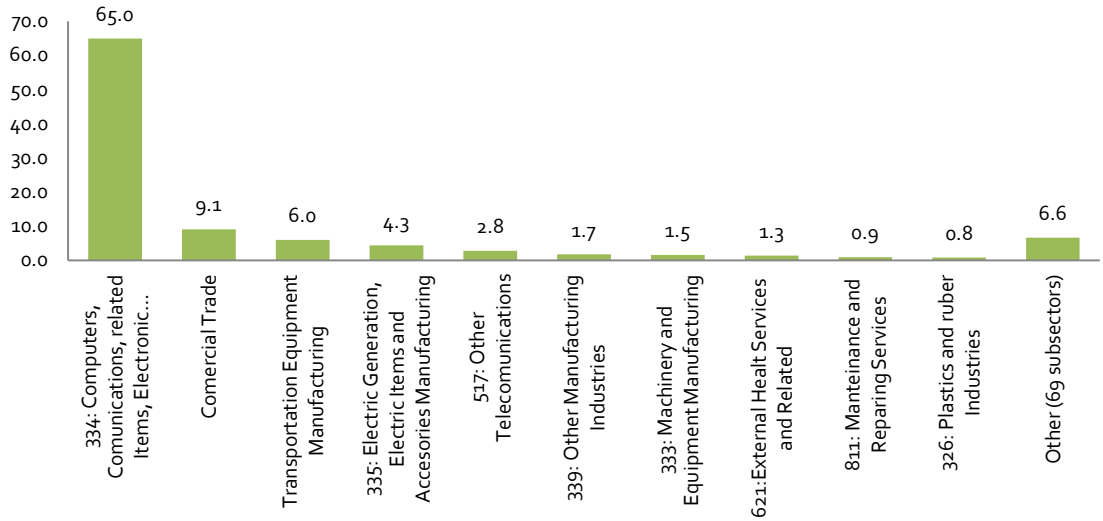
The starting element analysis of the input-output matrix is its use as an instrument of economic analysis and projection, by which it is possible take decisions for businesses and government policymakers, identifying the total impacts of demand for each sector the other activities of the economy, so that lets you know the interdependence of the production system in the intermediate links and end of production and demand.

Thereby, it is possible to calculate backwards and *forward.* In the first case the capacity is measured in an activity of trigger development for others, since it uses inputs from these, in the second is to quantify the relevance of activity when offer or supply certain product, which happens to be input for another industry.

To simplify the analysis, we used the simplest definition of multipliers, which incorporates only direct impacts, it does not include side effects that occur in cross flows. In this regard, in order to define the related sub-electronics industry, the coefficients were calculated backward direct linkages (measuring the ability of a sector directly drag to others) and forward (quantifying a sector capacity to stimulate other via demand).

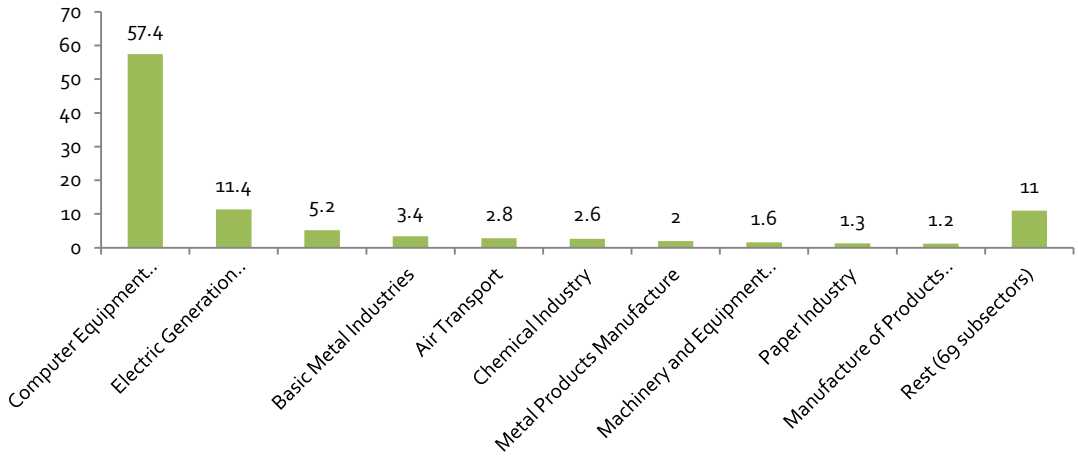
The subsector 334 Manufacture of computer, communication, and other measurement equipment, electronic components and accessories, 65% of its forward chaining production to the subsector (branches inside), 9.1% of its production goes to commercial, 6% as inputs for the manufacture of transportation equipment, and 4.3% to the electricity sector (see Figure 1.49) . Regarding his backward chaining receives 57.4% of its inputs from the same subsector, 11.4% of the electricity industry, 5.2% in the plastic and rubber industry, and 3.4% with basic metal industries (see Figure 1.50).

Figure 1.49 Major Chains Subsector 334 Forward
(Relative Share of Value of Production by Subsector)



Source: Matrix Input-Output by Subsector Economic Activity, INEGI.

Figure 1.50 Major Chains Subsector 334 Backward
(Relative Share of Value of Production by Subsector)



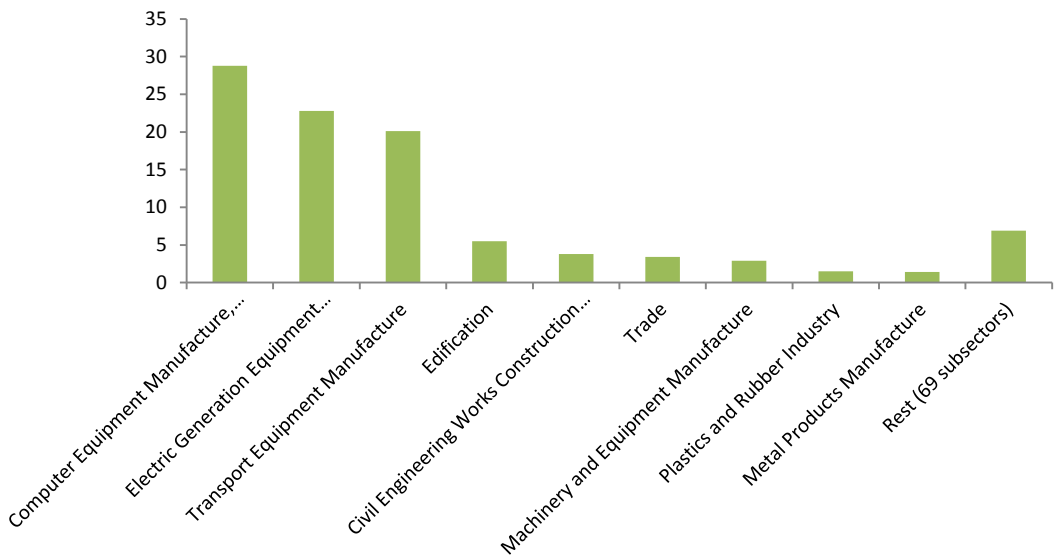
Source: Matrix Input-Output by Subsector Economic Activity, INEGI.

One of the main conclusions of the analysis of the matrix input - output 334 is that the subsector is highly correlated between the branches that compose it. As shown in the charts above, the sub 334 is demanding mainly of intermediate goods, since in this subsector are used large quantities of inputs of its own branches, however, maintains low levels of production linkages both backward and forward.

Thereby, analysis confirms the high dependence on intermediate inputs, majority of imports, so that subsector has not been consolidated as one shopper of local products but above all, main supplier inputs to other sectors, with a consequent high importance in the inter-industry framework.

Regarding the electrical industry, 28.8% of its production is chained forward to the electronics industry, 22.8% the same electrical industry, and 20.1% in the manufacture of transportation (see Figure I.51), demonstrating it is a highly supplier of inputs and equipment for other business activities.

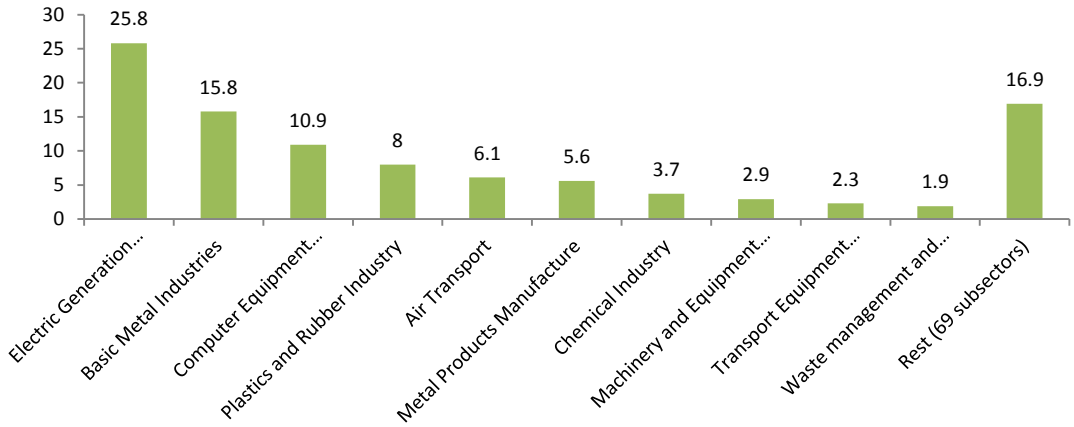
Figure 1.51 Major Chains Subsector 335 Forward
(Relative Share of Value of Production by Subsector)



Source: Matrix Input-Output by Subsector Economic Activity, INEGI.

Regarding his backward linkages is integrated in the branches of the same electrical industry 25.8% 15.8% with basic metal industry, and 10.9% with the electronics industry (see figure I.52).

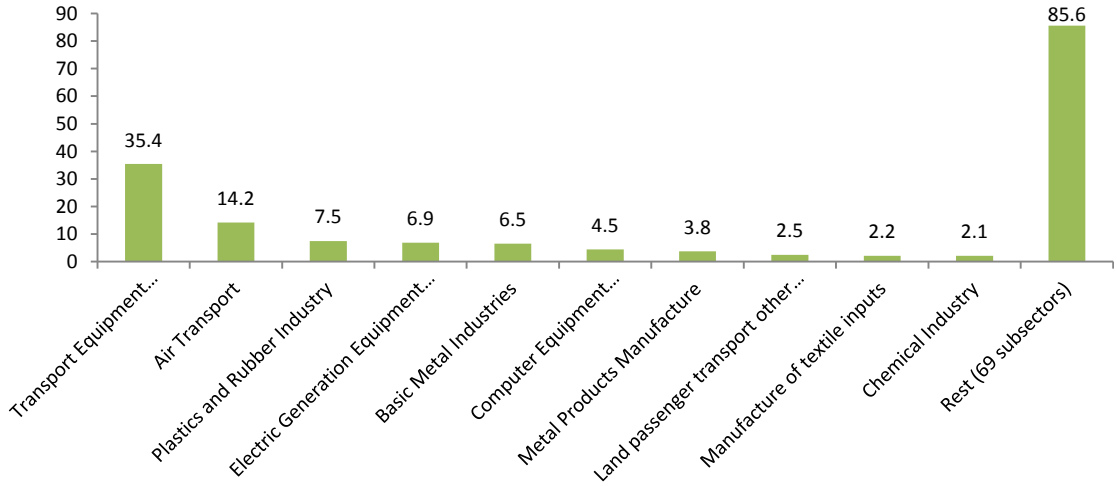
Figure 1.52 Major Chains Subsector 335 Backward
(Relative Share of Value of Production by Subsector)



Source: Matrix Input-Output by Subsector Economic Activity, INEGI.

In matter of auto industry, 35.4% its production is linked back to the branches of the automotive industry itself, 14.2% with the air transport industry, and 7.5% in the plastics and rubber industry (see Figure I. 53).

Figure 1.53 Major Chains Subsector 336 Backward
(Relative Share of Value of Production by Subsector)



Source: Matrix Input-Output by Subsector Economic Activity, INEGI.

The analysis of the matrix input - output shows that electronics industry (334) however boosted economic growth and exports of manufactured products, as part of the export assembly strategy, remains weak linkages within the economy given the lack of integration of the processes of global value chain with local suppliers.

Therefore, its transcendental design programs with a comprehensive strategy that allows strengthened and made more competitive local industry, in order to obtain greater advantage of domestic and international economic expansion, particularly as a result of increased demand from consumers.

2.2 Comparative Productivity and Competitiveness Operational

This section analyzes the economic behavior related industries electronics sector. The aim is identifying those industries that have shown the best performance in terms of productivity and competitiveness, in good shape, reflecting a greater ability to insert the current globalization scheme.

One of the most practical and accepted ways to measure and analyze the productivity and competitiveness of economic activities, is the ratio of the value added and number of workers and number of firms (labor productivity and facility). Through these measures it is possible to know or productivity approximate and labor and business competitiveness, in good shape reflecting diverse and complex conditions (inside and outside of companies) that stimulate or inhibit higher levels of production to a fixed number of inputs.

For example, if a company has better management and organization management, more & better technology assets, incentive schemes & trained personnel, -internal competitiveness factors to the company-, but also is located in an efficient regional and national environment which facilitates and provisioning timely inputs required on production (materials), adequate public goods and services (electricity, water, security), business environment (regulatory framework, mainly), infrastructure (physical, human and institutional); government support to the needs of the industry, (such as a credit system, market information, consulting and marketing channels), external factors for the company, -it will certainly be more successful to minimize production costs, maintain high quality standards and, consequently, achieve higher levels of product with a fixed stock of workers.

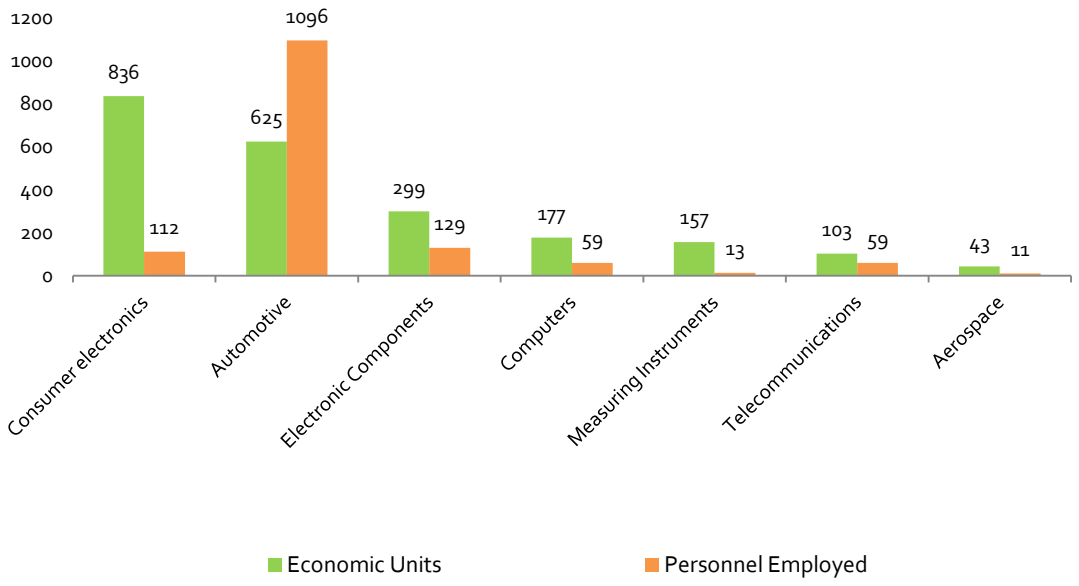
Thereby, to the extent a company to reduce costs and improve the quality of their products, placed in a better position to compete nationally and internationally. For this reason, productivity often related to competitiveness, as the value added per employee or per enterprise, in good shape reflects this potential and production efficiency and, therefore, the ability to penetrate markets with the best price-quality relationship.

In order to have pictured enough about the competitive behavior of the industries under analysis, productivity indicators are complemented by others that help to explain the observed results. They are fundamental, in this first general diagnosis, basic reasons as the productivity of labor productivity per establishment, and fixed asset inventory personnel employed by industry.

Comparative Productivity by Industry

The electronics industry of consume has 836 nationwide economic units, generating more than 112,000 jobs, second place is the automotive industry with 635 affordable units, being a highly industry jobs generating more than 1 million. The aerospace industry has only 46 companies, creating more than 11 jobs (see Figure 1.54).

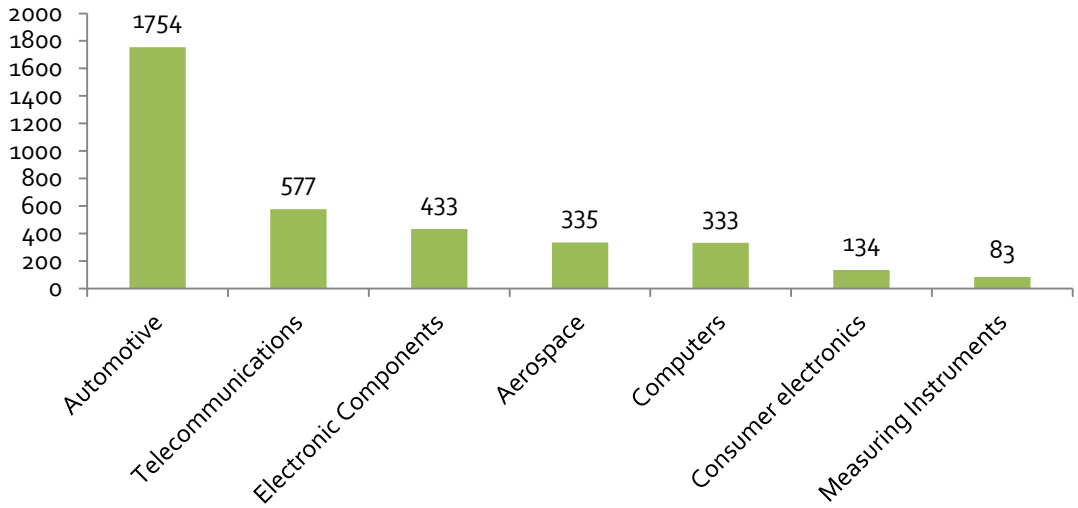
Figure 1.54 Economic Units - Staff employed by industry.
(Economic Units - Thousands of Persons)



Source: 2009 Economic Census, INEGI.

Another competitive factor is the ability to generate internal scale economies for enterprises, which certainly favors plants and industries in large sizes. Thus, when analyzing the average size of establishments, calculated with the number of workers between the numbers of economic units, a clear pattern stands characterized by a larger more productive in those industries. Regarding the size of companies, the automotive industry has the highest average with 1,754 jobs per company, and measuring instrument industry by setting the smaller size with 83 employees per company (see Figure 1.55).

Figure 1.55 Average Size of Establishments by Industry
(Number of Employees)



Source: 2009 Economic Census, INEGI.

While generating scale internal economies definitely a business competitive advantage, empirical studies show that manufacturing plants in Mexico in general are missing much of the benefits achieved external economies of scale to businesses, through productive complementarily relations in the territory where they are located. In other countries, this strategy has become relevant for small and medium enterprises, obviously, do not have the same ability to generate internal economies of plant size. This is particularly important for industries that are home to a significant number of small and medium enterprises, such as industries related to the field of electronics.

Overall, the structure of related industries electronics sector is unsophisticated, with the exception of OEM and CM integrated into the global production chain localized in our country, and in many cases are characterized by a weak association and relationship with small and medium enterprises in the same industry or similar industries.

It is important to note that the domestic industry, especially small and medium enterprises pass through a stage in which the supports regionalization, productive linkages and cooperation among enterprises are still isolated attempts and do not constitute an articulated network.

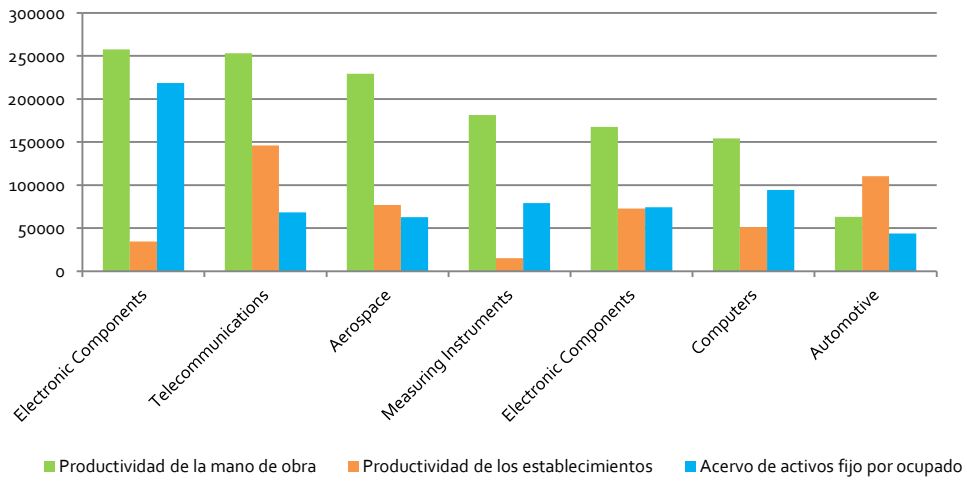
Trade liberalization has urged small and medium companies to operate more efficiently, which could be obtained with formation from networks among them to face competition. However, integration possibility has been hindered by the lack of a culture of collaboration, so much of the small and medium enterprises in Mexico

are missing many of the benefits of concentration and intra - industry specialization, and therefore, the generation of localization economies has been limited.

In the industries productivity analysis, the consume of electronics industry is the most productive in its workforce with 257 thousand dollars per worker per year, followed by telecommunications and aerospace industries, being the least productive electronics industry - automotive 62 thousand pesos per worker per year. It is important to note that the electronics industry - automotive displays this behavior since it only considered in the analysis items of electrical and electronic equipment for the automotive sector and other parts for automotive vehicles. Similarly, the establishment productivity is higher in the telecommunications industry on 146 thousand dollars annually and lower productivity in the industry have measuring instruments 14 000 pesos per year (see Figure 1.56).

Without doubt, one of the most important internal factors for efficient production, the fixed assets level and technology are there. The value added per unit of production factors will be higher while workers operate with more and better machines, among other items of business competitiveness. As noted, an important determinant of the competitiveness of related industries electronics industry is the fixed assets level of net to each worker receives. With respect to the stock of fixed assets employed personnel, highlights the consumer electronics industry with 219 thousand pesos and electronics industries - automotive has the lowest fixed asset inventory.

Figure 1.56 Productivity of Labor, Productivity of Establishments, and Stock of Fixed Assets by Industry Busy
(Thousands of Pesos)

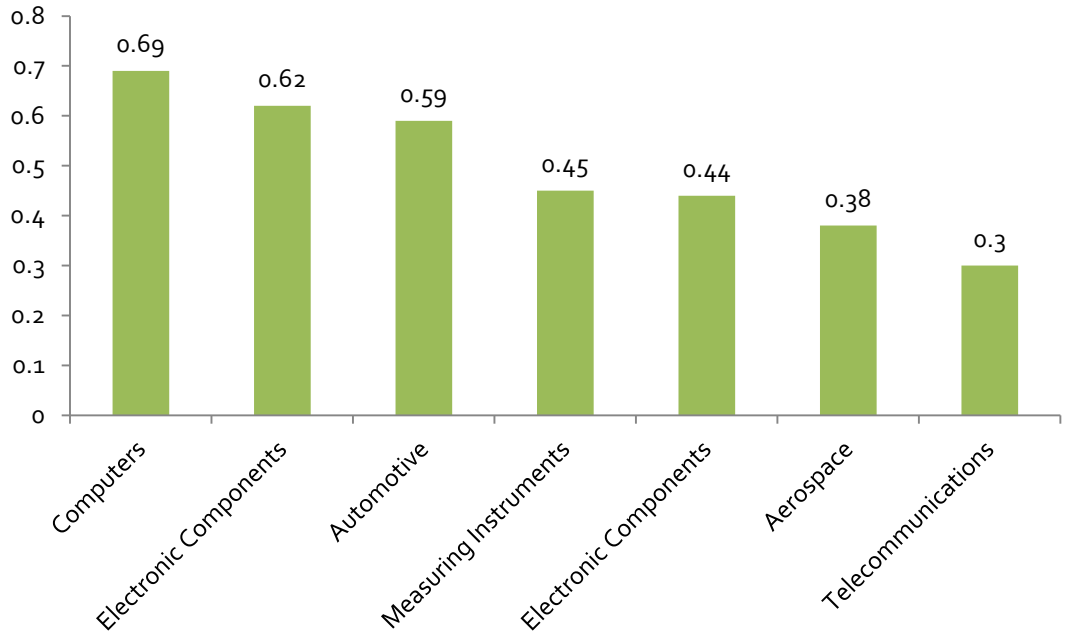


Source: 2009 Economic Census, INEGI

The relation between intermediate consumption and total gross production yields a measure of intermediate goods consumption, as noted with all intermediate goods those material resources, goods and services that are used as intermediates in the production process, used as inputs or raw materials for the production and sale of other goods.

In this sense, the telecommunications industry has a better ratio of intermediate consumption by industry, requires less intermediate inputs imported for final production, followed by the aerospace industry. In the case of industries with higher requirements of intermediate inputs industries stand computers and electronics consume (see Figure 1.57).

Figure 1.57 Intermediate consumption by industry
(Relationship Intermediate Consumption / Production Total Brutal)



Source: 2009 Economic Census, INEGI

3.1 Regional Location Business of National Electronic Sector

In order to have a broad enough picture of the competitive behavior of the industries under analysis, in this section the industries national location of the that make up the electronics sector, analyzing the number of establishments, the personnel employed, the productivity manpower and facilities, the stock of fixed assets employed persons, the participation of intermediate consumption in total gross output principal states and municipalities.

In this regard, it is essential to complement the diagnosis of national and international electronics industry considering its regional geographic dimension, due to the extent that the diagnosis is sufficiently disaggregated industrial and regionally, the conclusions should be more robust. This will provide more and better design elements for a comprehensive strategy for companies. It is, in this sense, to exploit the best possible information to provide public data (hard data), later to conjoin and complement them with the field information will be obtained through surveys and interviews applied to entrepreneurs electronics industry locally.

In an approximation of the results of the various regional and local characteristics that affect heterogeneously in production costs and the ability to sell successfully in national and international markets, had a higher productivity in the northern states of the country, along with some states in the center and center-west. As shown in the map below, the regional competitive pattern associated industries to electronics is characterized by higher productivity in the northern states of the country, along with some entities of the center and center-west. In the north stand the states of Chihuahua, Nuevo Leon, Coahuila, Baja California and Tamaulipas. In the western we can find State of Jalisco, and in the center Aguascalientes, Mexico and Queretaro. The remaining states present some outstanding productivity with a clear lag particularly in some southern and southeastern states (see Figure 1.58)

Figure 1.58 Top Electronics Industry Entities

Source: Based on data from INEGI Economic Census 2009.

In Baja California State, the Electronics Industry of Consumption has a clear focus, with a strong presence in the sector of audio and video equipment. Among the leading companies (OEM) of the state include Hitachi, LG Electronics, Panasonic, Samsung Electronics, Sanyo, Sharp and Sony.

In Chihuahua State, unlike California, there is no dominant sector and industry produces televisions, monitors, telecommunications equipment and computer. Besides the presence of OEMs such as Philips and Motorola, this statement highlights large contract manufacturers´ presence: Jabil, Flextronics, Sanmina-SCI and Foxconn, among others. In Nuevo Leon, Sonora and Tamaulipas again, no clear specialization, but is present OEM computer industry like LG Electronics, Nokia, Motorola and Panasonic.

Among other states highlights Jalisco, where the computer industry is geared to the manufacture and assembly of computer hardware, peripherals and

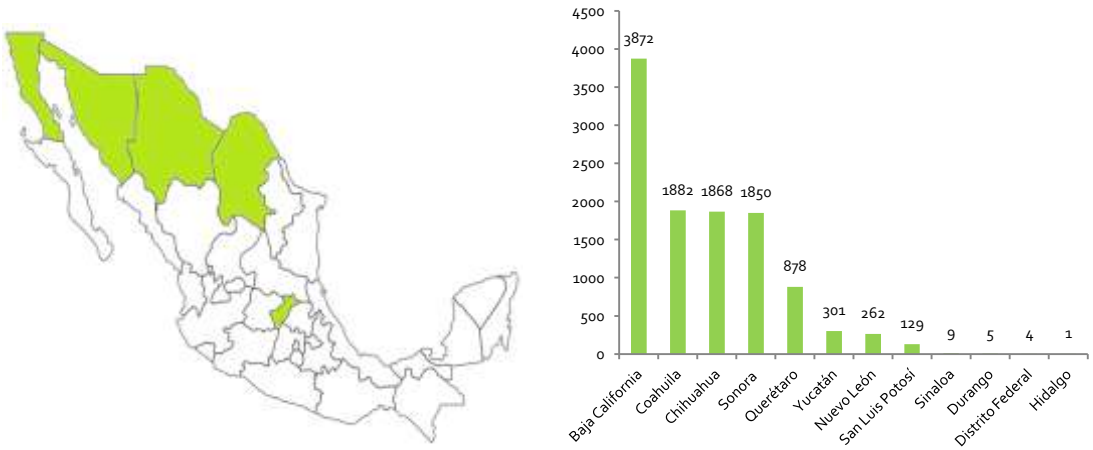
telecommunications. In this state there is a large presence of the CM major global: Flextronics, Jabil, Foxconn, Sanmina-SCI and USI, among others. Major OEMs such as HP and IBM, which also currently engaged with software and services, are located in the region, along with companies producing electronic components such as Intel and Freescale.

Aerospace

According to the Department of Heavy Industry and High Technology of the Ministry of Economy, Mexico has established itself as one of the most important actors in the aerospace field, having a growth of nearly 19% annually over the past seven. Currently, it has the presence of 249 companies and organizations support, mostly NADCAP and AS9100 certified, distributed mainly in six federal states and employing over 31,000 thousand senior professionals. In this sense, the national strategy is to turn our country approach as a destination that addresses the full cycle, beginning with the design and engineering of aircraft, continuing the process of manufacturing parts and components for aircraft, the subsequent assembly of these parts, aircraft maintenance and finally recycling and / or conversion of aircraft that have met their useful life.

For the integration of classification it was used Rama Aerospace 3364 Aerospace Equipment Manufacturing[11] NAICS. By the number of persons employed the aerospace industry is located in five states in northern states of Baja California, Coahuila, Chihuahua, Sonora, and in central Queretaro State (see Figure 1.59).

Figure 1.59 Staff employed in the Aerospace Sector by Major States.
(Number of Employees)



Source: 2009 Economic Census, INEGI.

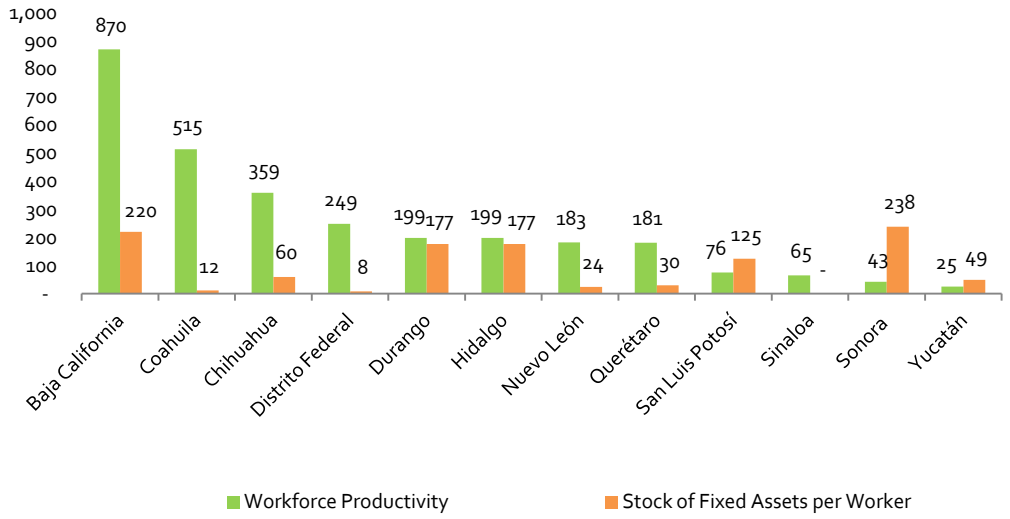
[11] Economic units mainly engaged in manufacturing and aerospace equipment rebuilding, internal combustion engines, turbines and transmissions for aircraft, excluding the manufacture of navigational instruments and measurement.

Baja California state stands out with the highest number of people employed, supporting strategy based to services focused on high value knowledge (Knowledge Process Outsourcing) for aerospace and defense capabilities for the development of airframe systems and plants of power, and thus become a major supplier of manufacturing with integrated value chains. Chihuahua's strategy is based on attracting leading strategic projects in hi-tech goods, particularly manufacturing precision machined.

In Sonora State, the strategy is based on developing a supplier chain innovation with a focus primarily in the manufacture of turbines, and the State of Querétaro, considered with the greatest growth potential for recent investments received, oriented towards specialization in turbine design and specialized MRO as well as manufacturing and assembly complex airframe parts and engineering for turbine design.

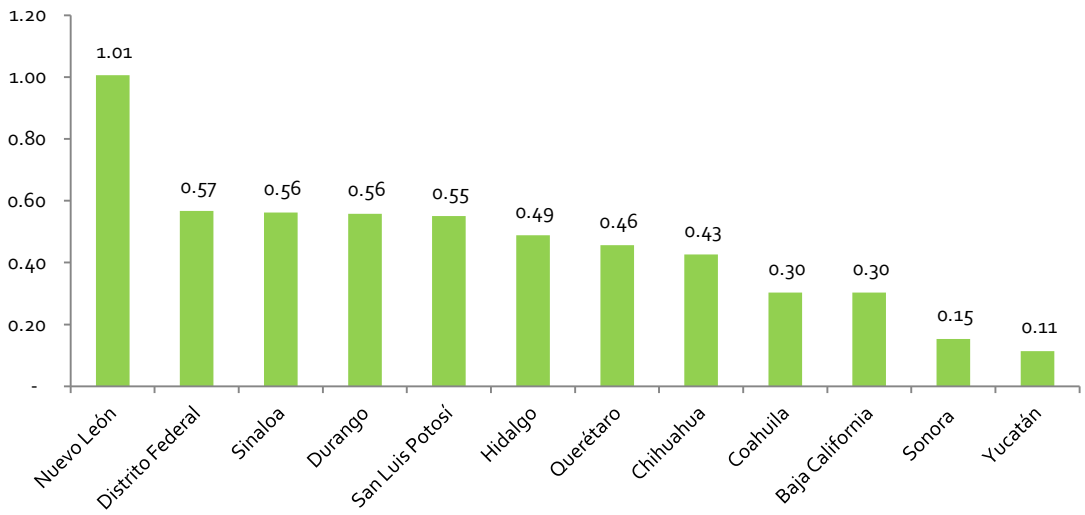
In terms of the productivity of labor and stock of fixed assets, the State of Baja California recorded the highest productivity in the amount of 870 thousand dollars per job with a stock of fixed assets of 220 thousand dollars per employee. In the same way, the states of Yucatan, Sonora, Baja California, Coahuila and Chihuahua recorded the best value in the share of intermediate consumption in total gross production of aerospace (see graphs 1.60, 1.61 and 1.62)

Figure 1.60 Productivity of Labor and Asset Acquits by
Busy Aerospace Sector by Major States
(Thousands of Pesos)



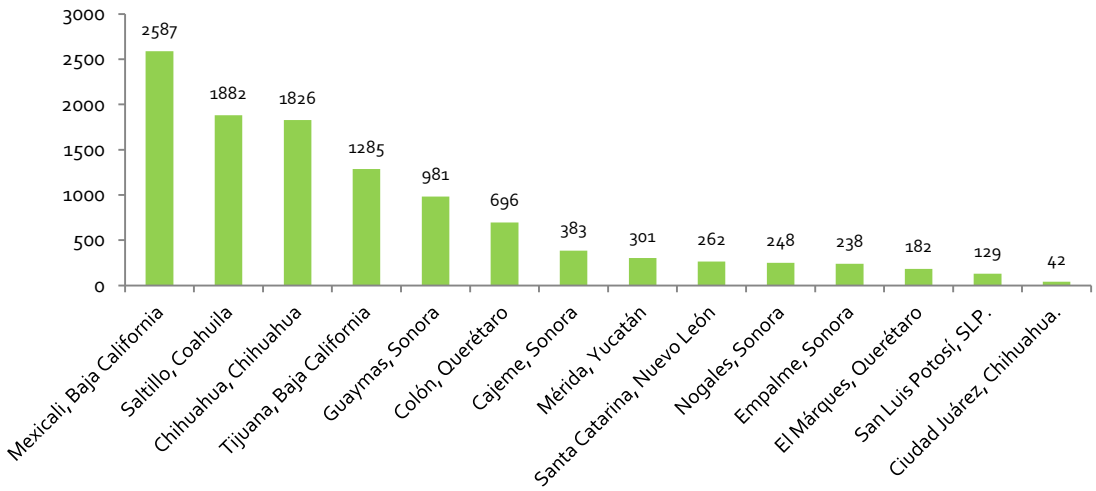
Source: 2009 Economic Census, INEGI.

Figure 1.61 Consumer Participation in Production Intermediate Total Gross Aerospace Sector by Major States (Relative Participation)



Source: 2009 Economic Census, INEGI.

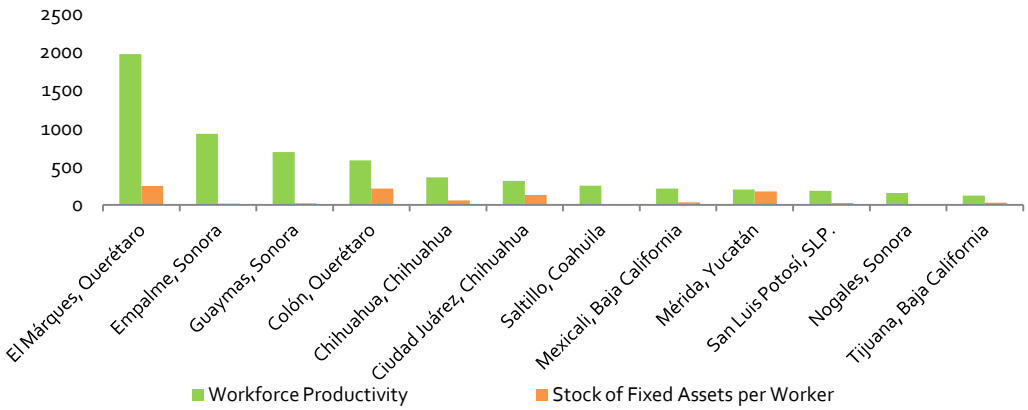
Figure I.62 Staff employed in the Aerospace Sector by Major Towns. (Number of Employees)



Source: 2009 Economic Census, INEGI.

There are two important aspects. On one hand, the high productivity of Queretaro and Sonora is attributed to presence and good performance of a few municipalities in each state. For example, in the case of the state of Queretaro, the result is due to the high productivity of El Marques and Colon municipalities and Sonora Junction and Guaymas municipalities. It is important that municipalities out of Baja California and Chihuahua, major in aerospace entities, not the highest returns in terms of productivity of acquit labor and fixed assets (see Figure 1.63).

Figure 1.63 Productivity of Labor and Asset Acquits by Busy Aerospace Sector by Major Towns (Thousands of Pesos)



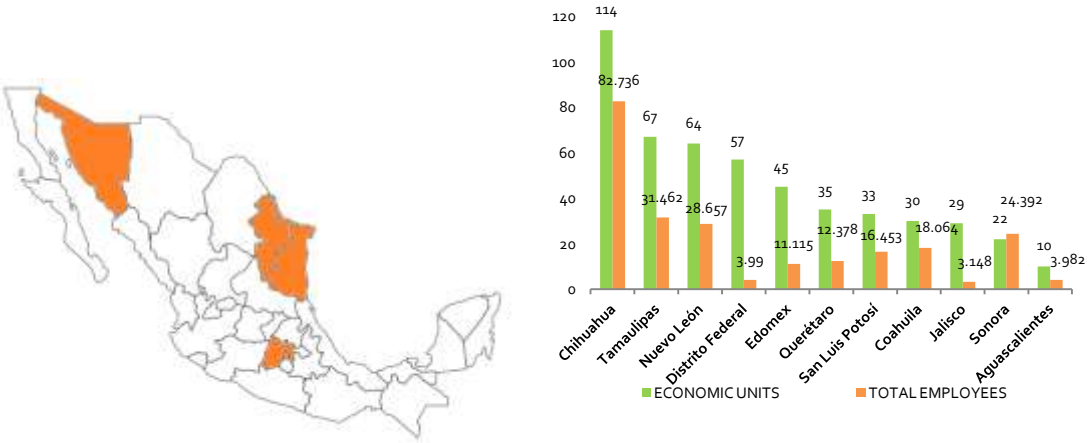
Source: 2009 Economic Census, INEGI.

Electronics - Automotive

For integrate a classification were used sorts Automotive 33632 Manufacture of electrical and electronic equipment and parts for motor vehicles[12], And the class 33639 Manufacture of other parts for automotive vehicles[13].

The automotive electronics industry is mainly concentrated in the northern states Chihuahua, Tamaulipas., Nuevo León, and in the center Mexico State and the Mexico City. The state of Chihuahua has 114 economic units that generate more than 81 000 jobs. In this industry, the state of Aguascalientes shows a presence with 10 local companies together generate 3,982 jobs (see Figure 1.64).

Figure 1.64 Economic Units and Personnel Employed in the Automotive Sector by Major States. (Number of Employees)



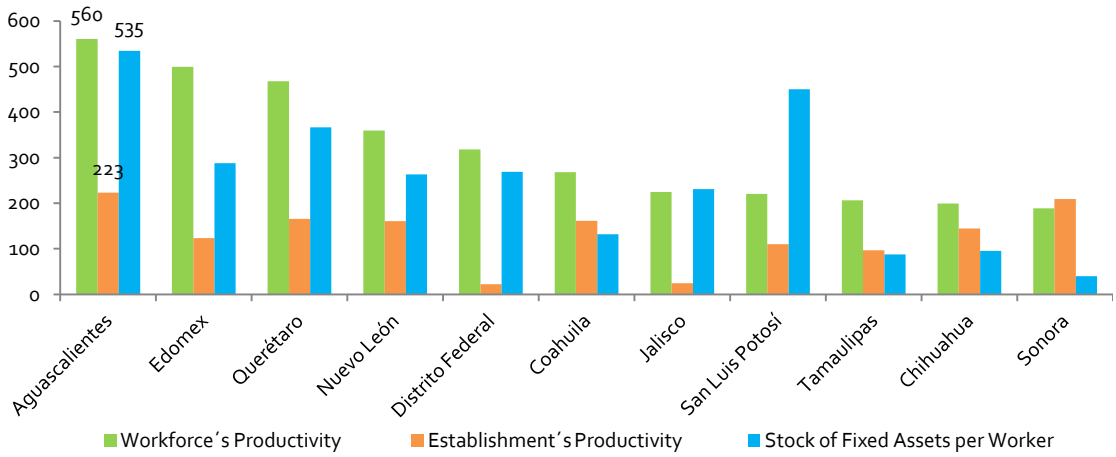
Source: 2009 Economic Census, INEGI.

[12] Economic units mainly engaged in the manufacture of electrical and electronic equipment for motor vehicles and parts, such as generators, distributors, gears, wiring and harnesses

[13] Economic units mainly engaged in manufacturing fuel filters, radiators, mirrors, elevators, exhaust, mufflers, air conditioning systems and other parts for automotive vehicles (cars and trucks) not elsewhere classified.

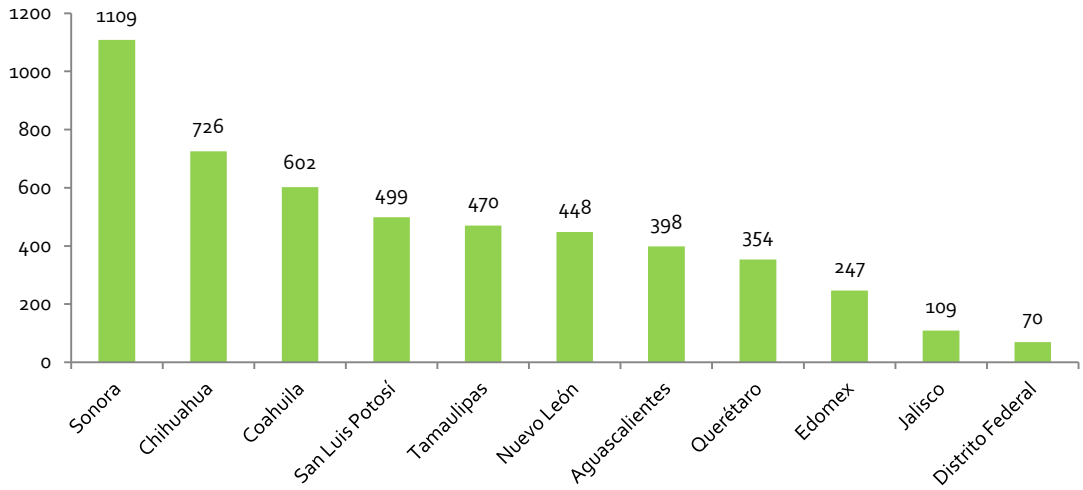
Importantly highlight Aguascalientes had the highest productivity of labor electronics sector - automotive 560 000 pesos for employment, establishments productivity of 223 thousand dollars and a stock of fixed assets of 535 thousand dollars per employee (Figure 1.65 and 1.66.)

