



**UNIVERSIDAD POPULAR AUTÓNOMA DEL ESTADO DE  
PUEBLA**

**CENTRO INTERDISCIPLINARIO DE POSGRADOS**

**INVESTIGACIÓN Y CONSULTORÍA**

**DEPARTAMENTO DE NEGOCIOS E INGENIERÍAS**

**MAESTRÍA EN DIRECCIÓN DE ORGANIZACIONES**

**Análisis competitivo Cluster de Tecnologías de información en el Estado de Tlaxcala  
basado en el diamante de competitividad de Porter**

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**Maestro en Dirección de Organizaciones**

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Por este medio nos permitimos informar a Uds. la aprobación de la Tesina:

**Análisis económico, social, organizacional y competitivo para el Cluster de  
Tecnologías de información en el Estado de Tlaxcala basado en el diamante de  
competitividad de Porter**

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## **Abstract**

Tlaxcala's Information Technology Cluster has had a gradual development, that is why it became important to study this cluster it is a detonator of the economy in this part of the country. The state of Tlaxcala is located within the Transversal Volcanic Axis and its neighbors are Puebla that surrounds it to the north, the south and the east; to the west it limits with the State of Mexico and to the northwest with Hidalgo. Due to its location, Tlaxcala has a temperate climate with some rains during the summer. In spite of being one of the smallest states, in terms of extension, of the Mexican Republic; it has diverse economic sectors in which the textile industry, the porcelain industry, the agricultural industry and, of course, the tourist industry stand out. The competitiveness analysis of the IT Cluster in Tlaxcala was based on Michael Porter's methodology, thanks to this study is possible to understand the reason of the existence of the cluster and its development. One of the greatest competitive advantages that the cluster has is the great infrastructure and fast communications that Tlaxcala's neighbors have, however, training of the future collaborators is deficient, and the majority of the inhabitants have to migrate to Puebla in order to be trained in IT. There is also a great difficulty in terms of competitiveness, since all IT companies in the state of Tlaxcala joined to form a single cluster, which is why they end up being their own suppliers, the dependence on the automotive cluster of the city of Puebla is very big. For its development this agglomerate receives government aid, in order to be able to grow and be a referent in the economy of the state.

## Introduction

The Information and Communication Technology Industry ICT has been a major performer in the changes the world has experienced since the second half of XX century. At the same time ICT industry has become an engine to economic growth and it also has started a revolution aimed to transform the way all human beings perform their daily activities, do business, entertain themselves and connect with each other.

Progress in science has busted this revolution and taking it to a next level in a shorter period. Transformation and changes in technology are in continuous acceleration, hence, ICT industry is one of the most dynamics in global economy, growing even faster than average economy. According to the Instituto Mexicano para la Competitividad, between 2000 and 2010, global IT industry has being growing at 5.7% annually, in comparison to 4% global economic growth.

This growth can be explained as information technology has been integrated in majority of value chains in different industries and sectors (automotive, agriculture, customer service, retailing, tourism, government services, news media, transportation and logistics, and so on). This is the main explanation about importance of ITC industry for a country's economy in general. ICT is an industry with the capacity to create added value through a significant amount of investment in research and development, as all solutions this industry provides required a high level of innovation to respond to competition and quick changes pushed by the demand of more alternatives to control information, have communication with customer and suppliers in real time, analyze financial information or control inventories.

In a 2014 publication, IMCO is highlighting seven trends in ICT industry with a huge impact in business and life in general: electronic commerce, electronic money, “cloud” use and storage, social media, mobile applications, business analytics and mobile devices development.

Investment in R&D in the first decade of XXI century in global ICT industry has represented 15% of incomes, in comparison to 8% in automotive industry or 9% in aerospace industry.

In Mexico, ICT industry has also have a relevant contribution in economic transformation and growth. Between 2000 and 2010, contribution of ICT sector in GDP has moved from 3.2% to 5.6%, representing a 75% growth in ten years. Even when Mexico has a great potential in ICT, there are improvement areas to make this industry more dynamic and competitive, mainly in the promotion of new start-ups linked to entrepreneurship.

In Mexico, software and consumers has been the two most dynamic fields in ICT sector. Software industry has grown 226% in real terms between 2003 and 2011. Consumers had a growth of 176% in the same period.

Added value and growth in this industry has represented also an opportunity to create better quality jobs with higher wages level. In its study regarding ICT entrepreneurship in Mexico, IMCO stated that average annual wage in software industry is \$118,000 Mexican pesos in comparison to \$113,000 pesos in automotive industry.

Another key point related to ICT industry in Mexico is productivity increase. IMCO has pointed that productivity per worker in ICT sector is 80% higher than in the rest of economy.

There are successes in ICT growth in Mexico. Jalisco, Nuevo León, Baja California and Mexico City are the main software and IT services areas in the country. Guadalajara has been named “Mexican Silicon Valley” due to the amount of ICT manufacture and developed software.

In the other hand, the main challenge is to increase value added of ICT sector compared with other countries. According to Organization for Economic Cooperation and

Development (OECD) data, value added of ICT sector in 2013 as a percentage of total added value at current prices was 2.77% in Mexico, in comparison to 5.5% OECD countries average, and far away from Korea with 10.7% (Figure 1).

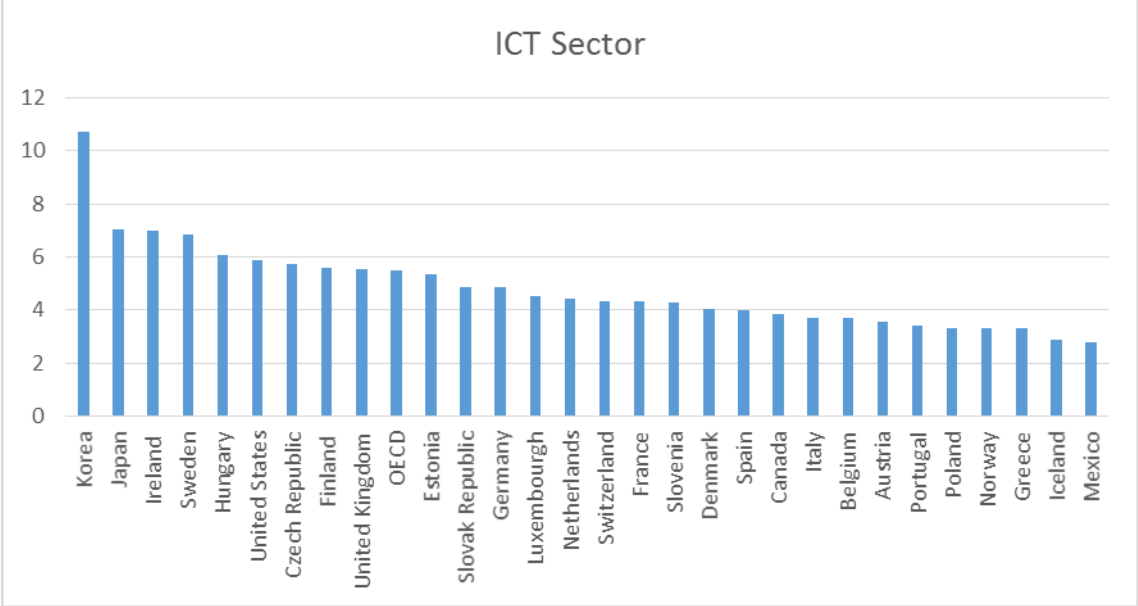


Figure 1 Value added of ICT sector 2013, as a percentage of total value added at current prices.  
Source: OECD Digital Economy Outlook 2015.