Figure 1.65 Productivity of Labor - Properties and Fixed Assets Acquits
By Busy in the Electronics Sector - Automotive by Major States.
(Thousands of Pesos)



Source: 2009 Economic Census, INEGI.

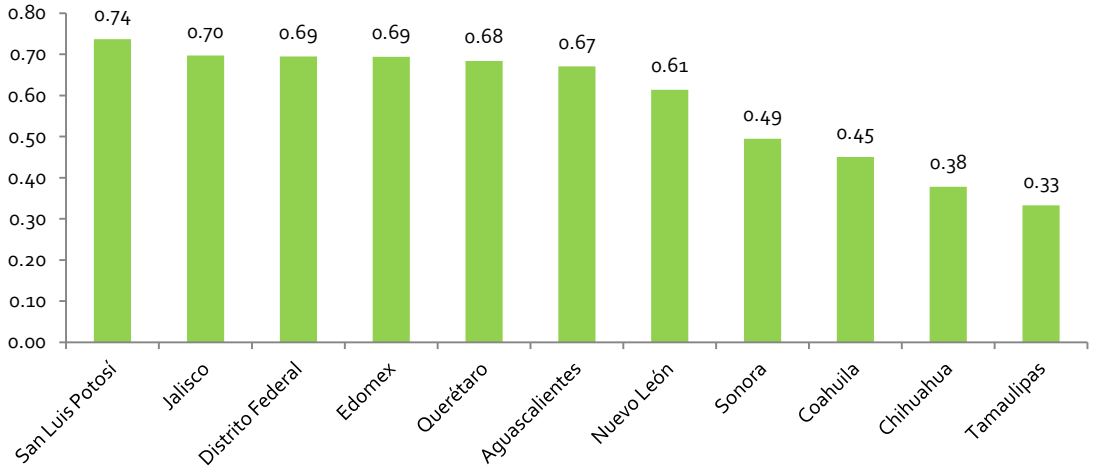
Figure 1.66 Average Size of Establishments
Electronics Sector - Automotive by Major States
(Number of Employees)



Source: 2009 Economic Census, INEGI.

Tamaulipas State recorded the best value of intermediate consumption compared to its total gross electronics sector - automotive statewide (see Figure 1.67). Registration Aguascalientes 0.67 a share.

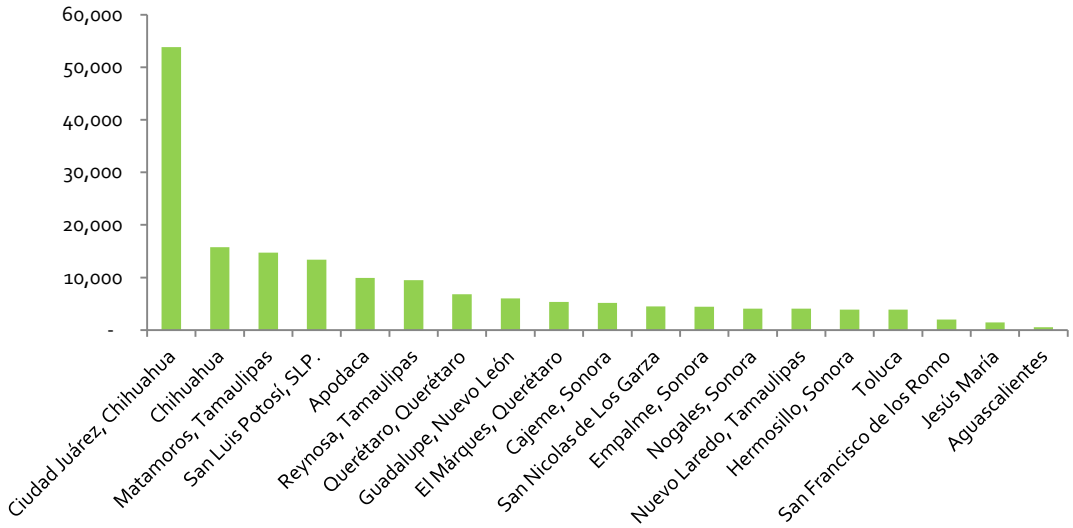
Figure 1.67 Consumer Participation in Production Intermediate Total Gross Electronics Sector - Automotive by Major States (Relative Participation)



Source: 2009 Economic Census, INEGI.

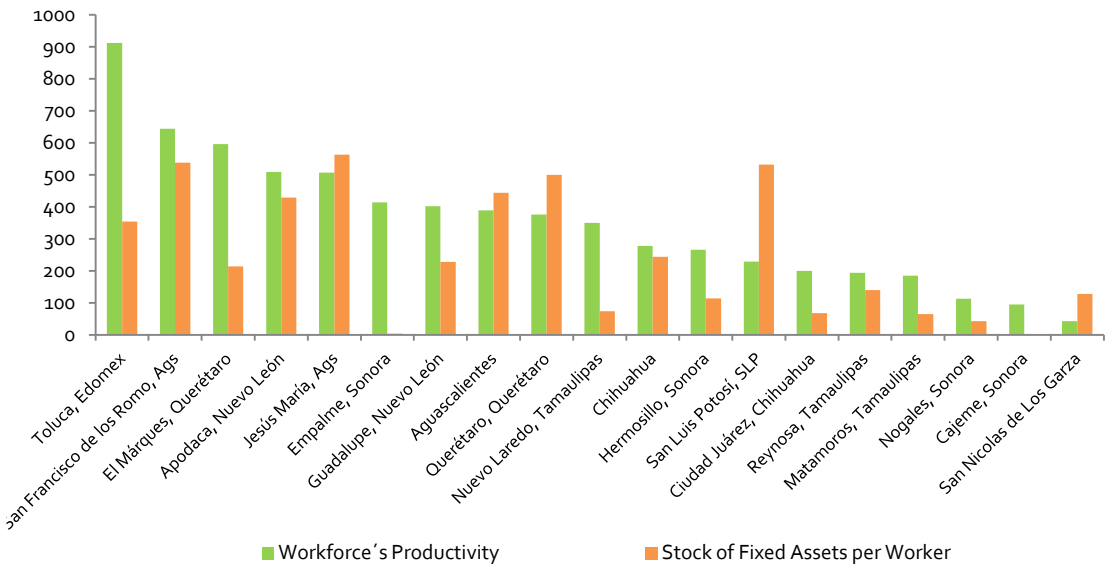
On respect to municipalities, Ciudad Juarez Chihuahua was the one that recorded the highest number of people employed in the electronics industry - automotive (see figure I.68).The municipality of Toluca, State of Mexico had the highest productivity on labor electronics sector - automotive employment 913 000 pesos (Gráfica1.69) and San Nicolas de los Garza municipality, Nuevo Leon's lower participation added value compared to its total gross production (see figure I.70).

Figure 1.68 Staff employed in the Electronics Industry - Automotive by Major Towns.
(Number of Employees)



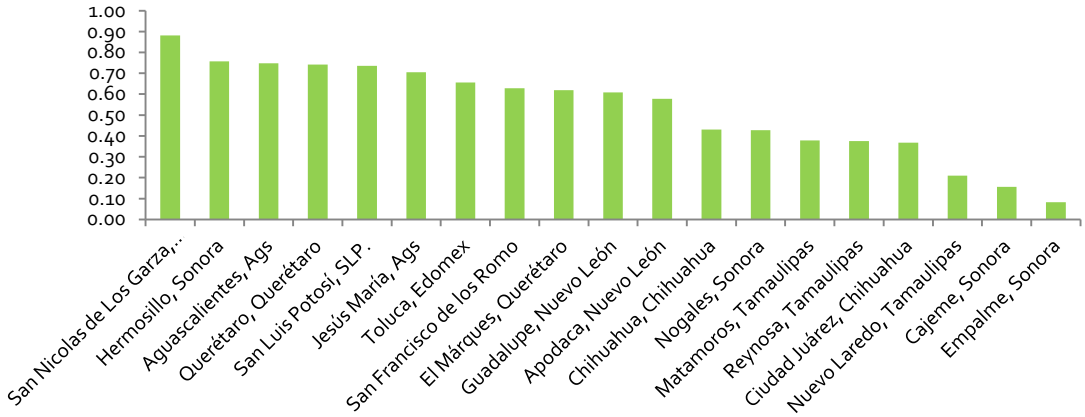
Source: 2009 Economic Census, INEGI

Figure 1.69 Productivity of Labor and Asset Acquits by
Busy in the Electronics Industry - Automotive by Major Towns
(Thousands of Pesos)



Source: 2009 Economic Census, INEGI.

Figure 1.70 Consumer Participation in Production Intermediate Total Gross
Electronics Sector - Automotive by Major Towns
(Relative Participation)

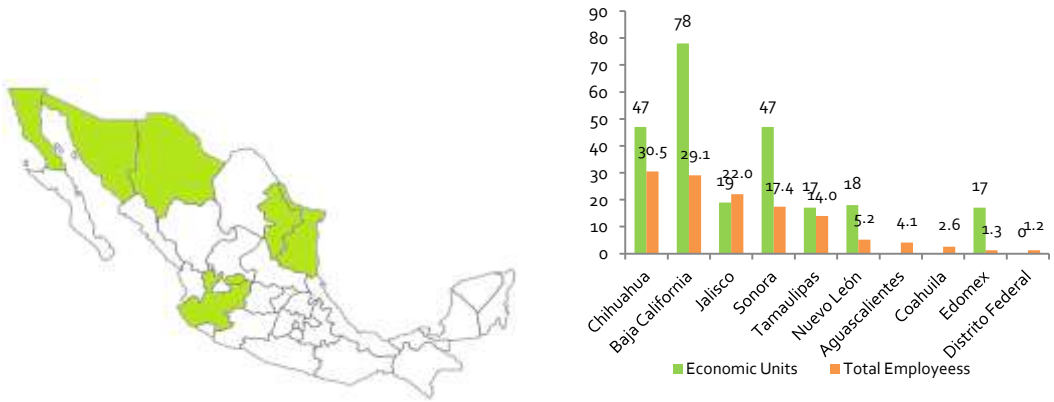


Source: 2009 Economic Census, INEGI.

Electronic Components

The Electronic Components sector was settled for 334410[14] class. The states that had the largest presence of electronic components industry were Chihuahua, Baja California, Jalisco, Sonora and Tamaulipas. Baja California State had the highest number of companies in the sector of electronic components with a total of 78 companies, generating more than 29,000 jobs, and the state of Chihuahua, a total of 47 affordable units with more than 30 000 jobs (see Figure 171). The state of Aguascalientes recorded more than 4,000 jobs.

Figure 1.71. Busy Economic Units and Personal Electronic Components Sector
by Major States.
(Number of Establishments and Employees)

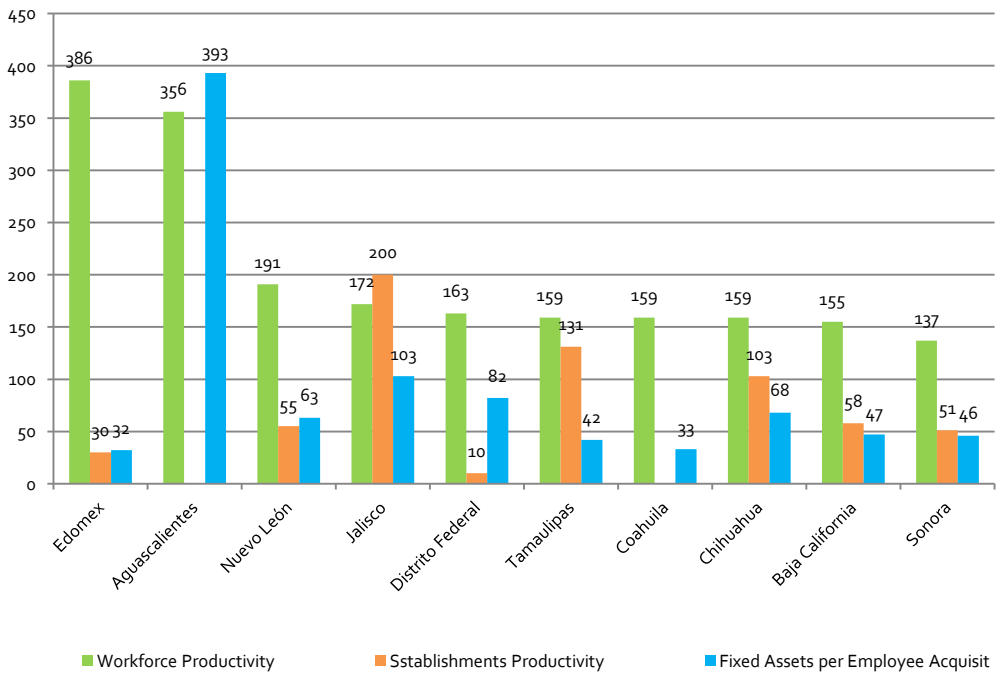


Source: 2009 Economic Census, INEGI.

[14] Economic units mainly engaged in manufacturing electronic components such as simple or loaded cards, circuits, capacitors, capacitors, resistors, connectors and semiconductors, coils, transformers, computer modem, fax and telephone, harnesses, and other electronic components.

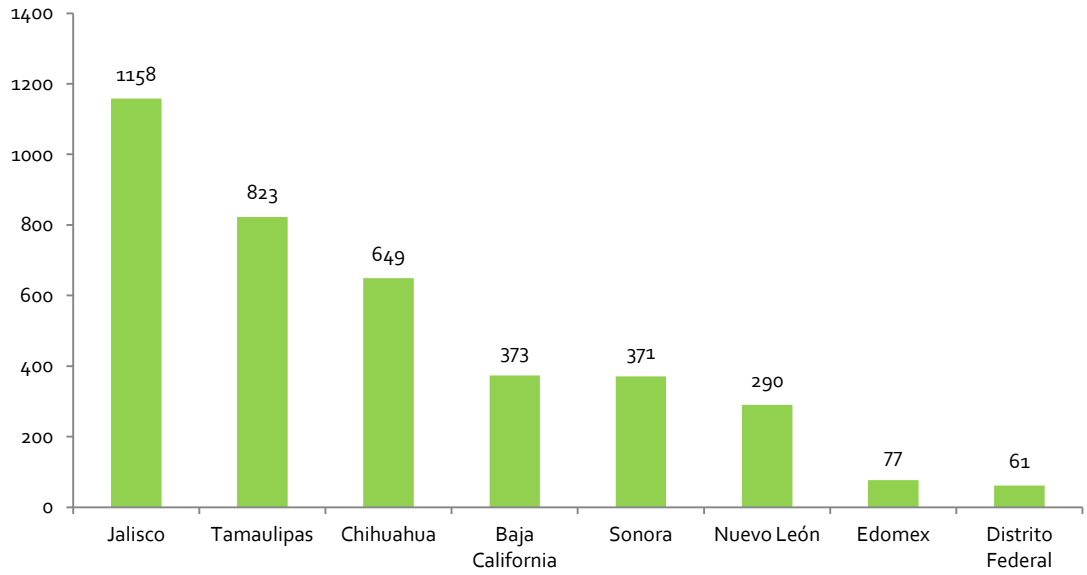
It is noted that in the electronic components industry Aguascalientes state recorded high labor productivity and its stock, fixed assets employed personnel, with records above the national average. Without doubt, one of the most important internal factors for efficient production, fixed assets level and technology in which account, the value added per factor unit of production is higher while operating workers with more and better machines, among other items of business competitiveness with respect to the stock of fixed assets employed personnel, highlights the electronics industry with 393 000 pesos of fixed assets employed persons (see Figure 1.72)

Figure 1.72. Productivity of Labor - Properties and Fixed Assets acquits
by Busy Electronic Components Sector by Major States.
(Thousands of Pesos)



Source: 2009 Economic Census, INEGI.

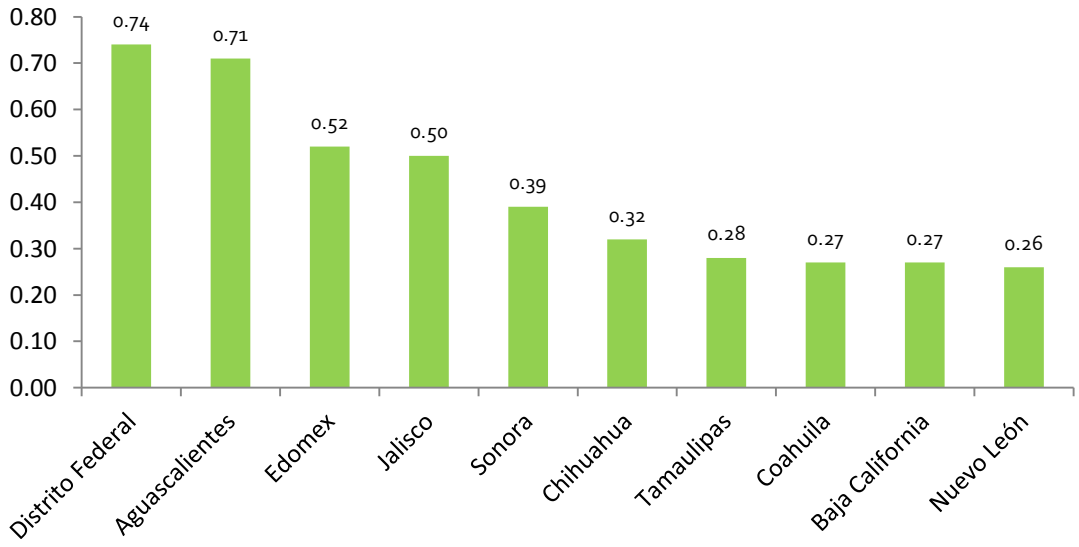
Figure 1.73 Average Size of Establishments
Electronic Components Sector by Major States
(Number of Employees)



Source: 2009 Economic Census, INEGI.

Jalisco State had the highest average size of establishments in the electronic components (see Figure 1.73). In share of intermediate consumption terms total gross output, the electronics industry in Aguascalientes State, recorded a higher requerimientos import inputs for their production processes (see Figure 1.74).

Figure 1.74 Intermediate Consumer Participation in Total Gross Production
Electronic Components Sector by Major States
(Relative Participation)

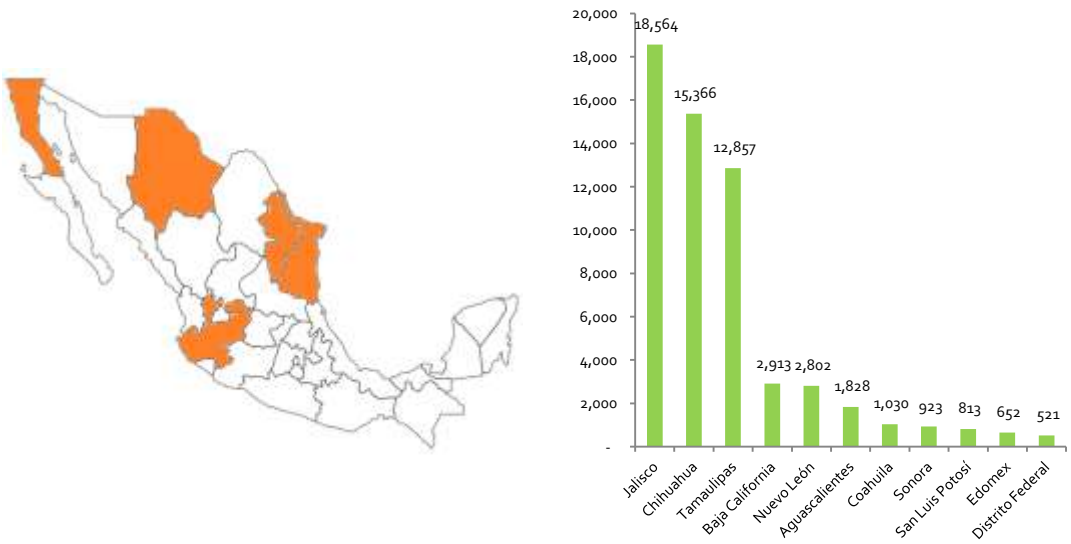


Source: 2009 Economic Census, INEGI.

Computers

The Computer Industry joined the sub-branch 33331 Manufacture of machinery and equipment for trade and services[15], and sub-branch 33411 Manufacture of computers and peripheral equipment[16]. The entities of Jalisco, Chihuahua, Baja California, Tamaulipas and Nuevo Leon recorded the highest number of economic units and jobs. The Jalisco State had a total of 18,564 jobs, followed by Chihuahua (15,366) and Tamaulipas (12,857). The State of Aguascalientes recorded a total of 1,828 jobs (see Figure 1.75).

Figure 1.75 Busy Personal Computers Sector by Major States.
(Number of Employees)

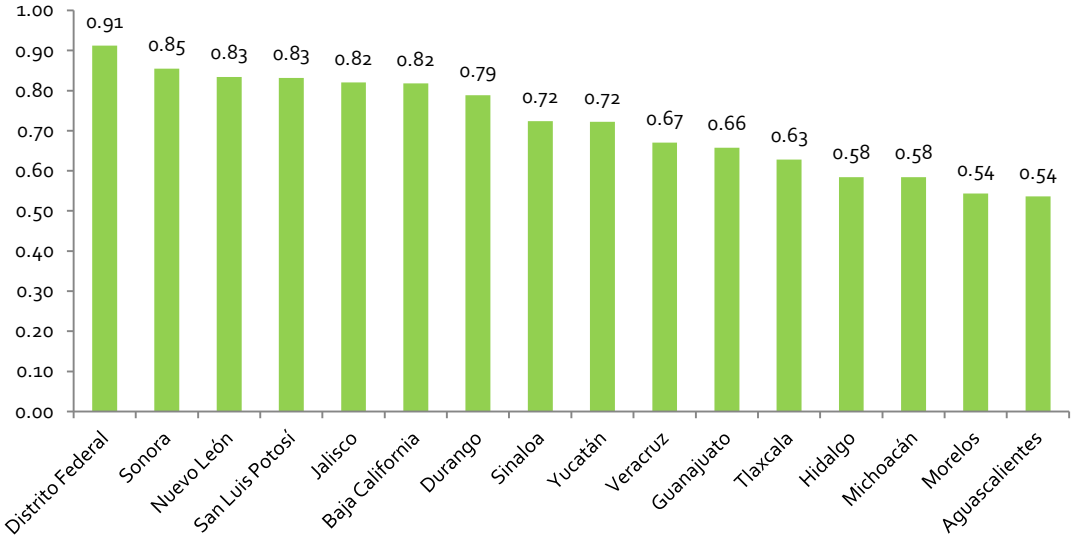


Source: 2009 Economic Census, INEGI.

Importantly industry Aguascalientes state, placed as the sixth production entity in the computer industry, registered the lowest requirement for production inputs importer Regarding intermediate consumption over total gross output (see Figure 1.76).

[15] Economic units mainly engaged in manufacturing machinery and equipment for trade and services, including cameras, photocopiers, and other machinery and equipment for trade and services.
[16] Economic units mainly engaged in the manufacture and assembly of computers and peripheral equipment, such as storage devices, printers, magnetic and optical readers, monitors, regulators.

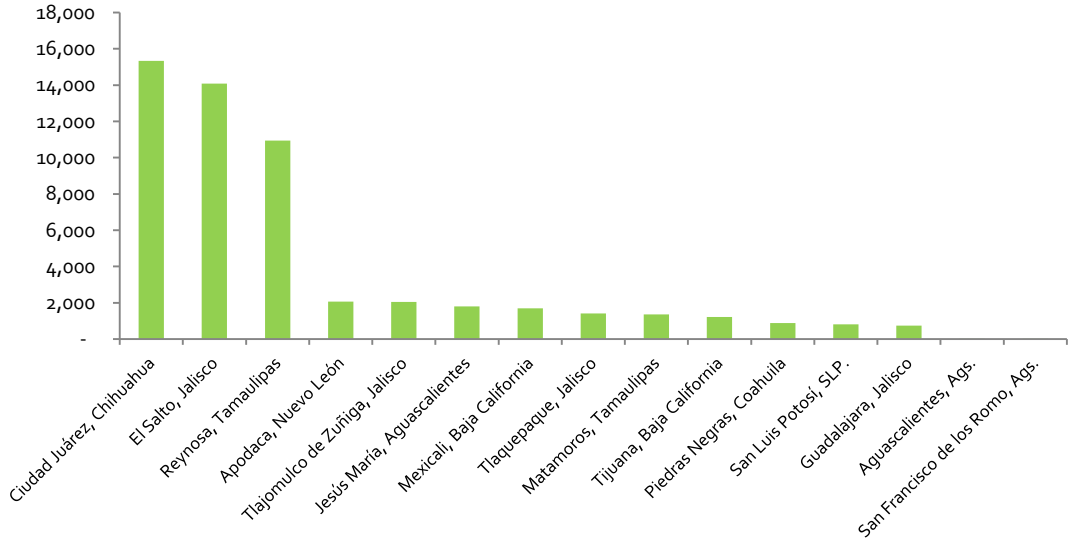
Figure 1.76 Consumer Participation in Production Intermediate Total Gross Computers Sector by Major States (Relative Participation)



Source: 2009 Economic Census, INEGI.

The Municipality of Ciudad Juarez, Chihuahua saw the highest number of staff with more than 15 thousand jobs. The municipality of Jesús María, Aguascalientes reported 1,798 jobs (see figure I.77).

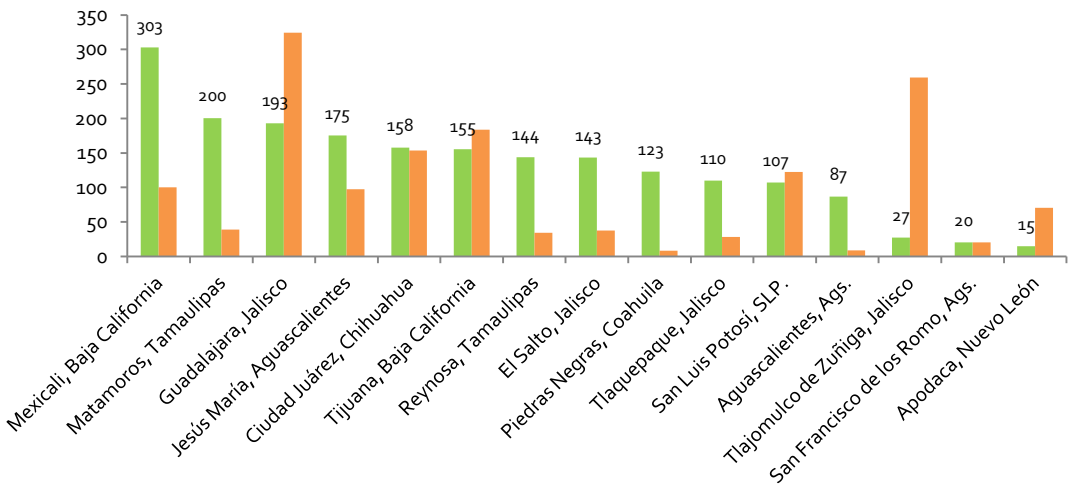
Figure 1.77 Busy Personal Computers Sector by Major Towns. (Number of Employees)



Source: 2009 Economic Census, INEGI.

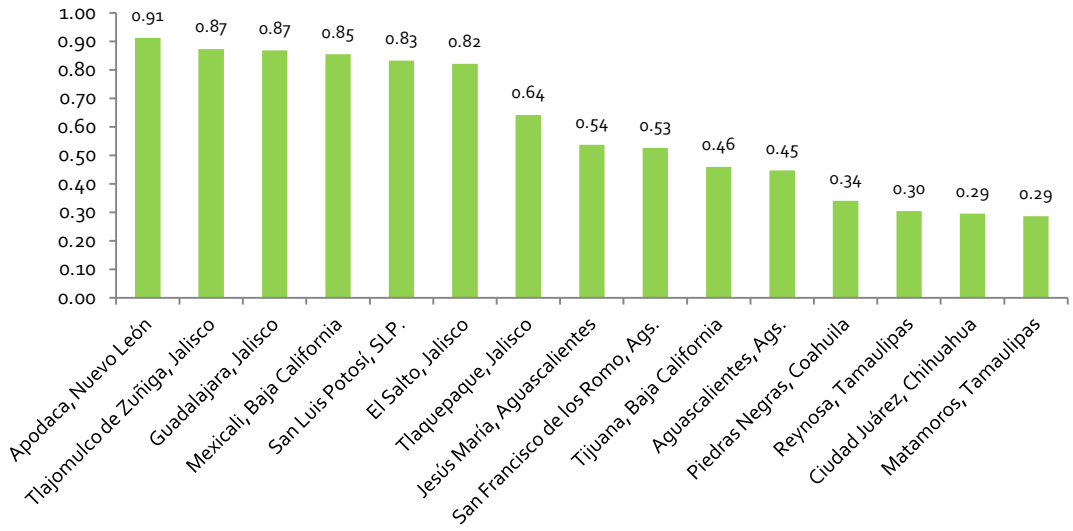
The Municipality of Mexicali, Baja California recorded the highest productivity of labor in the sector of computers 303 000 pesos per job (see Figure 1.78). The municipalities of Matamoros, Tamaulipas and Ciudad Juarez, Chihuahua, recorded the highest value-added contributions of intermediate consumption 0.29 (see Figure 1.79).

Graphics. 1.78 Productivity of Labor and Asset Acquits
by Busy on the Computer Sector by Major Towns.
(Thousands of Pesos)



Source: 2009 Economic Census, INEGI.

Figure 1.79 Consumer Participation in Production Intermediate Total Gross
Computers Sector by Major Towns.
(Relative Participation)



Source: 2009 Economic Census, INEGI.

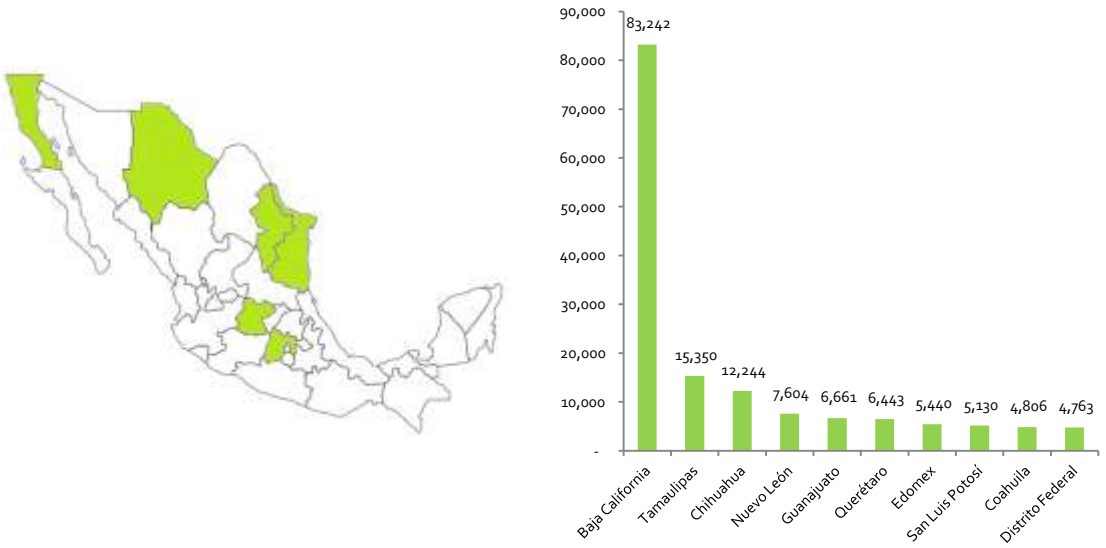
Consumer Electronics

The Consumer Electronics industry is integrated with the following classes: 334610 Manufacturing and reproducing magnetic and optical media; 334310 Manufacture of audio and video; 335210 Manufacture of household appliances minors; 335220 Manufacture of white goods, and 339991 Manufacture of musical instruments.

Entities registered as many people employed were Baja California, Tamaulipas, Chihuahua, Nuevo Leon and Guanajuato. However there was a clear orientation towards the industry of the state of Baja California with a generation above 80 thousand jobs, much higher than his follower Tamaulipas with more than 15 thousand jobs (see Figure 1.80).

In the State of Baja California, the consumer electronics industry has a clear focus, with a strong presence in the sector of audio and video equipment. Among the leading companies (OEM) of the state include Hitachi, LG Electronics, Panasonic, Samsung Electronics, Sanyo, Sharp and Sony.

Figure 1.80 Staff employed at the Consumer Electronics Sector by Major States.
(Number of Employees)



Source: 2009 Economic Census, INEGI.

The municipality of Tijuana, Baja California registered the highest number of people employed in consumer electronics industries (see Figure 1.81).

Figure 1.81 Staff employed at the Consumer Electronics Sector by Major Towns.
(Number of Employees)

Source: 2009 Economic Census, INEGI.

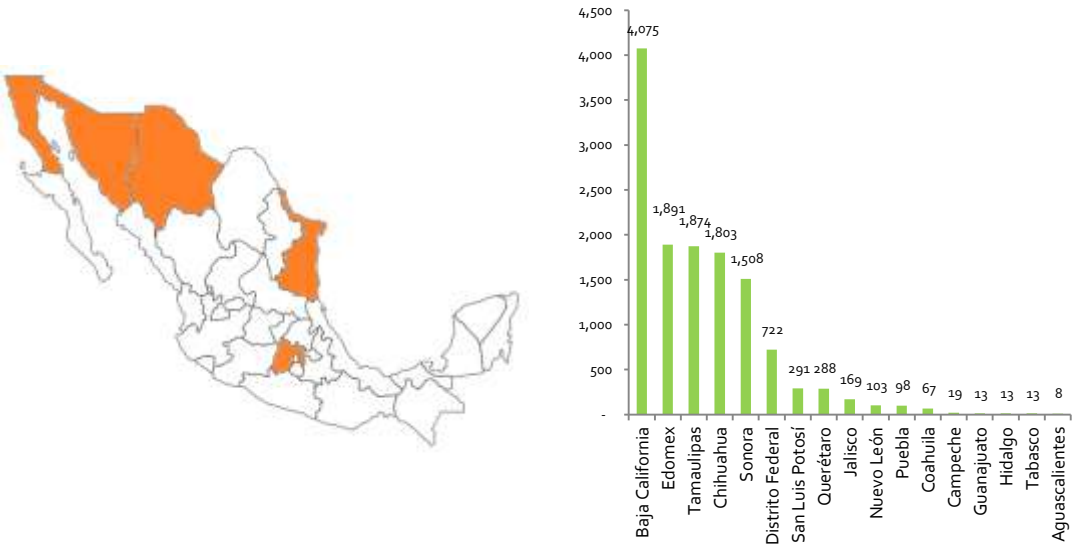
Measuring Instruments

Measuring Instruments Sector integrates the following classes: *334511 Manufacture of watches*[17], Which includes those, and 334519 Manufacture of other measuring instruments, control, navigation, and electronic medical equipment[18]. Baja California recorded the highest number with 4,075 people employed. The states with the greatest presence of measurement instrumentation industries were Baja California, State of Mexico, Tamaulipas, Chihuahua, Sonora and Mexico (see Figure 1.82).

[17] Economic units mainly engaged in manufacturing clocks, time clocks, stopwatches, time controllers and other instruments to measure time

[18] Economic units mainly engaged in manufacturing measuring and control instruments such as gas meters and water taxi meters, apparatus for meteorological, geophysical and surveying equipment, industrial process control, instrumentation and equipment for analysis and laboratory tests, electron microscopes, aircraft navigation instruments and nautical, detectors, plotting and drawing instruments, and electronic medical equipment such as diagnostic and radiotherapy equipment, pacemakers, hearing aids and other implant devices.

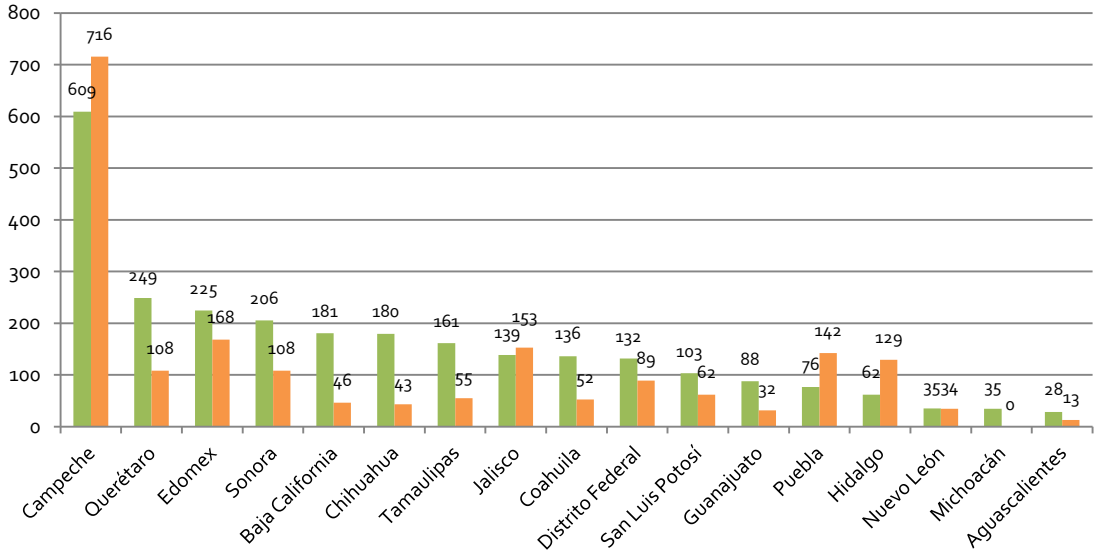
Figure 1.82 Sector Personnel Employed in Measuring Instruments Main States.
(Number of Employees)



Source: 2009 Economic Census, INEGI.

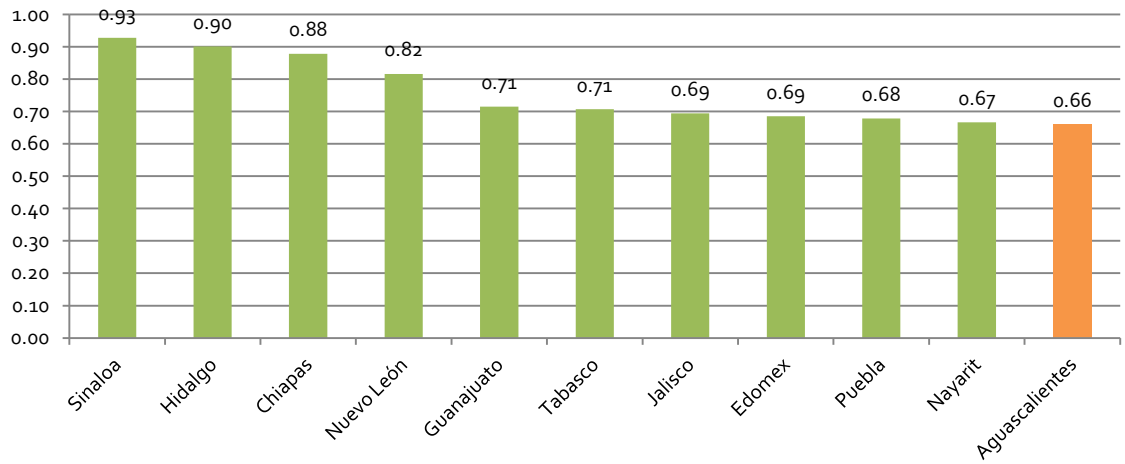
The state of Aguascalientes showed the lowest labor productivity and stock of fixed assets, however recorded the highest contribution to value added by requiring fewer imported inputs for their production (see graphs 1.83 and 1.84)

Figure 1.83 Productivity of Labor and Asset Acquits
by Busy Sector Measuring Instruments Main Municipalities.
(Thousands of Pesos)



Source: 2009 Economic Census, INEGI.

Figure 1.84 Consumer Participation in Production Intermediate Total Gross Sector Measuring Instruments Major States (Relative Participation)



Source: 2009 Economic Census, INEGI

As described in this chapter, related industries electronics sector nationally are characterized not only by the existence of high competitive disparities within largely determined by the different size of companies in the local, and in the provision of fixed assets and technology, but also by important regional contrasts are reflected in high concentrations of activity in a few states, mostly Chihuahua, Baja California, Tamaulipas, Nuevo Leon in the north of the country, and states Queretaro and Jalisco in Central and West and, moreover, in some municipalities, where is recorded the highest number of establishments, value added, wages and capital assets.

The competitive landscape of the Electronics Industry in Aguascalientes recorded a pattern with outstanding electronic components industries, electronics - automotive and computers (see Table 1.85).

Table 1.85. Productivities Aguascalientes Electronics Industry

	Jobs	Productivity hand Artwork	Establishment Productivity	Stock of Fixed Assets	Intermediate Consumption
Aerospace	-	-	-	-	-
Electronics Automotive -	3,981	560	223	535	0.67
Electronics	4,100	356	-	393	0.71
Computers	1,820	-	-	-	0-54
Consumer electronics	-	-	-	-	-
Measuring instruments	8	28	-	13	0.66

Source: Based on data from INEGI.

In general, the behavior of related industries in the electronics sector, suggests that only a small number of states, municipalities and companies are involved in networks of regional and global supplier high added value and benefit from the location of important national and international consortia.

These successful companies in Mexico have established key strategic alliances with such companies demanding industries and their products, forcing himself to follow international quality standards, and using modern technologies and organizational schemes for both design and for production and distribution.

DESCRIPTION OF LOCAL ELECTRONICS SECTOR

Highlights

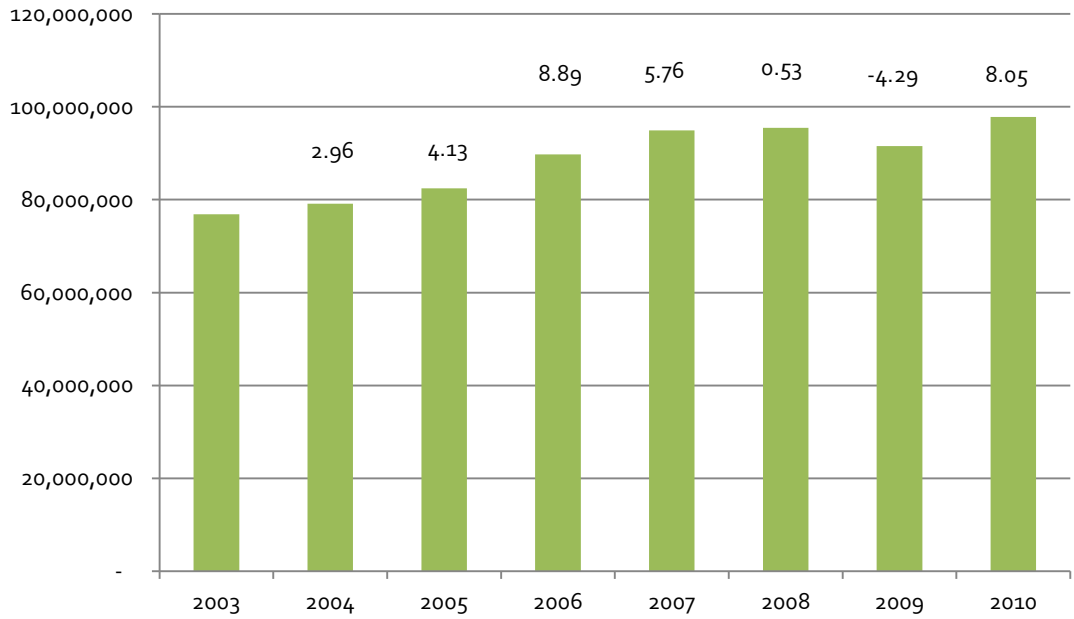
- Local economy of Aguascalientes state, has growth by a rate of 3.08% between 2004 to 2009, highest rate compared to national average.
- Direct Foreign Investment in this period (2004-2009) has been received from Japan and the United States.
- Aguascalientes state economy is based mainly from tertiary sector (services), delivering 56% of the GDP of the state.
- Regarding secondary economic activities, the manufacturing industry delivers the 76% of the value, and construction with 22%.
- The Transportation Equipment Manufacturing subsector, delivers almost 16,000 jobs, representing 30% of the jobs offered on the manufacturing companies.
- Total exportation for Aguascalientes in 2011 was 8,063 million dollars, representing the 2.3% of national totals.
- NISSAN is investing in the Aguascalientes state more than 2,000 million dollars on the construction of their new automotive plant.
- This Japanese company will offer 3,000 new direct jobs and 9,000 indirect, with an estimate production of 175,000 vehicles annually.
- There are 54,062 companies in Aguascalientes, 99.77% micro, small y medium companies.

Description of Local Electronics Sector

3.1 General Structure of the Electronics Sector in Aguascalientes

From the 70s to the 90s, the state of Aguascalientes has gone from an urbanization process into different stages of industrialization, driven largely by the processes of globalization. The state's economic growth in the period of 2004-2009 provided an average growth rate of 3.08%, still higher than the national growth of around 1.88% (see Figure 1.86).

Figure 1.86 Gross Domestic Product of the State of Aguascalientes.
(Thousands of Pesos 2003 price)

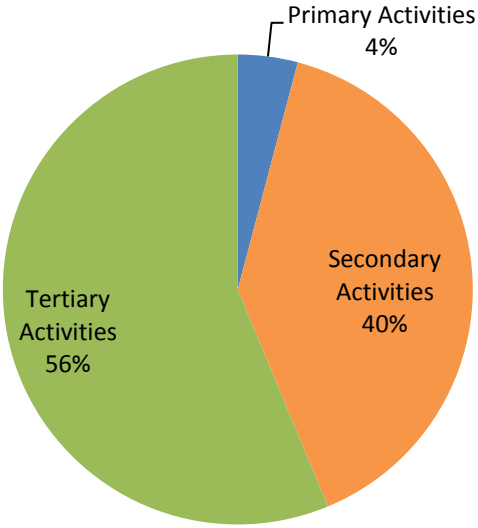


Source: INEGI, System of National Accounts.

In this period, there was a high uptake of foreign direct investment mainly from countries like Japan and the United States, targeting mostly in the automotive industry, iron and steel, clothing and apparel. Participation of the automotive industry in Aguascalientes represents more than a third of the state GDP. This generates a high variability for drops of the global automotive industry, reflected in a fall of the state GDP in 2009, with growth of -4.29%.

Currently, the state economy State has moved toward the tertiary sector (services)[19] contributing 56% state GDP, while the secondary sector (industry)[20] participates with 40% (see Figure 1.87).

Figure 1.87 Share of State GDP Activities.
(Thousands of Pesos)



Source: INEGI, System of National Accounts.

The main secondary activities involving the manufacture of automobiles and auto parts, electrical manufacturing, textile and apparel, aerospace, metallurgy, food, beverages and snuff, showing production specialized of these components and the intensive use of modern technology.

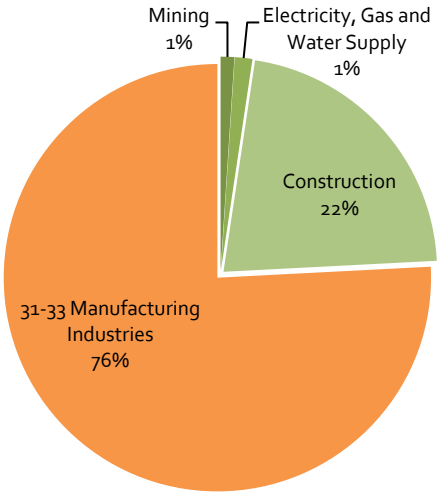
It also highlights the presence of global companies whose production has an employment multiplier effect throughout the industry operations as well as installation and specialization in the computer services sector. The sectors with the greatest potential for innovation are: information technology, automotive, textile, food processing and agricultural technology. The most innovative businesses also include electronics, information and robotics.

[19] SIU tertiary or service industry includes those economic activities related to services that produce goods materials

[20] Secondary or industrial sector transforms raw material extracted or produced by the primary sector in consumer products or goods

Within secondary economic activities, manufacturing industries involved with 76% of the construction value and 22% (see Figure 1.88).

Figure 1.88 Participation of Secondary Economic Activities.
(Thousands of Pesos)

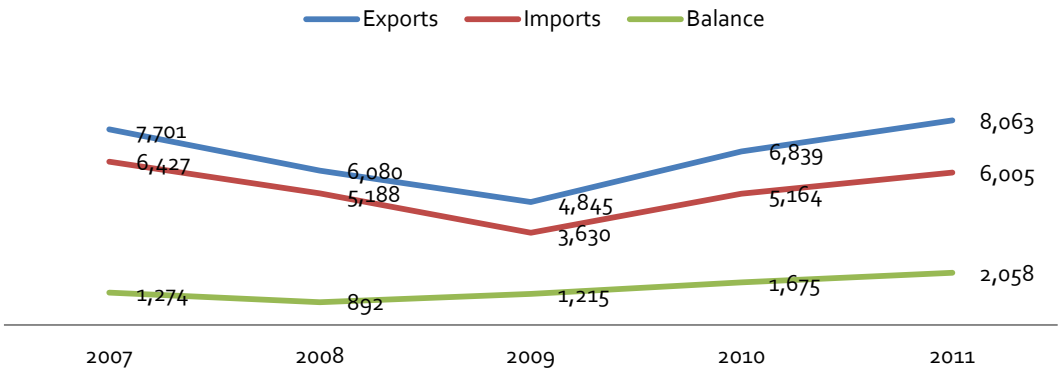


Source: System of National Accounts, INEGI.

Within manufacturing, the subsector Transportation Equipment Manufacturing contributes about 16,000 jobs representing 30% of the jobs created in the manufacturing industries. The electronics industry generates 7,350 jobs representing 14% of jobs.

The amount of exports from the state of Aguascalientes was $ 8,063,000 in 2011 on preliminary figures, representing 2.3% of the national total, while imports amounted to U.S. $ 6.005 million, 1.7% of the national total, resulting in a balance positive trade 2.058 million dollars (see Figure 1.89).

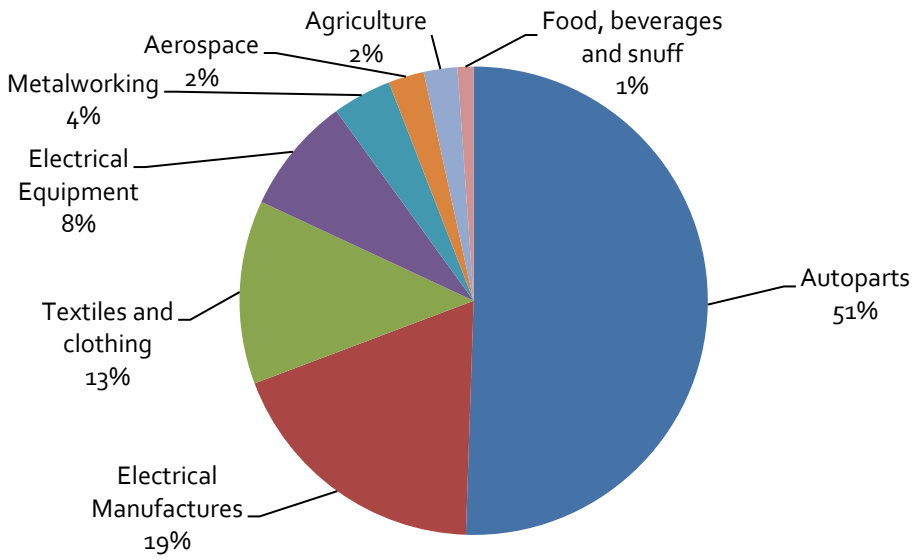
Figure 1.89 Share of State GDP Activities.
(Thousands of Pesos)



Source: Trade Balance by chapter Aguascalientes State, Directorate General of Foreign Trade, Ministry of Economy, April 2012.

Of total manufacturing exports recorded in the period 2009 - 2010, there are 10 products generated in the state with a significant competitive advantage: audio and video equipment, air conditioning and industrial heating, motor vehicle parts, vehicle parts, frozen fruits , vehicle drive train, brake systems for vehicles, bikes equipment, construction equipment and light vehicles (see Figure 1.90).

Figure 1.90. Main Export Economic Branches - June 2010.
(Percentage)



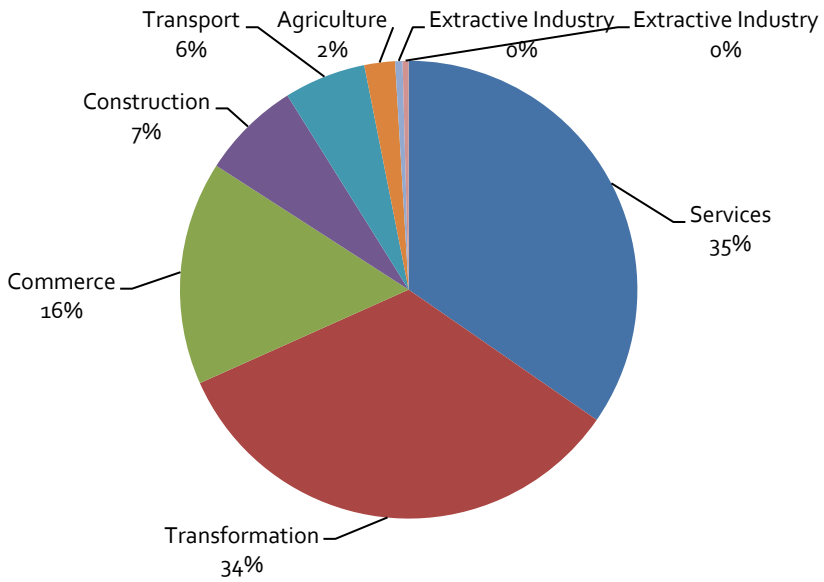
Source: Six-Year Plan 2010 - 2016, Aguascalientes State Government.

Among the main economic branches stand export auto parts industry, electrical manufacturing, textiles and clothing, and electrical equipment. In this sense, it highlights the confirmation of the Japanese automotive company Nissan to build a new plant in the state of Aguascalientes, with an investment of 2,000 million dollars and a generation of 3,000 direct and 9,000 indirect jobs, with a production capacity of more than 175,000 vehicles a year, accompanying the new NISSAN complex with a new supplier park.

In terms of the economically active population, the state of Aguascalientes has a 32% of its population under 15 years old about to join the labor force in the coming years, so you should use this momentum-age population work (demographic).

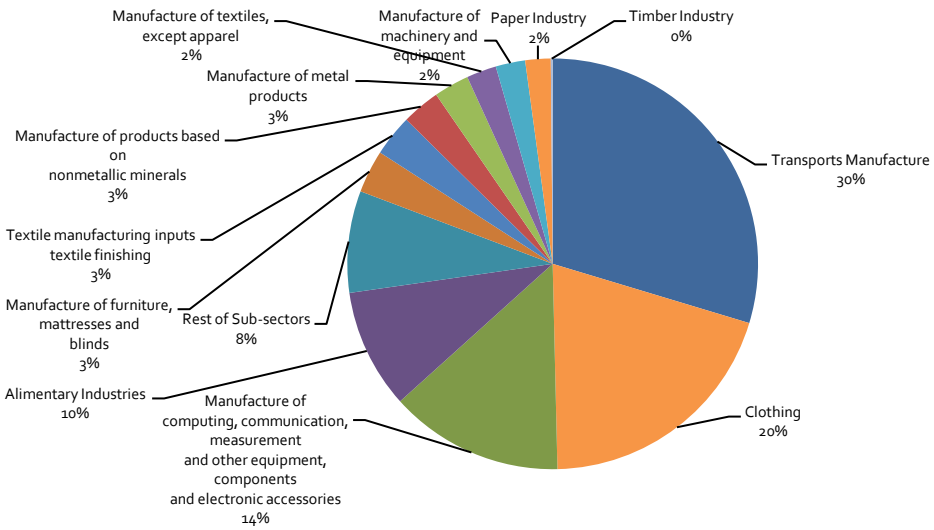
According to the National Survey of Occupation and Employment, there were a 5.8% of people employed in the primary sector, 29.9% in the secondary sector and 64% in the tertiary sector (see graphs 1.91 and 1.92).

Figure 1.91. Main Sectors of Employment Generators
(Percentage)



Source: Ministry of Economic Development, Economic Information Aguascalientes, 2012.

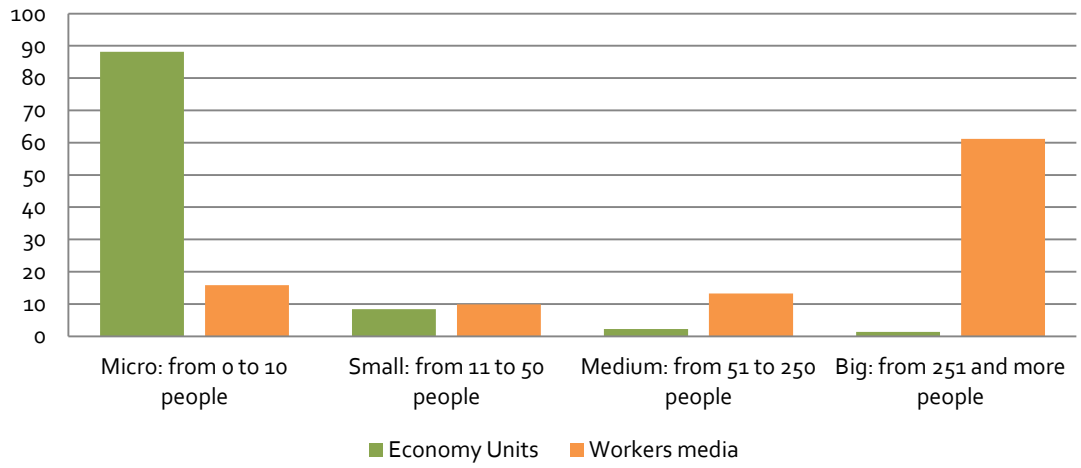
Figure 1.92. Staff employed by Manufacturing Subsector.
(Percentage)



Source: System of National Accounts, INEGI.

Regarding the level of preparedness of the population and access to good jobs, people with lower levels of preparation are they mostly have a job, while those who have a university education are those recorded higher unemployment . The implementation strategy is to increase the number of higher paying jobs. In Aguascalientes there are more than 54,062 companies, of which 99.77% are micro, small and medium enterprises, themselves occupying 73% of the economically active population, providing a total gross production of about 30% of state GDP (see 1.93 graph).

Figure 1.93. Economics and Personal Occupied Units Average (Percentage)



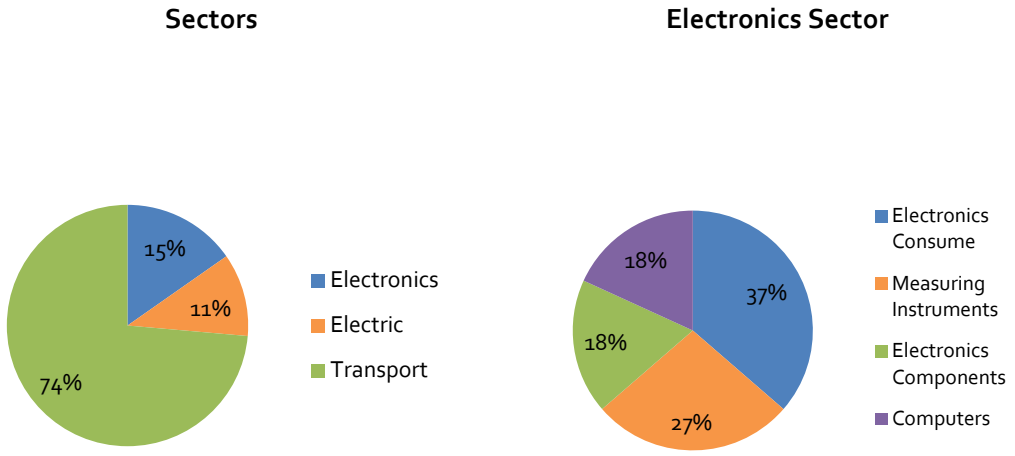
Source: Ministry of Economic Development of the Government of the State of Aguascalientes [2011], Sector Program 2010-2016.

3.2 Electronics Industry in Aguascalientes

With information from the National Statistical Directory Economic Units (DENUE) INEGI, we identified 11 companies in the state of Aguascalientes Subsector 334, 8 Subsector 335 companies, and 53 companies in the Transportation Equipment Subsector.

In related branches electronics industry, 74% are highlighted related companies transport sector companies engaged in manufacturing activities transportation equipment, 15% of companies engaged in the manufacture of equipment computing, communications, electronic components and accessories, and 14% of companies engaged in the manufacture of accessories and electrical equipment electrical power generation. Companies engaged in sector-mail directly to stand by 37% in consumer electronics industries and 27% in measuring instruments (see Figure 1.94)

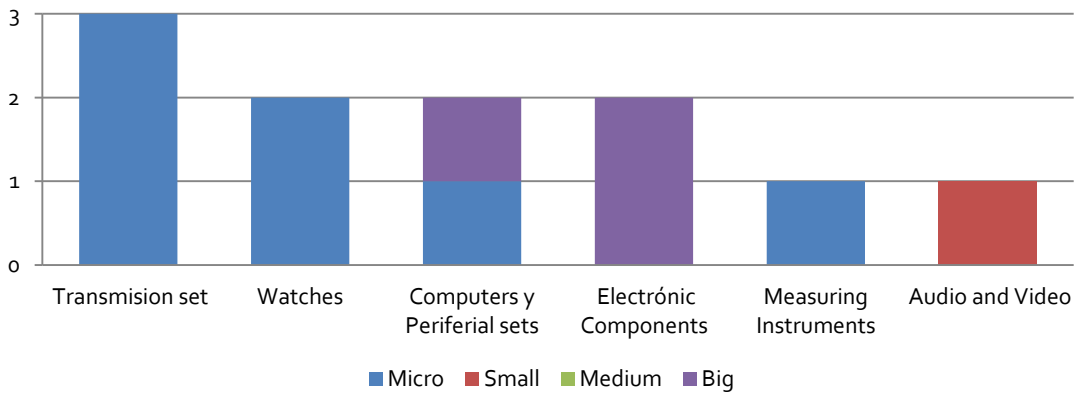
Figure 1.94. Percentage of Companies by Sector Aguascalientes.
(Percent of Companies)



Source: National Statistical Directory Economic Units, INEGI.

Regarding the size of companies in the electronics sector[21], Evidenced a preponderance of large companies in the industries of electronic components (2) and computers (1). In the remaining industries, there is a smaller scale size, especially micro businesses, with fewer than 10 employees, in the segments of transmission equipment, watches, measuring instruments and audio and video equipment (see Figure 1.95).

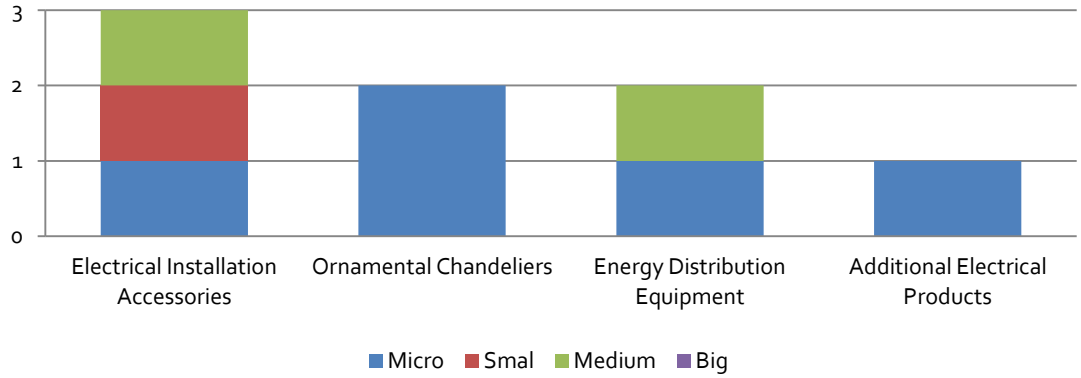
Figure 1.95. Number of Companies by Strata Electronics Industry.
(Number of Companies)



Source: National Statistical Directory Economic Units, INEGI.

[21] Competitiveness Act of Micro, Small and Medium Enterprises.

Gráfica1.95. Number of Companies by Stratum Electrical Industry.
(Number of Companies)

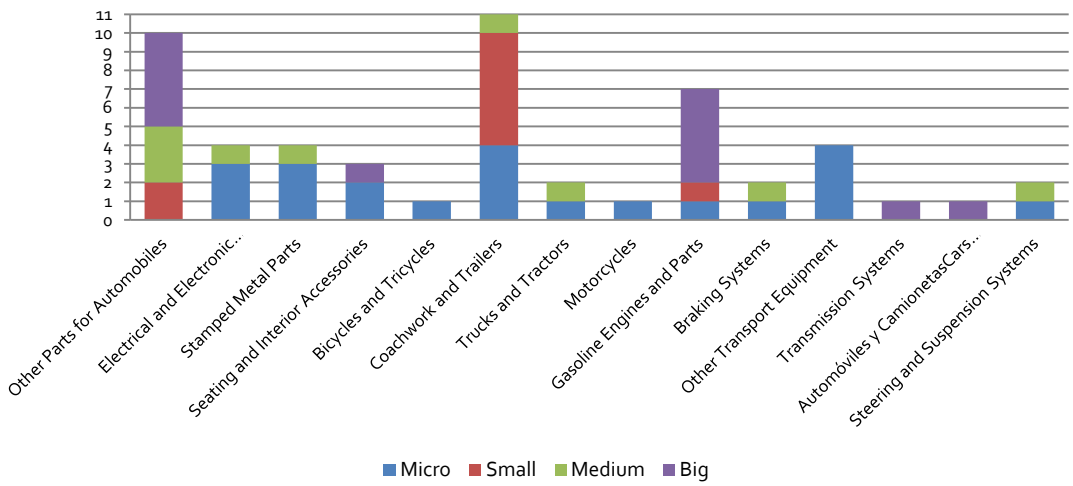


Source: National Statistical Directory Economic Units, INEGI.

The electricity industry has smaller state companies and accounted for two medium-sized companies with jobs between 51-100 employees in accessories for electrical and power distribution equipment. The remaining businesses are micro enterprises with less than 10 employees, in ornamental lamps and other electrical products (see Figure 1.95).

Under DNUE data, industry transportation equipment manufacturing is the strongest with a strong impact on the local economy. A whole consists of 13 large companies with the following distribution: Other parts for automotive vehicles (5) seats and interior accessories (1), gasoline engines and parts (5) Transmission Systems (1) and Automobiles and trucks (1). Economies of scale have on the activity of other parts for motor vehicles, with five large and three medium-sized enterprises (see Figure 1.96).

Figure 1.96. Number of Companies by Stratum Transportation Industry.
(Number of Companies)



Source: National Statistical Directory Economic Units, INEGI.

Activities with lower economies of scale for their body size are manufacturing companies with 6 small companies (11-50 employees) and 4 micro enterprises (between 1-10 employees). In electrical and electronic equipment for motor vehicles detected 4 companies, a medium and 3 micro enterprises.

Aguascalientes automotive industry is mainly involved in two parts of the production chain: end products and support services and related industries. In these kinds of products include the manufacture of automobiles and trucks (336110) and the Manufacture of gasoline engines and parts for motor vehicles (336310) that were identified as motor. The company operating in Aguascalientes and whose products are included in classes Nissan motor is Mexican.

One of the main conclusions of the local electronics industry is the difference in the size of enterprises, large companies are making computers and peripheral equipment and electronic components, however there is a small group of micro enterprises, which operate in isolation and without a corporate strategy or comprehensive regional approach, being immersed in a vicious cycle of lack of fixed assets and technology, miniaturization of scale and lack of strategic alliances, adverse contexts to compete successfully in global markets.

DIAGNOSIS OF THE LOCAL ELECTRONICS SECTOR

Highlights

- The 41% of the companies are related with a business corporation, 79% located in Mexico and 21% in the USA.
- Manufacturing companies on 20% of them are working on integrated circuits activities or printed, electrical cabinets.
- Regarding distribution by employment types, 41% of them are working on production activities at operational level, followed by 19% of directive level jobs.
- About training topics for Human Resources, 71% of the companies are implementing an internal training program.
- The 22% of the companies are confirming that their employees require management skills, 22% Technical Abilities and 9% Computing Tools.
- About 65% of the companies confirm they not found necessary to achieve internationally recognized certifications for their employees.
- In 16% of the companies are in the need of certifications about software development, like Microsoft, Linux and Oracle (Java).
- The professional degrees with highest demand by local industry, 21% confirms that they need electronic engineers and computation systems, and 9% mechanics and mecatronics engineers.
- About 56% of the companies have not implemented any quality management system.
- The 65% of the companies doesn't have an environmental improvement program.

Diagnosis of the Local Electronics sector

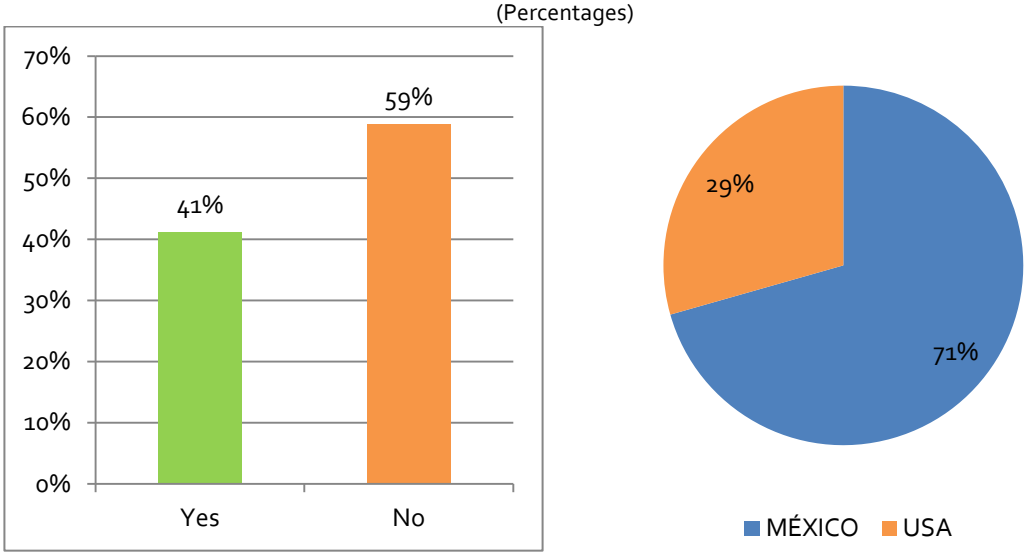
4.1 Local Industry Diagnosis

For the in-depth analysis of companies and educational institutions associated or related to CELESA, different surveys were developed for each study subject, given the characteristics and peculiarities of the interviewees.

The interview made for companies settled for a total of 7 sections: 1) Collaboration, 2) Human Resources, 3) Processes, 4) Infrastructure, 5) Commercial, 6) Innovation and Technological Development, and 7) Financing, bringing the 50 total reactants. The application of the interview was conducted through field visits at the premises of the participating companies with a duration of 1 hour and 30 minutes, applied to the directors or representatives businesses related to CELESA.

The 41% of companies surveyed said their company is part of a business corporation, the corporate are located 79% in Mexico and 21% in the U.S. (see Figure 1.100).

Figure 1.100. Relationship and Location with Corporate Business (Percentages)

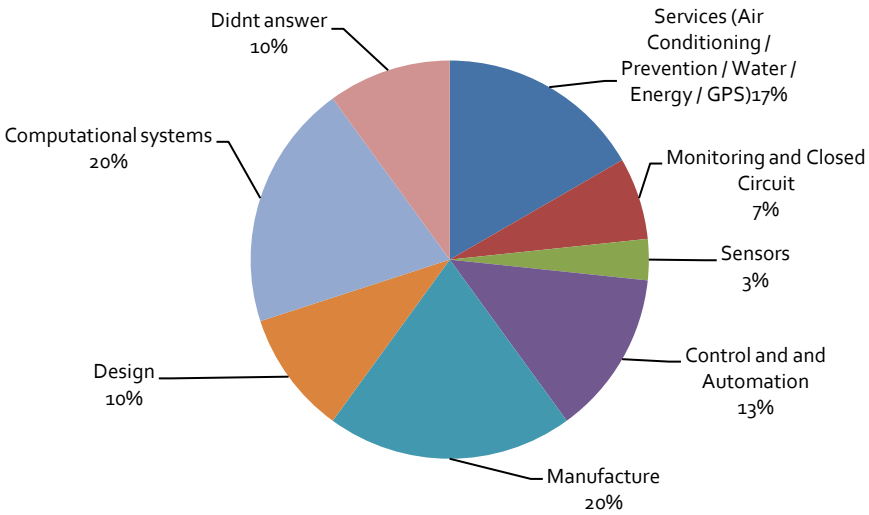


Source: Based on the results of the interviews applied.

Importantly, linking with business groups (parent companies) by 29% of companies with conglomerates in the United States, such as Sensata, Flextronics, Texas Instruments, among others, opens the possibility of attracting more activities with potential impact on the local economy, specifically activities and value-added services, including design, research and development, logistics and production firmware.

With regard to the main products and / or services of the companies interviewed general responses were obtained. It stands 20% of firms in manufacturing activities in the areas of integrated or printed circuits, electrical enclosures, automotive components and printing machines, 20% with software development activities and production of video, and 17% in provision air conditioning services, prevention, energy and GPS systems, among others (see Figure 1.101)

Figure 1.101. Main Products (Equipment and / or Components) and Services (Percentages)



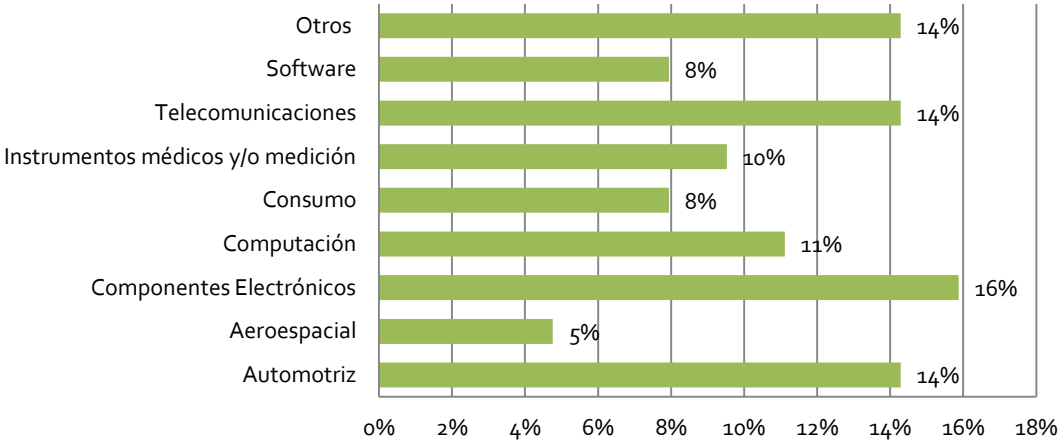
Source: Based on the results of the interviews applied.

With regard to the industries in which participating companies interviewed, 16% in the electronic components industry, and 14% in automotive industries and telecommunications. It has a smaller presence in the software industry, consumer electronics and aerospace.

The orientation of the local industry towards making electronic components (integrated or printed circuits, etc.), holds special significance, as it is an industry trade balance deficit of Mexico, opening areas of opportunity for the integration of

production chains associated that industry. It is also important to mention specializing in electronic components for the automotive sector, given its high relevance of this sector in the local economy (see Figure 1.102).

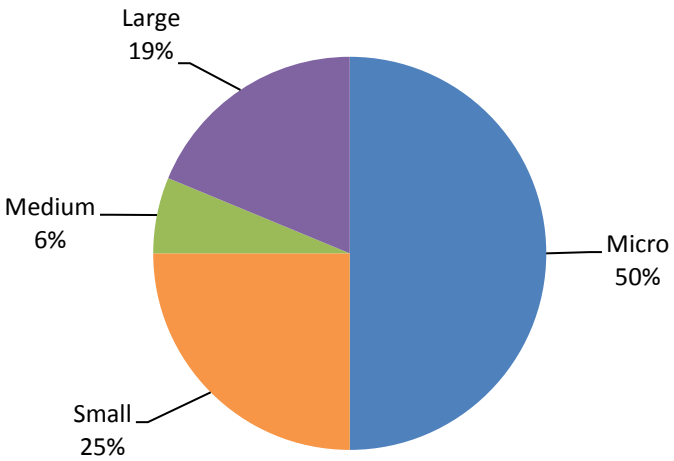
Figure 1.102. Participation by Local Business Industries.
(Percentage)



Source: Based on the results of the interviews applied.

The 81% are micro, small and medium enterprises and 19% large companies with more than 250 jobs. Importantly, whole companies generate more than 7,854 jobs, however you have to consider that large companies have an average more than 2,500 jobs (see Figure 1.103)

Figure 1.103. Local Business Size
(Percentage)

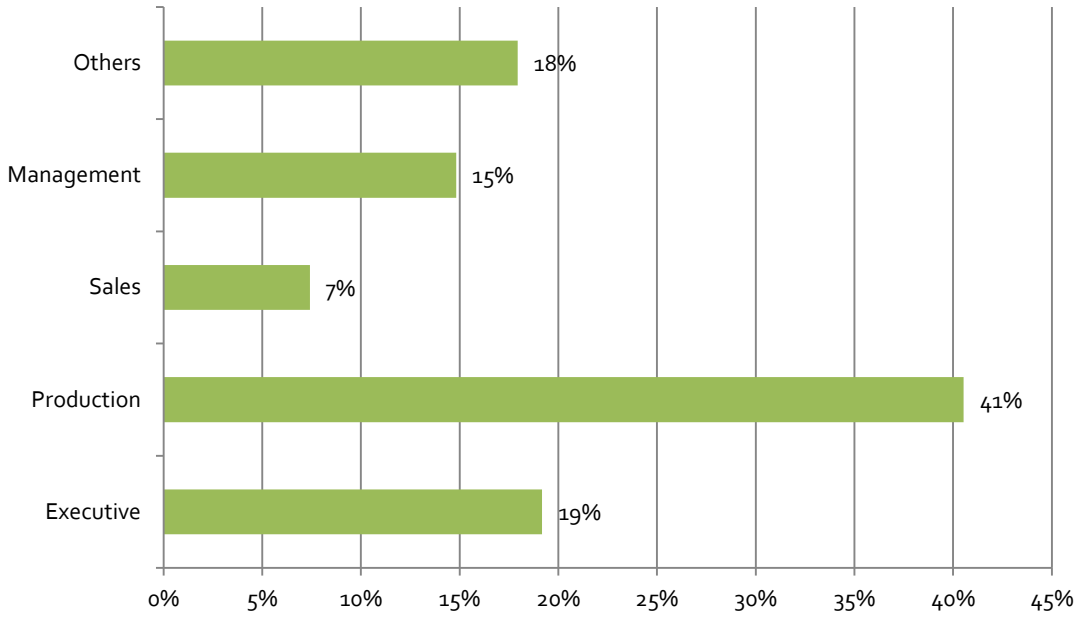


Source: Based on the results of the interviews applied.

It is important to note the high difference in the size of the companies, this evidence suggests that, given the small size of the domestic level of most local businesses do not have adequate productivity, both internal and external to integrate productively with large companies and / or to compete successfully.

Regarding the distribution by type of employment, 41% of jobs engage in production at the operational level, followed by 19% of jobs at management level, this evidence shows the orientation towards intensive activities in human resources (assembly and / or sub - Assemble) given the orientation of the local industry to manufacturing activities (see Figure 1.104)

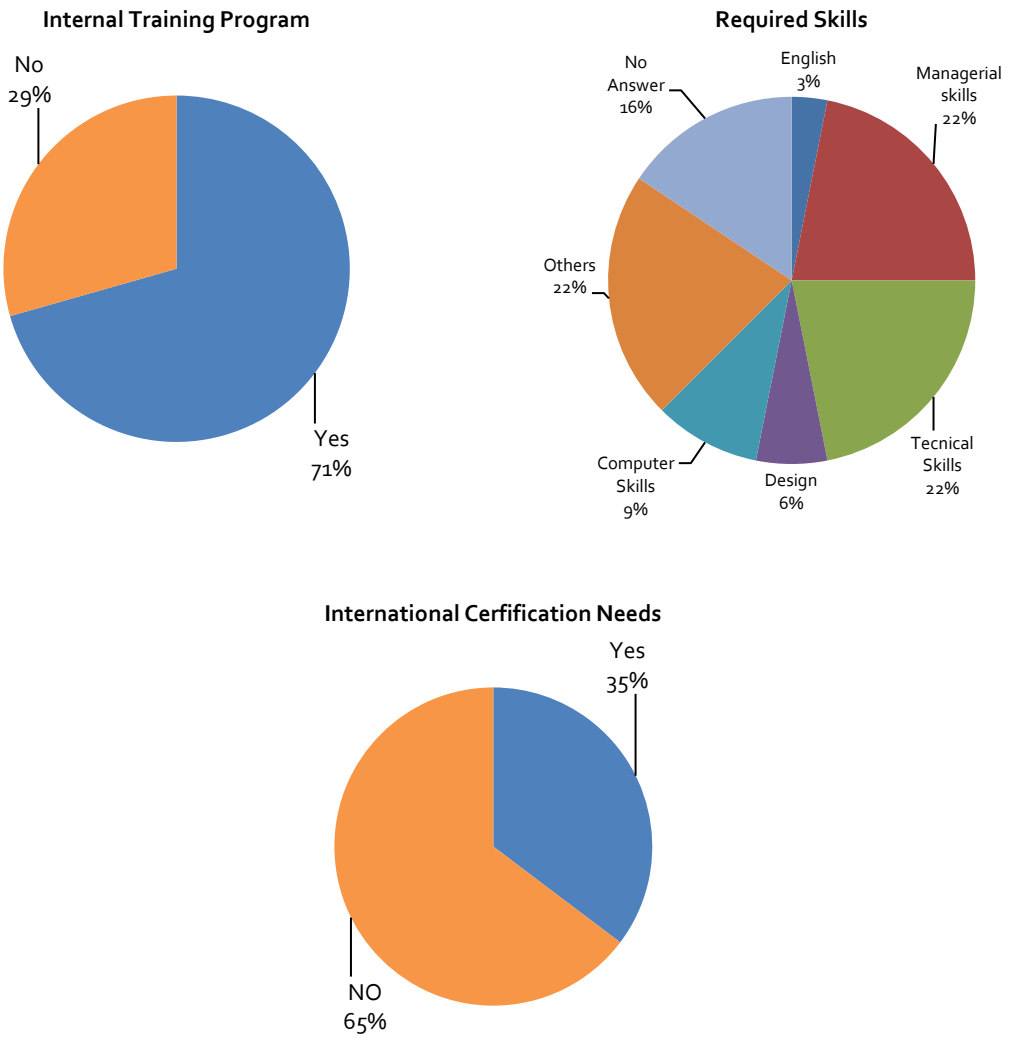
Figure 1.104. Employment Distribution by type.
(Percentage)



Source: Based on the results of the interviews applied.

The topics in human resource training, 71% of companies have an internal training program, which opens up the possibilities of providing continuous training and systematic manner in order to improve the knowledge and skills of the staff of the companies pursuant to a professional growth path, 22% of companies said their employees require managerial skills, understood as the set of knowledge and skills for leadership activities and coordination roles of manager or work team leaders, 22 % technical skills in certain processes, techniques or tools, and 9% in computing tools. Also, 65% of companies indicated that they require internationally recognized certifications for its employees, showing little interest in developing human resources with knowledge standardized and approved in accordance with requirements of global production chains (see Figure 1.105).

Graphics. Internal Training Programs, Required Skills and Needs of International Certifications. (Percentage)



Source: Based on the results of the interviews applied.

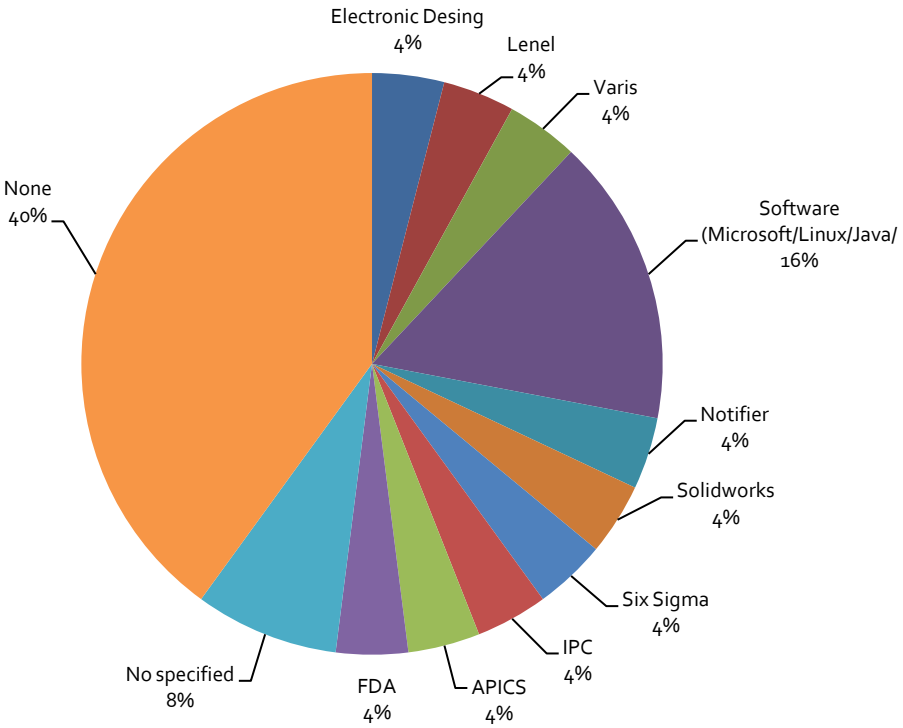
Among the main certifications required by companies, 16% of companies said certifications in software development tools such as Microsoft, Linux and Oracle (Java), and various mentions in certifications for specific purposes related to business activities as Lenel[22], Varis[23], Notifire[24], Solidworks[25], Six Sigma[26], IPC[27], APICS[28], And FDA[29], (See Figure 1.106).

[22] Integrated security systems such as access control, alarm monitoring, ID card production and management personnel..
[23] Digital photography systems.
[24] Fire alarm technology systems.
[25] Software 3D CAD design, simulation and product data managemen.
[26] Process improvement methodology focused on reducing the variability thereof, managing to reduce or eliminate defects..

It is important to mention as many answers to programming tools and software development, given the strong international momentum market segment embedded software (embedded software), is defined as a type of software that combines programming codes party applications that enhance the functionality of multiple products not originally computerized and electronic components for the automotive sector.

Unlike application software, embedded software, among other features, is an intermediary between the high-level software and hardware functions and has requirements related to the low power consumption and low cost of production. Among the main industries that use this type of software are automotive, wireless communications, mobile devices, as well as for the agribusiness and robotics.

Figure 1.106. International Certifications Main Defendants.
(Percentage)



Source: Based on the results of the interviews applied.

In terms of the rating companies assigned to the availability and skills of human resources at the local level, 47% of companies rated as fair availability in terms of number and access to human resources, reflecting the lack of alignment

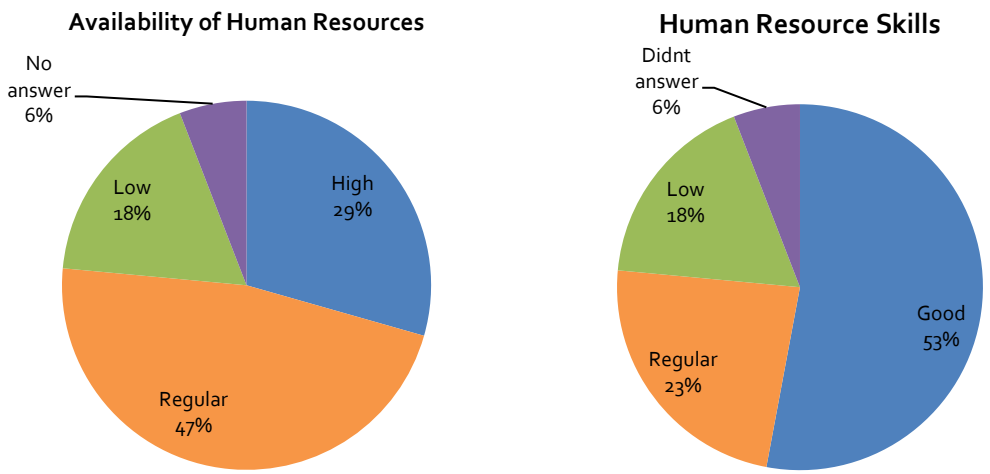
[27] IPC is a global trade association of the electronics industry, specifically to designers of printed boards, printed board manufacturers and electronics manufacturing companies

[28] Association for Operation Management (APICS) offers certification as a Professional in Supply Chain Management, and Administration of Production and Inventory.

[29] Food and Drugs Administration (FDA) - Electronic Product Radiation Control Program.

with offering students, graduates and professionals generated by local educational institutions: and 53% rated as good basic knowledge and skills of human resources to meet the proposed activities or skills required by companies. Overall, it has difficulties in availability (number and / or access to resources), but these meet the requirements in the workplace (see Figure 1.107).

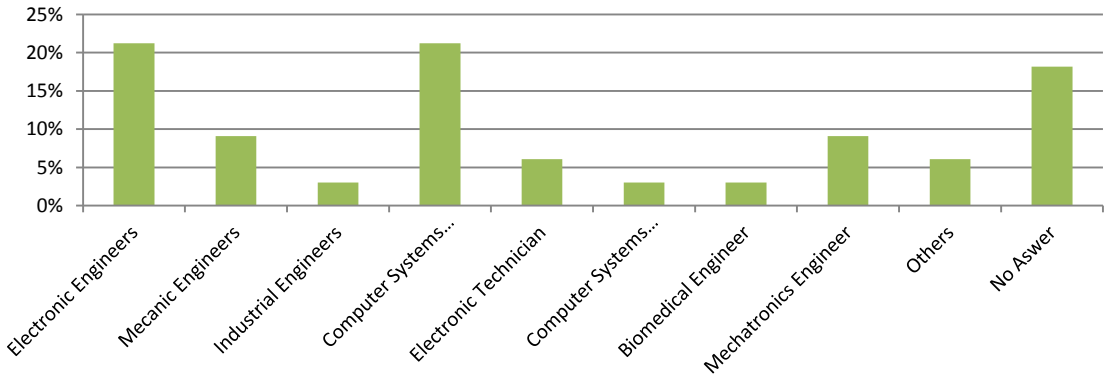
Figure 1.107. Availability Ratings Human Resources and Skills.
(Percentage)



Source: Based on the results of the interviews applied.