# **Chapter I**

## **1.1 Problem Statement**

The Information Technology Cluster of the state of Tlaxcala has had a slow development despite being located in a region that is surrounded by different sectors industries, these companies need to standardize and optimize processes, this document studies, explains and proposes a solution to the problem of the slow growth of the IT Cluster of the state of Tlaxcala.

## **1.2 Justification**

The problem of slow growth or development of this cluster becomes an object of research because as explained in the following pages this cluster is in a place whose geography favors it, in addition to the climatic factors, communication and professional human training. In the same way this cluster is surrounded by three important industrial parks of the state of Tlaxcala, its proximity to Puebla's industrial parks make it even more competitive.

## **1.3 Objective**

The main objective of this work is to analyze the IT cluster of the state of Tlaxcala with the tools proposed by Michael Porter, in his theory of competitiveness 2014 , the tools that will be used to make this analysis are the Porter's diamond, the study of the value chain, the proposal of a cluster map and the analysis of the IT industry through Porter's five forces.

## **1.4 Scope and limitations**

Based on the existing cluster information, the Porter diamond is generated with the value chain and the cluster's own map, and a value proposition is generated to make the cluster grow faster.

## **1.5 World cluster status. ICT Mexican clusters position in comparison to other countries.**

ICT industry is one example of cluster policy that has been embedded in several economies. ICT companies in different regions has created cooperation organizations to create synergies, take advantage of union of various actors in the sector and have a better representation before government, suppliers, supportive organizations and to attract more and higher volume customers.

Mexico is one of the most vibrant and dynamic economies in Latin America and the World: Mexican population is 120 million inhabitants, GDP is circa 1.2 trillion USD, placing the country as the 12<sup>th</sup> economy in the world and second economy in Latin America, after Brazil. Mexico was ranked 51st on overall competitiveness among the 138 countries covered by the 2016-2017 Global Competitiveness Report. Mexico has been scored among top ten “fastest risers” between previous year and 2016-2017 Global Report. This movement in the ranking has placed the country as the third most competitive economy in Latin America, after Chile and Panama (Figure 1.1). In this context, ICT sector is one of the most dynamic, with a great potential for future growth as well as an engine to increase value added in other sectors as well.

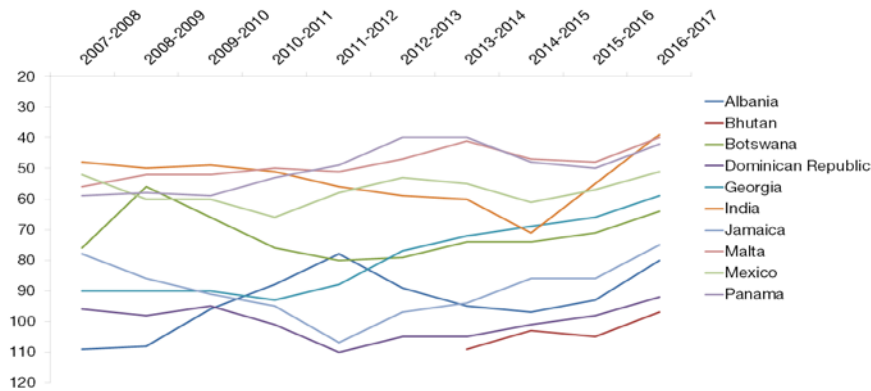


Figure 1.1 Top 10 movers over the last 10 years. Source: World Economic Forum, Global Competitiveness Report 2016 - 2017.

In Mexico, ICT clusters started at the beginning of XXI century, when in 2004 some companies in Jalisco and Nuevo León identified some opportunities to cooperate and gain new markets. In 2002, the Ministry of Economy launched Prosoft, a federal program to support creation of ICT companies and software development entrepreneurs, in a joint effort with the World Bank. One strategic line of the program is the strengthening of IT clusters to increase their competitiveness and international projection.

The European Secretariat for Cluster Analysis (ESCA), based in Germany, has conducted a study to create a framework to analyze the cluster management in order to achieve excellence.

ESCA has analyzed performance of Mexican IT clusters in comparison to other European more mature clusters such as Germans, Polish and Spaniards. ESCA considers that Germany has a mature cluster policy in an engineering and technology based economy. For Poland, the status is an emergent cluster policy in an economy more oriented to IT based transformation. Spain has a mature cluster policy in a social comparable environment.

**Cluster organizational structure:**

- Formal age of the cluster
- Legal status of the cluster
- Type of participants (engaged, partially engaged)
- Market penetration percentage
- Specialization degree

**Cluster Governance and Management**

- Implementation of governance body / committee
- Competencies and Human Talent Development
- Strategic Planning and implementation

**Funding**

- Contributions as percentage of total budget
- Cluster funding sources safety and continuity

**Joint services provided by the cluster to its members**

- Joint technology development
- Talent development provided by the cluster
- Entrepreneurship development
- Joint ventures and networking with external companies

**Achievement and awareness in cluster's market**

- Number of received applications for external cooperation
- Visibility of cluster in media
- Cluster's internationalization degree

ESCA study shows interesting conclusions about the level of development of Mexican ICT clusters, pointing also some focus areas to make this sector more productive and competitive in the future. Some of the key findings are:

- Type of cooperation: Cooperation in Mexican clusters is more centralized, where companies are following initiatives launched by cluster management. German

clusters are cooperating in a centralized way as well as in a decentralized way, having initiatives launched by cluster management or by any company in the cluster, in the same proportion. Polish clusters are more decentralized and Spanish clusters are highly centralized (Figure 1.2).

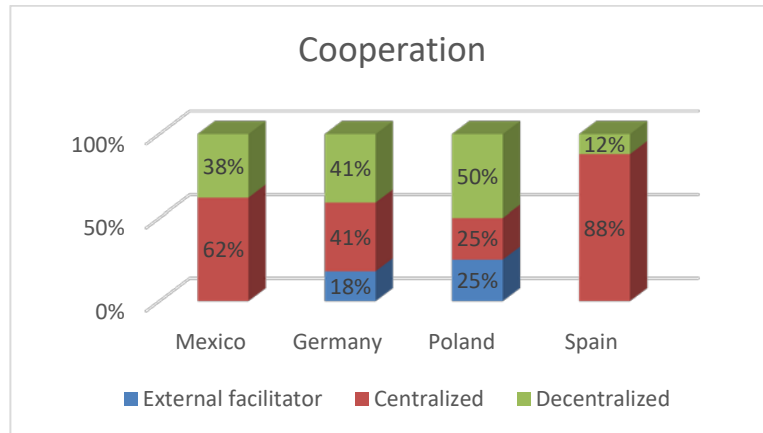


Figure 1.2 Cooperation in Mexican clusters.: European Secretariat for Cluster Analysis, 2015.