Regarding races with greater demand for local industry, 21% of companies noted the need for electrical engineers and computer systems, and 9% with mechanical and mechatronics engineers. It is noted that local educational institutions have curricula in major races defendants, being the state of Aguascalientes high resource generator these profiles (see Figure 1.108).

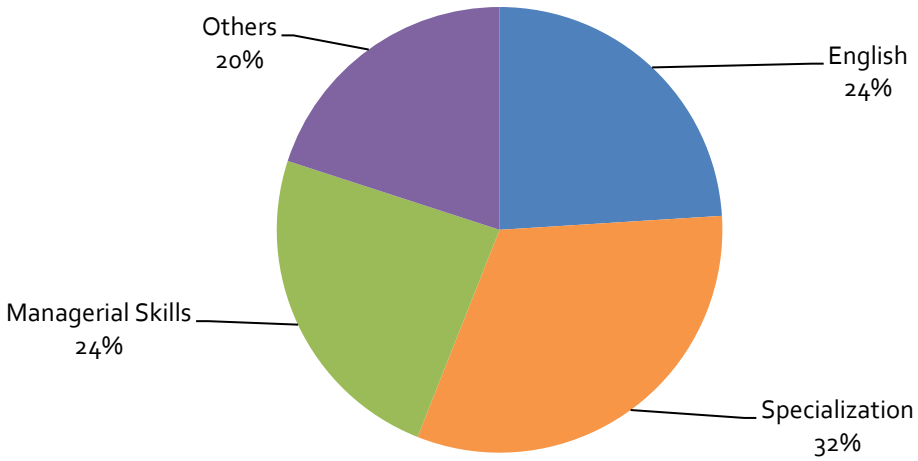
Figure 1.108. Careers Required by Industry
(Percentage)



Source: Based on the results of the interviews applied.

Among the features not found in local human resources, 40% of the interviewed companies want greater specialization, a situation that encouraged through races with developing sciences (engineering sectors or emerging technologies), 24% in handling English, given its importance for the high integration of the electronics sector in global production chains, and 24% in managerial skills (see Figure 1.109).

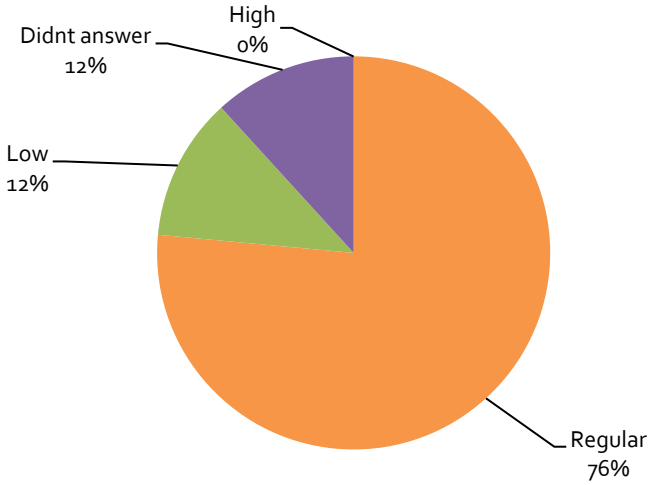
Figure 1.109. Important Feature Not Found in Local Human Resources (Percentage)



Source: Based on the results of the interviews applied

With respect to the costs of local human resources, 76% of the companies interviewed considered it an average cost (regular), noting that none of the companies considered it a high cost. Importantly, in terms of reducing costs continuously, given the strong international competition, the position of an average cost would be favorable for the local industry, notwithstanding the above, international companies are cutting costs often through technological innovation(New materials, smaller design, more power and functionality of components, etc..), So that the comparative advantage of low costs remains a major decision factor (see Figure 1.110).

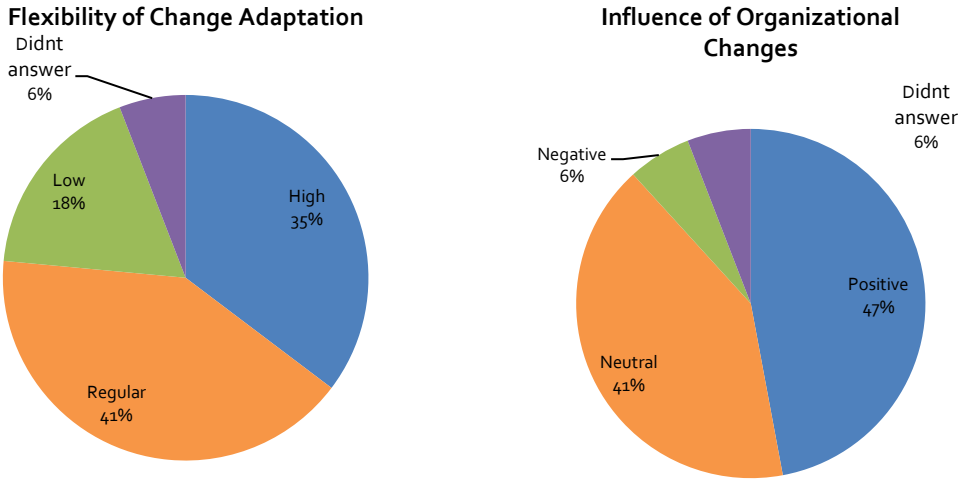
Figure 1.110. Cost of Local Human Resources
(Percentage)



Source: Based on the results of the interviews applied.

The 41% of the companies interviewed regularly considers its flexibility to adapt to change, implying limited competitiveness in productive environments competitive strategies that require flexibility and rapid changes in design, technologies and processes, 47% of companies reported a positive influence organizational changes in the performance of the company, in this sense, labor flexibility allows companies greater opportunities within an environment of global production chains, where the structures are rigid and complex impediments to have greater flexibility and adaptation change (see Figure 1.111).

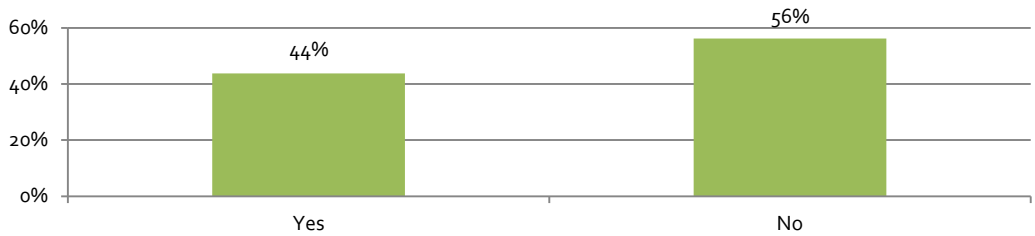
Figure 1.111 Adaptation and Influence of Organizational Changes
(Percentage)

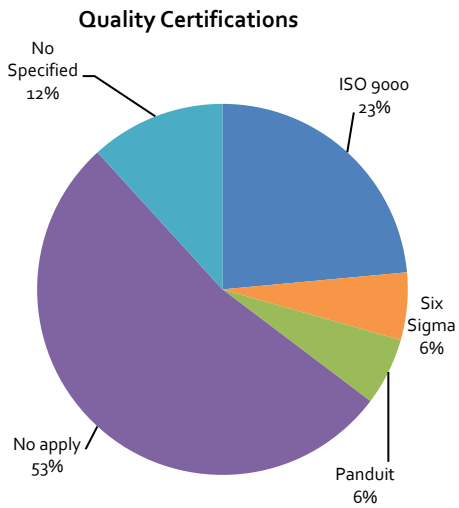


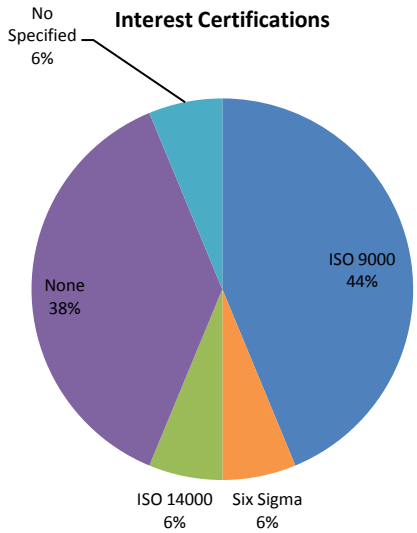
Source: Based on the results of the interviews applied.

The 56% of the companies interviewed have not implemented a quality management system or, essential models for standardization of a product or service in order to generate greater trust and communication channels with manufacturers, suppliers and / or customers, and as continuous improvement processes among employees to handle its usual, 23% of enterprises have implemented ISO 9000[30], And 6% Six Sigma certifications and Panduit[31]Within the certifications that would be interested to implement within their organizations 44% said ISO 9000 (see Figure 1.112)

Figure 1.112. Adoption of Quality Certifications, Certifications Implemented and Interest Certifications
(Percentage)







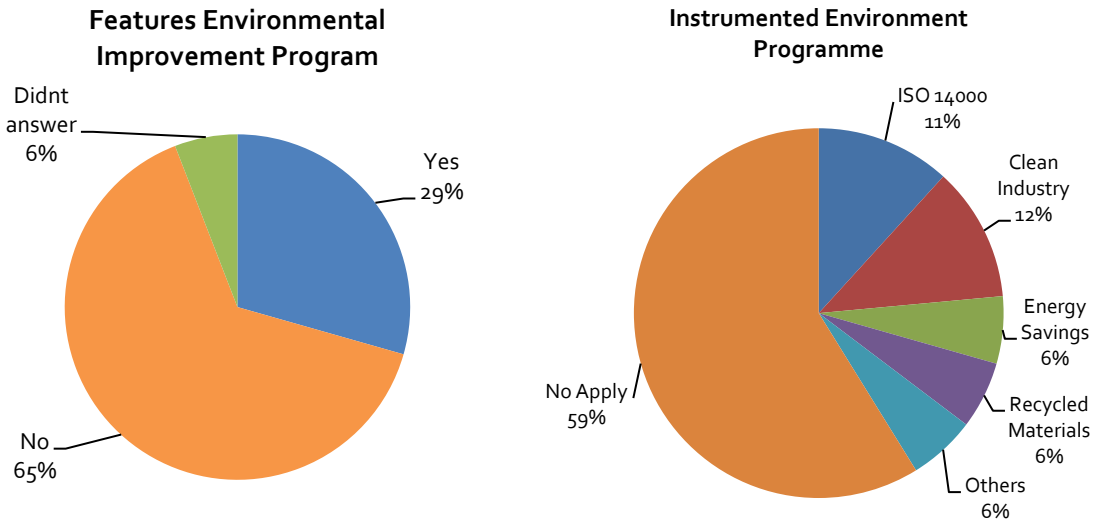
[30] ISO 9000 is a set of quality standards and quality management, established by the International Organization for Standardization (ISO). Can be applied in any type of organization or activity aimed at the production of goods or services. The standards include both the minimum and specific guidelines and implementation tools as audit methods.

[31] Panduit is a global manufacturer of physical infrastructure solutions with solutions for energy, communications, computing and control security systems.

Source: Based on the results of the interviews applied.

Internationally in the electronics sector is a widespread practice increasingly investing resources to achieve an adequate voluntary environmental performance, and contribute to improving the environment in which companies conduct their business. In this regard, 65% of companies do not have an environmental improvement program, 12% of companies have implemented the Enterprise Program / Clean Industry[32], 11% ISO 14000 model[33], 6% energy saving programs[34] and material recycling[35] (See Figure 1-113)

Figure 1.113. Environmental Improvement Program
(Percentage)



Source: Based on the results of the interviews applied.

Internationally, the electronics industry is characterized by its high integration through global production chains. In this regard, 65% of companies do not outsource certain production processes to external suppliers. One explanation for this dynamic integration is that 75% of companies are micro and small businesses that have not developed internal economies, which undoubtedly favors plants and industries in large sizes.

Overall, only 14% of companies outsource processes: 18% between 25% and 50% of its processes, and 12% over 50% of its processes. In this regard, it is noteworthy that even large companies with high economies of scale and integrated

[32] The National Environmental Audit of the Federal Environmental Protection (PROFEPA) considers the issuance of a Clean Industry Certificate.

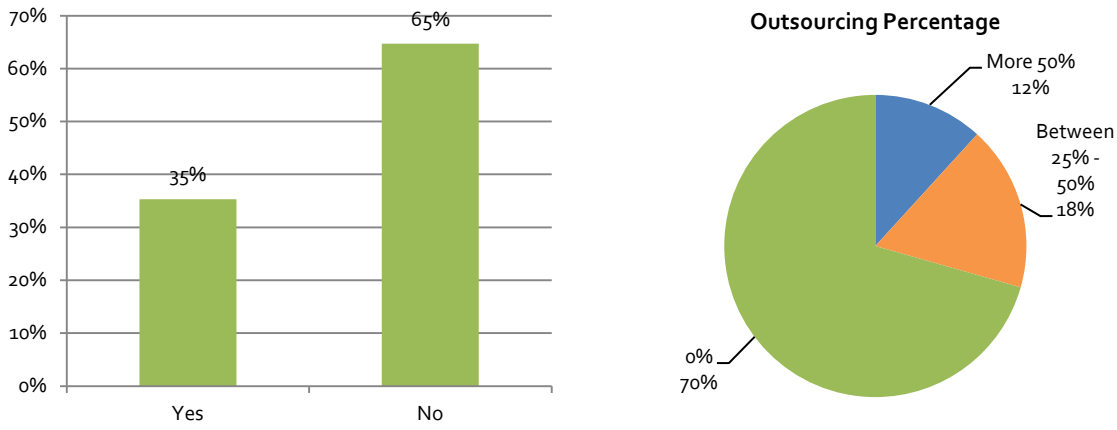
[33] ISO 14000 is an internationally accepted standard that expresses how to establish an Environmental Management System (EMS) cash. The standard is designed to achieve a balance between maintaining profitability and reducing environmental impacts..

[34] The efficient use of electricity, through projects that allow the link between technological innovation and power consumption by implementing efficient technologies. (FIDE).

[35] The recycling of electronic materials is to disassemble the product leg and reintroducing recover primary materials in another chain

into the global production chain, have limited alternatives to outsource certain processes or services to local businesses, primarily due to the risks identified in the local supply levels (see Figure 1.114).

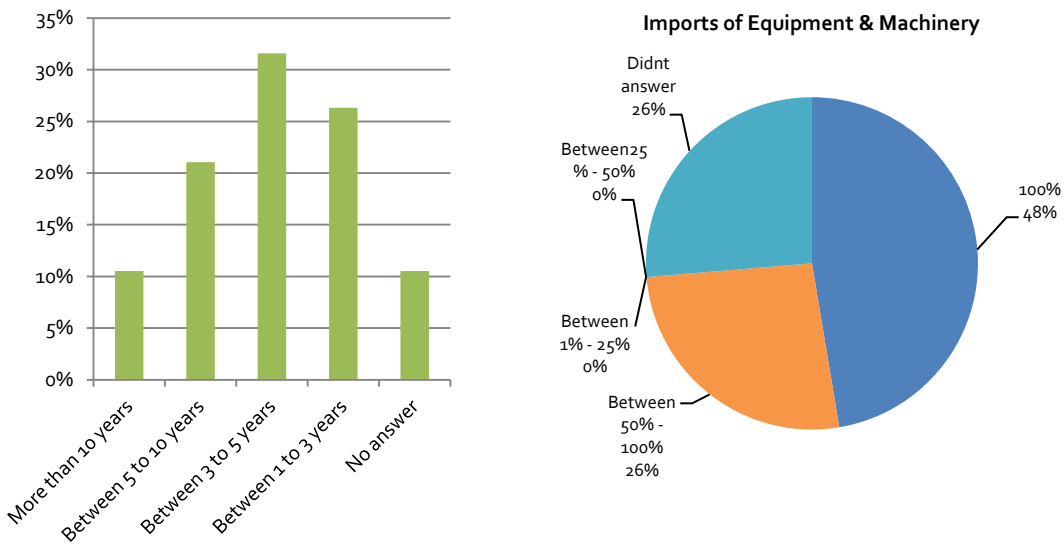
Figure 1.114. Services Outsourcing to External Providers
(Percentage)



Source: Based on the results of the interviews applied.

One of the most important internal factors for efficient production, the level of fixed assets and technology are there in companies, 32% of business equipment and machinery has between 3-5 years old, with an average of 4.3 years old. With regard to imports of equipment and machinery, 48% of firms import 100%, low import schemes assets would be exempt from tax if it is temporary imports for subsequent export and import between 26% 100% and 50% of the equipment required (see Figure 1.115)

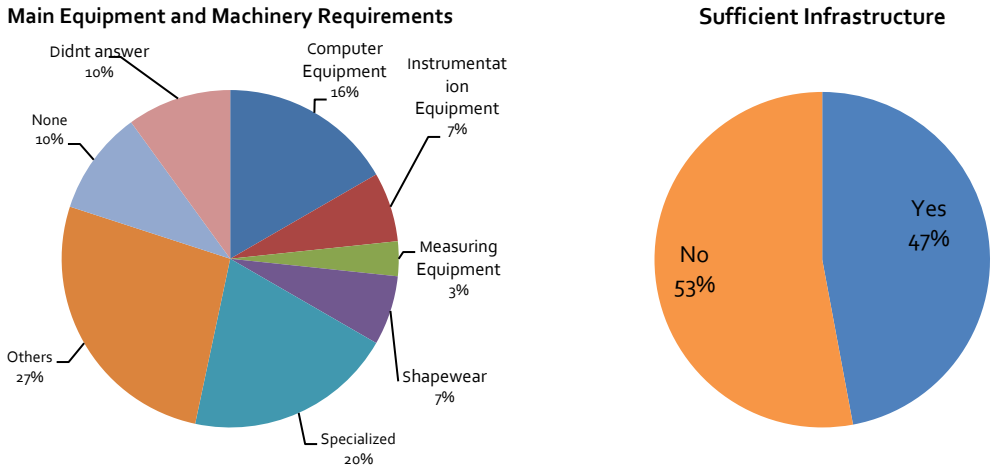
Figure 1.115. Age and Import of Equipment and Machinery
(Percentage)



Source: Based on the results of the interviews applied.

Regarding its main infrastructure requirements, 27% of the companies interviewed stated requirements as stamping, milling, turning, video and audio equipment, among others, 20% as a team specialized equipment characterization of integrated circuits, laser machines, electrostatic painting, among others, and 16% computer equipment. The 56% of companies stated that there is sufficient equipment and machinery for the development of production processes (see Figure 1.116).

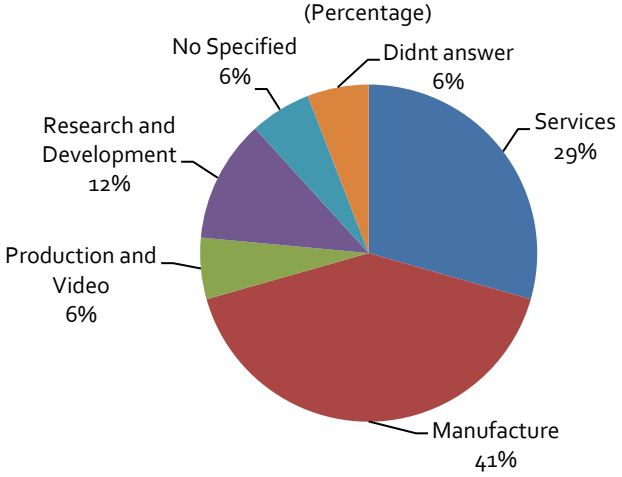
Figure 1.116. Major Infrastructure Requirements and Adequacy (Percentage)



Source: Based on the results of the interviews applied.

Among the main activities in the value chain, 49% of companies primarily engaged in manufacturing processes, 29% in the provision of services, and only 12% engaged in some form of research and development activity (see Graphical 1.117).

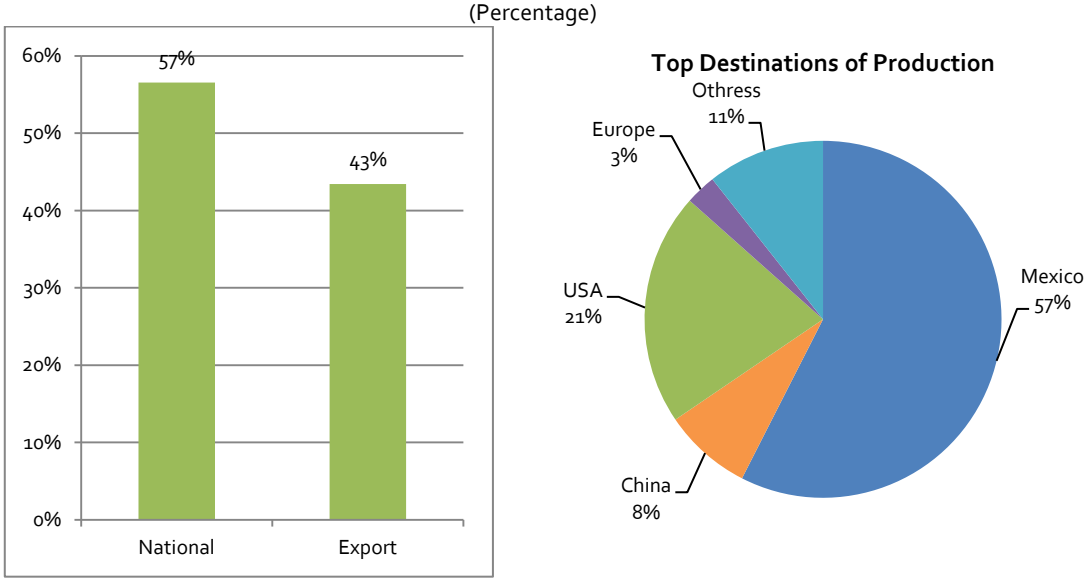
Figure 1.117. Main Activities in the Value Chain (Percentage)



Source: Based on the results of the interviews applied

With regard to the main destination countries of production, 57% of companies reported Mexico as their main destination, and 43% to export markets, in which 21% of the production goes to the United States, 8% China and 3% in Europe (see Figure 1.118)

Figure 1.118. Production Locations
(Percentage)

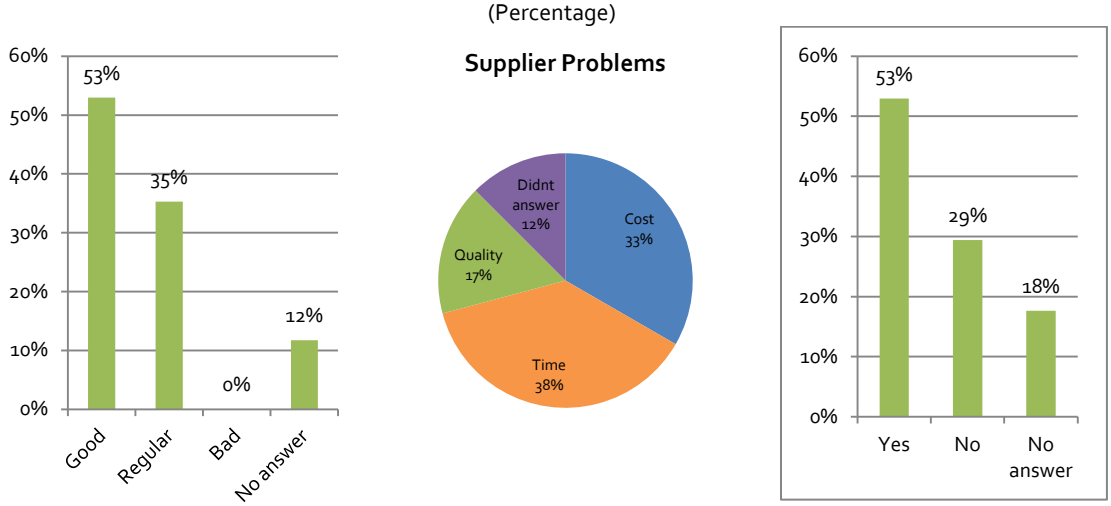


Source: Based on the results of the interviews applied

With regard to the qualification of access, problems and existence of mechanisms for assessing local supply, 53% of companies said Good access level local suppliers in terms of availability. It is important to note that within the main problems identified include 38% with delayed delivery times, which has a high cost in production process vertically oriented, 33% cost of procurement, and 17% quality in the delivery of products and services.

It should be noted that 53% of companies interviewed indicated that they have mechanisms for evaluating local suppliers, which opens important areas of opportunity to share publicly the demands and procurement procedures in order to promote productive integration of companies by analyzing the local business profile, operating capacity, financial profile and business profile providers by potential customers (see Figure 1.119)

Figure 1.119. Rate of Access, Problems, and Evaluation Mechanisms Existence of Local Supplier (Percentage)



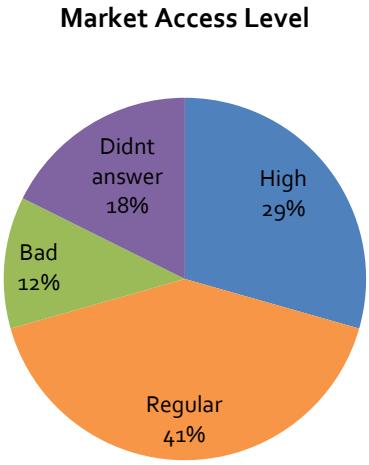
Source: Based on the results of the interviews applied

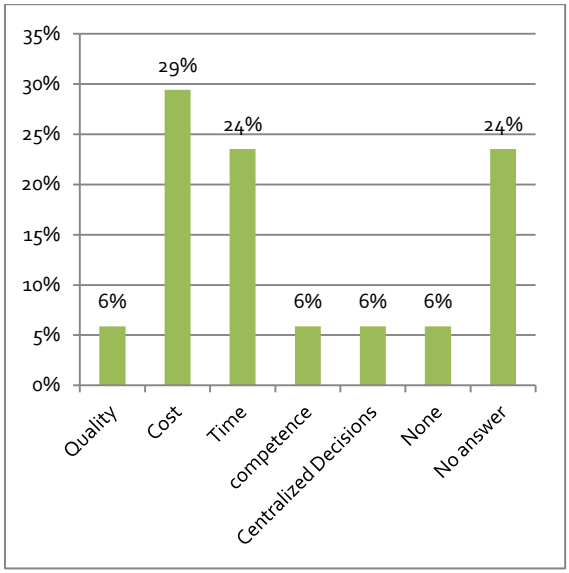
In terms of the level and problems of access to international markets, 47% of businesses reported as Regular access, standing out as major problems with 29% and 24% the cost and time of entry to international markets.

It should be noted that given the size of local firms face a number of challenges to access global markets and ensure high production volumes, a wide variety of products and regular supplies. Most micro and small businesses do not meet these requirements, and often lack information, sales skills, access to financing and technical training, so do not have the skills to successfully establish a presence in international markets.

In this sense, one of the practices used to promote the export of small businesses is international cooperation - business to improve their competitiveness and thereby take advantage of emerging opportunities in international markets, through a combination of knowledge, skills and resources this format of companies to improve their export potential, reduce costs and risks involved in the penetration of new markets (see Figure 1.120).

Figure 1.120. International Market Access
(Percentage)





Source: Based on the results of the interviews applied.

In terms of the availability of promotion offices and / or sales representation in international markets, 71% of companies indicated that they have offices abroad.

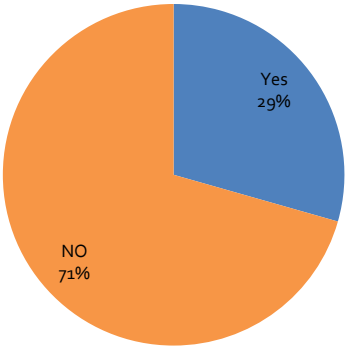
A representative office can become an effective tool for establishing the presence of one or groups of companies to open new markets and opportunities. The office must have knowledge of the target market, meet the needs of local industry, identify factors or motivators of purchase as well as helping businesses understand the regulation, culture, customs and habits of local buyers (see Figure 1.121).

With regard to the main arrival models used to access international markets, 17% of companies reported direct sales, sales by demonstrating or custom contact a representative of the company and the potential buyer, and 12% by sales Satellite channels and / or local businesses, selling through distribution channels or business partners, paying a consideration and / or service fee. It is important to note that both models have advantages and disadvantages, the first with a higher added value in sales (high contact) but with a higher cost, and the second with value added and intermediate cost, subject to payment incentives. There is a third alternative by using Internet (electronic markets), with low customer contact but efficient in terms of costs.

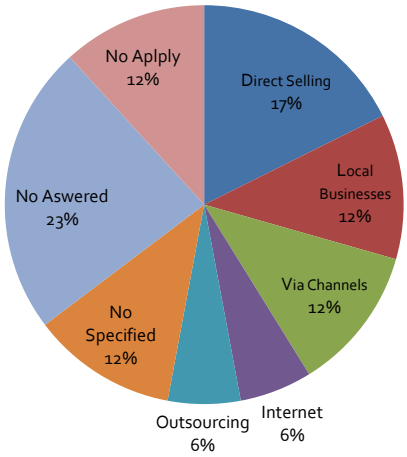
Finally, 39% of companies have not identified potential export markets, which show their low interest to participate in these markets, especially entry barriers. In the same vein, 33% of companies have expressed interest to venture into other markets nationwide, either as providers of value chains, and only 11% said the United States and Asia.

Figure 1.121. Promotion Offices / Representation, Models and Market Potential Arrival (Percentage)

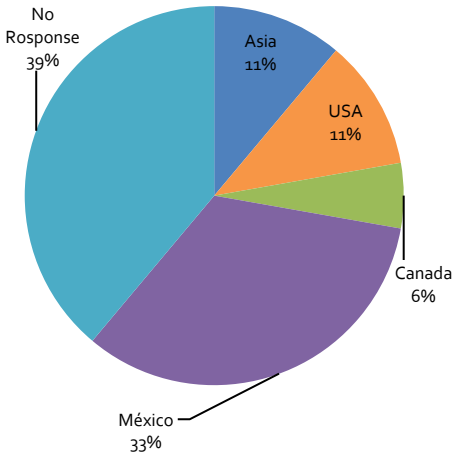
Representative Offices Abroad



Arrival Model Export Markets



Potencial markets



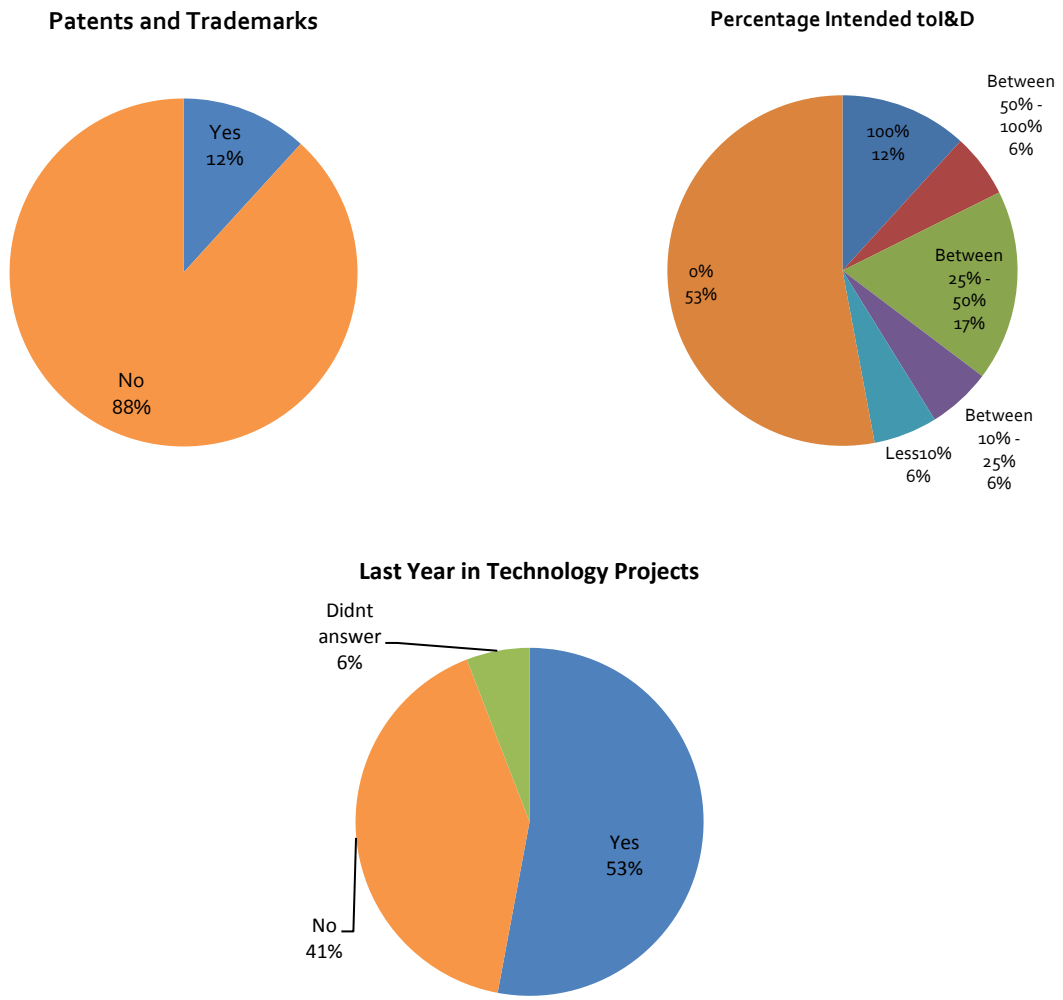
Source: Based on the results of the interviews applied.

The 88% of companies have no patents or trademarks, industrial patents are a title that recognizes the right to exclusively exploit the patented invention, preventing other companies from manufacturing, selling or using it without the consent of the patentee . The markings are a distinctive sign, an asset of the

company, used for advertising or product development and / or services. In the case of patent records, its absence indicates a low level of process research and technological development (see Figure 1.122)

In terms of spending on research processes and technological development, 53% of the interviewed companies do not allocate resources to these activities, under the assumption that economic growth is associated with technological innovation and the rational use of factors of production, especially important in the electronics industry. In this sense, it highlights that 53% of companies undertook a technology project in the last year, however if this is not a systematic process, it generates negative externalities such as assimilation of technology for non-patent competitors, allocate more resources for adoption and lack of technological spread.

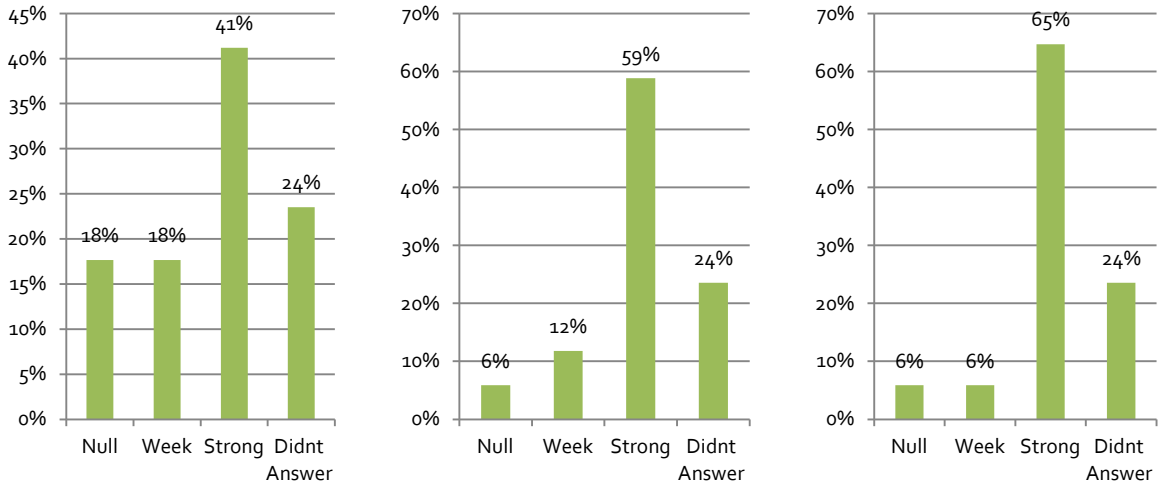
Figure 1.122. Licensed Patents, expenditure on R & D and Technological Project Execution (Percentage)



Source: Based on the results of the interviews applied.

In terms of their relationship, use and results of research and technological development, 41% of companies reported having a strong external linkage level, 59% reported to make a strong advantage as a result of the relationship, and 65% reported Strong results as a result of external linkage and use. Importantly, the lack of patents by firms determines the economic use (utilization and outcomes) (see Figure 1.123)

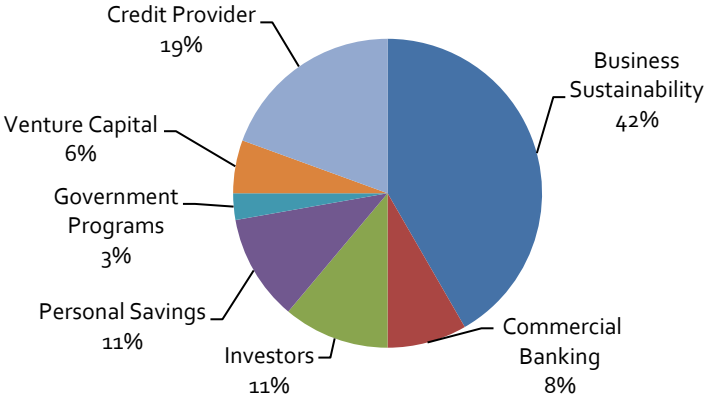
Figure 1.123. External Linking, Leveraging and R & D Results
(Percentage)



Source: Based on the results of the interviews applied.

The 42% of the companies stated as the main source of funding for the development of their business sustainability activities, and 19% obtaining credit from suppliers. It features a low percentage of access to financing schemes such as commercial banks (8%), venture capital (6%) and government support programs (3%), reflecting the limitations on access to sustainable economic growth, which inhibits the ability to exploit business opportunities by not having the availability of financial products and services designed to your specifications (see Figure 1.124).

Figure 1.124. Main Sources of Funding
(Percentage)

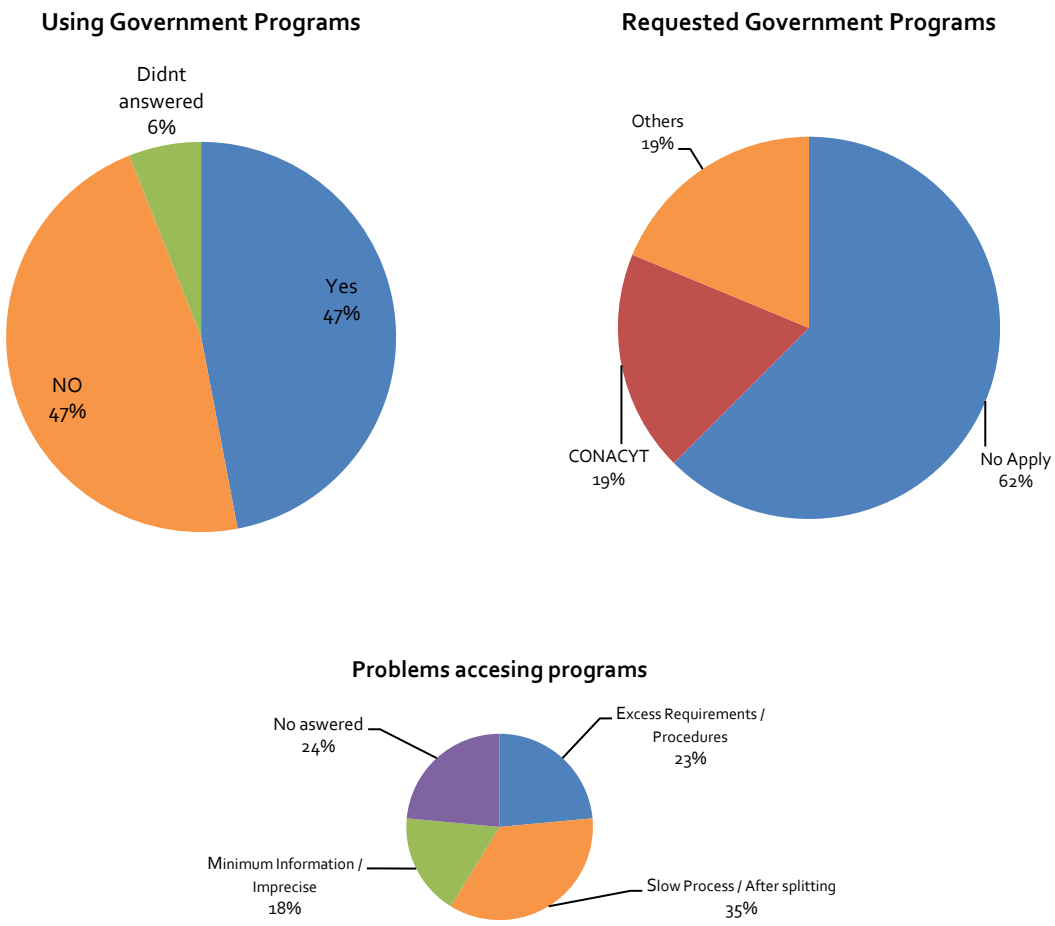


Source: Based on the results of the interviews applied.

As regards access to government support programs, 47% of companies reported no government support programs used for the development of business activities or research projects and technological development, and 19% of companies have applied support to CONACYT. In this regard, 35% of companies identified as the main problem the slow process, which differs with its resource requirements to make business decisions, 23% excess procedures and requirements which hinders the integration of applications and projects under regulations to support programs, and 18% a lack of complete information (minimum information) and imprecise limiting the understanding of the mechanisms to access the supports (see Figure 1.125).

One of the opportunities to provide access to commercial bank financing and government support programs is the creation of a project management office, self-sustaining charge of integration, management, administration and monitoring of research and development projects and / or strengthening local industry capabilities.

Figure 1.125. Supports Government Programs
(Percentage)



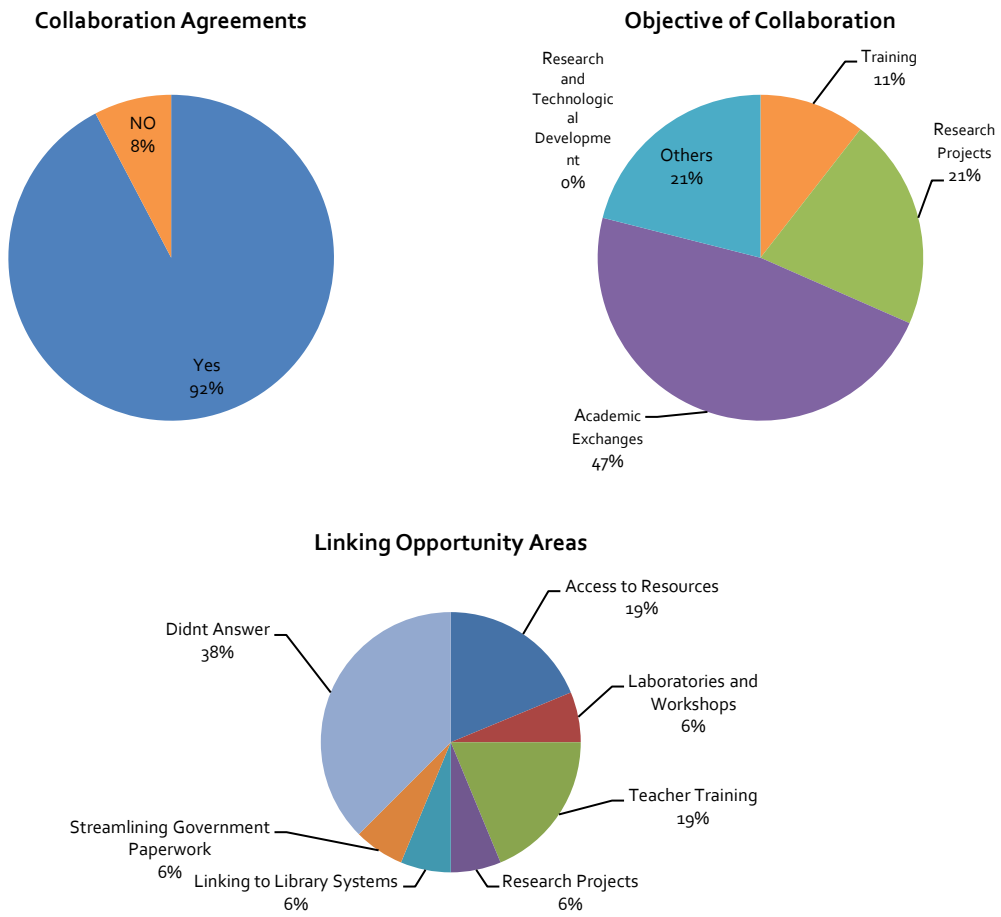
Source: Based on the results of the interviews applied

Educational Institutions

To perform the analysis of the educational institutions developed an interview participants comprised of 7 sections: 1) Collaboration, 2) Linkage, 3) Technological Innovation and Development, 4) Teaching, 5) Technology Services, 6) Conferences and Conventions, and 8) Funding, totaling 40 reagents. The application of the interview was conducted through field visits at the premises of universities and educational institutions with duration of 1 hour and 30 minutes, applied to managers or directors of related careers.

In terms of collaboration, 92% of educational institutions interviewed indicated that they have signed cooperation agreements with other universities and educational institutions, 47% through agreements aimed at academic exchange programs, and 21% to research projects. Among the main areas of opportunity to improve the relationship, 19% reported educational institutions access to economic resources and to increase training among teachers (see Figure 1.126)

Figure 1.126. Collaboration Agreements Educational Institutions (Percentage)



Source: Based on the results of the interviews applied

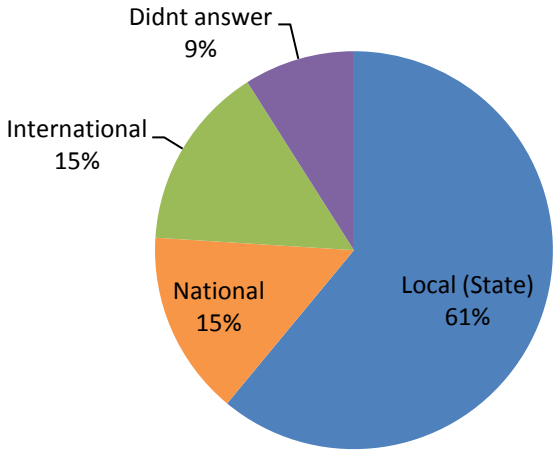
Table 1.127. Signing of cooperation agreements between educational institutions.

COLEGIO DE EDUCACION PROFESIONAL TECNICA DEL ESTADO DE AGUASCALIENTES	• Instituto Tecnológico de Aguascalientes • Universidad Cuauhtémoc • Universidad Politécnica de Aguscalientes
UNIVERSIDAD PANAMERICANA	• Universidad Autónoma Metropolitana • Universidad Tecnológica de Tehuacan • Universidad Mixteca de Oaxaca • Universidad Salento (Italy)
UNID	• Universidad Francisco Victoria de Madrid (Spain) • Organización EBSCO KANSAS (USA) • Cámara Colombo Alemana (Colombia)
Capacitación Integral	• Harmon Hall • Pro English
Universidad del Valle de México	• Laureate International Universities (Inglaterra)

Source: Based on the results of the interviews applied.

The state of Aguascalientes has been characterized as an entity generating human resources to other states, mainly Jalisco, Nuevo Leon and Coahuila. As noted in the Six-Year Plan of the State Government, people with lower levels of preparation are they mostly have jobs, while those who have a university education are the ones with the highest unemployment. In this sense, concerning the place of origin of the students,61% are from statewide and 15% nationally and internationally (see Figure 1.127).

Figure 1.127. Place of Origin of Students (Percentage)



Source: Based on the results of the interviews applied.

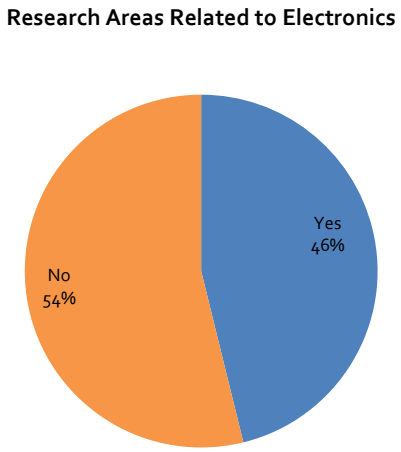
With respect to the implementation of research and technological development areas related to electronics sector, 54% of educational institutions interviewed indicated no project-related projects in areas and / or areas of the electronics industry. Among the main areas of research are highlighted internal, 17% of institutions with areas dedicated to electronic and information technology (Visual 3D, Augmented Reality, etc.), and 11% in mechatronics and telecommunications. It is important to note that 28% of educational institutions interviewed have no internal research areas, mainly oriented teaching activities (see Figure 1.128).

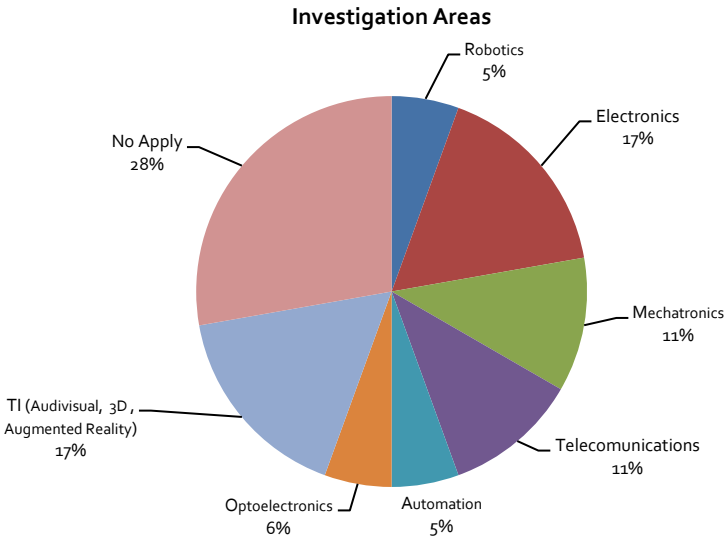
It is important to notes that given the heterogeneity of universities and educational institutions (public - private, autonomous, decentralized, etc.) having different academic, research performing different levels, however the most weight is emphasized in vocational education.

In this sense, the number of researchers is limited with regard to teachers, due to lack of funding, lack of critical mass of researchers, lack of time and scientific infrastructure dedicated to research.

On other occasions the investigation is separated from teaching, creating a low impact on vocational training, is common to see indicators of research in educational institutions that have a low impact on the business and scientific publications (magazines), international collaborations, scientific quality of publications and journal publications class. The challenge of local educational institutions is aimed at establishing links between both sectors, by integrating the functions of applied research and teaching (teacher-researcher) to specific sectors.

Figure 1.128. Electronics Research Areas
(Percentages)

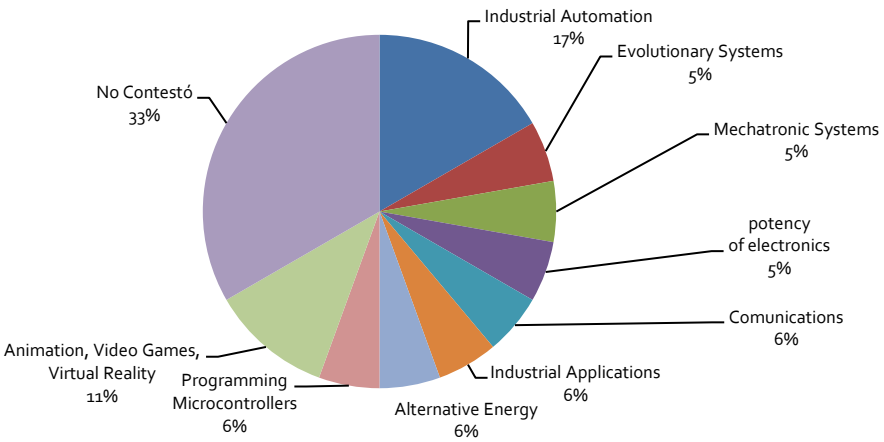




Source: Based on the results of the interviews applied.

With regard to current research areas, 17% of educational institutions are conducting research for industrial automation, and 11% in animation, video games and augmented reality, as well as diverse topics as evolutionary systems, mechatronic systems, electronic power, industrial applications, micro - controllers among others. With this re-emphasizes the need to improve communication and exchange of ideas, initiatives and / or projects between local industry, primarily engaged in manufacturing electronic components and automotive sector, in order to join forces and present projects sets that receive public resources required for its execution (see Figure 1.129).

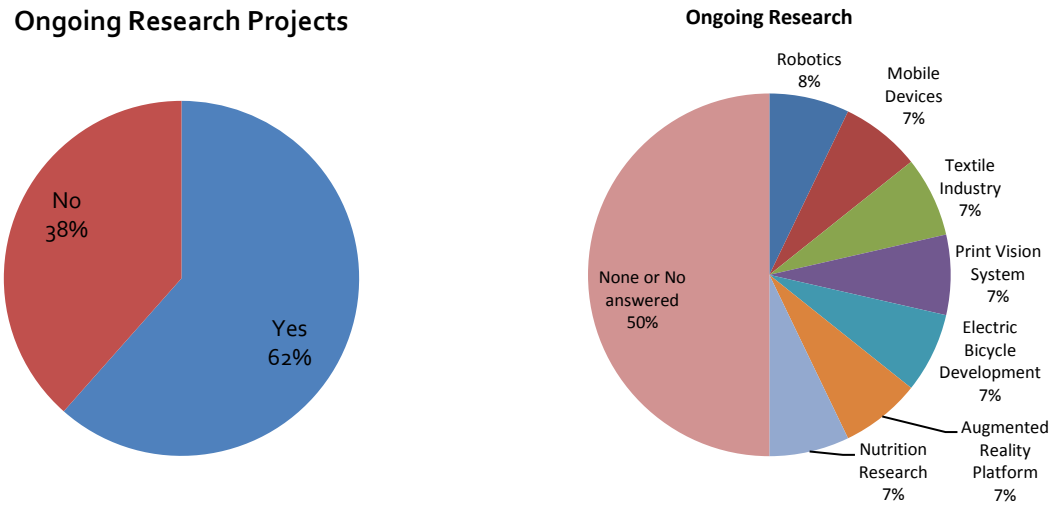
Figure 1.129. Areas of Current Research in Educational Institutions (Percentage)



Source: Based on the results of the interviews applied.

The 62% of educational institutions are conducting research projects currently underway. By research area has a variety of projects such as robotics, textiles, and vision systems, among others (see Figure 1.130).

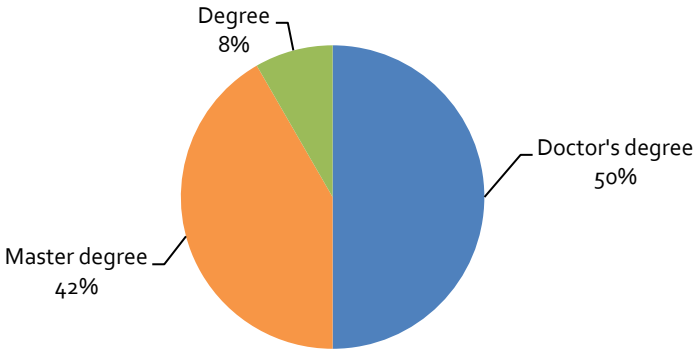
Figure 1.130. Ongoing Research Projects
(Percentage)



Source: Based on the results of the interviews applied.

Regarding the degree of the researchers, 50% have a graduate degree at the doctoral level and 42% have master's degree. What opens important areas of opportunity for the development of projects related to research and development on issues related to the electronics sector (see Figure 1.131)

Figure 1.131. Researchers Academic Degree
(Percentage)

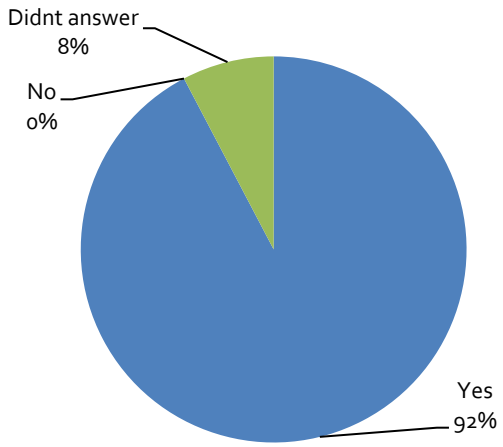


Source: Based on the results of the interviews applied.

+

The 92% of educational institutions interviewed indicated that they have some connection with electronics companies. This market knowledge must be exploited positively for the implementation of joint projects linking academia - industry (see Figure 1.132)

Gráfica1.132. Linking with Companies of Electronics (Percentage)

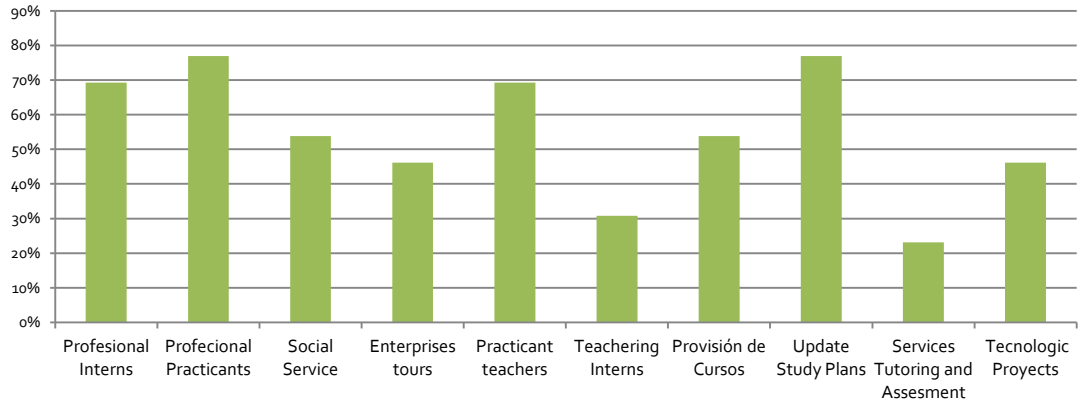


Source: Based on the results of the interviews applied.

The 77% of educational institutions interviewed noted the importance of professional practices and update curricula according to the needs of the industry as the most important means of linking academia - industry. With a minor practice stand out performing teachers stay in the industry and service development; consulting and advisory services to educational institutions to domestic firms (see Figure 1.133).

Importantly, in terms of research and development in educational institutions, linkage modes marked with less importance, are of greater importance in terms of innovation versus teaching practice or student training. To the extent that teachers - researchers become more involved in business and universities to offer services, advice and consulting firms with the participation of teachers - researchers and students can create virtuous cycles of generation of knowledge from universities to industry. The foregoing is without prejudice to the value for student internships and work placements in companies, and updating curricula according to the demand of human resources.

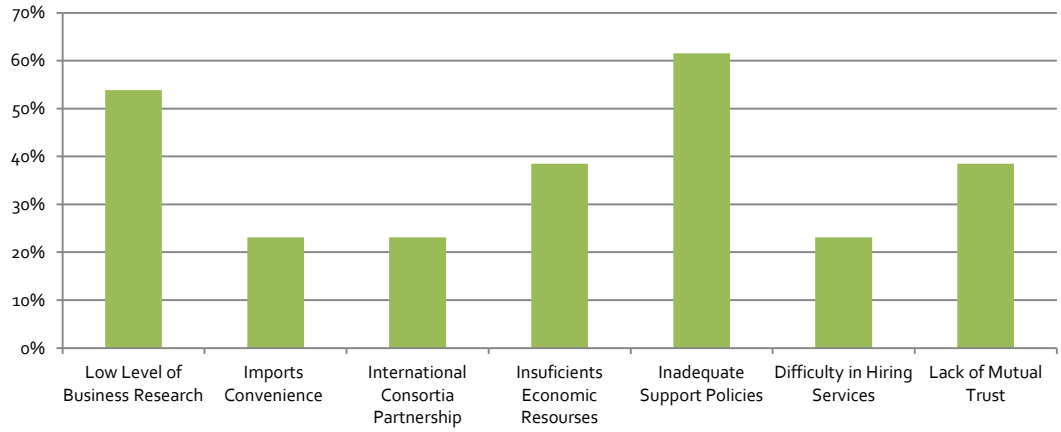
Figure 1.133. Importance of Bonding Modes
(Percentage)



Source: Based on the results of the interviews applied.

The 62% of educational institutions noted the lack of adequate support policies as the main problem for linking academia - industry, 54% of the low level of research and development processes technology companies, and 38% resource scarcity economic for the implementation of joint projects. In this regard, it is worth mentioning that incentives programs CONACYT innovation favor joint participation of universities and educational institutions with businesses, allocating a greater percentage of support to micro and small enterprises that involve educational institutions in developing project deliverables, so that should drive the development of such partnerships in future calls (see Figure 1.134).

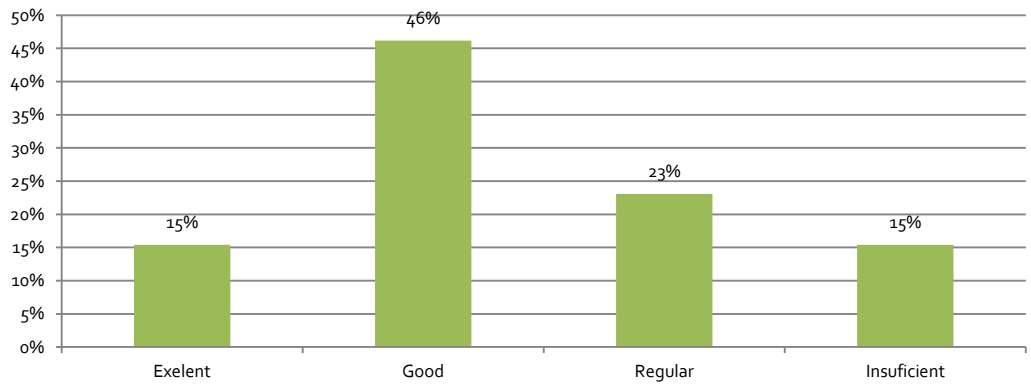
Figure 1.134. Main causes Linking Problems
(Percentage)



Source: Based on the results of the interviews applied.

The 46% of educational institutions interviewed stated as Good links with local businesses, and 38% rated this as Regular and Mala. Importantly, the mismatch administrative structures of the governmental institutions hinders the links with universities and sectors; another aspect to note is the dissociation of human resources training and transfer science and technology, and access to policy engagement with companies and universities especially in financing (See Figure 1.135).

Figure 1.135. Companies Rating Linkage
(Percentage)

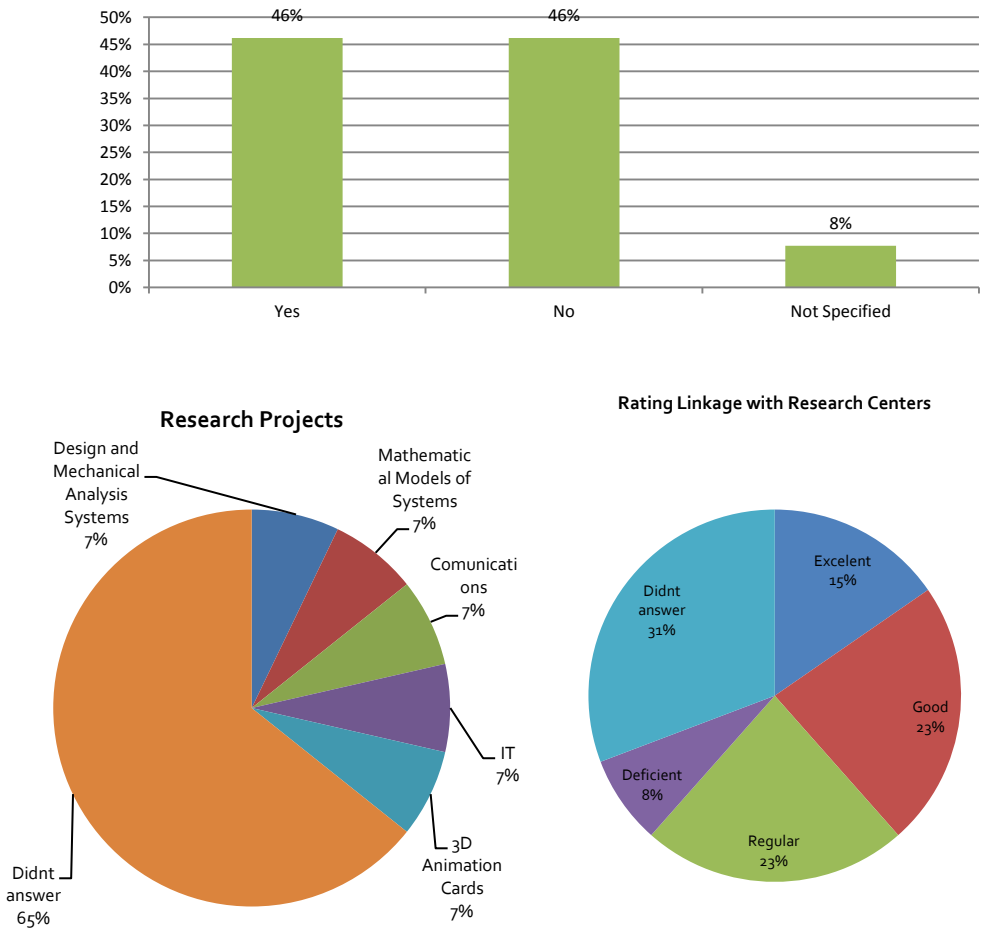


Source: Based on the results of the interviews applied.

In Mexico, the joint participation between educational institutions and research centers have been treated as unrelated entities, mainly from the emerging research and technological development in educational institutions with a greater focus on human resource training, and orientation of research towards the integration of research groups, but also perform other activities related to science and technology education and training such as human capital, technology transfer, dissemination popular science and management, monitoring and evaluation of science and technology processes.

Nevertheless, 46% of educational institutions interviewed indicated that have joint projects with research centers on issues of design and mechanical analysis of systems, mathematical models, communications, information and entertainment technologies. The 23% of educational institutions qualify as Regular its links with research centers (see Figure 1.136)

Figure 1.136. Joint Projects with Research Centers
(Percentage)



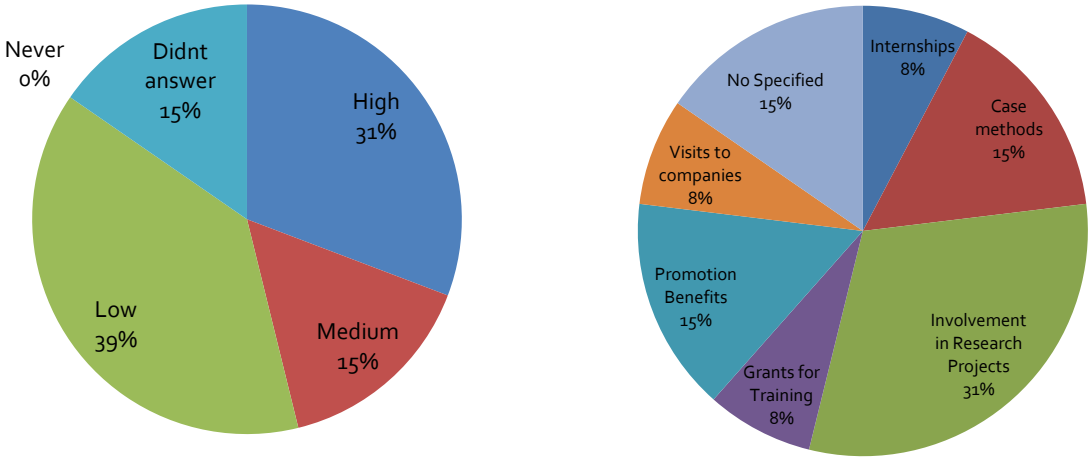
Source: Based on the results of the interviews applied.

Note that the synergy between educational institutions and research centers reinforce and complement their skills for the development of joint projects, one of the main limitations of the universities is the access to technological infrastructure dedicated to research, access to resources for the participation of teachers, among others, limitations that can be addressed by research centers, who have greater access to infrastructure and compensation for project.

One of the main objectives of educational participation in joint projects with industry, is the ability to train students for future recruitment, 39% of educational institutions often pointed out that the recruitment of students and / or graduates is low , which may mean limiting the participation of universities and affect the level of student motivation in participating in such projects. Among the main incentives to develop research and innovation processes in students, 31% pointed to their

involvement in research projects, 15% in the case method development and increase the promotion of the benefits of innovation (see Figure 1.136)

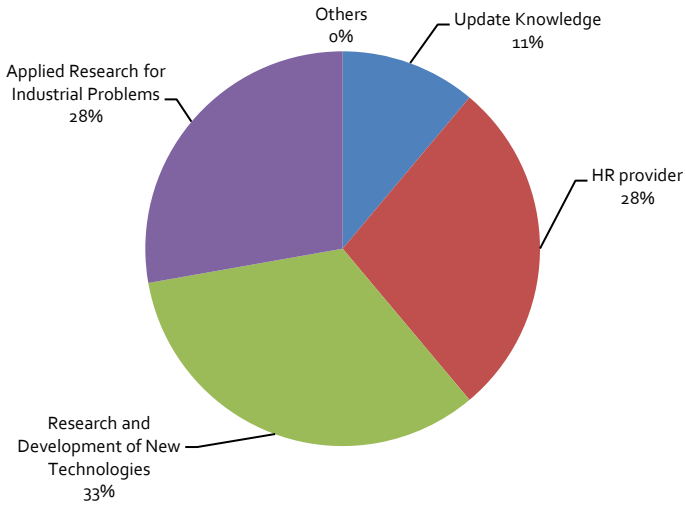
Figure 1.136. Frequency of Procurement and Incentives for Research Students (Percentage)



Source: Based on the results of the interviews applied.

Also, 33% of educational institutions noted the research and technological development as the main target of the link with industry, 28% HR commissary and applied research to industrial problems (see Figure 1.137)

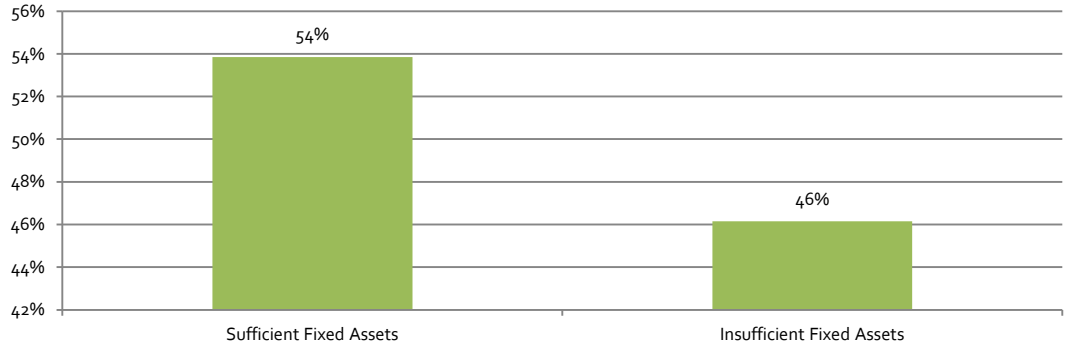
Figure 1.137. Main Objectives of the Liaison with Industry (Percentage)



Source: Based on the results of the interviews applied.

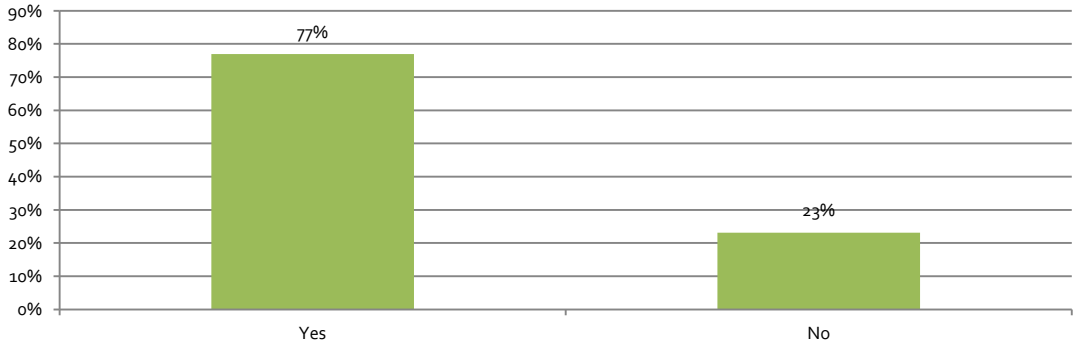
Regarding the availability of fixed assets for research and development activities, 54% of the interviewed educational institutions rated as adequate, and 77% of educational institutions have reported availability of initiating new areas of research and technological development (see chart 1,138 and 1,139)

Figure 1.138. Asset Availability for Research and Development Activities (Percentage)



. Source: Based on the results of the interviews applied.

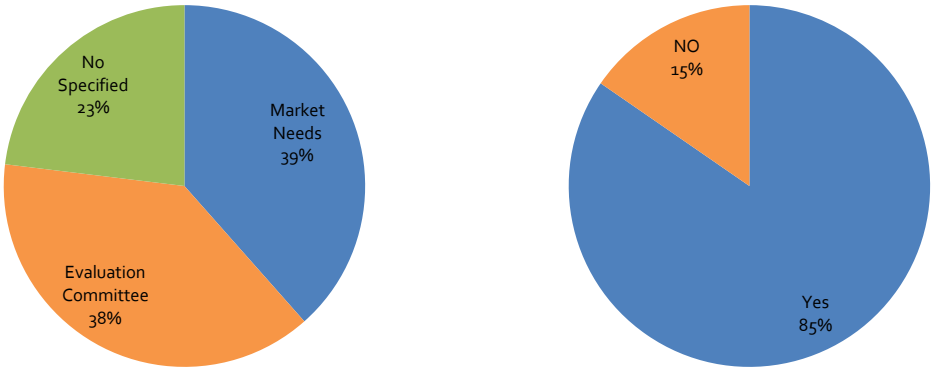
Figure 1.139. Openness to New Areas of Research and Development (Percentage)



Source: Based on the results of the interviews applied.

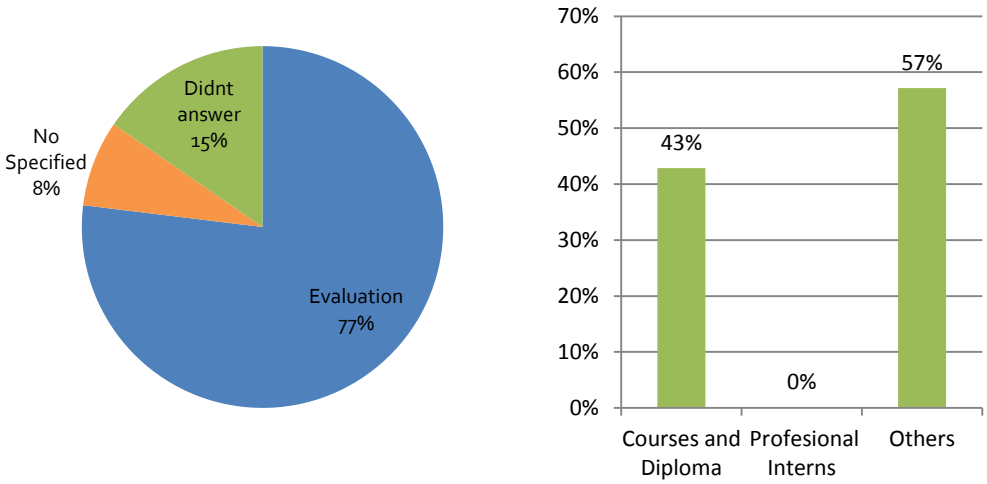
Among the main selection mechanisms curricula, 38% of educational institutions identified as the main mechanisms developing market needs studies, considering the educational offer in the region, the impact of labor and occupational improvement of future graduates of the program, the social and academic potential and graduate population related. It should be noted that 85% of participating schools indicated that curricula are geared to the needs of the industry. It is important to emphasize the need for active participation in developing Cluster demand studies to align educational curricula with local industry requirements (see graphs 1.140 and 1.141).

Figure 1.140. Mechanisms of Selection and Needs Study Programs Update (Percentage)



Source: Based on the results of the interviews applied.

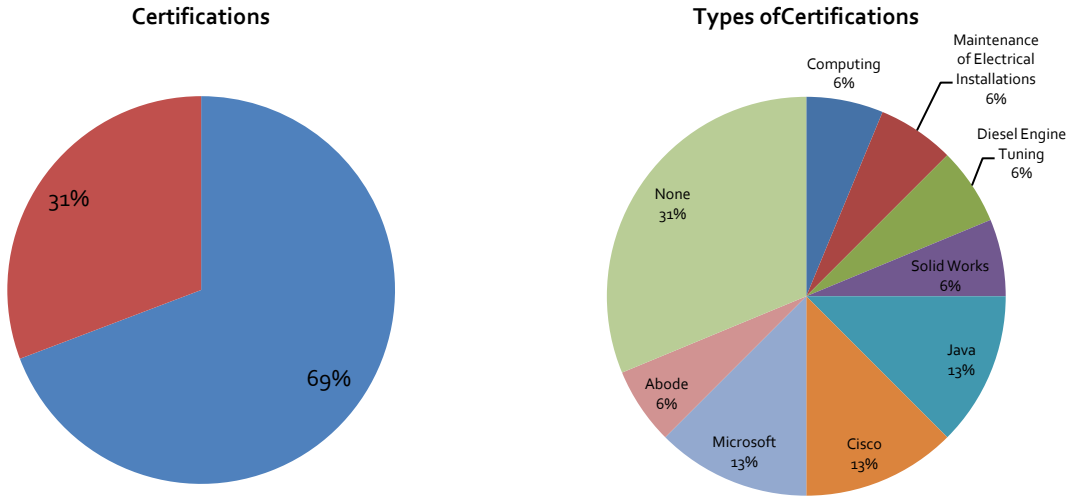
Figure 1.141. Evaluation Mechanisms and updating teachers (Percentage)



Source: Based on the results of the interviews applied.

69% of educational institutions that grant certifications identified with recognition of market, 13% in Microsoft technologies, Java and Cisco (see Figure 1.142).

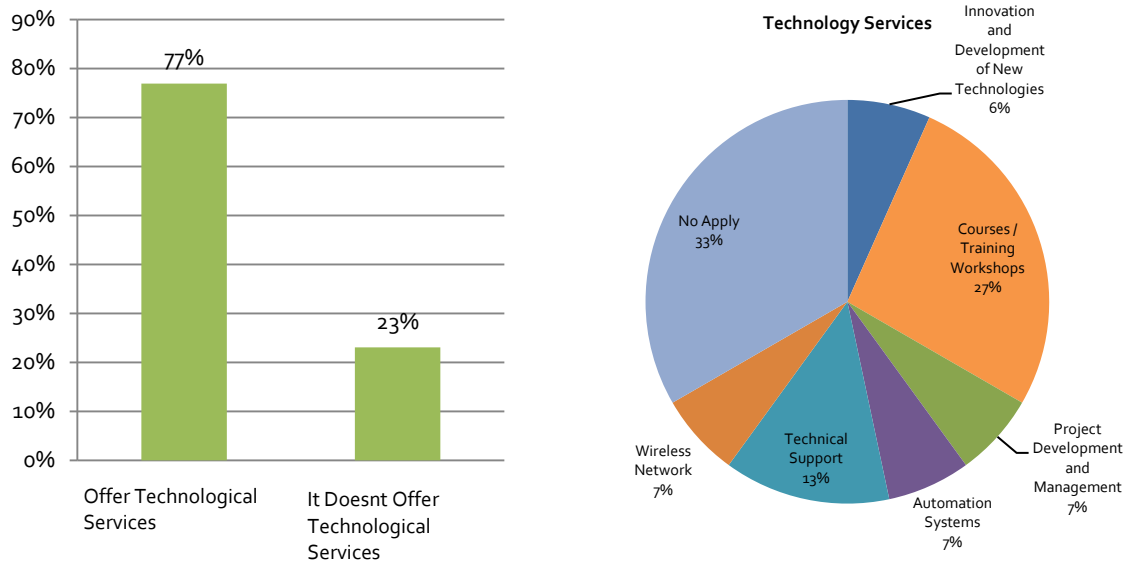
Figure 1.142. Granting Certification with Market Recognition
(Percentage)



Source: Based on the results of the interviews applied.

The 77% of educational institutions have technological services targeting enterprise, 27% mainly offers training courses and workshops and 13% support services (see Figure 1.143)

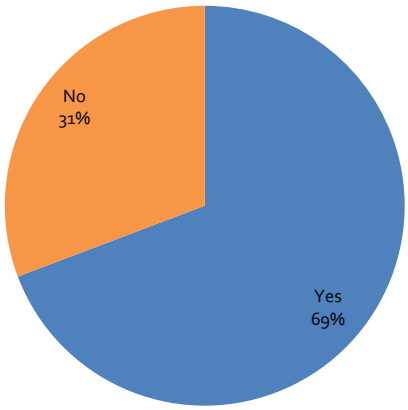
Figure 1.143. Technology Services Offer
(Percentage)



Source: Based on the results of the interviews applied.

The 69% of educational institutions interviewed made congress, conventions, workshops and seminars (see Figure 1.144).

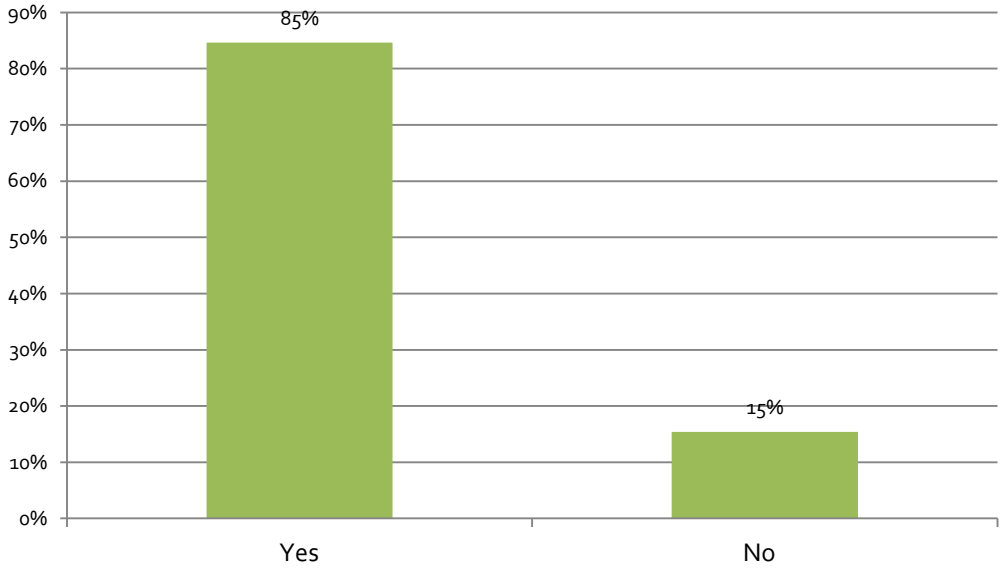
Figure 1.44. Offer Congresses, Workshops, Seminars
(Percentage)



Source: Based on the results of the interviews applied.

The 85% of educational institutions generate their own income as a result of the services offered (see Figure 1.145).

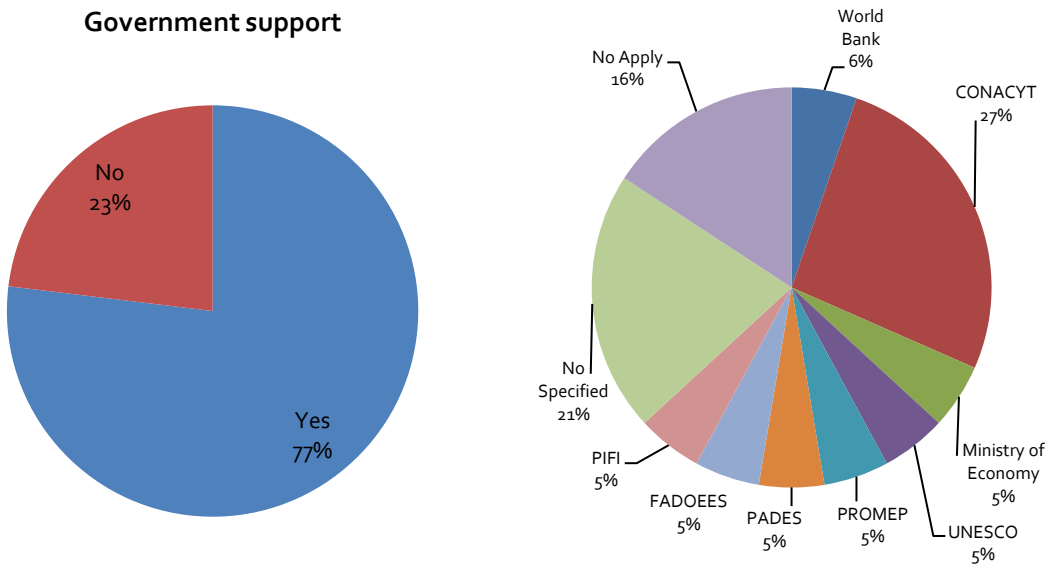
Figure 1.145. Generating Revenues
(Percentage)



Source: Based on the results of the interviews applied.

The 77% of educational institutions have obtained resources through participation in governmental support programs, 27% of educational institutions have received support from CONACYT programs (see Figure 1.146)

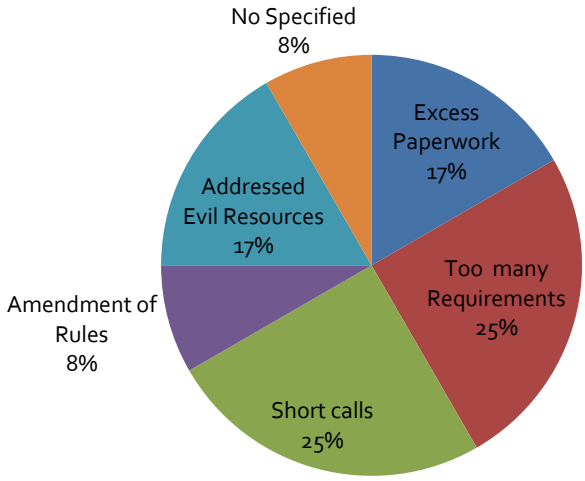
Figure 1.146. Getting Government Support Programs
(Percentage)



Source: Based on the results of the interviews applied.

The 25% of educational institutions declared as the main problems the short time of the calls, too many requirements, and 17% excess paperwork (see Figure 1.147).

Figure 1.147. Major Problems in Getting Support
(Percentage)



Source: Based on the results of the interviews applied.

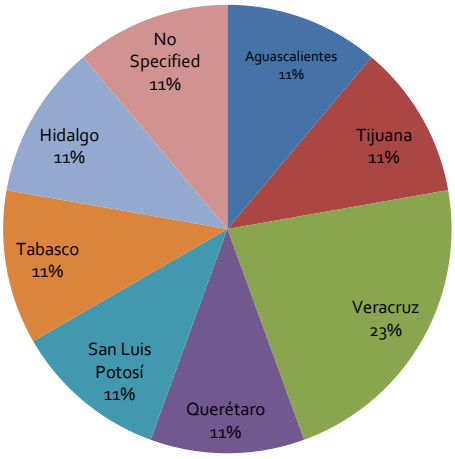
Research Centers

The detailed analysis of the research interview was developed consisting of 7 sections: 1) Collaboration, 2) Human Resources, 3) Bonding, 4) Teaching, 5) Technology Services, 6) Innovation and Technological Development, 7) Congress and Conventions and 8) Financing, totaling 40 reagents. The application of the interview was conducted through field visits at the premises of the research centers with duration of 1 hour 30 minutes.

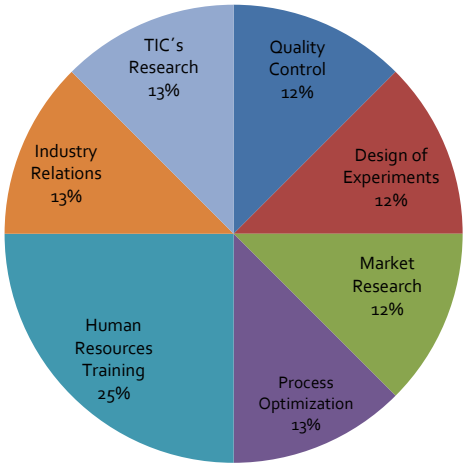
100% of respondents have research collaboration agreements with other national research centers. Among the main areas of opportunity to improve collaboration, research centers identified areas joint training of human resources, ICT research, design of experiments and optimization of processes, among others (see Figure 1.148).

Figure 1.148. Location and Areas of Opportunity
Research Centers with Conventions
(Percentage)

Research Locations with Conventions



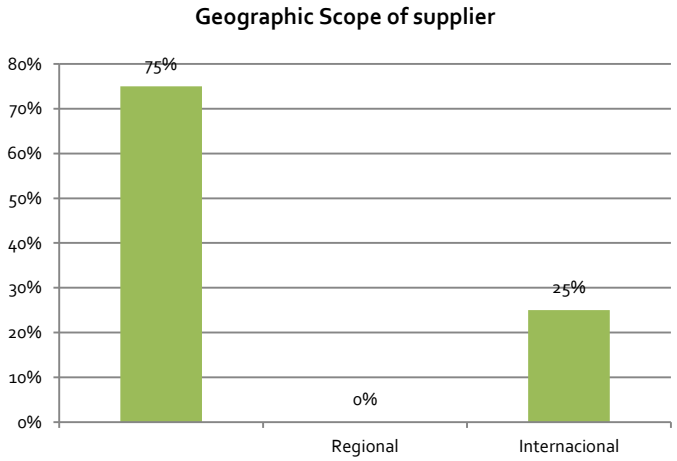
Areas of Opportunity to Improve Linkages with Research Centers



Source: Based on the results of the interviews applied.