- **Competencies and HR development:** In this point, the study considers the level of preparation of managerial team and staff in general to fulfill their roles and ensure excellence in service to cluster's customers. This line includes the experience of managers and staff working abroad, their educational level, their language proficiency in other languages, their regular update regarding sector knowledge and the existence of a continuous improvement and learning program. Mexican clusters have only an 8% of highly developed staff and 62% of moderately developed staff, in comparison to German clusters with 53% of highly developed staff, Polish clusters with 63% in the same category (highly developed) and Spanish clusters with 35% (Figure 1.3).

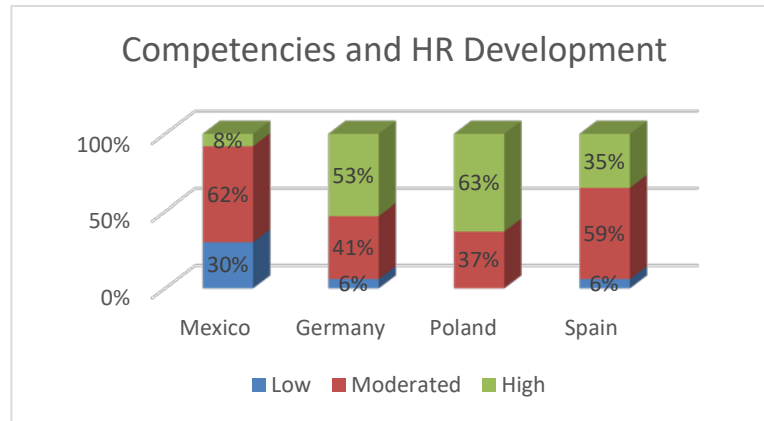


Figure 1.3 Development between Mexico, Germany, Poland, Spain. : European Secretariat for Cluster Analysis, 2015.

- Governance:** This point of the study includes the existence of a board of directors that makes decisions in the cluster, with roles and responsibilities well defined, periodic meetings with members representatives to review cluster status and make decisions about projects and strategy. ESCA considers that 54% of Mexican clusters have a strong governance, in comparison to 76% of German clusters, 50% of Polish clusters and 71% of Spanish clusters (Figure 1.3).

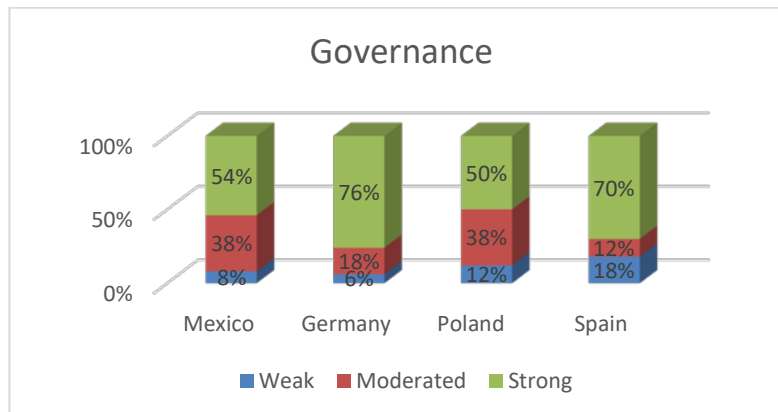


Figure 1.4 Governance. European Secretariat for Cluster Analysis, 2015.

- Funding:** This point is referring to the origin of cluster budget for regular activities managed by cluster board and performed for its members. The study considers

different funding categories such as public funding, membership fees, charged services, other private funding (e.g. donations), or in kind contributions. Mexican clusters are funded mainly by public sector, receiving membership fees as second funding source. Polish clusters have a similar situation. German clusters are funded by public sector and membership fees in the same proportion and Spanish clusters are founded mainly by membership fees (Figure 1. 5).

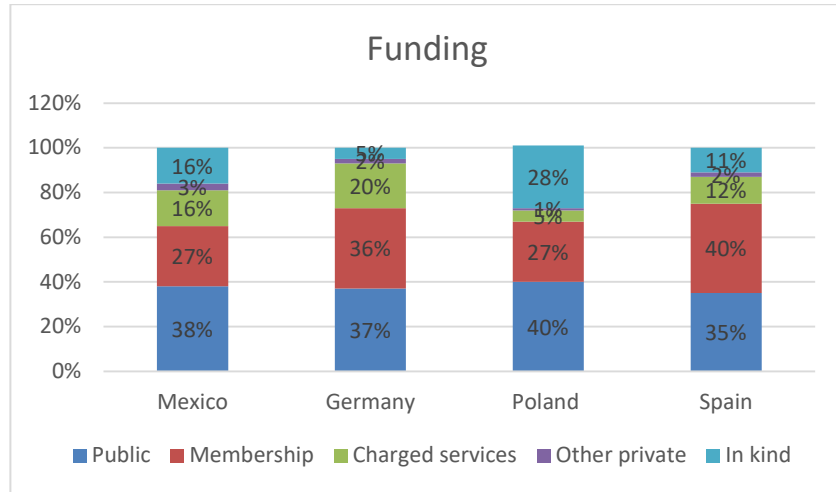


Figure 1.5 Situation of the clusters . Source: European Secretariat for Cluster Analysis, 2015.

## **Chapter II. Theoretical framework**

### **2.1 Relevant Cluster Charts**

#### **2.1.2 Tlaxcala's analysis**

Territory Tlaxcala is mostly bordered by Puebla to the north, east and south, to the west by the State of Mexico and to the northwest by Hidalgo. Its territory represents 0.2% of the total national territory, of which its population density is 318.4 inhabitants / km<sup>2</sup>. It is divided in 60 municipalities distributed in a territory of 3,991 km<sup>2</sup>, where the most populous is the municipality of Tlaxcala with 95,051 inhabitants, and the less populated is the municipality of Lázaro Cárdenas with 3,103 inhabitants. (INEGI 2014)

The strategic geographical location, forms a market of more than 20 million consumers (DF, Mexico City and Puebla mainly). Infrastructure in the field of communication routes boosts the high demand for products and services related to IT, as it allows for rapid movement throughout the state when communicating with neighboring states.

##### **2.1.2.1 Population**

Tlaxcala has a total population of 1,272,847 inhabitants, which represent 1.1% of the national population. There are 93 men for every 100 women, that is, 48.3% are men and 51.7% are women; the average age of the population is 26 years; in addition there are 54 people of age of dependency for every 100 of productive age.

### **2.1.2.2 Living place**

There are a total of 310,504 private homes inhabited, which represent 1% of the national total. The ownership of the same corresponds to 75.9% as own, and 9.9% in rent.

### **2.1.2.3 ICT availability**

20.8% have access to the Internet, 35.3% have pay TV, 28.3% have flat screens, 22.9% have computers, 74% have a cell phone and 27.2% have a landline.

#### **2.1.2.3.1 Homes with Internet, by Federative Entity, 2010.**

Baja California, the Federal District, Nuevo Leon, Sonora and Quintana Roo stand out among the Federative Entities with Internet in the home, since three out of 10 homes have access; While Chiapas, Oaxaca, Tlaxcala, Guerrero and Zacatecas have the least access to the Internet, reporting only one in 10 households with Access (source INEGI 2014).

#### **2.1.2.3.2 Internet users, by Federative Entity, 2010 (%).**

The Federal District, Quintana Roo and the northern border states show that four out of 10 people over the age of six have internet access, when the national percentage is 33.8%. (Annex 2) Source INEGI.