The 75% of research respondents reported having regional geographical coverage, and only point out a research service delivery experiences internationally (see Figure 1.149)

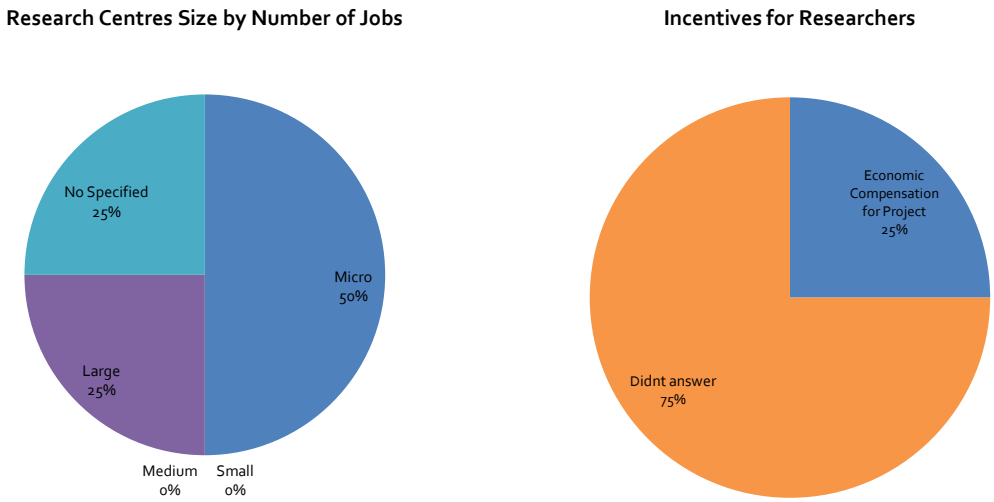
Figure 1.149. Geographic Scope of the Provision of Services Local Research Centers (Percentage)

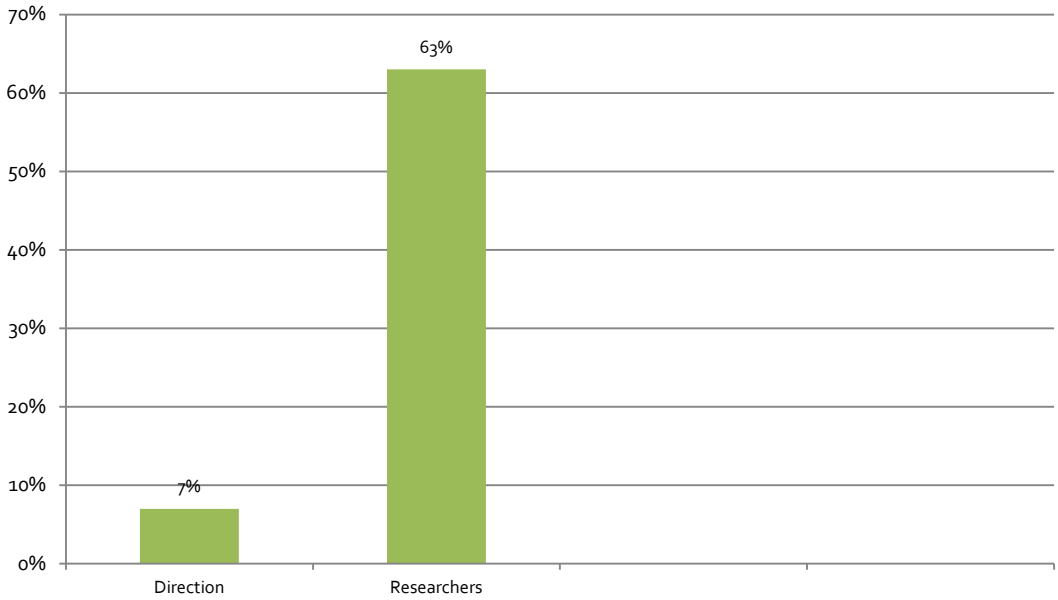


Source: Based on the results of the interviews applied.

In total, 3 research centers surveyed said a total of 580 employees. According to their size by number of employees, 50% are micro with 1-10 jobs, and 25% with more than 100 jobs. According to the distribution of seats, 63% are researchers, administrative jobs 9%, and 7% managers. Only 25% of the research centers have a financial reward for researchers for their involvement in research projects (see graphic 1,150)

Graphics. Number and Distribution by Employment Type, and Incentives for Research (Percentage)

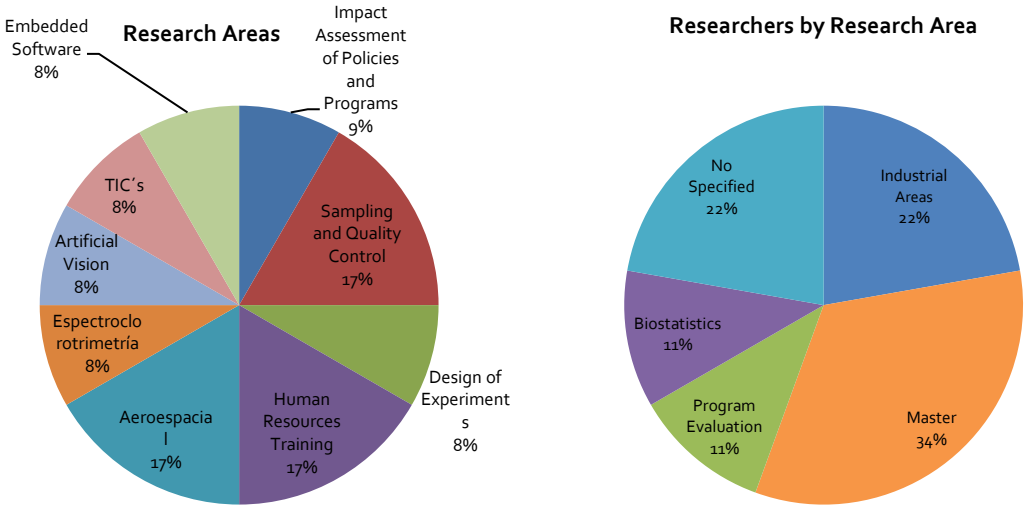


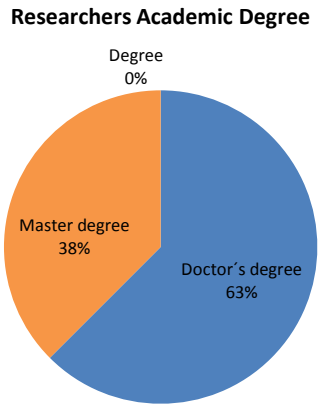


Source: Based on the results of the interviews applied.

The 17% of the areas of specialization identified by the research respondents are directed to issues of human resource training, sampling and quality control in aerospace. The 34% of researchers specialized in statistical sampling issues, and 22% in industrial areas, and 11% in program evaluation and biostatistics. The 62% of researchers have doctoral level, and 38% with master's level (see Graph 1.151).

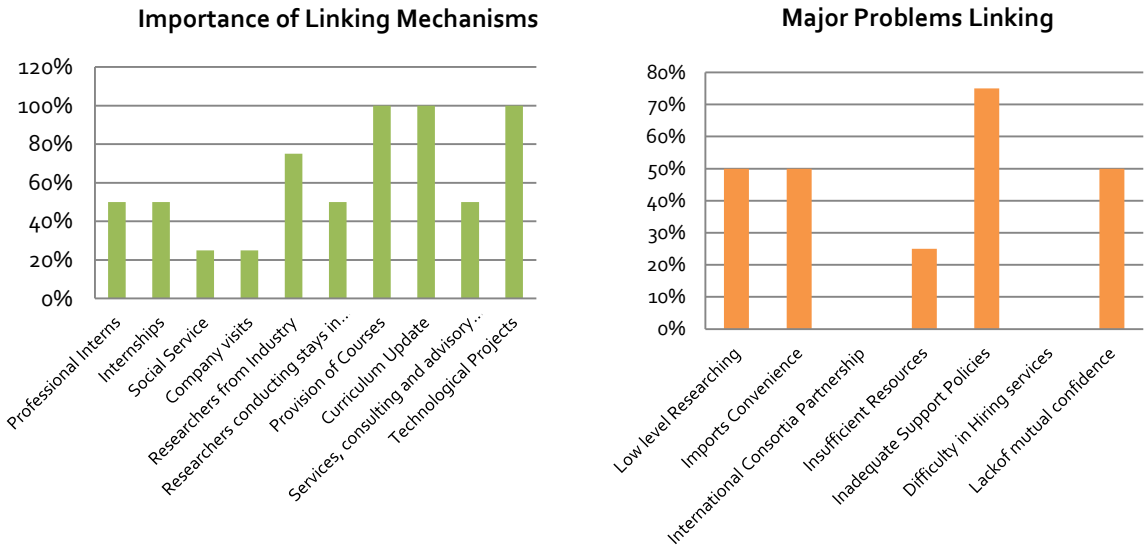
Figure 1.151. Main Areas of Research and Researchers by Area Academic Degree (Percentage)





The research respondents assigned high importance to the development of joint technology projects, updating curricula and providing training courses for human capital; related with relevant social service activities such as students or visits to companies. Among the main problems highlighted link the perception of inadequate support policies, the low level of research on companies and their preference for the import of goods (machinery and equipment), processes and services, and a lack of mutual trust to develop joint projects with companies (see graphs 1.152).

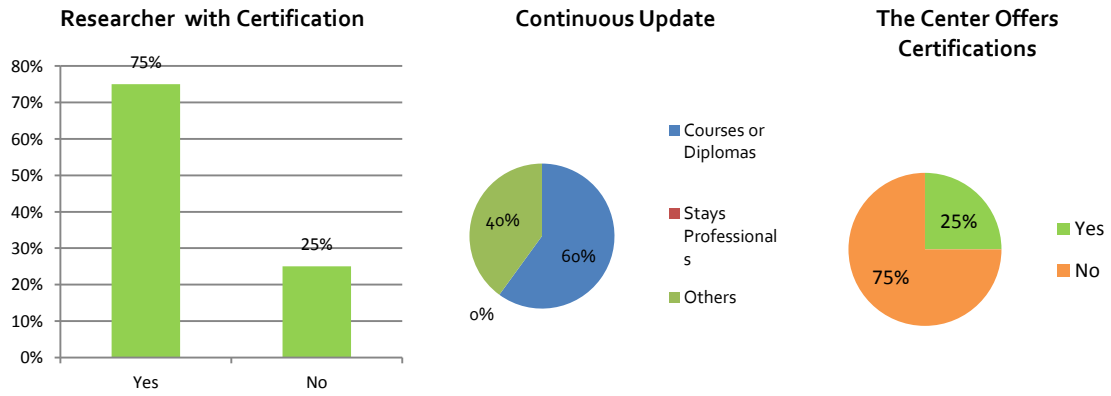
Figure 1.152. Importance of Mechanisms and Main Problems to Link (Percentage)



Source: Based on the results of the interviews applied.

100% of respondents research centers offer courses and programs for continuous updating, but did not specify the mechanisms used for the definition of the courses to be taught. The 75% of researchers have some kind of certification, 60% of the upgrade programs conducted through the delivery of courses and diploma, and only 25% of schools (1) international certifications provide recognition market (see graphic 1,153)

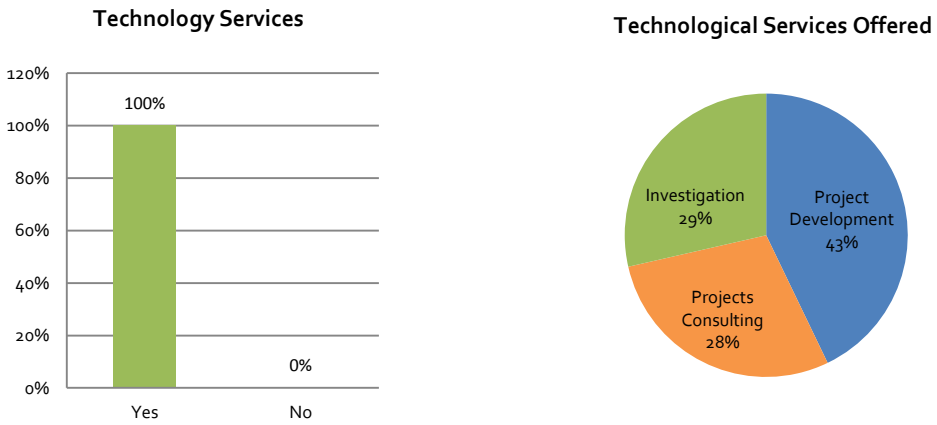
Figure 1.153. Researchers with Certifications, and Continuous Update Process Certification Offer (Percentages)



Source: Based on the results of the interviews applied.

100% of respondent research centers offer technology services within the main services offered are highlighted by 43% in the development of projects, 29% research and technological development, and 28% of technology projects consultancy (see chart 1154).

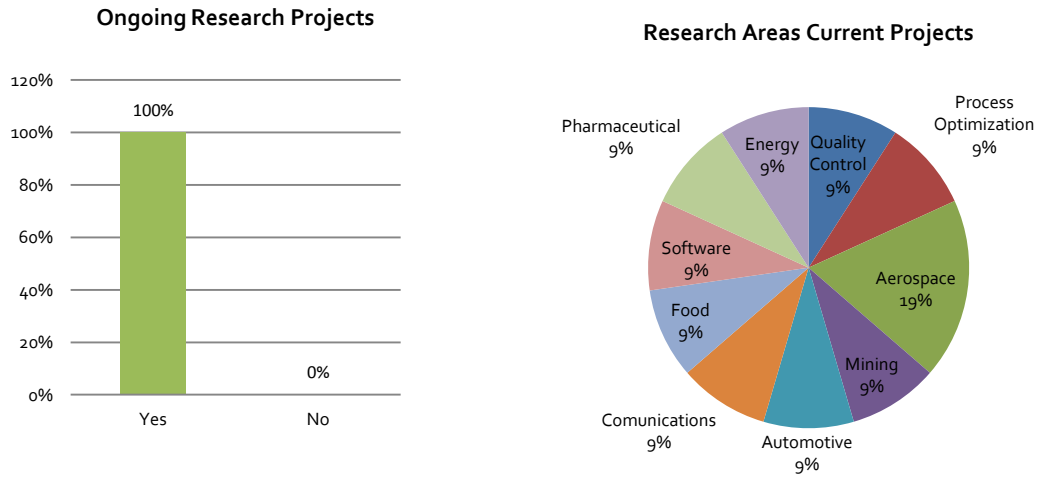
Figure 1.154. Researchers with Certifications, and Continuous Update Process Certification Offer (Percentages)



Source: Based on the results of the interviews applied.

100% of respondents said research centers have ongoing research projects with companies, within the main research areas include specialties such as quality control, process optimization, and the aerospace, software, automotive, energy and pharmaceuticals (see Figure 1.155).

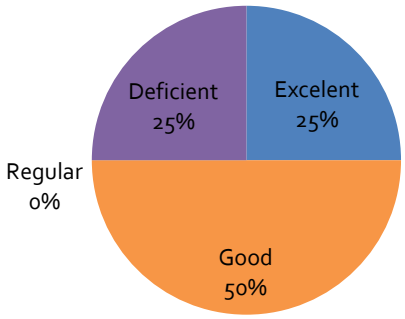
Figure 1.155. Current Research Projects and Research Areas
(Percentages)



Source: Based on the results of the interviews applied.

The 50% of research respondents identified as Well on their connection with the business sector for the implementation of joint projects, and access to technology services offered by the centers (see Figure 1.156).

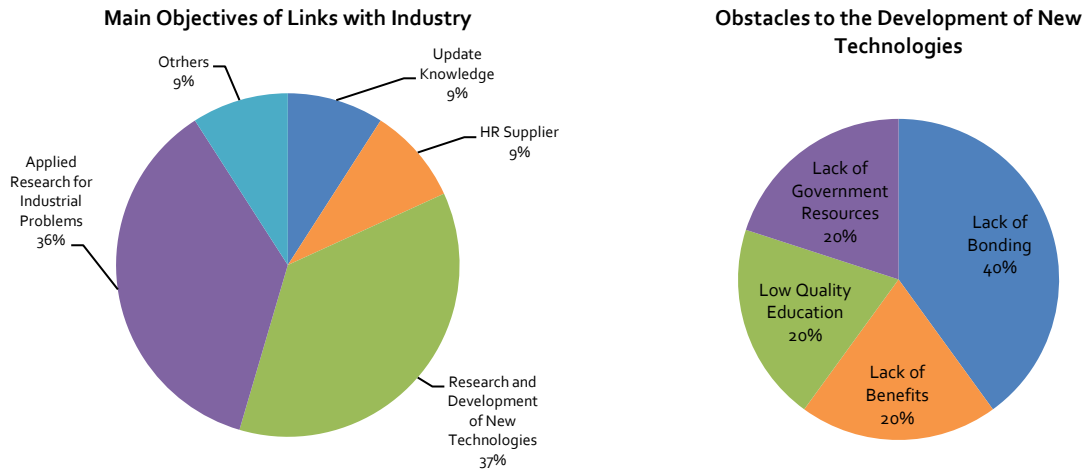
Figure 1.156. Links with Companies
(Percentages)



Source: Based on the results of the interviews applied.

The 37% of research respondents said the main objective research and development of new technologies, and 36% applied research to problems of an industrial nature. Regarding the main obstacles to the development of new technologies, 40% said the lack of connection as the main obstacle, and mentions about the lack of government resources, the low level of educational quality and lack of benefits of using of new technologies (see graphic 1,157)

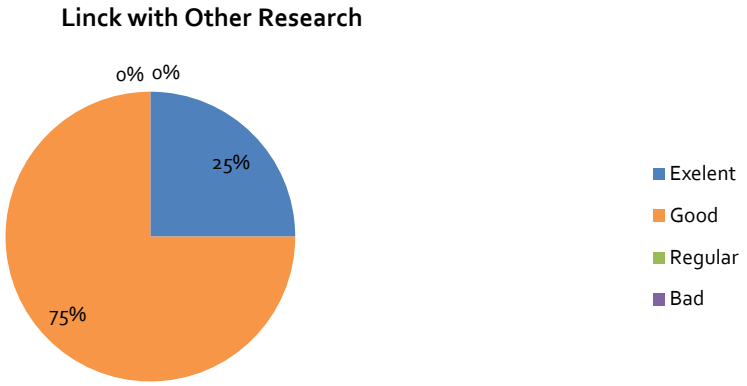
Figure 1.157. Main Objectives of the Liaison with Industry and Obstacles to the Development of New Technologies
(Percentages)

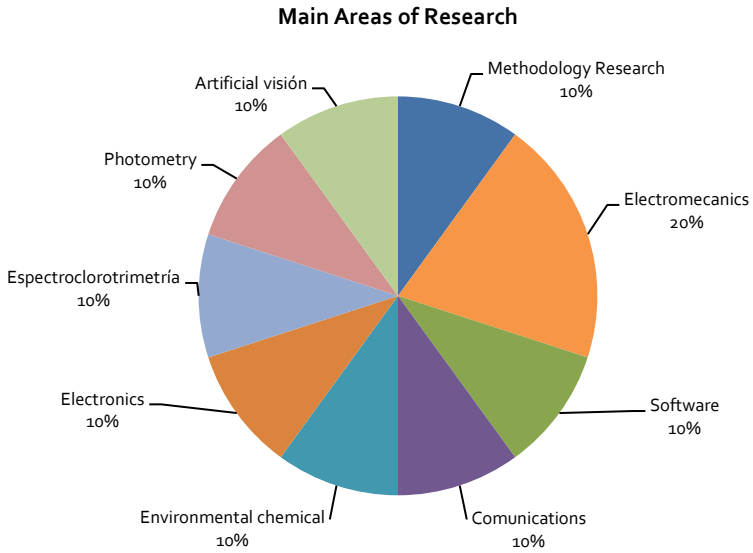


Source: Based on the results of the interviews applied.

The 75% of respondents said research centers as Buena their links with other research centers, developing projects related to the electromechanical sector, electronics, machine vision, among others (see Figure 1.158)

Figure 1.158. Linking Research Centers and Key Areas of Research
(Percentages)

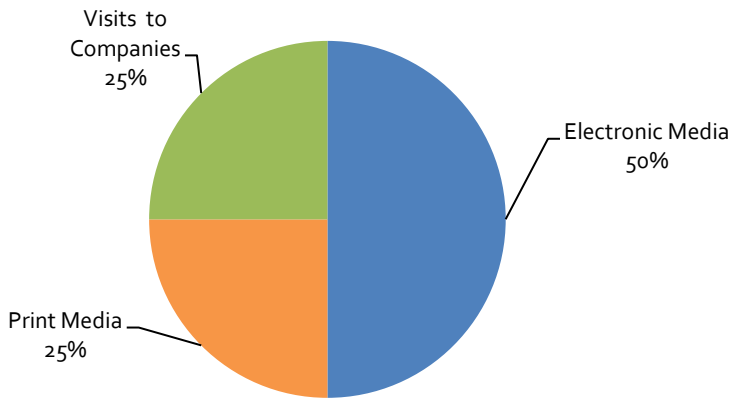




Source: Based on the results of the interviews applied.

100% of respondents performed research conferences and / or conventions as elements for the dissemination of research and technological development, with 50% being electronic media broadcasting major mechanisms (see Figure 1.159).

Figure 1.159. Broadcast Media Conference and / or Convention (Percentages)



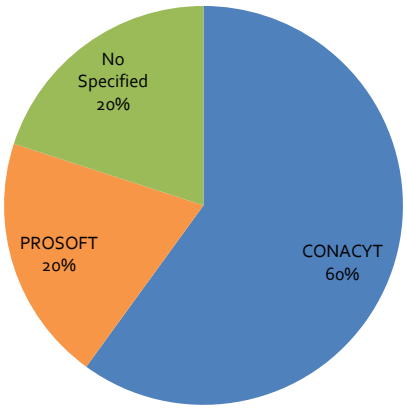
Source: Based on the results of the interviews applied.

100% of responses research centers generate their own income as a result of the marketing of its product and services, and 100% have received government support for the project implementation, which involves extended use of the opportunities of access government support.

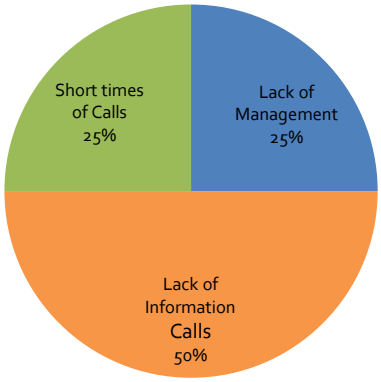
60% of the research centers have agreed to support programs coordinated by CONACYT, and 20% through support provided by the Program for the Development of Software Industry (Prosoft) coordinated by the Ministry of Economy. Among the main limitations and / or restrictions to access programs stands out with 50% reporting lack of calls, lack of capacity management and administration of applications and projects presented to governmental and limited time for submission of proposals to the participating entities (see graphs 1.160).

Graphics. Major Programs Support and Access Limitations Governmental Funds
(Percentages)

Major Support Programs



Limitations and / or Restrictions to Access Government Support Programs



Source: Based on the results of the interviews applied.

4.2 SWOT Analysis

The SWOT analysis is an essential tool that provides the necessary inputs to the strategic planning process CELESA, providing useful information for implementing corrective actions and measures, and generating new improvement projects.

The strengths and weaknesses in the field are contextualized within the organization and within the strategic planning process, are due perform the analysis of what those strengths it has and what are the weaknesses that hinder the achievement of its objectives.

Opportunities and threats are contextualized in the external environment, and refer to opportunities over which they have direct control of the variables, however, are events of their direct and indirect affect positively, threats are in the external environment and affect negatively directly or indirectly.

Thus, the strategic planning process is considered functional when weaknesses are diminished, the strengths are increased, the impact of threats is considered and treated promptly, and the exploitation of opportunities is capitalized in the achievement of objectives.

This SWOT analysis is integrated with the results of the analysis of the following sections: i) global macroeconomic environment, ii) Diagnosis and analysis of the national electronics industry, iii) Description of the local electronics sector, and iv) Diagnosis local electronics sector.

SWOT Analysis

The main strengths that support the electronics industry in Aguascalientes are those having hand availability of human resources. The talent and creativity stands out as the main factor of human resources. Secondly, we defined the growing market and infrastructure available in the industry today. In contrast, the weaknesses involve factors such as insufficient quality of professionals, low and poor

organizational culture alignment with academia and industry research centers that cause a high level of imports.

The main opportunities for the electronics industry are concentrated on the relationship between the horizontal integration of global capabilities and technological market globalization (off shoring trend). These opportunities, in turn, will be threatened by increased international competition, mainly from emerging countries, adverse factors in the international economy and the low level of organization and access to financing for businesses.

STRATEGIC PLAN OBJECTIVES

Highlights

- Transit trough activities of highest value added and technological contents on the global production chain.
- Empower the productive chains with all the economy factors locally.
- Reach a better linkup between companies, universities and local research centers.

Strategic Plan Objectives

The economic opening of the nineties attracted strong foreign investment by installing leading OEMs and CMs to Mexico. In this sense, global value chains, beyond open up new areas of opportunity beyond the assembly and manufacturing and job creation, should be directed to achieve as a country, the dissemination of technological knowledge, providing new opportunities for building the capacity of local businesses and the development of products that are at the forefront of technology for international markets.

The main changes in emerging economies such as China, has been sustaining not only in the process of attracting investment, but the systematic and purposeful foray into design processes and / or advanced manufacturing, through the implementation of the public policies structural.

In our country, investments around the global value chain, have not substantially changed the position of our companies within the same, regardless of our position as a major producer of computer hardware, consumer electronics and telecommunications, domestic industry remains particularly focused on links in manufacturing, assembly and sub - assembly, design activities are reduced and there is still a heavy reliance on imported electronic components.

In this sense, Aguascalientes electronics industry faces big challenges to better exploit the benefits offered by integration into global chains: i) the transition activities within the global chain with more value added and technological content, ii) strengthening productive linkages with the rest of the local economy, increase local production of parts and components, and iii) the increased linkages between companies in the supply chain (especially the leaders) with universities and local research centers.

Government plays a central role by designing and implementing integrated policies to attract FDI. However, it is important to note that the improvement in infrastructure, logistics and reducing bureaucratic procedures are essential for those integrated policies to have a greater effect and to promote export competitiveness.

An important element is to strengthen the technological capabilities of the host country of FDI through human capital formation and investment in research and development. The training of professionals with undergraduate and graduate degree is essential to participate in links in the value chain more intensive use of knowledge and offer greater opportunities to create value. The development of local capacity would enter a virtuous circle in which FDI is attracted more complex activities, such as research and development and design, that transfer new knowledge, strengthening its capacity.

Similarly, the strengthening of ties between firm's electronics industry and universities and local research centers would increase the dissemination of knowledge in the local economy and strengthen the capacity of those organizations to provide high quality and value aggregate. However, policies to strengthen technological capabilities have their limitations, especially in an industry with rapid technological change.

These policies certainly help developing countries to move towards higher value-added activities, but rapid technological change makes the process of convergence of these, so that the activities of manufacturing and research and development efforts in the region are not generally, activities at the technological frontier, and it is likely that this trend will continue.

Another element is integrated policies to attract selected businesses, putting special emphasis on attracting businesses and activities that have greater potential to influence the local economy. Finally, in the absence of productive chains and high entry barriers to supply components and intermediate goods, there is the opportunity to support the development of the services sector associated with the electronics industry, including design, research and development, logistics and production firmware.

The challenge for policy is to ensure access to goods in an economically efficient without neglecting their industry's transition towards higher value-added activities in the value chain. However, the high barriers to entry, expressed in accumulative investment in technologic and industrial capacity in other regions makes the process more difficult. In this context it is essential to a search of strategic options to identify the competitive capabilities in the local electronics sector, accompanied by a cost-benefit analysis, to evaluate the possibility of implementing measures to overcome some of the shortcomings of competitiveness of electronics.

5.1 Importance and Scope of the Development

For its strategic role as one of the major exporter and generating labor, Electronics Industry requires a state policy to help improve the context in which companies, especially small and micro enterprises operate. Aware of this, as well as increasing competition posed by globalization, the governments of countries such as China and Southeast Asian countries are providing important and strategic funding based supports, incentives for new technologies and access to market information, as well to international certifications and marketing channels.

Aguascalientes requires a strategic plan that addresses the imperfections market adversely affecting most companies Electronics Industry. No subsidies require short-term palliative, but a comprehensive and systematic policy to correct structural problems crossing the Mexican economy decades ago, mainly affecting to companies in the electronics sector small size.

Systemic Competitiveness Model

The concept of Systemic Competitiveness Model[36] recognizes that successful industrial development depends not only on the comparative advantages as geographical location or abundant endowment of labor, - factors on which Mexico has emphasized for industrial development, but also, in a significant manner, the existence of measures specific targeted government to attend the social and productive sectors to correct market imperfections.

He also argues that competitiveness must be based on a national system of norms, rules and institutions that encourage companies to compete. In addition, the ability to link policies at different levels plays a crucial role, which is a function of the political, economic and socio-cultural factors in the territory.

Under this concept, learning through the interaction of businesses and workers in the area, is a key process in innovation capacity, so it is essential to the establishment of institutions that generate dynamic competitive advantages based on technological advancement and the creation of productive clusters.

This is critical because at the inability of internal scale economies by the majority of micro and small enterprises in the electronics of Aguascalientes, the competitive strategy of these companies should focus on the possibility of achieving increasing returns in the aggregate of these companies, external economies of scale, exploiting the potential offered by the territory to generate agglomeration economies.

[36] Systemic Competitiveness Model developed by the German Development Institute (GDI).

However, since it is precisely economies external to companies, and because it is essential to correct the "failures or imperfections market ", strategy requires the coordinated involvement federal, state, regional and municipal levels, as well as entrepreneurs themselves.

It is in this area, precisely where it requires the National Systemic Competitiveness Policy, which must be championed by the central government, the Federal Government. Put another way, structural measures Sector Strategic Plan of electronics should be based on promoting a systemic context of competitiveness, which can only come through decisive intervention of the state in industrial, in conjunction with a supporting culture and the institutional framework that promotes partnerships between employers in the industry, and the promotion of more and better linkages between the different actors involved in the process of production and sale.

For example, it is extremely important to adapt curricula, especially in technical education and research, to the needs and realities of Electronics Industry, particularly where it has a presence.

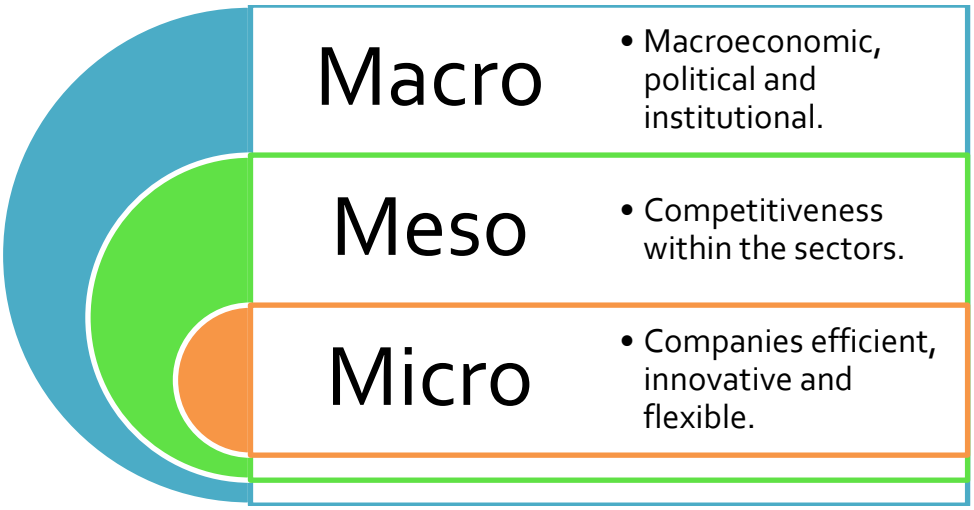
Illustrative purposes only, the following is briefly Systemic Competitiveness concept defined by the IAD.

Micro Level

It is formed by each of the companies in the local electronics sector individually, as flexible and efficient production units with total quality systems and devotes significant efforts in research and development. This level takes into account the ability of firms to innovate and integrate various forms of strategic partnership with others, with the aim of reducing the costs of production and distribution from their activities to survive, create and develop competitive advantages.

Meso Level

Currently it is not possible to think of corporations as individual entities, but rather must be understood that these are part of industrial clusters, groups of firms organized in networks whose dynamics depends on the potential development of each particular region. In general, it is established that there are two areas that influence the ability of businesses to develop successfully: the *meso - institutions that offer specific services* industrial enterprises, and the *meso - policies that shape the regulatory framework* to achieve industrial development incentives.



In the case of *meso - institutions, we find different types of factors to be* provided at each level of industrial development. For the early stages of development is necessary to start with the provision of so-called *"Generalized factors"* as an efficient highway system, an adequate supply of credit to businesses and staff training. Once installed these factors, it is recommended to move to the implementation of so-called "advanced factors" and "factors *specialized "that include information systems infrastructure* digital, research institutions and highly specialized knowledge and sophisticated management processes that allow interaction of firms.

Regarding *meso, the competitiveness study includes three* basic elements: regulatory policies, financial instruments, and government activities. The objective of these policies is to correct those market failures that impede increased productivity and competitiveness of domestic industry. Regarding the first element, are emphasized policies that protect infant industries and environmental conservation. With respect to financial instruments includes measures to support investment in research and development and export promotion.

In the same way we can find tax incentives and direct subsidies that encourage intra - firm. Finally, in the case of governmental activities is there are many cases, especially in underdeveloped countries, where the small market size, the high investment risk and high transaction costs prevent the private sector to invest in research and development as well as staff training for this reason, government activities should focus on solving this type of market failures.

Macro Level

It is represented by macroeconomic policies, especially in economic contexts, financial and social, which are intended to bring stability and certainty of the environment in which enterprises operate.

At this level, it is important adequate financial intermediation facilitates access to finance for productive activities, a tax policy that encourages voluntary payment of contributions and, in turn, dowry of goods and efficient public services to citizens and businesses; and a trade policy that enhances the opportunities of globalization of markets.

In this sense, it is crucial to strengthen the external frames competitiveness of the electronics industry internationally, considering courses of action to ensure the regulatory framework promoting investment, efficient access to indirect inputs, increase resources to improve the quality infrastructure, the development of an institutional framework around a policies in research and development, foreign direct investment, human resources and education, among others.

STRATEGIES AND LINES OF ACTION

Highlights

The strategies and action lines for the development of the electronics sector in Aguascalientes should focus on the following topics:

- Design and national product integration.
- Joining international networks.
- Strategic Plan for attracting Direct Foreign Investment (DFI).
- Companies Certification.
- Special Talent Management Systems.
- Consolidation of specialization opportunities.
- Supplier development.

Design product and national integration

Consolidate a local industry with design skills, develop and manufacture products and services of higher added value, registered in Mexico through the following procedures:

- *Establish a Project Management Office*
- *Acquire the technological infrastructure required*
- *Access to commerce financing*
- *Development of innovation projects*
- *Registration of patents and trademarks*

Joining international networks

The electronics industry worldwide is characterized by its high integration into global value chains, that's why it is essential the execution of strategies and action plans in order to incorporate local industry into international networks.

- *Business Networking Platform*
- *Export Promotion*
- *Marketing Channels*
- *Efficiency in English Language Proficiency*

Strategic Plan for attracting Direct Foreign Investment (DFI)

Take advantage of opportunities beyond manufacturing, in order to attract in a selective way companies and/or projects, promote knowledge diffusion about technological topics, capacities and new products development.

- *Procedures Simplification*
- *Creation of Design Centers in Specialty Areas*
- *Diagnostic of the investment costs of the state*

International Enterprises (Companies) Certification

Providing a positive environment in terms of regulations (in searching for harmonization with international standards), through adoption of international certifications on quality and environmental models.

- *Certification on Quality and Environmental models*
- *Creating a Center for Technology Standards*

Specialized Talent Management

Generate human resources into added value cycles as research and development, new product design, manufacturing strategic inputs, distribution and logistics, product customization, after-sale services and brand & market development.

- *Training and certification of human resources*
- *Development of Management Skills*
- *Improve the link up with academic institutions and research centers*

Develop Local Specialty Areas

Develop the projects portfolio for vertical markets with a high priority for the local economy as automotive-electronics, agribusiness, robotic-mechatronics, as well nanoelectronics in emerging markets, aerospace and aeronautics.

- *Create an Electronic Design Center for Automotive Sector*
- *Project of a Product Marketing Channel*
- *Project of Service Development for Manufacturing Processes (Electronics-Robotics)*
- *Nanoelectronics Design Center*
- *Electronic Design Center Aerospace / Aeronautical*

Supplier Development

Developing suppliers with high levels of expertise in areas of design, engineering, development and advanced manufacturing of higher value added.

- *Vertical Integration: Global Value Chains.*
- *Horizontal Integration: associations and strategic alliances*

Strategies and Lines of Action

6.1 Strategies and Lines of Action Proposals

The strategies and lines of action for the development of the electronics sector in Aguascalientes should focus on the following topics:

- Design product and national integration.
- Joining international networks.
- Strategic Plan for attracting FDI.
- Certification of companies.
- Management systems specialized talent.
- Consolidation of specialty niches.
- Supplier development.

1.8 Design product and national integration

One of the main objectives for the development of the electronics industry in the state of Aguascalientes is the consolidation of a local industry with the ability to design, develop and manufacture products and services of higher added value, registered in Mexico from proprietary technologies.

In this regard, greater national integration of products and services, generate local industry, not only limited to the assembly of products, but also with the design, engineering and advanced manufacturing, by boosting competitiveness factors such as improved designs, the acquisition of knowledge and technology associated favoring the evolution of the sector, providing a higher percentage of integration to generate added value.

Its implementation depends on the technological development of enterprises, linking academia and research centers with industry for the development of research and technological development, and the promotion of innovation, factors closely related to the level of complexity and added value of domestic products.

Lines of Action

1.8.1 Create a Project Management Office

One of the main problems identified in the diagnosis of local industry is to implement partial or isolated efforts by educational institutions, research centers

and local businesses. Thus, only 45% rated this as good their relationship, with research centers that have greater access to public resources, versus 47% of the companies surveyed. In terms of the main problems identified highlights the slow process (35%), excessive paperwork and requirements (23%), and lack of information (18%).

In this sense, one of the best international practices is to have a dedicated project office for counseling, management, integration and monitoring of projects to access government support programs of the Ministry of Economy and CONACYT. The Project Office would be established as an articulator of enterprise project demand and supply of products, services and capabilities, both educational institutions as local research centers, with a focus on self - sustainability, supported by manual organizational, operational, technology management and business model.

1.8.2 Acquisition of technological infrastructure

The electronics companies are intensive in the use of capital assets (equipment, machinery and technological infrastructure) to their production processes and developing new products and services and laboratories enabling engineering design and product testing. The 56% of companies stated that there are sufficient equipment and machinery for the development of their production processes, 32% of business equipment and machinery has between 3-5 years old, with an average of 4.3 years old, in of its main requirements are dies, milling, turning, video and audio equipment, equipment for characterization of integrated circuits, laser machines, electrostatic painting, and computer equipment, among others.

In this regard, it is important to note the existence of support programs that enable the acquisition of fixed assets for the development of research projects and technology development business, with the emphasis on developing joint projects with educational institutions and research centers like the Fund Stimulus CONACYT for innovation.

1.8.3 Access to trade finance

Micro and small businesses generally lack the traditional safeguards recognized by commercial banks, so they do not have access to private financing, even when they have economically viable projects. This is a clear "failure or market imperfection", since if a company does not have funding sources available rates and soft, it is virtually impossible to modernize technologically, implement programs, human resource development and achieve quality standards required by large companies, among other limitations. This problem of lack of access to the credit market problems is known as information and credit rationing, since the problem is

generated as a result of not having enough information to interested parties in the transactions.

It should be noted that 42% of the companies stated as the main source of funding for the development of activities sustainability of the business itself, the use of those revenues generated to support the operation of the company and the undertaking of other projects, and 19% obtaining credit from suppliers, highlighting a low percentage of access to financing schemes such as commercial banks (8%) and venture capital (6%). In this sense, by creating the Project Office proposed the identification, selection and evaluation of financing mechanisms provided by commercial banks, aimed at micro and small enterprises for obtaining working capital and asset acquisition fixed and alternative schemes of access to seed capital and venture.

1.1.4. Development of innovation projects

Innovation projects, research and development of new products, processes and / or services of particular importance to local businesses electronics sector, mainly by the need to move into higher value-added activities in the areas of design, engineering, advanced manufacturing and embedded software among other segments of value.

Stimulus funds to the innovation of CONACYT (INNOVAPYME, PROINNOVA and INNOVATEC) business competition privilege with educational institutions and research centers. In this regard, it is essential to develop innovative projects in partnership with educational institutions and research centers that allow a gradual process of knowledge generation. In this regard, it should privilege innovation projects areas integrated circuits or printed, electrical cabinets and electronic components, embedded software (embedded software), video production, as well as projects related to new services in the areas of air conditioning, prevention, energy and GPS systems, among others. The educational institutions and research centers could provide research on issues of augmented reality, evolutionary systems, mechatronic systems, power electronics, industrial applications, micro - controllers, and process optimization

1.1.5. Registration of patents and trademarks

Industrial patents are a title that recognizes the right to exclusively exploit the patented invention, preventing other companies from manufacturing, selling or using it without the consent of the patentee. The markings are a distinctive sign, an asset of the company, used for advertising or product development and / or services.

Diagnosis of local electronics industry Aguascalientes state shows that 88% of companies do not have patents and trademarks, which shows whether a low level

of innovation processes, research and development, or lack for records of innovation processes. Also, 53% of companies undertook a technology project in the last year, however, it lacks a systematic process, which creates negative externalities such as lack of assimilation of technology and patents.

In this sense, the development of innovation projects and technological development programs presented stimuli to innovation CONACYT associated with the generation of patents and trademarks, which are being proposed to be developed in conjunction with the Center Patenting INFOTEC installed in Aguascalientes, conceptualized as a unit for management and administration of intellectual property aimed at supporting the provision of information in patent documents, protection of assets created, strengthening the capacities of local electronics industry in terms of ownership intellectual.

1.9 Joining international networks

The electronics industry worldwide is characterized by its high integration into global value chains, so it is essential to the implementation of strategies and action plans for incorporating local industry in global models.

Internationally, international networks are a tool that promotes linkage between research institutions and companies, generating synergies to increase the competitiveness of the productive sector. These networks are made up of innovation in specific topics and groups associated educational and research institutions and companies. The main objective of this strategy is to encourage the creation of a network of networks for the local electronics industry to help raise the competitiveness of the sector.

1.9.1 Business Networking Platform

One of the major concerns is the existence of asymmetric information regarding the developments and market trends, as most of the local electronics companies, for its small size, no mechanisms trends demands for products. This aspect is of utmost importance, since many of the major industries that consumer electronic products, including automotive, often change their models constantly and in the short term. Thus, the lack of knowledge and prediction of relevant markets by companies inhibits strategic planning capacity.

To promote horizontal and vertical integration of local companies in the electronics sector, one strategy is to develop a business networking platform to provide shared information of local industry with the objectives to promote the local sector in international markets , facilitate communication and information exchange between businesses, educational institutions and research centers, and companies outsourcing buyers and sellers.

Conceptualization of business networking platform includes individual information and aggregate local companies in the electronics industry and related (electric and automotive, among others), general and contact information, product catalog and services, human resource capabilities, processes and certifications, technology trends, business channels, access to programs and projects, exchange of human resources, among others, both in Spanish and English.

1.9.2 Export Promotion

In highly globalized industries such as electronics, many companies recognize the importance of selling their products and services in international markets, but entry into these markets can be expensive and difficult, largely because the standards and certifications searched, and not have the expertise to meet the needs of customers in these new markets.

Under the diagnosis of local companies in the electronics sector, 57% of companies reported Mexico as their main destination of sales, and 21% to the United States, which shows the lack of export processes especially in micro and small local companies, 47% of companies rated as regulate their ability to access international markets, the main issues identified the costs and time of access to those markets.

Regarding cooperation with ProMéxico and export promotion companies are facilitating mechanisms to increase participation opportunities in international markets, mainly the United States. In the first stage, projects that could be implemented in conjunction with ProMéxico are: 1) Consultancy for the improvement of production processes and products export, 2) Market Research to identify missing links or minimal presence in the productive chains, 3) Studies to form export consortia projects or other business associations. ProMéxico may receive from federal, state and municipal levels through Institutional Collaboration Agreement, contributions in cash or its equivalent in kind to supplement the resources are there to provide their services.

1.9.3 Marketing Channels

The promotion of exports of goods and services in the local electronics industry, must be complemented by the development of efficient marketing channels; 17% of companies stated that they use direct sales strategies, by demonstrating sales or custom contact a representative of the company and the potential buyer, and 12% through sales via channels and / or local businesses, sale through distribution channels or business partners, paying a consideration and / or service fee.

In this sense, we propose the development of joint projects with ProMéxico through support services such as business development agendas, participation in fairs, promotion of export supply, media advertising, and distribution centers, showrooms and centers overseas business, organization and conduct of business meetings, and individual business involvement in international events. The promotion in international markets will be complemented by business networking platform.

1.9.4 Efficiency in the management of English

One of the main problems for participation in international markets is the efficient handling of the English language. Among the features not found in local human resources, 24% of companies surveyed said managing English, given its importance for the high integration of the electronics sector in global production chains.

In this sense, is indispensable to develop a certification program for human resource efficient handling of language, for it in the first stage we propose the development of a training project resources and middle management level to get your certification in the language. To do this, management intends to support Federal Ministry of Economy, so together with the Government of the State of Aguascalientes is further a certification project in the language.

1.10 Strategic Plan for attracting FDI

The electronics industry worldwide is highly globalized, the vast majority of the production of original equipment manufacturers (OEMs) and Tier 1 supplier distributed worldwide, in countries and regions with the conditions and Internal factors for reducing costs (search for efficiency), access to markets under better conditions (market research) and specialized resources (search for strategic assets).

In this sense, global value chains, beyond open up new areas of opportunity beyond manufacturing and job creation, should be directed towards achieving a state, the diffusion of technological knowledge, providing new opportunities for training capacities in local businesses and the development of products that are at the forefront of technology for global markets, focusing in attracting businesses and projects in those areas that have the greatest potential to influence the local economy, including design centers, research and development, and logistics.

1.10.1 Simplification of Procedures

In Mexico are still significant administrative backlogs and inefficiencies to open and operate a business, which has become a strong barrier to entry,

particularly for micro and small businesses, as evidenced in several important limitations to establish and develop a business efficiently.

Thus, simplification strategy of procedures intended that the State Government to fulfill its role to correct market failures and imperfections in the economy, and improve the regulatory framework in which they operate electronic companies, facilitating centers specializing in specific niches of the electronics industry.

1.10.2 Creating design centers in specialty niches

The development of strategies to attract companies and projects in niche specialty is conditioned the development of a solid structural basis between the participation of industry, educational institutions, research centers and the federal, state and municipal. Importantly, 41% of companies surveyed are part of business clusters so you have to take advantage of the relationship of medium and large electronics sector and related industries (automotive) to attract projects and expanding operations.

In this sense, we have support from the Ministry of Economy and CONACYT for attracting new projects and creation of centers and / or research groups with complementary inputs federal, state and private initiative. The main thrust should be to direct efforts towards attracting design centers, engineering and advanced manufacturing electronic components, electronics - automotive, computer and embedded software, agribusiness and mechatronics and design centers emerging sectors with high growth potential in the entity as nanoelectronics, aeronautics and aerospace.

1.10.3 Diagnostic state investment costs

The electronics industry of the state of Aguascalientes must move from an industry focused mainly on manufacturing processes to an industry design, engineering and advanced manufacturing expertise in niche and emerging markets. This indicates a greater importance for the disadvantage of our country compared to other Asian emerging countries in terms of comparative costs of human resources with a low level of specialization. However, 76% of the companies interviewed considered as half the cost of human resources, which no doubt continue to be an important factor in business decisions, local strategy must be reoriented from a focus on cost reduction (efficiency seeking) towards a specialized resource (strategic asset search).

In this sense, we propose the development of a comparative study of the costs of specialized human resources, logistics and transportation, tax burden, tax incentives, among others, with respect to other regional and international locations,

which supports a strategy for positioning Aguascalientes as an international investment destination for electronics sector, funded by the Program for the Development of Heavy Industry and High Technology (PRODIAT) of the Ministry of Economy.

1.11 International Business Certification

Currently, the electronics products face greater regulatory requirements increasing demanding that raise the costs and risks of product development. This regulatory environment increases the likelihood that the product tests are satisfactory, a fact that could jeopardize development costs. Success in today's challenging environment requires innovation process faster design cycles and shorter validation to reduce time to market and engineering costs. In this sense, the local industry is required to offer a favorable environment in terms of regulations (seeking a harmonization with international standards), through the adoption of international certifications for quality and environmental models.

1.11.1 Quality certification and environmental models

To the extent that local businesses are progressing in the certification used in the electronics industry will be viable international demand and production increase, especially those from large OEMs and CME; these quality certifications are useful either to access tenders or chains onto high added value.

It is noteworthy that 56% of the companies interviewed have not implemented a quality management system or, and 44% of companies showed their interest in implementing ISO 9000 certification process. ISO 9000 is a set of international standards that certify quality practices, specifying standards, procedures, delivery time and service levels. The ISO 9000 is subdivided in ISO 9001: 2008, which provides a series of standard requirements to have the quality management system. In this regard, one of the most important topics is to launch a Certificate Program Quality Models for meet standards Quality and certifications required by large manufacturing companies.

Also, the international electronics industry requires the use of environmental management programs for their production processes. In this regard, 65% of companies do not have an environmental improvement program, so it requires the implementation of environmental certifications such as ISO 14000, an international norm that regulates aspects of the environment, which is subdivided into ISO 14001: 2004 and ISO 14004:2004, regulate the effective environmental management system, which aims to help companies to achieve environmental and economic goals, by establishing requirements and procedures for setting environmental policies and objectives.

1.11.2 Creating a Center for Technology Standards

It is essential that all those companies wishing electronics venture into international markets should consider the technological standards of different markets, as well as operating and safety characteristics of the components and systems that want to market. For this it is essential to develop a center of technological standards for the electronics industry and related sectors (electrical, mechatronics, etc.) on issues such as voltage, frequency, technology, reproductions, in conjunction with research centers and / or local educational institutions .

Through the center could be developed laboratories, the promotion and dissemination of documentation of specifications, certifications, standards and regulations with international approval trends, organizing state awards, among others.

1.12 Specialized talent management

The development and talent management for the electronics sector activities, especially those related to the complete cycle of value added products: research and development, new product design, manufacturing strategic inputs, production of generic inputs, assembly, manufacturing and packaging, distribution and logistics, product customization, after - sales services and brand and market development. In this regard, it is essential to ensure a multidisciplinary talent base that is available as it develops the local sector.

The goal of a talent management program is to identify the needs to provide training and certification for companies to integrate successfully the cycle of generation of value added in the sector, manage their integration, identifying requirements required for current and future industry, to promote its development and retention in the sector.

1.12.1 Training and human resource certification

It is essential to improve human resource training and certification of companies in the local electronics sector in the various activities of the value generation cycle, through its certification internationally recognized technical tools. It is important to note that 72% of companies have implemented internal training programs that must be exploited, however,65% of companies indicated that they require internationally recognized certifications for their employees, perceived to be changed gradually.

Therefore, it is important to access support for training and certification of employees of companies in technical tools recognized internationally, especially in

higher value-added activities as research and development, new product design and manufacturing of strategic inputs.

In this sense, we propose the development of a draft human resource training in conjunction with the Ministry of Economy for professional certification in project management tools (Project Management Institute), Solidworks, Six Sigma, Software Development (Microsoft , Linux, Java,), electronic design, and Innovation (TOGAF), as well as IPC models, APICS, and FDA.

1.12.2 Development of management skills

One of the main requirements of local companies is the development of management skills, 22% of companies said they need to develop management skills for the development of activities of the value chain as product customization, after - sales services and brand and market development.

In this regard, it is essential to support the development of marketing strategies of local electronics companies, by implementing competitive practices to improve your business skills. To achieve this, we propose the analysis of current business strategy, prepare a status report and recommendations, and develop your strategy and building your communication tools, and developing sales tactics campaigns in the identified markets.

1.12.3 Better linkages with academia and research centers

The improvement in linking local industry with educational institutions and research centers is critical to the growth of the industry in the medium and long term. It is important to note that the link should not be limited only to access human resources for recruitment,47% of companies rated as fair availability in terms of number and access to human resources, or the development of professional practices and evaluation of curricula, both classified as the primary means of linkage between industry and academia, but also in higher value-added items such as the development of joint research projects, training of specialized human resources, technology services, advice and consultancy, among others.

In this regard, it is essential to develop the following points: 1) evaluation and update curricula, mainly oriented towards activities with higher value added in electronics production cycle: research and development, new product design strategic procurement and manufacturing, the development of joint projects by presenting joint projects industry - academia stimulus projects CONACYT for innovation, by hiring assessments, consulting and technology services provided by educational institutions and research centers Local on innovation and development of new technologies, automation systems, among others.

1.13 Develop local specialty niches

Currently, the electronics industry is mainly oriented Aguascalientes in manufacturing activities and computer electronic components, backed by large firms in highly integrated entity in the global value chain of the industry, and a set of services under added value provided by the micro and small enterprises for their internal capabilities cannot successfully enter the global chains.

In later sections develop the portfolio of projects for the development of niche specialization, detonating local market differentiator's vertical high priority for the local economy as electronics - automotive, agribusiness, robotics - mechatronics as well as emerging markets in nanoelectronics segments, aerospace and aeronautics.

Electronic Design Center for the Automotive Industry

General Objective:

Strengthen scientific and technological infrastructure by forming the product design capabilities and electronic processes linked to the local automotive industry, implementing participative mechanisms that drives innovation technological upgrading of enterprises cluster institutions that make up the mail - automotive.

Description

The purpose of the project is to increase the capabilities and skills of electronic companies in the region, enabling the development and implementation of process and product design to supply the assembly plants in the region. As scope of the implementation of the project is expected to encourage new investments regional capacity offering electronic products for the automotive sector:

- Sensors tire pressure monitoring;
- Entertainment systems;
- OCR occupants
- Intelligent Braking Systems
- Connectivity with other electronic devices,
- Increased sales of hybrid cars.

1.14 Supplier development

The development of the supply chain for electronics sector allows the integration of local capacities in global chains. This process of replacing imports of parts and components that could be manufactured by local companies, shall be supported by the design, development and advanced manufacturing higher value added.

It is important to recognize that supplier development is not a short term process, given the gap in the value chain of the sector by the internal capabilities of local firms. Therefore, the development of suppliers should support the development of business strategies, through access to technology infrastructure, trained personnel and specialized best techniques and tools for planning and study of markets and through strategic alliances, quality standards and certifications demanded by leading manufacturing companies. Put another way, the best way to integrate into high-value chains is through increased productivity and competitiveness, offering products or services with the best value for money.

1.14.1 Vertical Integration: Global Value Chains

Vertical integration in the global value chain, focus on a systematic effort to strengthen the capabilities of local firms. The 65% of companies surveyed do not subcontract production processes to external providers, 38% mainly due to delays in delivery times and 33% by high costs for suppliers. One factor that you have to take advantage is that 53% of companies interviewed indicated that they have mechanisms for evaluating local suppliers, so we propose the implementation of a mechanism for evaluation and selection of suppliers, whereby large local companies the sector at local and regional level, as well as related sectors, assess the possibilities for suppliers of local businesses in order to identify areas of opportunity.

In recent years, increased competition has led to reduced profit margins in traditional manufacturing activities of the CM. In response, these companies are now moving into higher value-added services such as product design and prototyping, testing of components and products, material procurement and management of the supply chain. It is in this type of activity, where local businesses could complement the activities of the local CM.

1.14.2 Horizontal integration: associations and strategic alliances

One of the best practices is to increase and improve the partnership and strategic alliances between companies, in order to generate synergies for access to credit, technology and certifications. As already noted, at the failure of internal scale

economies for local micro and small enterprises, greater horizontal integration is essential to achieve increasing returns in the aggregate planning.

In this sense, it is proposed to develop a process for integrating consulting capabilities of micro and small enterprises through horizontal integration, with a focus on vertical integration to global value chains.

6.2 Project Portfolio for Niche Specialization

Effective integration of elements of technological innovation is a key to the strategic planning of an area, especially when these are developed on a high mobility environment and great technological competitiveness such as the electronics industry sector and its various branches. In this sector, technological orientation and approach to innovation are of vital importance due to strategic implications and the role it plays in value creation and long-term competitive advantage in a region.

The essence of business strategy and planning is aimed at aligning the activities and resources of industry, academia and government in order to generate sustainable competitiveness in the market. This requires understanding the nature of change in the business environment in the medium and long term, in terms of opportunities and external threats, and all the weaknesses and strengths of the industry and environment. The electronics industry has an impact on the internal and external strategic issues in terms of technology and innovation platforms.

For the definition of portfolio of projects for niche specialization developed SWOT analysis, technology roadmaps and business models using the Model Canvas, for each selected niches, through the development of two sessions strategic planning, applying specific tools to define the necessary elements that underpin a balanced portfolio of innovation projects.

The working group's multidisciplinary teams were made up of government, industry clusters, academia, research centers and other entities related necessary electronics industry in Aguascalientes for proper approach to the subject.

The niches were selected electronics - automotive, agribusiness and robotics for its impact by developing innovative projects, research and technological development in the priority sectors identified by the Government of the State of Aguascalientes, the niche electronics - automotive high relevance for automotive and auto parts industry in the local economy, the niche agribusiness, given the importance of the primary sector, despite the state's economic transition, secondary and tertiary sectors and their implications for the proper management of the environment, and niche robotics for its cross effect in most of the state priority

sectors: Automotive / Metalworking. Textile and Clothing, Transportation and Logistics and furniture.

Electronics Industry - Agribusiness

Work Team

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SWOT Analysis

AGROINDUSTRIA							
Opportunities		Threats		Strengths		Weaknesses	
O1.	**Value Added**	**A1**	**Technologies**	**F1**	**Human Resources**	**D1**	**Planning**
O1.1	Value added product	A1.1	Lack of New Technologies	F1.1	Labor in need of work	D1.1	Planning the medium and long term
O1.2	Diversification of production systems (Greenhouses)	A1.2	The modernization process of the competitors are given advantages	F1.2	Professionals with competitive	D1.2	Lack Research
O1.3	Originally packaging system	A1.3	Changing Paradigms	F1.3	Many Universities	D1.3	Lack of long-term programs
		A1.4	Low application of electronic technology	F1.4	Research Centers	D1.4	Recovery of dry
		A1.5	Lack of Preparation				
		A1.6	Lack of Preparation of Products				
		A1.7	Behavior producer traditionalist resistance to change				
		A1.8	Small production units				
		A1.9	Heavy duty equipment				
O2	**Logistics**	**A2**	**Competitors**	**F2**	**Quality**	**D2**	**Human Resources**
O2.1	Logistic Distribution Centers	A2.1	Competition unknown	F2.1	Pioneers in agricultural developments	D2.1	Improvisation
O2.2	Distribution Logistics	A2.2	Acquisition of farmland international companies	F2.2	Product Knowledge and command	D2.2	Projects deficient
O2.3	Databases	A2.3	Foreign Malls	F2.3	Few products in the region	D2.3	Personnel Refresh
O2.4	Communication Systems	A2.4	Great advertising campaigns on foreign products	F2.4	High quality of products	D2.4	Teamwork
O2.5	Census Develop research topics HEIs and research centers	A2.5		F2.5	National Model Company (The Orchard)	D2.5	Lack of knowledge to optimize the environment
Ø2.6	Many participants in the supply chain with degree of specialization (transport, warehouses, distributors)	A2.6	Few large companies in the region	F2.6	Crops controlled	D2.6	Lack of knowledge of providing added value to the product
				F2.7	Only agricultural equipment company in Mexico	D2.7	Lack of knowledge in greenhouse crops, organics, hydroponics
				F2.8	The guava symbol AGS	D2.8	Fear of change
						D2.9	Few people speak English
O3	**Entailment**	**A3**	**Government Involvement**	**F3**	**Competition**	**D3**	**Quality**
O3.1	Search partnering with other	A3.1	Government is skewed only to the	F3.1	Few producers	D3.1	Lack of crop certification

	countries to do projects		automotive industry				
O3.2	Involvement Projects Research Centers	A3.2	Dumping in other countries allows them greater advantages	F3.2	Electronics companies able to develop technology to support the food industry	D3.2	Improve production processes
Ø3.3	Communication with other sectors Agricultural Sector	A3.3	Environmental regulations by customers	F3.3	Export Quality	D3.3	Little use of technology in the field
Ø3.4	Feeding IES-INDUSTRY interaction through projects	A3.4	Foreign competitors, make their entrance	F3.4	Existence of specialized clusters	D3.4	Techniques obsolete
		A3.5	Ignoring new environmental policies	F3.5	We quickly organized	D3.5	Some bottlenecks, especially in inspection systems
		A3.6	Lack of farm support policies				
		A3.7	Increased Food Imports				
O4	**Merchandising**	**A4**	**Environment**	**F4**	**Environment**	**D4**	**Entailment**
O4.1	Markets with additional services: parking, shopping carts ...	A4.1	Insecurity	F4.1	Similarity of climate and soil	D4.1	Lack of technology centers
Ø4.2	Changing the traditional market	A4.2	Water scarcity affects the food industry	F4.2	Weather for specific products (guava, garlic, etc.)	D4.2	Development processes at different speeds between agencies involved
Ø4.3	Display windows as fairs and conferences frequented by producers (Irapuato, Sinaloa)	A4.3	Uncontrollable weather conditions	F4.3	Polo Development	D4.3	Linking divergent objectives, linking divergent objectives
O4.4	Demands diversified needs food	A4.4	Water scarcity and land	F4.4	The geographical center of the country		
Ø4.5	Few competitors in	A4.5	Lack of water	F4.5	Pleasant living environment		
		A4.6	Contamination of soil and water	F4.6	Geographical logistics center		
				F4.7	Quick access to output ports for export		
O5	**Automation**	**A5**	**Entailment**	**F5**	**Government**	**D5**	**Government**
O5.1	Electronic Meters	A5.1	Lack of teamwork	F5.1	Aware that Government should support	D5.1	Lack of continuity in programs
Ø5.2	Quality Control Equipment			F5.2	Closeness of state government	D5.2	Lack of coordinated objectives
O5.3	Increasing the level of automation in the beginning of the agro food chain					D5.3	Scarce government resources
Ø5.4	Need to optimize water and land					D5.4	Lack of promotion of Aguascalientes

	resources						
						D5.5	No programs focused
						D5.6	Vision of the Government in the development of the field
O6	**Government Support**	**A6**	**Financial**	**F6**	**Government**	**D6**	**Suppliers**
G6.1	Take advantage of new support programs GDP-EDUC government	A6.1	Lack of financial resources	F6.1	100 percent support from the Government (Politics)	D6.1	Low rate of domestic suppliers
O6.2	Government supports through programs	A6.2	Income variables	F6.2	Disposition of Government / Academia / Business		
		A6.3	Low income customers	F6.3	Access to all levels of government		
		A6.4	Low profitability	F6.4	Communication Infrastructure (Land and Air)		
		A6.5	Low capitalization of field				
		A6.6	High cost of new tools				
O7	**Social Environment**	**A7**	**Projects**	**F6**	**Government**	**D7**	**Financial**
O7.1	Social Stability	A7.1	There are not enough projects			D7.1	Overweight on immediate profitability of projects

Integrating SWOT

Strengths	Opportunities			Threats		
	O1: F1, F2			**O1, 5: A2, A7**		
	What?	**How?**	**Who?**	**What?**	**How?**	**Who?**
	a. Seek support for researchers and students to stay	Stays	Electronics cluster CELESA	a. Propose projects that add value for national and international competitive	Invite the agricultural sector, to submit their problems and propose ideas for projects arising	CELESA invites the agribusiness sector with the participation of HEIs and research centers
	b. Invite suppliers of Electrical and Electronics Industry to capture niche opportunities	Agro Expo	SEDRAE-Ministry of Rural Development and Agro Business	b. Investigate who are the national and international competitors, local products	Requesting databases to INEGI, SEDRAE and international organizations (FAO)	Agro industrial Sector, CELESA and IES
	c. Engage the electronics sector in the dissemination of best practices agro food	Purchasing Best Products	Contact Foundation Produce Products-Guava Systems, garlic, chili, peach, corn, beans, nopal, / livestock	c. Research what other products can result in Aguascalientes and market nationally and internationally	Developing research projects	Research centers: INIFAP, UAA, Technological del Llano
	d. Exchange of ideas between industry Electronics and Agro food	Forums	Organize CELESA with producers	d. Identify opportunities directly in agribusiness	Through field visits and the productive process	IES Research centers and coordinated by CELESA
	O2: F4, F5			**O3: A7**		
	What?	**How?**	**Who?**	**What?**	**How?**	**Who?**
	a. Facilities for storage and distribution of agricultural and industrial production	Logistics Center	Federal, state and industry	a. To establish a real link	Engaging the parties to the agreement are carried out taken and monitor the activities	The parties and CELESA
	b. Manage funding to build the logistics center	Macro Logistics Project	State Government	c. Learn CONALEP model	Inviting the CONALEP responsible for linking you to share your experience with the model and parts (IES, research centers and Agribusiness)	CELESA
	O3: F1, F4			**O7: A3, A4**		
	What?	**How?**	**Who?**	**What?**	**How?**	**Who?**
	a. Promote the development of Human Resources	RH development logistics	CELESA, UNIVERSITIES	a. Ensuring security, stability and social peace	Strengthening institutional safety programs	Government

	b. The need to manage financial resources for development of projects related	Getting Projects Resources	CELESA, CONACYT	b. Protecting our natural resources	Making wise use of natural resources through state and federal programs	Government, Civil Society Organizations, IES
				c. Improving the quality of life of the inhabitants of the State	Advancing to the state to attract more investment to generate more jobs and increase investment in education	Government
Weaknesses	**O1: D3, D1, D5 + O2: D1, D4**			**A1: D7, D1, D4**		
	What?	**How?**	**Who?**	**What?**	**How?**	**Who?**
	a. Participate Electronics sector agro dissemination of best practices	Forums	Producers organizes Celesa	Increasing government allocates financial resources to research and development	Government Programs	Manage resources for Research Centers, local deputies, CELESA
	b. Creating databases by IES, filter and disseminate the same CELESA	Research Databases	Universities create database, and filter Celesa disclose / obtain needs	Make the food Agro cluster plan	Long-term planning	IACE, Institutions CELESA knowledge society that promotes
	c. Foster stays	Little use of technology in the field	CELESA and Universities	Investigate facts and ongoing projects that can be used	Knowledge of technology centers	Research Centers, CELESA
	O3: LINK D1, D4, D5, D2			**A2: D1, D2, D3, D5**		
	What?	**How?**	**Who?**	**What?**	**How?**	**Who?**
	D1 Planning a. Identify the entities linked, make contact and commitment to participate	Filtering DB. Meetings convened by the cluster, calls, visits and monitoring	IES, GOVERNMENT and CELESA	**D1. PLANNING** a. Studying the situation of the company and market competition to develop competitive strategy	Make use of INEGI statistics, FAO, UN. Hire Market Research companies directly every business.	Producers, Business, Government
	D2 R.H b. Preparing people to know that it is linking	Develop training packages on what is linking	IES	**D2 R.H** b. Increasing the educational level of the food chain	Develop training programs for the food chain using new technologies	IES / SAGARPA
	Linking D3 c. Prepare a plan short, medium and long term, to make the relationship sustainable.	Develop the plan	CELESA, IES	**D3.CALIDAD** c. Find success stories that show how to do things	Make benchmarking study of the success stories. Include life experiences	Producers, Business, Government
	Government D4 d.	Lobbies	CELESA, IES	**D4. GOVERNMENT**	Simplifying procedures,	Government

	Promote the Govt. Include in their programs and budget support	d. Function as a true facilitator	developing infrastructure, providing financial support for soft rates	
		Environment A4 D2, D5		
		What?	**How?**	**Who?**
		D2. Educating RH 3Rs (Reuse, Recycle, Reduce)	Strengthen environmental protection programs and plan the outreach program	Secretary of State Environmental
		D5Gob. - Strengthen Regulations on environmental protection- Ensuring security and social peace	Auditing compliance regulations that combat corruption and continue the fight against organized crime continue and increase public servants' education and promote employment opportunities	Ministry of Public Security, Attorney General, Federal Institute for Access to Information IES / IEA

Technology Roadmap

Project: SMART (Supermarket to purchase real-time identifier) is a project to achieve in the medium term of 1-5 years.

At present the majority of the populations consume more sugars and less protein foods and healthy; generating triggering malnutrition diseases such as obesity, diabetes, hypertension, even generating that people become passive, affecting their mood and lifestyle.

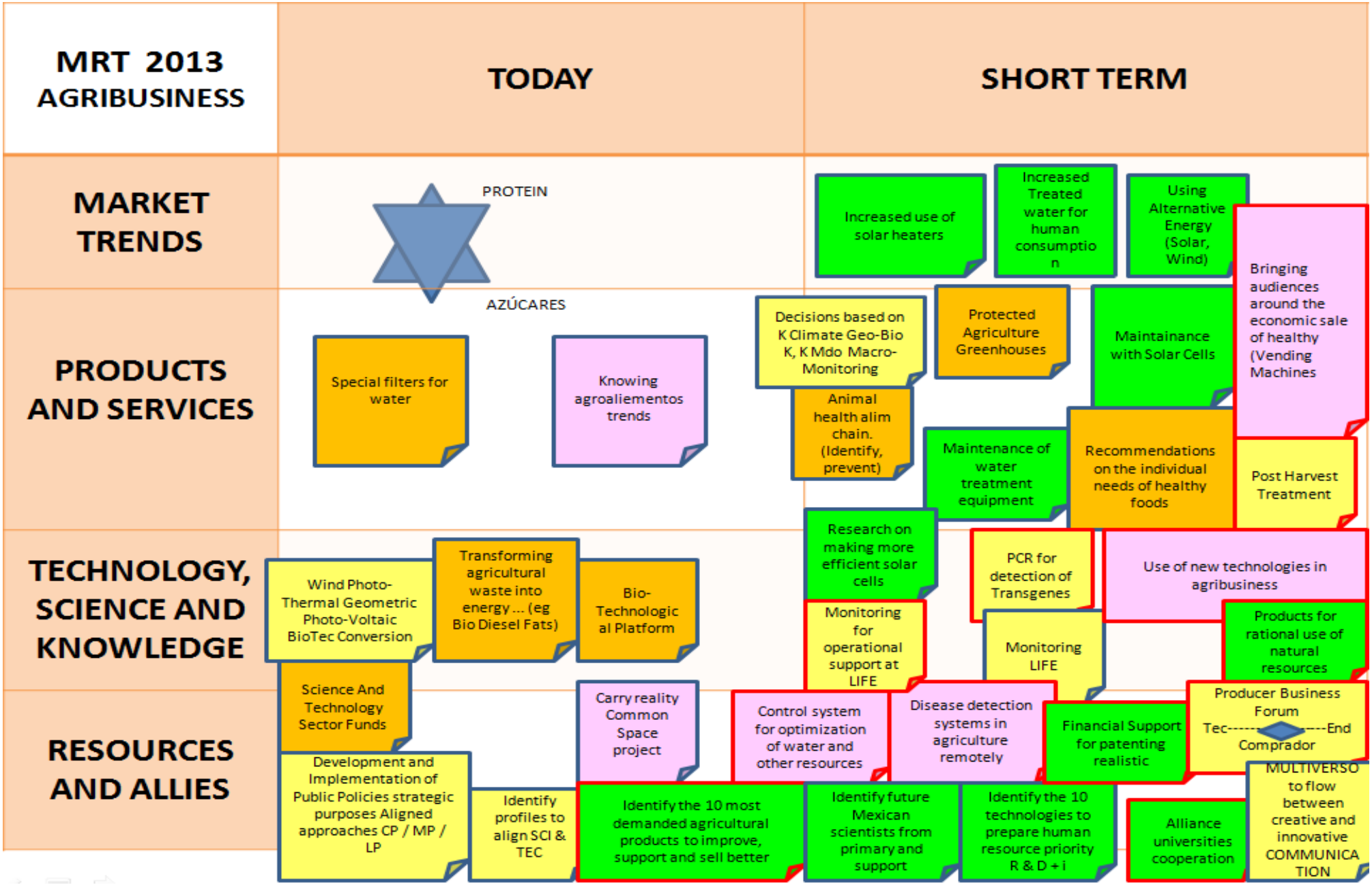
To solve this problem we propose a SMART supermarket, food market which nutritional quality where consumers can learn about the traceability of food they will eat. A part of the nutritional value, added value is the decrease of the distance between producer and final consumer and all that this implies (time, freshness, hygiene, availability, quality, variety of payment methods, etc..)

According to the technology roadmap, now could employ energy conversion technologies such as photo thermal, wind, photovoltaic, and biotechnology (waste-to-energy, through a technology platform) for the food production.

In the short term, it should take into account the health of the animals, the food chain, as well as plants. To achieve this, you must use alternatives such as greenhouses, water quality, disease detection systems, sensors for monitoring farmland and use a polymer chain reactor for detection of transgenic, taking into account the agro - food market trends and climate change, and advice on agricultural soil nutrients with optimal water use and knowledge of the weather conditions.

The medium-term trend would increase demand for certified organic products for which it is necessary to use emerging technologies in its production as in the field of telecommunications, the use of specialized machinery (tractors recognition system soil characteristics) spectrum analysis graph farmland, monitoring the production process of agricultural products, use of specialized packaging for local consumption and export.

In order to execute a project that uses technology organic food production must use sector funds to support science and technology, aligned to strategic purposes of public policy, proposing ten agricultural products most in demand in the region, where scientists involved Mexican universities, producers and international organizations to promote multidisciplinary forums, on the basis of the understanding of national and local producers. For this project the marketing system will have to be innovative using current information technologies to support the production process, logistics, marketing and distribution of organic food. This was achieved with the communication of the actors in the entire production chain through direct contact with the consumer.


MRT 2013
AGRIBUSINESS
TODAY
SHORT TERM
MARKET TRENDS
PROTEIN
AZÚCARES
Increased use of solar heaters
Increased Treated water for human consumptio n
Using Alternative Energy (Solar, Wind)
PRODUCTS AND SERVICES
Special filters for water
Knowing agroaliementos trends
Decisions based on K Climate Geo-Bio K, K Mdo Macro-Monitoring
Protected Agriculture Greenhouses
Maintainance with Solar Cells
Bringing audiences around the economic sale of healthy (Vending Machines
Animal health alim chain. (Identify, prevent)
Maintenance of water treatment equipment
Recommendations on the individual needs of healthy foods
Post Harvest Treatment
TECHNOLOGY, SCIENCE AND KNOWLEDGE
Wind Photo-Thermal Geometric Photo-Voltaic BioTec Conversion
Transforming agricultural waste into energy ... (eg Bio Diesel Fats)
Bio-Technologic al Platform
Research on making more efficient solar cells
PCR for detection of Transgenes
Use of new technologies in agribusiness
Monitoring for operational support at LIFE
Monitoring LIFE
Products for rational use of natural resources
RESOURCES AND ALLIES
Science And Technology Sector Funds
Carry reality Common Space project
Control system for optimization of water and other resources
Disease detection systems in agriculture remotely
Financial Support for patenting realistic
Producer Business Forum
Tec------End
Comprador
Development and Implementation of Public Policies strategic purposes Aligned approaches CP / MP / LP
Identify profiles to align SCI & TEC
Identify the 10 most demanded agricultural products to improve, support and sell better
Identify future Mexican scientists from primary and support
Identify the 10 technologies to prepare human resource priority R & D + i
Alliance universities cooperation
MULTIVERSO to flow between creative and innovative COMMUNICA TION

AGRIBUSINESS	SHORT TERM	LONG TERM
MARKET TRENDS	Supermarkets Identifier Real Time Products related to climate change Expand the type of products in the region Skill and Ability Public Supports Basic Operating Gral farmer Using telemarketing to end users Lost AGRICOLD border by climate change Prod consumption increase. organic Increased food prices	Conversion to new cropping patterns x ecological niche Products with higher nutritional value and easily accessible (Preparation - Consumption) Fancy Food (Nutrition-On the Cheap) Deleting intermediary links in the chain Fast Food-Slow Food
PRODUCTS AND SERVICES	Manufacture of solar cells SYSTEM ID time R Use of IT in the field food Funicionales Food Measurement Serv. Nutritional Advice from Earth (H02, CLIMATE) Communication equipment inexpensive to use in the field Agricultural Prod Tracking Nutraceuticals, Pharmaceuticals, Functional Foods, Textiles and Fibers, Pigments, Bio Fuels	Tracking system product Monitoring bioethical Agroproductos storage
TECHNOLOGY, SCIENCE AND KNOWLEDGE	IR home to measure food freshness Diffusion of electronic products for use in agribusiness Application of Sensor Systems in agribusiness Application variables measuring systems in the growing cycle of the plant Spectrographic analysis devices dela quality crop land NEW food pyramid Machinery with NT (eg Tractor with sist. Recognition soil characteristics Having more efficient systems at plot level	I E M
RESOURCES AND ALLIES	Scholarship Program for supporting 10 lines priority technology Establish policies to favor domestic producers or local Packaging systems for distribution to end-user anywhere in the world Micro-Monitoring Sensors (Fito Health, 200 Health, Homo Health) BIO ETIC	

Business Model

The proposals are aimed at a single supply center called SMART, distinguishing himself as our customer segments: producers, end customers, food processors (manufacturers, livestock industry), new complementary industries to identify and control marketing food distribution and that will support the project Smart is a store of innovative food products and services.

The value proposition for this new business called is to lower consumer prices, improved nutritional value, accessibility improved, higher margin to the producer, through electronic grocery shopping, sensors to identify qualities of the food, packaging with nutritional information tracking systems for product origin, cultivation, post harvest and nutritional value, customer distribution fast and effective detection of customer profile consumer trend, personalized service, use of feedback directed.

The channels used to give out to Smart and promote their products would be the use of mass media (magazines, newspapers, radio, TV, industrial cameras, industrial clusters, social networks). Retail channels used would be the use of smart phones, and Web pages with the Smart product offering. Delivery channels are: the use of clean vehicles and delivery in time.

The customers relationship is through: a trusting and proactive, ensuring quality and good information about the products offered in the Smart, identifying that staff are highly trained in this way the customer has the fidelity with Smart for quality, consistency, price, delivery time and high added value.

The income is defined as it needs further analysis to quantify, however proposed to be from food products and innovative customer services, the uptake of these will be through cash, credit and debit cards, vouchers, prepayment, bank transfers, among others.

The resources needed to carry out this business are highly trained, using quick and efficient transportation for distribution, packaging systems, cooling systems, communication systems, waste management systems, internal communication equipment, internet, phone and radio.

Key activities for this business are product quality inspection, development of procurement, tracking and product traceability, unique logistics, continuous flow and processing of information, communication with customers friendly and easy to understand.

ALLIES

- Most important strategic allies
- Antad, Specialized suppliers, producers, WHO, programmers, law advice, Universities, chambers ...
- Organic Products
- Support strategic resource yactus
- Government (Secretaries, Sedrad) Banks
- Internal Activities that can esternalizar with higher quality and lower cost
- Service delivery, Loyalty Customer

ACTIVITIES MAIN

- Activities and key processes
- Activities required for the value proposition and distribution
- Inspection of product quality and supplier development
- Information Flow-friendly information (catalog) and simple.

RESOURCES

- Which require the channels used?
- What resources requires the value proposition?
- Personal, Transportation, Consumables, Maintenance
- Internet, Phones, Vehicles, Packaging, Personal
- Resources + major and costly
- Vehicle safety, quality and integrity in service, distribution capabilities, internal communication network
- Cast and crew, packing system, cooling, waste communication ...

PROPOSAL VALUE

- Sensing Pack Tracing Transport Syndicate
- <CONSUMER PRICES
- > NUTRITIONAL VALUE
- > ACCESSIBILITY
- BUY ELECTRONICS
- > MARGIN PRODUCER
- TRACKING from ORIGIN CROP PROCESSING, POST-HARVEST and Nutritional Value

CUSTOMER RELATIONS

- Construction and Foreign Exchange
- Foreign customers expect
- Reliable and productive relationship
- Relationship Management
- Reliability Quality Good information
- Staff training packer, distributor, IT and marketing
- Customer Loyalty
- Proof Quality Price Delivery Time

CHANNEL

- Social Networks (google...)
- Mechanisms of sale (Smart Phone, SMART website)
- Through TV
- Service and personal attention
- Profile Detection consumer trend customers

SEGMENTS DE MARKET AND CLIENTS

- SMART Supply Center
- Producers
- End user
- Distribution and Marketing
- New Industries
- Livestock Industry
- Manufacturing sensors for detecting various parameters applied in humans is constantly and in real time
- Self Shops, Restaurants Hosp
- Diagnostic Systems in real time the physical condition of a person sending alarms and decision making
- Instant foods that contain adequate nutrients, plus livable and enduring flavors

COST $

- Major costs give the business model execution
- Economics focus: product energy inventories
- Ways to control the cost of the business model
- Improve storage and transport logistics

INCOME $

- INCOME Structure
- How much and when you receive income?
- What other types of income received?
- How do customers currently pay?
- $ X TDC XTDD X ELECTRONIC VOUCHER
- TBD
- PREPAID For third party credit support
- TDC Cash Vouchers

The strategic partners: The National Association of Shops, Supermarkets and Department Stores (ANTAD), specialized suppliers, producers of organic products, world health organization, systems programmers, consultants, universities, industrial cameras. For support of strategic resources and assets allies would the government, banks, specialized financial agribusiness.

The costs are based on a strong focus on the country's economy, product cost, energy and inventories, and control improvements in logistics of storage and transportation of products, as well as the same product, inventory and energy required to carry out activities.

Electronics Industry - Automotive

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SWOT Analysis

AUTOMOTIVE							
Opportunities		Threats		Strengths		Weaknesses	
O1.	**Research and Technological Development and Innovation in EI and CI**	**A1**	**How 2 2 Now Now Now**	**F1**	**Academia and Research**	**D1**	**Government**
O1.1	Cars designed for Young. Mexico is a country of young	A1.1	Lack of Corporate Culture	F1.1	Technological Universities = Industry	D1.1	Tax system which stifles small business
O1.2	Custom Design for general consumption	A1.2	Archaic Mentality	F1.2	High levels of education	D1.2	Bureaucracy
O1.3	Featuring Automotive Design Centers	A1.3	Resistance to Change	F1.3	Large numbers of Universities and Institutes of Technology	D1.3	Lack of clarity in the legislatures and the regulations of the various trade agreements such Temporary Program Imp
		A1.4	Low Level of Education	F1.4	Academic structure with capacity for	D1.4	Changes every 1, 3 and 6 years

					growth		
		A1.5	Image of Mexican Industry to International	F1.5	Lots of research centers (Public and Private)	D1.5	Fashion Business (What we sell at the moment)
		A1.6	Completing the Cycle of a New Product Market				
O2	**New Technologies**	**A2**	**Infrastructure, Resources, Sustainability**	**F2**	**Location**	**D2**	**View**
O2.1	High Efficiency Car	A2.1	Resources and Infrastructure	F2.1	Geographical Position	D2.1	Lack of focus as a community and as a cluster
O2.2	Development of New Technologies	A2.2	Infrastructure	F2.2	Geographic Location	D2.2	Lack of focus
O2.3	High Power Car but you should use in compact villages, mountain	A2.3	Lack of Suppliers	F2.3	Geographic Location	D2.3	Lack of Interest
O2.4	Electric Cars	A2.4	Water	F2.4	Geographic Location / Climatological / Strategic	D2.4	Labor Culture at the "Mexican"
O2.5	Design of new products and services	A2.5	Rapid reduction of salaries and allowances	F2.5	Climate	D2.5	Long-term goals
Ø2.6	Advanced Process Control	A2.6	Sustainability	F2.6	With respect to U.S.: Time Zone, Easy Access, Communication	D2.6	Know How
O3	**Study Association**	**A3**	**Globalization**	**F3**	**Experience and Potential**	**D3**	**Link or P.I**
O3.1	Opportunity Partnerships with Universities	A3.1	Country Economic Instability	F3.1	Automotive Experience	D3.1	Company = University = Linking Research Center
O3.2	Support to Universities	A3.2	Economy USA	F3.2	Diversity of Industries that require electronics and automation	D3.2	Integration between Inst.de Lower Higher Ed, Government, Business
Ø3.3	Joining forces	A3.3	Foreign Dependence	F3.3	Specialized Labor	D3.3	Lack of International Relations
		A3.4	China	F3.4	Resource Upgrade Available	D3.4	Lack of proper design
		A3.5	European Automotive Market Stagnation	F3.5	Power / Technical	D3.5	Lack of Expertise
		A3.6	Competitors National / International	F3.6	We can make and create almost all		
		A3.7	Globalization				
		A3.8	Global Economy				
O4	**New Markets**	**A4**	**Insecurity**	**F4**	**Culture and Human Capital**	**D4**	**Infrastructure**
O4.1	Local market and the growing Continent	A4.1	Insecurity in Mexico	F4.1	Standard of living high	D4.1	Load airport
Ø4.2	Create nationalism with 100per cent Mexican brands	A4.2	Racketeering	F4.2	Salary very competitive	D4.2	Low Speed Internet and High Cost
Ø4.3	Market Evolution	A4.3	Social Security	F4.3	Good people	D4.3	Poor Public Transportation
O4.4	Regionalization Efforts	A4.4	Security in the Region	F4.4	Opportunities awaiting young	D4.4	High cost of equipment for research

					population		
				F4.5	Creative Ability	D4.5	Very closed sector
				F4.6	Creativity	D4.6	Supplier delivery times
				F4.7	Country Youth = Human Capital	D4.7	Infrastructure: Transport, Communications
				F4.8	Adaptation to Japanese Culture Working		
O5	**Investment and Economic Development**	**A5**	**Market Behavior**	**F5**	**Clusters**	**D5**	**Languages**
O5.1	New Investments City and Region	A5.1	Very rapid onset of new products	F5.1	Separate clusters (Legally Constituted)	D5.1	Fluency in English, or other languages
Ø5.2	Obtaining greater economic resources (Public and Private)	A5.2	New or more ecological forms of transportation	F5.2	Participation of large firms	D5.2	English and other languages
O5.3	Supplier Development	A5.3	Lack of competitors			D5.3	English
Ø5.4	Successful Local Industry Base	A5.4	Rapid growth markets (Paste in quality and innovation)				
O6	**Supplier Development and Human Capital**	**A6**	**Government**	**F6**	**Government**	**D6**	**Cultural Factor**
G6.1	Training and Expertise	A6.1	Corruption in Mexico	F6.1	100 percent support from the Government (Politics)	D6.1	Lack of Culture and Education in Entrepreneurship
O6.2	Site Training	A6.2	Lawlessness	F6.2	Disposition of Government / Academia / Business	D6.2	R&D companies with low maturity in terms of processes, certifications.
Ø6.3	Power Electronics	A6.3	Little support from Government	F6.3	Access to all levels of government	D6.3	Lack of a strategic plan
Ø6.4	Innovation and Development (Human Capital)	A6.4	Lack of government regulations	F6.4	Communication Infrastructure (Land and Air)	D6.4	Certifications
O6.5	Highly skilled Supplier Development					D6.5	Increased training
						D6.6	Integral Education
						D6.7	Lack of Economic Resources
						D6.8	Lack of Cultural Capital Investment

Integrating SWOT

	Opportunities	Threats
Strengths	**O1: F1, F3, F5**	**A1: F1, F3, F5**
	Cluster design committee	Existing Resources information given by the cluster
	Abilities and Skills Inventory	Assessment opening of business: entrepreneurial
	Linking Projects = Legalization	Facilitate BUSINESS methodology
		Clusters: Conferences, Workshops, Courses, Training
		Supplier development
	O2: F1, F2, F4	**A2: F2, F4, F5**
	Application of New Technologies Committee	Fostering a culture of human capital and sustainable development
	Strategic Plan Timeline	Create new infrastructure in the state
	Firm commitments	The cluster infrastructure providing information
	O3: F1, F4	**A3: F2, F4, F1**
	Cluster involve more universities	Dissemination of success stories
	Get to know ALL of the medium	Linking Business-University (Global Vision)
	Propose a direct link GOB + IND + UNIV	
	Awards, social activities	
	Fight robots in the arena	
Weaknesses	**O1: D2, D6**	**A1: D1, D5, D2, D6**
	EXPOS Success, CONFERENCES	Support programs for the company tax
	Ideas Incubator	Capital Investment Promotion
	Social Events, Business Network	
	Business Vision	
	O2: D2, D6, D5, D4	**A2: D1, D4**
	Forcing Universities, High the ENGLISH LANGUAGE	Bookmark the needs and constraints the government
	Lack of internet at good speed telecommunications	Costs of Internet services
	Promoting languages	Comparison with other companies
		Design Tools: + college + company
	O3: D2, D3	**A3: D1, D2, D4, D5**
	Knowledge of Confidentiality Agreement	Promoting education based languages (primary, middle, high)
	Piracy	Create from universities professionals with global vision
		Wow2now workshops, know how to promote a comprehensive industry
		Politicians encourage developing the sector competitiveness to promote these initiatives supporting it: Create channels of communication with government agencies (executive, legislative, and Federal, Local)
		Financial Support, develop and facilitate support programs through the CLUSTER

Automotive Technology Roadmap

The current market trends are mainly three:

1. The search for greater safety through seat belts and air bags.
2. The concepts of Smart Car and Smart Street.
3. Entertainment systems.
4. The focused energy saving final product and company processes.