#### **2.1.2.4 Socio-demographic overview**

##### **2.1.2.4.1 Education**

The literacy rate is 98.9% among those between 15 and 24 years of age, and 94% for those who are 25 years of age or older. As for the level of schooling among the population aged 15 or over, 4.1% do not have any schooling, 56.7% have basic schooling, 22.3% have a higher average schooling, 16.7% have higher education (source SEP-INEGI 2014) in all cases where you use secondary data.

Compared to the rest of the country's institutions, Tlaxcala has a literacy rate of 5%, occupying the number 16, since Chiapas has the highest literacy rate, with 17% and Nuevo Leon the lowest rate, with 2%. (INEGI 2014)

In terms of school attendance and mobility, 61.7% of the population between 3 and 5 years of age attend school in the municipality, while 4.9% of the same age group attend schools in another municipality or delegation; While people between 15 and 24 years old, 44.3% attend schools of the municipality and 22.7% attend schools of another municipality or delegation (Annex 3).

##### **2.1.2.4.2 Health Services Affiliation**

The 83.3% of the population has some type of health affiliation, of which 70.3% are affiliated to Seguro Popular, 21.7% to IMSS and 6.9% to ISSSTE, while 2.2% are affiliated with private insurance (Annex 5).

### **2.1.2.4.3 Ethnicity**

According to the population with 3 years or more, we have 2.74% speak some indigenous language, of which 0.46% do not speak Spanish.

### **2.1.2.4.4 Economy**

The Economically Active Population (PEA) corresponds to the population that is 12 years old or more, that is, 50.4%, of which 34.4% are women and 65.6% are men. Regarding the Non-Economically Active Population (PNEA), 34.7% are students, 48.7% are people dedicated to housework and 3.7% are retired or pensioned (Annex 4).

#### **2.1.2.4.4.1 Economic activities**

According to the three economic activities: primary, secondary and tertiary, Tlaxcala presents tertiary activities as those that give the largest contribution to the state GDP, 62%, while primary activities contribute 4% and secondary activities 35%, according to the figures figure 4 of INEGI 2015.

#### **2.1.2.4.4.2 Participation by economic activity, in current values, 2015.**

According to tertiary activities, which contribute the most to the state's GDP, we find in agriculture that peppermint is the most produced product, 85 tons, or 29% of the national total and occupies the second place of four.

At the general level, Tlaxcala contributes 0.02% to the national GDP, taking into account that the contribution to growth indicates the percentage variation weighted, that is, the share that each state contributes to the National variation (2.53%). Tlaxcala occupies the 13th

place among the entities, with 3.89%, as regards the total economic activity of the country. (INEGI 2014)

### 2.1.2.5 Culture and standard of living

<b>Indicador</b>	<b>Mexico (country)</b>	<b>Tlaxcala</b>
<b>New Scholarships CONACYT 2014</b>	25,815	168
<b>Current scholarships CONACYT 2014</b>	49,640	272
<b>Patents requested 2014</b>	3,627	15
<b>Patents requested 2015</b>	3,680	30
<b>Public Libraries 2014</b>	7,401	137
<b>Public Libraries 2015</b>	7,413	138
<b>Theaters</b>	638	3
<b>Museums</b>	1,261	17
<b>Cultural centers</b>	1,902	16
<b>Auditoriums</b>	817	8

Table 2.1 Tlaxcala's Culture and standard of living

### 2.1.2.6 Competitiveness

Globally, Mexico ranks 57, out of 144 comparative economies, according to the Global Competitiveness Index 2015-2016 Rankings, with a score of 4.29; And among the economies of Latin America, Mexico ranks fourth, below Chile, Panama and Costa Rica (Table 2.2). FORUM 2014.

Economy	Rank	Score	Prev
<b>Chile</b>	35	4.58	33
<b>Panama</b>	50	4.38	48
<b>Costa Rica</b>	52	4.33	51
<b>Mexico</b>	57	4.29	61
<b>Colombia</b>	61	4.28	66
<b>Peru</b>	69	4.21	65
<b>Uruguay</b>	73	4.09	80
<b>Brazil</b>	75	4.08	57
<b>Ecuador</b>	76	4.07	n/a
<b>Guatemala</b>	78	4.05	78
<b>Jamaica</b>	86	3.97	86
<b>Honduras</b>	88	3.95	100
<b>Tinidad y Tobago</b>	89	3.94	89

<b>El Salvador</b>	95	3.87	84
<b>Dominic Republic</b>	98	3.86	101
<b>Argentina</b>	106	3.79	104
<b>Nicaragua</b>	108	3.75	99
<b>Bolivia</b>	117	3.6	105
<b>Paraguay</b>	118	3.6	120
<b>Guyana</b>	121	3.56	117
<b>Venezuela</b>	132	3.3	131
<b>Haiti</b>	134	3.18	137

Table 2.2 Competitiveness among the economies of Latin America. Source

As for Efficiency Enhancers, Mexico has a Rank 53 with a score of 4.27, with respect to Innovation and Sophistication Factors a Rank of 52 with a score of 3.78, and as for Basic Requirements a Rank of 73 with a score of 4.53 Sources INEGI (Table No. 2.3).

<b>GCI MEXICO 2015 - 2016 SUBINDEX</b>		<b>Rank</b>	<b>Score</b>
<b>Basic Requirements</b>			
<b>Rank 73</b>	Institutions	109	3.34
	Infrastructure	59	4.22
	Macroeconomic environment	56	4.85

	Health and primary education	71	5.71
<b>Efficiency Enhancers</b>			
<b>Rank 53</b>	Higher education and training	86	4
	Goods market efficiency	82	4.23
	Labor market efficiency	114	3.75
	Financial market development	46	4.24
	Technological readiness	73	3.77
	Market size	11	5.65
<b>Innovation and Sophistication Factors</b>			
<b>Rank 52</b>	Business sophistication	50	4.18
	Innovation	59	3.38

Table 2.3 GCI Mexico 2015 – 2016 Subindex. INEGI

Mexico progresses four places to 57th, despite some deterioration of the institutional environment, thanks to improvements in the efficiency of financial markets (up 17 places to 46th), business sophistication (up eight places to 50th), and fostering innovation (59th) Sources. The country’s competitiveness also benefits from an efficient goods market with enhanced, albeit low, level of competition (99th) and a large market (11th)—Mexico is the second largest country in the region. These results signal that recent reforms are bearing fruit, but challenges remain. Despite some improvement in the labor market (up seven places to 114th), rigidities are still a problem, as are weak public (115th) and private (78th)

institutions—which reflect the fact that corruption is considered the most problematic factor for doing business (Global Competitiveness Report 2015-2016).

#### **2.1.2.7 Total Exports as a Share of GDP**

In terms of Total Exports as a Share of GDP, Mexico has a share of 28.21%, while GDP per capita, PPP adjustments is the least compared to Canada and USA, with \$ 14,406 DLS.

#### **2.1.2.8 Information Technology Cluster**

The Mexico Average World Export Share is 1.816%, and the Average Change In Mexico World Export Share is -0.6484%.(Global Competitiveness Report 2015-2016).

As for the Information Technology Cluster, the peripherals have the highest percentage share with 4.83% against electronic components and assemblies, 0.40% (Annex 7).