The current products and services we consider are: standardize the use of navigation systems such as GOOGLE MAPS, and another as sinister alarm systems (panic button to contact Red Cross, insurance companies, hospitals, etc.). In

technology, science and knowledge is existing technology has for the development of these devices.

MRT 2013 AUTOMOTIVE	TODAY	SHORT TERM
MARKET TRENDS	Safety Belts Air Bags Smart Car Entertainment Saving (Product-Company)	ELECTRIC CARS HIGH EFFICIENCY Proximity Sensor (Distance)-Temperature-Weight ELECTRICAL SENSORS
PRODUCTS AND SERVICES	Standard System Using Google Maps Alarm System Claims	MOBILE DEVICES Charging Station Charging regulators Connectivity Internet Access Routers SOLAR CELL BATTERY Batteries and electric motors EMI Measurement Services
TECHNOLOGY, SCIENCE AND KNOWLEDGE	developed Panic Button Existing Technology	Regulation of electricity service Devices Mov. Programming Software Design Hard, Nanoelectróncia Nanotechnology Sensors, Electrical, Microelectronics Materials Science Zero Jacks (solar panels, electricity generators, braking, Start, constant use Batteries optimization Silicon Technology Chemical Systems, Catalysts Biochemistry Inc Batteries Med Inert Simulators, Meters, RadioFrec. Charge Controllers (Electrical, Electronic, Chemical)
RESOURCES AND ALLIES	Infrastructure Push general services (IT, Communication, etc. ..) state Govt. Canieti ClusterAutomotriz, Local and National IT Cluster, Cluster Robotics Programming Language Google Alliances with other Clusters and Insurance	Conacyt Government Programs, Prosoft CIMAT measuring Materials (Loads and Movement) InfoTEC software development, programming languages Science Teachers Engineers Devices UPBonaterra Mov. Alarm systems, control, sensoreo, charge controllers

AUTOMOTIVE	MEDIUM TERM	LONG TERM
MARKET TRENDS	Smaller vehicles for city use	Smart Car 10 años Smart Street Hydrogen Cell Cars
PRODUCTS AND SERVICES	Gamification Electronic Design Center Automotive NAVIGATION Systems WIFI Entertainment Virtual Reality Accelerometers Position and Speed Control Coordinate Load Capacitors Condensers	Autonomy Vehicle Control Induction Charging Levitation cars
TECHNOLOGY, SCIENCE AND KNOWLEDGE	Mechanical, Physical Sensors Languages, Artificial Intelligence Programs Patents Technology to National Development Reverse Engineering	Study of Hydrogen Cells
RESOURCES AND ALLIES	CEDIAM, AUTO DESIGN, PACKAGING CIATEQ, METROLOGY, MATERIALS UTA Automation, Microcontrollers communication protocols, Mat Development. Doctors and Researchers	Flextronics, Calsomic, Sensata (Supplier Development)

In resources and partnerships proposed boosting overall service infrastructure (IT, communication, etc.). Among the main actors is considered the State Government, and the development of partnerships with other clusters as Robotics, Automotive, IT, Insurance and CANIETI.

The short-term project focuses on the development of electric cars (preferably with 100% domestic content) for this was identified as a trend (driver) for the development of electronic sensors, mobile devices, solar cells and batteries, among others.

The products and services proposed for the development of the electric car are the development of proximity sensors, temperature and weight, constant connectivity through advanced routers, as well as regulation of electricity service by charging stations.

On the subject battery optimization found the following trends to develop: Charge controller, batteries and electric motors, metering services, electromagnetic interference. Removing the plugs and connectors to the electricity grid by optimizing the system through solar panels and power generators related to braking and acceleration.

In the short term within the topic of technology, science and knowledge were detected the following: the use of mobile devices, software programming, hardware design and nano - electronics, chemical systems, silicon technology, catalysts, sensors, nanotechnology, science materials and microelectronics, engineering agrochemical interference measurement, simulators, gauges and radio, charge controllers (electrical, chemical and electronic), promoting the development of domestic technologies.

A proposed short-term partnerships with state, federal and municipal governments to take advantage of support programs (CONACYT, Prosoft, PRODIAT), partnerships with research centers like CIMAT (Studies of materials, measuring loads and movement), InfoTEC (Development software and programming languages), Universidad Panamericana (mobile devices, alarm systems, control, sensors and charge controllers), CEDIAM (automotive design and packaging), CIATEQ (metrology, materials and metalworking), Technological University of Aguascalientes (Automation , micro controllers, communication protocol and development of materials)

The aim would be to create electronic design center of the automotive industry, developing business opportunities with companies (Flextronics, Calsonic, Sensata, Texas Instruments ....) and the development of human capital, strengthening graduate levels.

In the medium term trend is identified as developing navigation systems, entertainment, storage energy capacitors through cargo or trainers, and systems "gamification" for the development of technologies. In the area of products and services needed to develop technologies such as accelerometers, position control systems coordinate speed by implementing reverse engineering systems as well as continuing with the development of mechanical and physical sensors, and languages and artificial intelligence integration with patents to create and encourage national development technology.

Finally, trend that people use smaller vehicles for use in cities. A long-term trend was detected in the development of technologies such as virtual reality, smart car, automotive control autonomy, cars with levitation, and the smart streets, as well as the products and technologies of hydrogen-cell cars and charging systems induction.

Electronic Business Model - Automotive

Different proposals were mainly detected value creation and consolidation of a design and service center focused on the development of automotive electronic devices such as electronic sensors, mobile devices and speed regulators, elevator (electronic-mechanical) gamification (Process Control and conduction), night vision systems, navigation systems, vehicle control, electronic control cards, energy independence, reducing noise, and reduced heat emissions monitoring applications in transportation, speed applications measurement, readers Credit card payments.

Focused the above to an end customer such as: Formers automotive assembler's providers (sensors, installation, maintenance, batteries, regulators), upper middle class youth, state and federal government (Ministry of Defense, Ministry of Economy, CONACYT). Public transports focused forgive with disabilities, cargo transportation, and transportation of military (army).

CANVAS AUTOMOTIVE HM2013

ALLIES

- Chamber of Commerce
- Government
- Universities and Research Centers
- Cluster Electronics
- Cluster Automotive
- Cluster IT

ACTIVITIES MAIN

- Patenting Design
- Testing Destructive Testing Laboratory Devices
- Market Study
- Customer Service (Satisfaction Surveys)
- Public Relations
- Analysis, regulations, standards
- Business Plan

RESOURCES

- Business Platform
- Inv/Ing Nanotechnology Materials Science Electrical Microelectronics
- Grants Resources Investor
- Testing Infrastructure, Laboratories
- Developer Applications

PROPOSAL VALUE

- Center for Design and Services
- Automotive Electronic Devices
- Design of electrical sensors, mobile devices
- Speed regulation
- Electronic Elevators, Mechanical
- Night Vision System, Navigation System
- Vehicle Control (Control Cards)
- Proximity Sensors Speed regulation, Geolocation,Tracing density
- Application for monitoring transport
- Pay Card Reader
- Speed measuring application

CUSTOMER RELATIONS

- Case Studies of Market Segments
- Medium-Low Price
- Social-deductible Pay Zero Accidents

CHANNEL

- DIRECT SALES
- BUSINESS PLATFORM
- OFFICE OF ATTACHMENT

SEGMENTS DE MARKET AND CLIENTS

- Automotive Armadora
- Formers Providers
- Sensors Intaladores Maintenance Batteries, Regulators
- Adults-Young
- Young Upper Middle Class
- Federal and State Government (Sedena,Conacyt)
- Army Transportation Military Use
- Public transport
- Transportation People Different Capabilities

To carry out all necessary strategic alliances with the following organizations: industrial cameras, federal, state and municipal levels, universities and research centers and clusters electronics, automotive, IT and Telecommunications. All these allies made available the following resources such as application developers, research in technical areas of nanotechnology, electronics, materials science and microelectronics, and lab tests to different infrastructure elements all supported by economic resources such as government grants or private investors to establish a business platform that works in all directions.

Ongoing activities: are the design and patent registration, laboratory destructive and nondestructive, customer care (specialized surveys of satisfaction), conducting market research and business plans, strengthen public relations, conducting control analysis and regulation in the sector and finally realization of effective management in the allocation of economic support.

The proposed distribution channels are mainly three: Direct sales, establish a business platform and establish linkage Office (Industry, Government and Universities).

To make business success model we find that the relationship with the client should focus on three points: Creating success stories in different market segments, establish an average price and low maintenance cost in the lower social to o accidents and establish a payment of a reducible.

The costs involved in this business model are: training, staff salaries, software licenses, and prototyping costs and final product testing.

The revenue generated will flow primarily through the following channels: technology development, applications for the sale of advertising, product sales, maintenance services sales, selling patent licenses, training courses, and fees reader through electronic card / magnetic

Robotics Industry - Electronics

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SWOT Analysis

ROBOTICS							
	Opportunities		Threats		Strengths		Weaknesses
O1.	**Research and Technological Development and Innovation in IES and CI**	**A1**	**Bureaucracy, Institutions and dissemination of opportunities**	**F1**	**Ability to develop IT**	**D1**	**'S PY Survey and Investment Risk**
O1.1	Universities require training with real projects. Support the Academy for projects	A1.1	Difficulty and excessive bureaucracy for funds	F1.1	Universities with high level for the sector	D1.1	Capital Investment
O1.2	Specialized training to increase high-value activities that provide conversion of profiles	A1.2	SHCP Rules, Taxes	F1.2	Possibility of postgraduates in the area (MI-DI) ITA	D1.2	Software tool
O1.3	Integrate as an industry cluster or promote research and development in robotics and automation, seeking technological strength	A1.3	Conacyt: Resources, funds	F1.3	There is at least the basic infrastructure	D1.3	Certifications
O1.4	Integrate design electives and / or applications of robotics	A1.4	Institutional bureaucracy	F1.4	Software in development	D1.4	Certifications
O1.5	Promote effective linkages with academia, real scheme involving a continuous gain	A1.5	Recognition of funds and financing bags			D1.5	Updated Software
O1.6	Strengthen partnerships between CPI, companies and universities for use of federal, state and municipal governments in the region promoting knowledge	A1.6	Knowledge of methodology to obtain funds				
O1.7	The industry favors infrastructure of HEIs						
O1.8	Having a cluster with a standard capacity of R & D in the state by HE institutions and research centers						
O2	**Supplier Development, Entrepreneurship**	**A2**	**Linking effective**	**F2**	**Human Resource**	**D2**	**Infrastructure and Linkage**
O2.1	Students to specialize in the field of automation and motivate. Developing as providers or entrepreneurs	A2.1	Lack of awareness in academia	F2.1	Human Resource	D2.1	Infrastructure
O2.2	Automation of the large flow that comes from opening businesses by Nissan 1	A2.2	Lack of infrastructure in HEIs and CIS	F2.2	Linking business students	D2.2	Specialized high-tech infrastructure
		A2.3	As IP distribute And as is done	F2.3	Better human resource	D2.3	Lack Coordination of effective outreach efforts and its rules of operation
		A2.4	The possible not harmonious integration between IES and CIS	F2.4	Fellows highly competent residents		

		A2.5	Diversity of Opinions What is important-Feedback	F2.5	Quite IES & CIS		
		A2.6		F2.6	Diversity Profiling		
O3	**Traceability**	**A3**	**Competitiveness**	**F3**	**Competitiveness**	**D3**	**Monitoring and Consolidation**
O3.1	Product traceability requirement	A3.1	Integration of low quality third disreputable shares	F3.1	3 Brands of companies of industrial robots: Fanuc, etc..	D3.1	Process maturity
		A3.2	Release of the goods must be in a short time by sector dynamics	F3.2	There experienced suppliers in the automation and control area	D3.2	Vision of the future
				F3.3	Innovation, Experience and Flexibility	D3.3	No base technology development
O4	**Automation and control satellites ET**	**A4**	**Competition**	**F4**	**Location and potential markets**	**D4**	**Languages**
O4.1	New residents needing suppliers. Satellite-Service Automation	A4.1	Mexican Companies outsourcing	F4.1	Location	D4.1	Languages
		A4.2	Growth in direct competition	F4.2	There is much local and regional target industry	D4.2	Language
		A4.3	Lack of companies that provide quality services, foreign entry				
O5	**Certification**	**A5**	**Foreign Language**	**F5**	**Public Policy**	**D5**	**Environment**
O5.1	Certifications with Solid Works facilities, Nat Inst, Microsoft 2012 low costs.	A5.1	English	F5.1	Smoothly State strikes, insecurity,,,,	D5.1	State with little water
				F5.2	Public Policy: Support generation installation companies public and private universities, CPI	D5.2	Environment, Natural Resources
O6	**New niches**	**A6**	**Public Policy**			**D6**	**Lack sector broadcasting in your prospects**
G6.1	Dissemination of Robotics and Automation	A6.1	Let all be directed to the automotive sector				
O6.2	Manufacturing industry and research in motorcycle design						
Ø6.3	Process automation in the food industry-Industry Development processes (Agribusiness)						
Ø6.4	The biomedical sector, emerging sectors						

SWOT Matrix Integration

	Opportunities	Threats
Strengths	**O1: F1, F2**	**A1: F3, F1, F5**
	Inventory of Skills and Competencies as to actual demands (Textile, food, automotive)	Competitiveness
	We employ process control, signals, networks, interaction workshops	Ability to develop IT
	An analysis of supply chain (design, manufacturing, distribution ... through an Inter Value Chain	Public Policy
	O2: F3, F5, F4	**A2: F2, F1, F3**
	Competitiveness	Human Resource
	Public Policy	Ability to develop IT
	Location and potential markets	Competitiveness
	O3: F1, F2	**A3: F3, F5**
	Ability to develop IT	Competitiveness
	Human Resource	Public Policy
		A4: F2, F4
		Human Resource
		Location and potential markets
		A5: F1, F2, F3
		Ability to develop IT
		Human Resource
		Competitiveness
		A6: F3, F5
		Competitiveness
		Public Policy
Weaknesses	**O1: D1, D2**	**A1: D2, D3**
	Offer and support programs	Infrastructure and Linkage
		Monitoring and Consolidation
	O2: D4, D6	**A2: D2, D3**
	English	Infrastructure and Linkage
	Japanese	Monitoring and Consolidation
	International Language Institute	
	Product catalogs	
	Mexico First	
	O3: D3	**A3: D1, D2, D3, D4, D6**
	Augmented Reality	'S PY Survey and Investment Risk
		Infrastructure and Linkage
		Monitoring and Consolidation
		Languages
		Lack sector broadcasting in your prospects
		A4: D2, D3, D4
		Infrastructure and Linkage
		Monitoring and Consolidation
		Languages
		A5: D4
		Languages
		A6: D1, D6
		'S PY Survey and Investment Risk
		Lack sector broadcasting in your prospects

Technology Road Maps

In the short term the market requires quality products and services at a competitive cost and shortest delivery time, for this it is necessary to improve the management of the processes associated with the value chain. So we should establish in the short term, improved processes through the implementation of control and automation systems efficient. Systems such as Data Acquisition and

Supervisory Control (SCADA) improve productivity, with that quality through process traceability. This will create a reduction of time in which products and services are brought to market.

MRT 2013 ROBOTICS	TODAY	SHORT TERM
MARKET TRENDS		New Industries Production Lines Information Management strategic Alliances
PRODUCTS AND SERVICES	Applications in Security, working in high-risk Training and Education Automation Equipment (Auto Control) "Improving Productivity Traceability processes for product history	Process Improvement Automation and Control Consulting, specializing in process improvement Security in the Cloud System Integrators (Sensors, Transducers, Controllers, Actuators, Communications) SCADA Packages cloud service
TECHNOLOGY, SCIENCE AND KNOWLEDGE	Strengthen math instruction Automatic Inspection for process quality Applying Mathematics to control software Cost Reduction Approach-Instrumentation and Process Control-Monitoria-Data for decision making Monitoring and control of water consumption	Knowledge Management Cloud Herramientas de trabajo colaborativo y Generación de Conocimiento Increased tendency to reduce dimensions of technological devices Affordable Dedicated Internet Services Statistical Process Control (Control Data)
RESOURCES AND ALLIES	Strategic alliances Identifiers GOVERNMENT INDUSTRIAL UNIVERSITY Alliances Energy: Diversification of sources, optimization of use, increased consumption, increased heat generation, carbon footprint Teamwork: Mathematical Comp Application Changes for process improvem ent	UNIVERSITIES CIMAT CIO CIDE CIATEQ INVESTAV Fundraising Training Develop courses for funds Fostering Business-University participation Applied Basic Research Centers Carlos Slim Foundation, World Bank, IMF, IDB Information Visualization with mathematical models

ROBOTICS	MEDIUM TERM	LONG TERM
MARKET TRENDS	Take advantage of alternative energy; Need for production and cost; Strengthening Integration supply; Integrators development in the region; Using new energy; Need to reduce variation; Development of a testing laboratory to achieve certification; social Responsibility; Intelligent Monitoring System	
PRODUCTS AND SERVICES	Sensor devices for data transmission; Develop Internet Connected Devices (Sensors Monitors, Phones, Actuators); Growing Interest in process automation; Government Management; More efficient self-sustaining systems; process development with high quality; Mexican laboratory highly recognized certification	Intelligent Self Improvement
TECHNOLOGY, SCIENCE AND KNOWLEDGE	Development of patents and Intellectual Property Registration; Special Materials (Design and Manufacturing); Agrosocial Energy Industry; Information Economics (Higher amount of information); Computing Applications in the Cloud; Cimat Research Centers, Cio, CIATEQ, Cinvestav, Infotec; Connectivity, Collaborative work, Environments to strengthen knowledge creation	Nanotechnology Intelligent Systems, Information Registry in real time, facilitate decision making
RESOURCES AND ALLIES	Partnerships between governments at Global; UL quality; Open Innovation Development: Funds SE, Nafin, CONACYT, State, Private; Funding and Regulation; Government Support Industry Alliance Gob; Building Improvement Fund and the Market Agreement; Develop highly skilled in providing legal	

For the implementation of these solutions is necessary to support the development of scientific and technological knowledge to allow its application in solving the problems mentioned, we must carry out the development of mathematical models, statistical process control, software development, instrumentation for measurement and control.

The management of scientific and technological knowledge necessary to establish strategic alliances between universities (UUA, ITA, UP, UPA ...) applied research centers both scientific and technological (CIATEQ, CIO, CIMAT, InfoTEC) industry and the government, counting with the support of international organizations such as the World Bank, Inter-American Development Bank, among others, through strong bonding schemes.

In the medium and long term trend will be a more efficient use of our natural resources and environmental protection. This raises the need to develop alternative sources of clean energy such as wind, solar, geothermal, tidal, which require the efficient development of systems for the generation, storage, distribution.

This will require the development of new technologies for their efficient generation, the development of new special materials capable of being patented registered me as intellectual property. For this it is necessary to develop highly qualified human capital to develop scientific knowledge, technological applications in research centers both public and private.

This is essential to the development in the field of nanotechnology, materials development, information systems integration through collaborative work teams create environments that allow for the development and strengthening of knowledge creation. Similarly are necessary strategic alliances and collaboration between research centers, universities, industry and the three levels of government (Federal, State and Municipal). Access to funds provided by international tender will be required to give the economic viability of projects in the short and medium term.

Robotics CANVAS Business Model

The robotics group proposals developed around five areas: general industry, automotive industry and its satellites in the state, health, home, and water quality.

An analysis of priority, feasibility and business rapid conversion to indicated that an integrated project for manufacturing enterprises of the industrial and automotive industry in general could be a viable development alternative short term. In that sense, it was thought in the development of an innovative system in which services are offered to support companies in their manufacturing processes.

The value proposition is that SMEs and other larger companies that use automated manufacturing systems with vision requirements, bands, programmable logic controllers, etc.., They design, install and maintain, manufacturing lines-a different levels-with minimal cost. For example, a company that already has a conveyor belt system, but that lacks control panels, PLCs, computers, etc.., May be subject to support from the design of what is needed to installation and maintenance, paying only a monthly rent for the equipment.

This will avoid large investments including engineering and design and purchase of equipment. The advantages are obtained, and are, for example, will not have to recruit Service Engineers, will have teams according to your demand, the latest technology, or at least the required-will not require to wait for long periods and requirements to fund their lines, among other things. SMEs may be doubly benefited as to support them, if your product is successful, you will be dealing with option to buy.

The channels used to publicize and promote this service would be the use of mass media (magazines, newspapers, radio, TV, Industrial Cameras, Industrial Clusters, social networks, industrial expos). Retail channels used would be the use of smart phones, Web Pages on the service as well as direct contact with the customer through sales representatives. Another way to bring the service will be through contacts between target companies and universities, the latter to be part of this initiative. Industrial Directories held by CONACYT, which reflect who they are and where they are potential customers; can be used to present this proposal to companies.

The relationship with customers is through equipment rental, personalized counseling, support in the development of their projects, etc.. We'll also contact through discussion forums and online communities or social networks. Finally, there will be measuring customer satisfaction to improve ourselves and improve their processes.

CANVAS ROBOTICS HM2013

ALLIES

- Supplier
- Convention Secretariat Delete Asset Economy
- Allen Bradley, Festo,Omron,Fanuc,National Insturments,Cognex,Sensure
- Senso Dir Study Merc. Data Access
- Universities Conalep
- Investment Company Funds Gob Inverse. Private

ACTIVITIES MAIN

- Design Construction Installation
- Detect Computer Offers, Demands force ...
- Monitor opportunities, trend
- Cloud of Information
- PROTECT Patent
- Conventions, web development, distribution network service platform

RESOURCES

- Computing, Information, Applications
- Cheap Equipment
- Experts and high-tech equipment
- Business Analysts

PROPOSAL VALUE

- The best team Current Need
- 0% Financing
- Free Maintenance and Depreciation
- Size reduction equipment
- Free to SMEs (maintenance)
- Energy Efficiency
- Operating Efficiency

CUSTOMER RELATIONS

- Rent Equipment
- Staff AesoríaAccompaniment, Virtual: Chats and Forums, Sales Communicators
- Customer Satisfaction Measurement

CHANNEL

- Cluster
- Expos and Fairs
- Government Conacyt
- Universities TICS Live / Door
- Distributors
- Marketing

SEGMENTS DE MARKET AND CLIENTS

- Automotive
- NISSAN JATCO Yoshihar u
- Monitoring Smart Phone
- SMEs UNIVERSITY GRANT
- HEALTH
- FOOD
- INDUSTRIAL
- CAASA / CAPAMA
- HOME

COST $

- Training and specialized training
- Technological Renovation
- High technology
- Base Equipment

INCOME $

- Federal Resources
- Patent
- Monthly rent
- Maintenance
- $ Sales

The income or financial inputs will be represented by their own income to be received from customers for basic services, plus extra for maintenance. On the other hand, you can anchor this initiative through federal resources through its various application CONACYT economic developments. Finally, the development of patentable products lead to the patenting may eventually generate resources for this project.

The resources needed to carry out this business are highly trained, internet, telephony, equipment and computer systems, information as input (environment, industry needs, prospecting, etc..), Industrial equipment such as PLCs, displays touch (HMI), among others.

The key to this business activities are: design, construction and installation; detecting offers new or used equipment, economic analysis, valuation techniques and trading, monitor opportunities and market trend, urgent demands detection of potential customers, access to cloud information management, web development, distribution network and service platform. Last, but not limited to, generate, protect intellectual property and patenting.

The strategic partners are divided into three: transnational and local companies that will provide the equipment that will be sub-leased to our customers arises to develop agreements with those in a way that would present their technologies and eventually make purchase of equipment and in this segment we find Allen Bradley, Festo, Omron, Fanuc, National Instruments, Cognex, and other special sensors covering companies, Institutions of Higher Education and Technical, since students may bring in technical stays, nursing or professional practice attack customer problems, effectively developing and engineering design work at low cost to the customer, funding institutions and investors to strengthen the finances of both our potential customers as our own.

The cost structure is divided into training and specialized training, high technology, technological renovation and equipment base. In addition to the current cost of any companies to: electricity, staff salaries, stationery and office supplies, etc..

SCENARIOS AND PERSPECTIVES

Highlights

- Transit to production schemes of a "large mixture, low volume". This scheme consists on produce different kind of products in a low and medium volume, in contrast with mass production of the same kind of product.

- Take advantage of the minimum response time compared with Asia. Mexico's geographic proximity to the USA, offers advantages to work under a flexible production scheme.

- Focus on high volume products: exporting from Asia high volume goods represents several costs, for example: large dimension TV's.

- A good integration of the activities from the value chain and/or a scaling thru the activities with high frequency use of knowledge.

Scenarios and Perspectives

7.1 Scenarios Electronics Sector and Challenges

The integration of global value chains has allowed companies to reorient and inserted into chain links that generate greater value added. Also, the increasing international competition, particularly in the Asian region, has also led to the electronics industry change its strategy to strengthen its competitiveness. In this sense, there are several strategies that explain the growth of the industry in recent years:

First strategy:

Transition to production schemes "high mix, low volume". This scheme is to produce various types of products in low to medium volume, in contrast to mass production of the same product type. The manufacture of one million units of the same type of mobile phone is an example of a production scheme "high volume, low mix", while manufacturing of several dozen models of servers configured according to specific customer needs, a production volume of several hundred, is an example of "high mix low-volume".

Second strategy:

Take advantage of lower response time compared to Asia. The geographical proximity of Mexico to U.S., offers advantages to operate under a system of flexible production, as companies established in Mexico are able to respond quickly and deliver new orders to changing customer preferences or changes in demand estimation.

Third strategy:

Focus on products with high physical volume: goods exported from Asia large physical volume represents a high cost, for example, larger TVs. Geographical proximity provides important benefits to companies located in Mexico to assemble or manufacture goods in large volume.

Fourth strategy:

Further integration of the activities of the value chain and / or scaling to more intensive activities of knowledge, as mentioned above. On the one hand, reduced margins in manufacturing and development capabilities have led to major companies in the electronics industry to logistics activities, including distribution of

production. Moreover, the gradual development of technological capabilities has enabled a number of companies, even small; participate in design and research and development.

In short, Mexico has the presence of many of the large transnational electronic products and components. The presence of the CM has been an important source of knowledge transfer, which has strengthened some of the manufacturing capabilities of the local industry. Nevertheless, most of the CM installed in Mexico is concentrated in the assembly and manufacturing links. The unbundling of production has promoted the transition or incursion of some companies in higher value-added activities and the emergence of design houses. These are certainly remarkable achievements, but the number of successful cases is still limited. This requires a set of strategies by both industry and government, to take advantage of the opportunities offered by the transformation of the electronics industry worldwide.

Also, as noted by the Study Monograph: Electronic Industry in Mexico prepared by the Directorate General of Heavy Industries and High Technology of the Ministry of Economy, since the Mexican industry is immersed in global value chains, it is essential to recognize the following international trends to identify areas of opportunity to drive their uptake by local industry:

1. Growing importance of global networks.

International production sharing in design activities and product development are conducted by companies not conducting physical production, plus there is a vertical specialization of research and development, complex systems into modules is done by specialized firms.

2. Product cycles becoming shorter

There is a growing trend towards reduced product cycles, a situation that is relevant to Mexico, because the product cycle can be divided into three general stages: entry, maturation and standardization, making it possible to geographically separate the various links in the chain value, and the different phases of the product cycle.

3. Modification of the involvement of different regions of the world in exports and global market

Countries that had traditionally been the lead in electronics production have drastically reduced their global market share, reduced their share in recent years. The decision to move manufacturing and assembly plants to third countries was

reflected in a decline in exports from the United States, Japan and Europe were reduced.

4. New sub-sectors and niches with high growth

The demand for electronic components will grow strongly as a result of the use of electronic technologies in a large number of consumer and industrial products, such as motor vehicles, consumer electronics, aerospace and optical communication, so this sub-sector will be the fastest growing the coming years. It is also noted that the sophistication and technological convergence devices like audio players and recorders, and video cameras, digital televisions and mobile phones, will cause it to multiply the use of microprocessors.

5. Proliferation of strategic alliances

Faced with an increasingly competitive market and in which technology moves at high speeds, the companies in the electronics industry together with competitors, share specialized knowledge and resources to develop their expansion strategies and technological development.

6. Strong and constant pressures to cut costs

The various electronics industries are markets in which there is a relatively low product differentiation. As a result, it is highly competed markets where price, innovation, quality and delivery are central. Strong competition coupled with rapid technological change requires companies continuously reduce costs.

One of the areas of opportunity to reduce costs must be through technology processes and products. Reducing costs and continually reduce capacity is achieved by using modern production (lean manufacturing, six sigma, right on time, continuous improvement, etc.) and innovation in product technology (new materials, designs lower Size - nanoelectronics, more power and functionality of components, etc..).

7. Fast response speed

The need for a rapid response, which is derived from the short product life cycle and strong competition, is confronted by large companies through a variety of strategies. The most common are: locate plants in low-cost consumer market close, as is the case of Mexico (for the NAFTA area), East Asia and China (for Japan and Korea) and Eastern Europe (for the European market).

Furthermore, to improve the administration of the value chain, both to accelerate the input supply and the distribution of final products, and improve

product technological capabilities that allow them to react with new designs or incremental improvements to existing ones in brief periods.

8. Changing technology-push to demand-pull

The model of the electronics industry has changed dramatically, being driven by technological changes to be reactive to demand. Each application of electronic products has its own specific propellant (consumer demand, investment cycles, infrastructure development, social needs, etc..), But a general feature is that the evolution of this industry no longer relies on some stimulus apparently randomly from a technological development that completely replaces the previous, but a more dynamic trend in the introduction of new products in all areas of application.

9. Small local companies assemble products cease to be High Tech

The market availability and lower component prices, which stems from the rapid evolution of technological advances, has meant that in less developed countries SMEs operate local assemblers. These teams produce their own brands or under contract nonproprietary technology companies in niches that are no longer of interest to the leaders but still have demand from consumers without financial capacity to purchase the latest equipment.

POLICIES, INSTRUMENTS AND DEVELOPING PROGRAMS

Policies, Instruments and Developing Programs

8.1 Proposed Agenda for the Development of Public Policy for Electronics Sector

Structural measures for the development of electronics industry are based on the implementation of a systemic competitiveness policy, coordinated by the Federal Government. The approach leaves behind the notion that industry competitiveness arises only from business strategies or to provide a stable macroeconomic environment, and replaced by an approach which considers that competitiveness is a product of the dynamic interaction permanent and integrating different levels of economic, political and social, and require coordinated action between governments at different orders, universities, trade unions, civil groups and society.

This will certainly help to small and medium electronics firms in the increasing returns achieved industrial added, external economies firms but internal to the production cluster. Since this is precisely the external economies, is essential to improve this context, which requires the coordinated involvement of federal, state, regional and municipal levels, as well as entrepreneurs themselves.

That is why the proposal is to correct market failures through decisive intervention of the State in industrial, in conjunction with a supporting culture that promotes partnerships between employers in the industry, and the promotion of more and better linkage between the different actors involved in the production and marketing process.

In this context, coordination of public policies and critical because it allows a more efficient application of available resources and promote joint development of micro, small and medium enterprises. This requires proper coordination, which is an agreement by which the activities of the various federal agencies and levels of government are executed in a structured manner to achieve a common goal, improving efficiency in the use of available resources to reduce duplication, promote complementarities and share expenses.

Thus, the performance of development banks and the various ministries and agencies of the Federal Government (mainly the direct impact, such as the Ministry of Economy, ProMéxico, NAFIN, CONACYT, etc..), In conjunction with state governments and municipal, must be coordinated to solve more efficiently the market imperfections that inhibit electronic business competitiveness. The

coordination of this kind is more relevant in contexts characterized by shortages in government budgetary resources, as is the case of Mexico. However, it should be recognized that in many cases the coordination is extremely difficult to achieve, due to lack of incentives and the risk that some participants take advantage of the collective resources without contributing themselves.

8.2 Impact Measurement Strategies

The present section shows the impact analysis of the proposed strategies, evaluating their complexity of implementation and impact to identify their priority of execution. To do this classification we used a 4 impact matrix quadrants.

DIAL	CLASSIFICATION	ACTION
I	Low Complexity and High Impact	Run
II	High Complexity and High Impact	Run
III	High Complexity and Low Impact	Avoid
IV	Low Complexity and Low Impact	Avoid

The following table expresses the impact measurement strategies and lines of action proposed, those established in the quadrant of low complexity and high impact are those that must be executed in a period not exceeding one year (short term) lines graded action in the quadrant of high complexity and high impact should be run over a period of one to three years, since its implementation requires having structural bases that enable sustainable development of the electronics industry in the state of Aguascalientes.

Box. Impact Measurement Strategies
(Percentages)

Strategy	Action Line	Quadrant
1.1 Design and national integration product	1.1.1 Creating a Project Management Office	I
	1.1.2 Acquisition of technological infrastructure	II
	1.1.3 Access to trade finance	II
	1.1.4 Development of innovative projects	II
	1.1.5 Registration of patents and trademarks	II
1.2 Incorporation of international networks	1.2.1 Business Networking Platform	I
	1.2.2 Export Promotion	II
	1.2.3 Marketing Channels	II
	1.2.4 Efficiency in the use of English	I
1.3 Strategic Plan for attracting FDI	1.3.1 Simplification of Procedures	II
	1.3.2 Creating design centers in specialty niches	II
	1.3.3 Study of state investment costs	I
1.4 International Business Certification	1.4.1 Certification and environmental quality models	I

	1.4.2 Creating a Center for Technology Standards	II
1.5 Management of specialized talent	1.5.1 Training and human resource certification	I
	1.5.2 Development of management skills	I
	1.5.3 Improve links with academia and research centers	I
1.6 Develop local specialty niches	1.6.1 Creation of Electronic Design Center for Automotive Sector	II
	1.6.2. Project Development of a Marketing Channel High Value Food Nutrition (SMART).	II
	1.6.3 Development Project Manufacturing Process Services (Electronics - Robotics)	II
	1.6.4 Nanotechnology	II
	1.6.5 Aerospace / Aeronautical	II
1.7 Development of suppliers	1.7.1 Vertical Integration: Global Value Chains	II
	1.7.2 Horizontal integration: associations and strategic alliances	II

8.3 Linking Strategies to Support Programs

In this section we present the federal support programs for the development of the proposed strategies for promoting the Electronics Industry in the state of Aguascalientes, under a comprehensive and systemic, as only in this way will enhance the sector steadily .

Strategy	Action Line	Impact	Program
1.1 Design and national integration product	1.1.1 Creating a Project Management Office	I	PRODIAT
	1.1.2 Acquisition of technological infrastructure	II	CONACYT
	1.1.3 Access to trade finance	II	Commercial and development banking
	1.1.4 Development of innovative projects	II	CONACYT
	1.1.5 Registration of patents and trademarks	II	InfoTEC
1.2 Incorporation of international networks	1.2.1 Business Networking Platform	I	PRODIAT
	1.2.2 Export Promotion	II	ProMéxico
	1.2.3 Marketing Channels	II	ProMéxico
	1.2.4 Efficiency in the use of English	I	Ministry of Economy
1.3 Strategic Plan for attracting FDI	1.3.1 Simplification of Procedures	II	ProMéxico
	1.3.2 Creating design centers in specialty niches	I - II	CONACYT
	1.3.3 Study of state investment costs	I	PRODIAT
1.4 International Business Certification	1.4.1 Certification and environmental quality models	I	PRODIAT
	1.4.2 Creating a Center for Technology Standards	II	CONACYT
1.5 Management of specialized talent	1.5.1 Training and human resource certification	I	Ministry of Economy
	1.5.2 Development of management skills	I	PRODIAT
	1.5.3 Improve links with academia and research centers	I	CONACYT - IE - IC
1.6 Develop local specialty niches	1.6.1 Creation of Electronic Design	I	CONACYT

	Center for Automotive Sector		
	1.6.2. Project Development of a Marketing Channel High Value Food Nutrition (SMART).	I	CONACYT
	1.6.3 Development Project Manufacturing Process Services (Electronics - Robotics)	I	CONACYT
	1.6.4 Design Center nanoelectronics	II	CONACYT
	1.6.5 Electronic Design Center Aerospace / Aeronautical	II	CONACYT
1.7 Development of suppliers	1.7.1 Vertical Integration: Global Value Chains	II	PRODIAT
	1.7.2 Horizontal integration: associations and strategic alliances	II	PRODIAT

QUANTITATIVE GOALS

Highlights

- In order to estimate the investments needed for development of the electronics industry in the state of Aguascalientes, the budget requirements in order to implement strategies and action lines proposed in the previous section.

- In the short term (1 year) there's a proposal about the implementation of 10 projects for a total amount of $15.4 million pesos, with a contribution of $9.1 million pesos from the Federal Government, through selected programs, $1.9 million State Government and $4.3 million private sector. In the medium term (1 to 3 years) proposes the implementation of 10 projects with a total of $23.8 million dollars, $16.3 million Federal Government State Government $1.6 million and $6.3 million private initiative.

Quantitative Goals

9.1 Investment and Indicators for Sector Development

In order to estimate the investments needed for the development of the electronics industry in the state of Aguascalientes, we calculated the budget requirements for the implementation of strategies and lines of action proposed in the previous section.

Importantly, this quantification of investments to strengthen the capacities of the sector and the companies were made on the basis of average cost estimate for the project implementation, as well as assumptions on the mixture of contributions from the federal, state and private, so that the proposed amounts may vary depending on the characteristics of each of the projects, however it is always useful to conduct an exercise to estimate the economic effort to achieve goals.

Additionally, it should be stressed that these investments must be made under a comprehensive and systemic scheme, considering that corresponds not only to support the public sector, but also private investment necessary for the promotion of local electronics industry.

		Contributions			
Term	Projects	Federal	State	Industry	Total
Short Term	10	9.1	1.9	4.3	15.4
Medium Term	10	16.3	1.6	6.3	23.8
Totals	20	25.4	3.5	10.6	39.2
Percentage		65%	9%	27%	100%

In the short term (1 year) proposes the implementation of 10 projects for a total amount of 15.4 million pesos, with a contribution of 9.1 million pesos from the Federal Government, through the selected programs, 1.9 million State Government and 4.3 million private sector. In the medium term (1 to 3 years) proposes the implementation of 10 projects with a total of 23.8 million dollars, 16.3 million Federal Government State Government 1.6 million and 6.3 million private initiative.

Strategy	Action Line	Type	Impact	Scope	Resource estimate					Program
				Companies benefit	Federal	State	Industry	Total	Unit Price	
1.1 Design and national integration product	1.1.1 Creating a Project Management Office	By project	I	20	750,000	375,000	375,000	1,500,000	18,750	PRODIAT
	1.1.2 Acquisition of technological infrastructure	By company	II							CONACYT
	1.1.3 Access to trade finance	By company	II	-	-	-	-	-		Commercial and development banking
	1.1.4 Development of innovative projects	By company	II	5	7,500,000		2,500,000	10,000,000	500,000	CONACYT
	1.1.5 Registration of patents and trademarks	By patent	II	10	450,000		450,000	900,000	45,000	InfoTEC
1.2 Incorporation of international networks	1.2.1 Business Networking Platform	By project	I	20	750,000	375,000	375,000	1,500,000	18,750	PRODIAT
	1.2.2 Export Promotion	By company	II	5	750,000	375,000	375,000	1,500,000	75,000	ProMéxico
	1.2.3 Marketing Channels	By company	II	5	750,000	375,000	375,000	1,500,000	75,000	ProMéxico
	1.2.4 Efficiency in the use of English	Per person	I	50	187,500	187,500	375,000	750,000	7,500	Ministry of Economy
1.3 Strategic Plan for attracting FDI	1.3.1 Simplification of Procedures	By project	II	20	112,500	112,500	225,000	450,000	11,250	ProMéxico
	1.3.2 Creating design centers in specialty niches	By project	II							CONACYT
	1.3.3 Study of state investment costs	By Project	I	20	750,000	375,000	375,000	1,500,000	18,750	PRODIAT
1.4 International Business Certification	1.4.1 Certification and environmental quality models	By company	I	10	225,000	112,500	112,500	450,000	11,250	PRODIAT
	1.4.2 Creating a Center for Technology Standards	By project	II	20	1,125,000		375,000	1,500,000	18,750	CONACYT
1.5 Management of specialized talent	1.5.1 Training and human resource certification	Per person	I	50	312,500	312,500	625,000	1,250,000	12,500	Ministry of Economy
	1.5.2 Development of management skills	By project	I	10	500,000	250,000	250,000	1,000,000	25,000	PRODIAT
	1.5.3 Improve links with	By project	I	20	-					CONACYT

	academia and research centers					-	-	-	-	
1.6 Develop local specialty niches	1.6.1 Creation of Electronic Design Center for Automotive Sector	By project	II	1	1,875,000		625,000	2,500,000	625,000	CONACYT
	1.6.2. Project Development of a Marketing Channel High Value Food Nutrition (SMART).	By project	I	1	1,875,000		625,000	2,500,000	625,000	CONACYT
	1.6.3 Development Project Manufacturing Process Services (Electronics - Robotics)	By project	II	1	1,875,000		625,000	2,500,000	625,000	CONACYT
	1.6.4 Design Center nanoelectronics	By project	I	1	1,875,000		625,000	2,500,000	625,000	CONACYT
	1.6.5 Electronic Design Center Aerospace / Aeronautical	By project	II	1	1,875,000		625,000	2,500,000	625,000	CONACYT
1.7 Development of suppliers	1.7.1 Vertical Integration: Global Value Chains	By project	II	10	750,000	375,000	375,000	1,500,000	37,500	PRODIAT
	1.7.2 Horizontal integration: associations and strategic alliances	By project	II	10	1,125,000	375,000	375,000	1,500,000	37,500	PRODIAT

QUALITATIVE GOALS

Qualitative Goals

10.1 Targets Qualitative Time Scenarios

Short-term (2013 - 2014)

- It has strategies to provide training programs for human capital and research and technological development,
- It initiates the development of niche specialization in agribusiness, electronics - automotive and robotics.
- Increased spending for research and technological development, leveraged with federal funds.
- Increased patent filing associated with the implementation of R & D.
- Capabilities are promoted Aguascalientes companies in international markets.

Medium-term

- 10 of the industry's leading companies have alliances design, engineering and / or advanced manufacturing with international companies
- They make investments in innovation projects.
- Industry, academia and schools develop joint projects.
- It consolidates the local industry leader in the implementation of quality and environmental models.
- It strengthens the integration of different sectors of the electronics through a research network.
- There is a talent management system specialized for electronics sector, which integrates academia and research centers with industry.
- It has micro - clusters specialization in niche interest of foreign companies, internationally recognized for its innovation and advanced manufacturing.
- The increase in exports and supplier development program generation materialize five thousand new jobs (better paid than the high national average).

Long term

- Local industry designs, develops and manufactures advanced in Aguascalientes, with a high percentage of local integration and use of local technologies.

Conclusions

The economic liberalization of the early 199s Mexico attracted important investments by leading OEMs and CMs in the electronics industry worldwide. That investment grew significantly in the second half of the decade, with the signing of NAFTA and the growth of local and global demand for electronic products. In this sense, global value chains have promoted the dissemination of technological knowledge to Mexico, providing new opportunities for skills training in companies located mainly in the north, west and center of the country, enabling the development of specific products for the markets international as well as open up new areas of opportunity beyond the assembly and manufacture.

Nevertheless, the changes in the international electronics industry have not changed substantially the reasons and nature of foreign direct investment reaching the state of Aguascalientes, inserting it as a major producer, especially for the U.S. market in terms of efficiency costs, accounting for the vast majority of industry links in manufacturing, assembly and sub - assembly, design activities being reduced and still heavily dependent on imported electronic components.

In this sense, the state of Aguascalientes serious challenges to better exploit the benefits offered by the integration of the electronics industry at the international level: i) the transition activities within the production chain, with more added value and content technological ii) strengthening productive chains with the rest of the local economy, increase local production of parts and components, and iii) the increased linkages between member companies, especially local companies with universities CM and local research centers.

The state government plays a central role through the design and implementation of integrated capacity building of local companies and attracting foreign investment. However, it is important to highlight their participation in the improvement of infrastructure, logistics and procedures and public services are essential for those integrated policies to have a greater effect and to promote export competitiveness.

An important element is to strengthen the technological capabilities of the state of Aguascalientes, through human capital formation and investment in research and development. The training of professionals with high levels of expertise is essential to participate in links in the value chain of more intensive use of knowledge and offer greater opportunities to create value. Local Capacity development would enter a virtuous circle in which impel and attract more complex activities, such as research and development and design, that transfer new knowledge to the local economy.

Similarly, strengthening links between industry companies, universities and local research centers, increase the dissemination of knowledge in the local economy and strengthen its ability to provide high quality and added value. However, policies to strengthen technological capabilities have their limitations, especially in an industry with rapid technological change, so that the activities of manufacturing and research and development proposed should be executed with a systematic and determined to start technological frontier activities, and change current trends.

Another element is integrated policies to attract selected businesses, putting special emphasis on attracting businesses, projects and activities that have greater potential to influence the state's economy. Finally, in the absence of productive chains and high entry barriers to supply components and intermediate goods to global value chains, there is the opportunity to support developing and emerging industries, particularly in design activities, engineering, testing, research and development, logistics, among others. In this context it is essential to develop strategies and action plans as well as identifying other competitive capabilities in the sector, to implement policies that allow the development of local electronics industry worldwide.

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