# Chapter III Methodology

## 3.1 Cluster Diamond

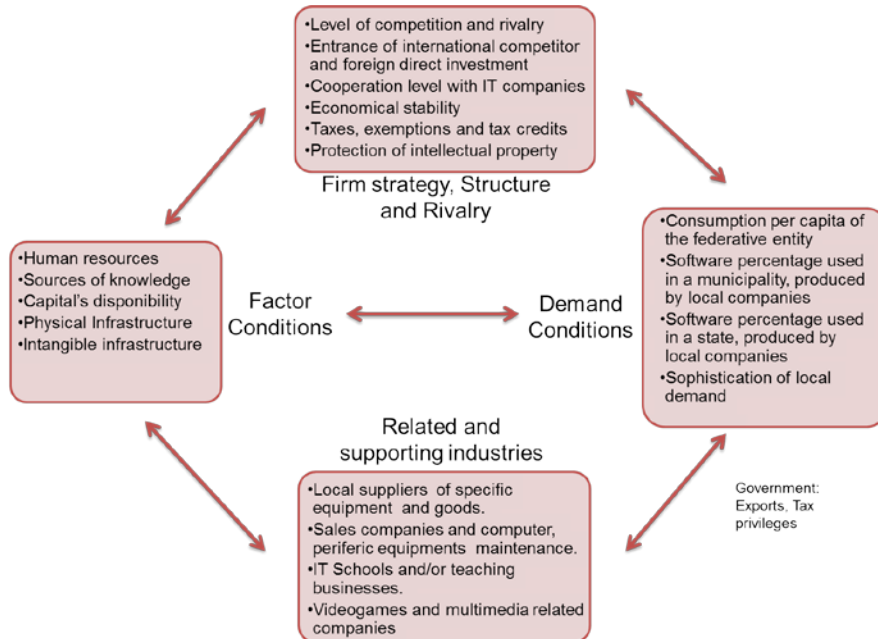


Figure 3.1 Cluster diamond. Adapted from (PROSOFT 2015)

### 3.1.1 Human resources

Students graduated from a bachelor's degree related to IT, which would indicate they have the basic knowledge to incorporate to the labor market. To incorporate a recently graduated student to the labor market, it is necessary to invest in training so he/she complies with the basic necessary knowledge.

### **3.1.2 Sources of knowledge**

There are no investigation, development and integration technology centers in the state of Tlaxcala. Regarding specialized training, in the state it is limited, but the state offers access to universities, companies and training centers located in the metropolitan area and in Puebla. Everyday there are more universities and education centers that have careers related to IT. Although their educational levels are not the ones required by the industry, there are special efforts done to improve the study plans to comply with the minimum required by the industry.

### **3.1.3 Capital's disponibility**

Capital's disponibility is reduced to companies own capacity to generate income. Since this type of industry is not well known in the financial sector, the access to credits is limited. They depend, in most cases, that the company already has a bank account that could provide credit references. At the present time, there is access to financing through support and guarantees from the government. For example: Hirpyme. The projects are usually financed internally from within the company.

### **3.1.4 Physical Infrastructure**

Tlaxcala has highway infrastructure that connects it with the states of Hidalgo, Puebla and the metropolitan area. Allowing the easy and fast access to a growing market of more than 20 million persons. Nowadays, all related to business centers is limited in the state, nevertheless, everyday there are more national and transnational companies that are located in the state due to its communication an easy access.

The Tlaxcala's IT cluster does not have a technological or research facility. However, it is something that is considered to be developed in a medium to long term.

### **3.1.5 Demand Conditions**

#### **3.1.5.1 Market size**

Local demand is limited, from the point of view that consumers lack information about the IT sector, including companies and government. Due to the limitation of the local demand, the cluster companies are focused in venturing at a regional and national market, where IT services demand is higher and needed for the development of other growing projects.

Possible increase of the regional demand due to anchor companies located in neighboring states such as Volkswagen, and short term AUDI; who could be potential clients to develop Technology Information Cluster of Tlaxcala A.C.

#### **3.1.5.2 Sophistication**

In the state of Tlaxcala, the demand is not very sophisticated, due to the type of companies that are located there. These companies should focus their efforts into the regional market, where the sophistication is higher. In this sense, Tlaxcala is not a potential market to offer highly specialized IT services.

Regarding demand's sophistication, it is important to highlight that the automotive industry requires high sophistication on IT services (for instance, Volkswagen and Audi" which are located in very near from Tlaxcala" ).

Within the cluster, there are companies that do IT specific projects for banks, which might require a high sophistication on knowledge

### **3.1.6 Related and supporting industries**

Within the IT market, it is very important to count with specialized suppliers, because they are the ones that give support and structure to the sector. In this sense, Tlaxcala doesn't have any specialized supplier, however, you can find them in Puebla and the metropolitan area.

Within the same cluster there are supply companies for the same partners. Synergy and bonds are created that allow each company to become a very specific part of the supply chain. Restraining to their own field of expertise

Specialization, is more evident in IT companies. Since its a transversal area and with application through all disciplines, it is necessary to focus oints that boost the growth and development of companies in particular. This way, a more robust and specialized sector is created. For this cluster, this specialization starts to notice when certain exclusive IT companies are identified. However the strategies are still looking to consolidate the nature of the cluster.

### **3.1.7 Related and complementary industries**

In the region, accesing to related and complementary industries is easy. Due to a privileged location and that companies are focusing towards a regional market which allows more access to technology that provides a good support to it.

Within the cluster there are some associates that are classified as related companies. They don't develop software but they provide a service to those who need it.

In relation to the support that the companies receive from the state government, it is still not enough to foment the sector's growth. However, the federal support has been beneficial to companies that invest in training and development of workers technical skills.

Recently some collaboration have been stated Within universities and research c, that allows to promote the development of technical skills of those who graduate from these institutions. With the objective that they can easily integrate into the productive sector that everyday demands more knowledge and specific technical skills

### **3.1.8 Firm strategy, Structure and Rivalry**

#### **3.1.8.1 Level of competition and rivalry**

The mentality of most company owners (15) allows to better assimilate the changes required by the cluster companies; in this way they create bonds of collaboration and healthy competition, since they can engage in joint projects that make them grown both grupally and individually.

The joint projects are mostly investment in workers training, then there are the projects on development of specialized software.

The cluster has companies that have well-defined products; however the lack of sales abilities hasn't allowed them position in a market that needs technology. This situation requires an alliance with a broker that allows new markets to sell to.

Outside of the cluster there are enterprises that dedicate to IT development. It can be observed slow growth patterns; however some of them show really high level of competition and specialization.

### **3.1.8.2 Local cooperation**

In terms of cooperation, the companies from the cluster have begin to work under this focus. Because they have seen that this type of organization allows them to attend projects that require more resources that they don't have on their own.

Even when the efforts are joint towards cooperation to consolidate the sector, there is still a lack of promotion of what is being developed at the state in order to provoke a higher demand.

### **3.1.8.3 Defined strategies**

There are more defined public politics in execution from the Federal Government, that impact in the development of the companies at local level.

An strategy has been developed towards promoting innovation within the cluster for medium to long term results. Same strategies are being developed for human resources and capital.

One of the cluster's long-term challenges is focused on the exportation of IT products and/or services. A 2017 objective has been set: to increase the cluster's maturity and competitiveness index

### **3.1.9 Investment and improvements**

Entrepreneurs, in the investment area, bet their capital to strengthen their companies. This way, the projects are being financed by themselves and the other part is on the negotiations that are done with suppliers.

Regarding bank investments, the access is almost non-existent, because of the type of product and/or services that is being developed.

Improvement is an issue , the cluster is working on human resources, because it knows that if they are developed, the result will be companies that are more competitive, mature and solid. Companies that will be able to work on bigger projects.

Overall, the cluster vision is focused on supporting companies improvement. But this will only be done through a smart planning, strategy design and following them up. This job is being actually done and it's in an initial phase.

## Chapter IV Results

### 4.1 Value Chain

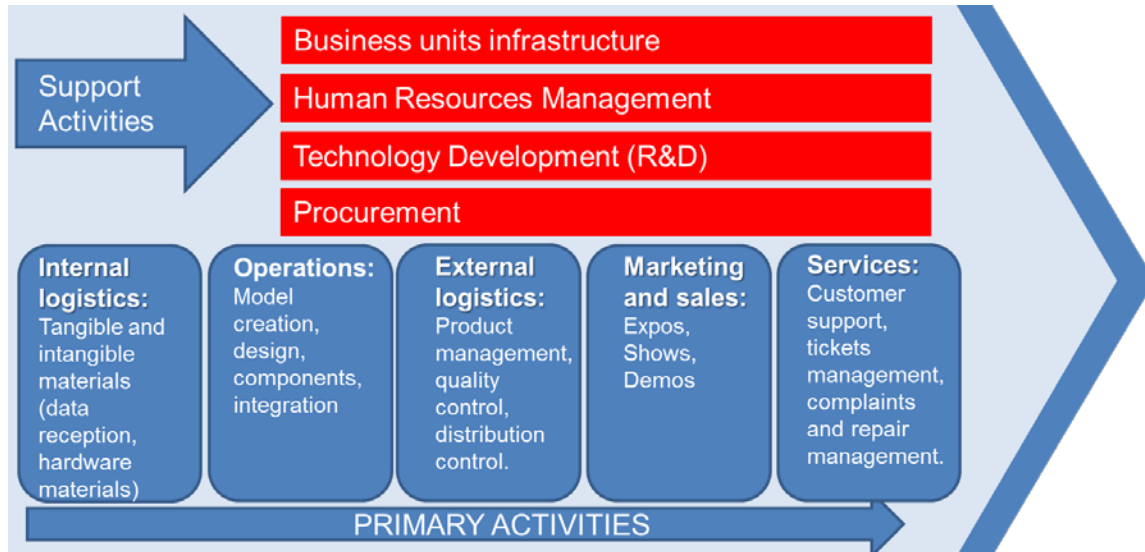


Figure 4.1 Value chain. Source: Software Guru Buzz Magazine, 2014.

The Tlaxcala ICT Cluster is mainly dedicated to customized software development, most of the companies in the cluster are focused on this particular market. The process companies in the cluster are following to develop software according to specific customer requirements and needs is based on knowledge management and a good coordination and teamwork between internal designers and project managers whom have interaction with customers; as well as coordination and team work with marketing officers and customer service representatives for after sales and ticket management services. All these primary activities requires highly skilled people to ensure success in value creation, hence Human Resources Management has a strategic impact as important as the research and development input (Figure 4.1) .

#### **4.1.1 Primary activities:**

Internal logistics: it is related to the management and control of all materials related to software development, not only tangible materials as computer devices, wires or servers, but also intangible materials as data reception (Source PROSOFT)

Operations: Operations are focused on software model creation, design and development. Model creation and design value is focused on to the high level of solution's practicality and functionality as well as on technological capabilities and tools integration. This value creation won't exist without analysis team intervention (Source PROSOFT)

External logistics: This part of software development process is dedicated to product management, quality control and distribution control. It means that staff working in this type of activity is fully dedicated to manage and review full functionality of software as a whole, identifying all possible applications of the tool and also using different test procedures and methodologies to make sure that designed solution is working in line with customer requirements and expectations.

Marketing and sales: This activity in the value chain is critical due to the fact that the final agreement with the customer to start the analysis phase and proceed with the design and implementation of any type of solution, depends on the ability of sales and marketing team to show a strong product portfolio and company's image. It is also essential for value creation the frequency and quality of promotional events, company visits and participation on different type of shows and expos focused on target market.

Services: Customer support, tickets, repair and complaints management are the foundations to retain customers and build a long term relation with the market, restarting a continuous

improvement process, upgrading solutions and applications to new customer's requirements and making possible the opening of new applications and projects (Source PROSOFT)

#### **4.1.2 Support activities:**

**Business units infrastructure:** This activity is related to planning, control and follow up of infrastructure maintenance, funding rising, networking with governmental agencies (like Prosoft) to gain support for infrastructure investment. Cluster management is playing a key role as facilitator of funding and networking activities.

**Human Resources Management:** Resourcing, staffing, development and retention of high profile, highly skilled employees in innovation, technological and business competencies is a must for ICT industry success. The cluster is organizing with local universities and consultants specific training programs to upgrade the entry level of competencies the "companies" staff have.

**Technology development:** Research and development activities are in line with public funded programs dedicated to attend sector conferences to look for new trends. Companies in cluster need to promote and invest on other type of R&D activities like research scholarships and employees external exchange for participation in research projects and educational institutions.

**Procurement:** This process is also critical for ICT business, as coordinates and controls interaction with different type of tangible and intangible materials suppliers, checking for best prices and taking advantage of volumes and scale economies of common supplies (as internet services or components) for majority of customers.

## 4.2 Cluster Map

The cluster system is compound of upstream, mainstream and downstream players which are supported by some other related and supporting industries that play an influential role as well. Additionally, the role of universities, government institutions and some institutions for collaboration is also involved in the cluster map.

The productivity of the cluster has been increasing since its inception, generating multiple opportunities for development at the local level, which allows them to continue to penetrate regional and national markets (Figure 4.2).

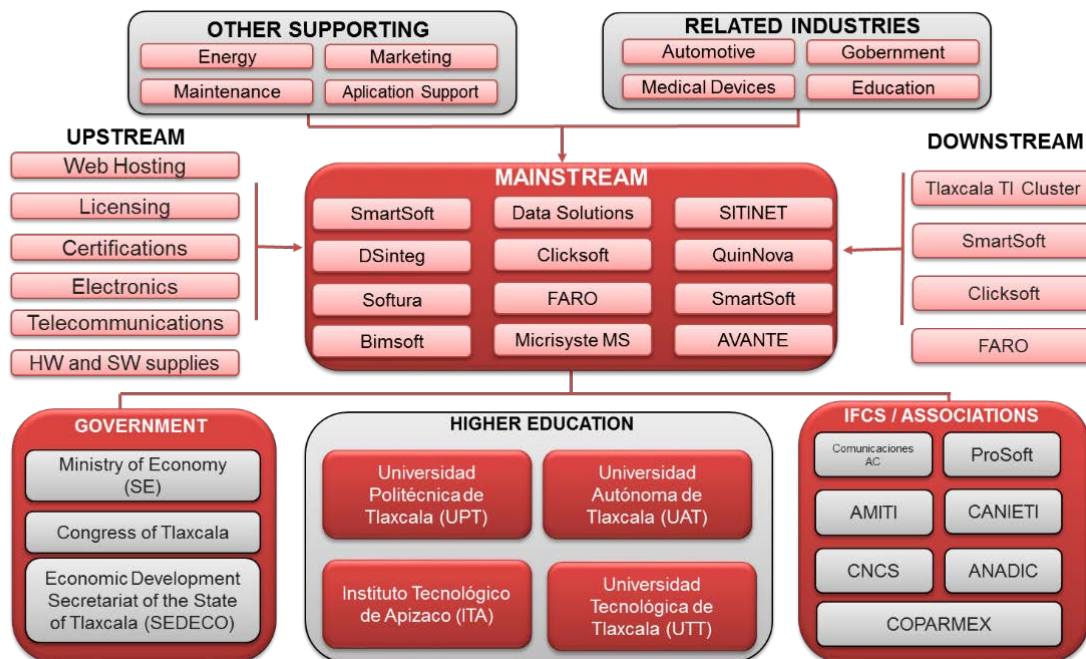


Figure 4.2 Cluster Map

### 4.3 Mainstream players

The mainstream players are the companies that make up and give life to the cluster in a central way, that is, those players that perform the main activity of the cluster.

The IT Cluster Tlaxcala is oriented towards the development of software, solutions and services of high added value in the IT area; Through the use of free and licensed languages for adaptation, and modification or creation of applications that respond to diverse needs and sectors.

According to PROSOFT 2015 The Tlaxcala IT cluster principal mainstream players are:

Faro BPC	Angio soluciones
Bimsoft	MBN
Smartsoft	Sitinet
Quinnova	Softura
Gravedad cero	DTI
Avante	AMD
Data	Microsyste MS
Clcksoft	Edusoft
HC-FX	ART3
Itein	Advantage
Ixer	

### *Upstream Players*

In the case of Cluster IT upstream players allow you to develop custom software, where we have as main:

**Web Hosting**, it is an industrial computer conditioned to be permanently content to a high speed network.

**Licensing**, contracts and authorizations of software for the use of software determined.

**Certifications**, official titles that allow to verify knowledge skills in the field of computer science.

**Electronics**, devices forming part of an electronic circuit.

**Telecommunications**, remote transmission of information data.

**Hardware and Software supplies**, physical and logical support that makes possible the accomplishment of specific tasks.

### *Downstream Players*

The downstream players are those that get the product, that is, the software tailor made to the final customer (Source PROSOFT 2014).

In the IT Cluster is the same Cluster of Tlaxcala, as well as some companies that make up the lodistribuyen, since this activity is carried out in two ways:

- 1.The customer go to his offices and describe his need.
- 2.Specialists from the IT Cluster go to the companies or offices of the client to study the need and propose solutions.

The main downstream players of the Tlaxcala IT Cluster are:

Tlaxcala TI Cluster

SmartSoft

Clicksoft

Faro BPC

Role of Government

The Cluster has governmental ties with:

- Ministry of Economy (SE)
- Secretariat of Economic Development of the State of Tlaxcala (SEDECO).

The Cluster has signed agreements with the Ministry of Economy for Intermediate Operation (OI) and the Support Fund for Micro, Small and Medium Enterprises (SME Fund), resulting in a support of three million four hundred and eight thousand One hundred Forty pesos in The registration of five projects, which benefited 74 MiPyMes, according to IT Industry Development Project (2012).

*IFC's / associations*

The Cluster has a level of cooperation of 8.6 according with PROSOFT 2014)

, this means that efforts have been made to strengthen the links between the companies that make up the association.

The growth of the companies that support the Cluster is translated into: search for new markets, improvement in the positioning of Clúster at external level and cooperation in projects.

The Cluster is linked to the following Associations and Chambers:

- COPARMEX - Confederation of Employers of the Mexican Republic S.P.
- AMITI - Mexican Association of the Information Technology Industry.
- CANIETI - National Chamber of the Electronic Industry of Telecommunications and
- ANADIC - National Association of Computer Technology Distributors and
- Communications A.C.
- CNCS - National Council of Software.
- Prosoft

The National Association of Computer Equipment Distributors (ANADIC) was the managing association of the cluster, that is, with whom it started operations.

It is important to mention that in the period from 2006 to 2008, the support received by ProSoft strengthened and supported the Cluster in the areas of:

- Equipment
- Skills development
- Technical knowledge

However, in the period between 2009 and 2011, ProSoft does not support the Cluster, so it stands in growth and momentum, but also caused the companies that formed it to seek a way to grow together. (Tabla 4.1)

<b>Projects channeled by ProSoft</b>		
<b>Proyecto</b>	<b>Beneficios</b>	<b>Recursos</b>
<b>Applied directly to the cluster</b>	Constitution and formation of the Cluster	State  Federal  Private sector
<b>Aplicados a las empresas del Cluster</b>	Training  Certifications	Federal  Private sector

Table 4.1 Projects channeled by ProSoft

It should be mentioned that MoProSoft detonated the development of software and the integration of more specialized companies in the development of information technologies.

#### **4.4 Higher Education**

The Tlaxcala cluster presents a level of linkage with academic and research institutions of 8.5 in terms of the scale that determines the degree of maturity of the Cluster in 2012 and in accordance with the IT Industry Development Project (2012) at the national level; As well as a 10-point Certification level.

It occupies the first place in connection with institutions of higher education and research centers, which has a positive impact on the quality and quantity of graduates INEGI 2014;

In plans of study according to the needs of the industry, in the purchase of technology, advice and hiring of personnel.

According to the statistics published by the Educational Services Unit of Tlaxcala (USET), the state of Tlaxcala has 692 graduates from the areas of science (natural, exact and computing) INEGI 2014, which allows most vacancies For Cluster jobs, are covered, however there are two drawbacks; The first refers to the number of graduates, because if this number does not increase, vacancies will be filled by graduates of neighboring states and the rest of the country; The second refers to human talent which causes a high demand for specialized resources.

The agreements that have the Cluster with Educational Institutions are:

- Universidad Politécnica de Tlaxcala (UPT)
- Autonomous University of Tlaxcala (UAT)
- Apizaco Technological Institute (ITA)
- Tlaxcala Technological University (UTT)

The institutions of higher education in the State of Tlaxcala according to the type of institution, shows with main:

Tipo/ Institución	Inst	Majors	Students	Comp.	Grad	PhD	Res
Higher Education	56	271	30666	5033	335	2961	189
Autonomous	1	61	12960	1933	1429	1527	0
Universidad autónoma de Tlaxcala	n/a	61	12960	1933	1429	1527	0
Decentralized	1	3	159	28	0	25	0
State	1	2	663	282	238	56	0
Technological Institutes	1	13	1620	563	55	40	25
Instituto tecnológico de apizaco	n/a	17	3094	228	184	198	0
Universidad Tecnológica de Tlaxcala	n/a	13	1620	563	55	40	25

Table 4.2 Institutions of higher education in the State of Tlaxcala. SEP 2015

## 4.5 Industry Analysis: The Five Forces

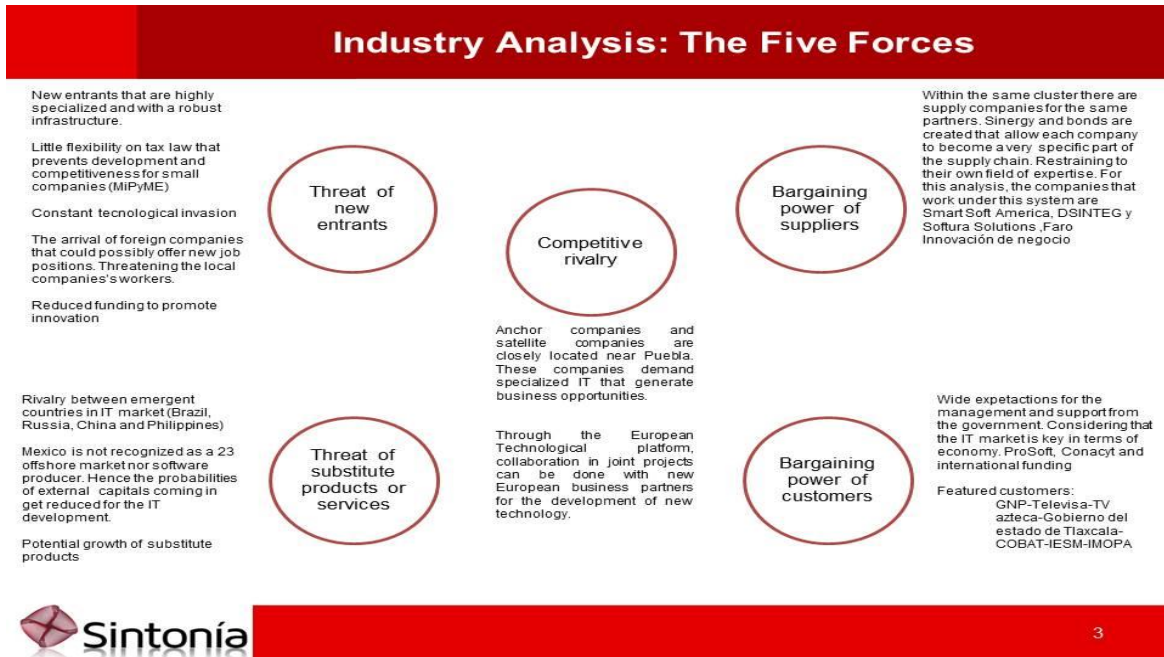


Figure 4.3 The five forces. Source Competitive Advantage to Corporate Strategy

### 4.5.1 Competitive rivalry

Anchor companies and satellite companies are closely located near Puebla. These companies demand specialized IT that generate business opportunities.

Through the European Technological platform, collaboration in joint projects can be done with new European business partners for the development of new technology.

#### **4.5.2 Threat of new entrants**

New entrants that are highly specialized and with a robust infrastructure. Little flexibility on tax law that prevents development and competitiveness for small companies (MiPyME).

- The arrival of foreign companies that could possibly offer new job positions. Threatening the local companies's workers. Reduced funding to promote innovation

According to the nature of the cluster, the companies that trade software and hardware as a main activity, when they don't differentiate, specialize in other lines of business, their stay in the market and the entrance to new competitive areas will make them weaker .

#### **4.5.3 Threat of substitute products or services**

Rivalry between emergent countries in IT market (Brazil, Russia, China and Philippines)

Mexico is not recognized as a 23 offshore market nor software producer (source HP Inc 2106). Hence the probabilities of external capitals coming in get reduced for the IT development.

Potential growth of substitute products

#### **4.5.4 Bargaining power of customers**

Wide expectations for the management and support from the government. Considering that the IT market is key in terms of economy. ProSoft, Conacyt and international funding.

Featured customers:

-GNP-Televisa-TV azteca-Gobierno del estado de Tlaxcala-COBAT-IESM-IMOPA

-The geographical location and Tlaxcala's competitive infrastructure could potentialize the business opportunities that the cluster already has.

- To invest or support skilled labor through alliances with universities and education institutes.

#### **4.5.5 Bargaining power of suppliers**

Recently, there are new associated companies. In 2011 and 2012, the cluster shows sustained growth regarding recent years.

Within the same cluster there are supply companies for the same partners. Synergy and bonds are created that allow each company to become a very specific part of the supply chain. Restraining to their own field of expertise. For this analysis, the companies that work under this system are Smart Soft America, DSINTEG y Softura Solutions, Faro Innovación de negocio

## **Chapter V Suggestions**

### **5.1 Strategy: Cluster Value Proposition**

Within Cluster Value Proposition, we find some important main issues :

#### **5.1.1 Infrastructure**

The Tlaxcala TI cluster, compared to the rest of Clusters in Puebla, has the set of elements that are considered necessary to enhance its functioning, development and growth.

Tlaxcala has a privileged location that connects with the states of Hidalgo, Puebla and the Metropolitan Area, allowing easy and quick access to a market of more than 20 million people.

#### **5.1.2 Linking**

The links between the companies that make up the association, according to the level of cooperation of five , could strengthen the Cluster as follows:

- Support for the growth of its partners
- Search for new markets
- Positioning the Cluster image to the outside
- Cooperation among its members for the development of joint projects.

#### **5.1.3 Competition**

Thanks to the competence level of five in which the Cluster qualifies, we can say that the number of entities that make it up is enough to guarantee a competition, of its place locally.

#### **5.1.4 Certifications**

According to studies carried out by the IT Industry Development Project (2012), Tlaxcala's Ti Cluster is defined as the Cluster in which all its partners are certified by Moprosoft, which intensifies the development of software and The integration of more specialized companies in the development of information technologies.

MoProSoft is a process model for the software industry in Mexico. Developed on the initiative of the Secretary of Economy and with the support of Mexican entrepreneurs and academics. Promotes standardization through good practice in software development and management.(Piello, 2007).

#### **5.1.5 Relations with universities and research centers**

The relationship that the IT Cluster of Tlaxcala has with higher education institutions and research centers, occupies the first place, increasing the value, since there exist :

- Quality and number of graduate students are available?
- Quality and quantity in study plans according to the needs of the industry.
- Quality in the purchase of technology.
- Quality in consulting and hiring of personnel.

On the other hand, Tlaxcala counts on Universities and Centers of study with related careers, or that allows to have trained human capital at hand.

### **5.1.5.1 Training and development**

There is a synergy of collaboration with universities, which increases the value, because they offer cutting edge in their services, being updated in knowledge, skills and specific or specialized techniques.

### **5.1.6 Product development and delivery**

The Tlaxcala IT Cluster adds value in software product development in three ways:

- Business
- General consumption
- To measure

The Cluster offers specifically what the customer needs in different aspects, which allows him to increase the demand, while at the same time satisfying the true needs of the client, offering him a timely and practical response to the problems he presents.

As for the delivery of the software product, we have what the Cluster determine as a Business Consulting, referring to the value that they deliver during and after the acquisition of the software product.

In this sense, the Cluster presents the following benefits:

- IT Product Management
- Software implementation
- Software and hardware support
- Change management by ICT projects
- Software quality management
- Maintenance of software and hardware

It should also be mentioned that the Cluster offers the following products and services, not all competitors have them, while the Tlaxcala IT Cluster can reintegrate them in one place for one or more customers at a time (Figure 5.2):

- Packaged software
- PSW Packages
- Application integration
- Reengineering
- Infrastructure solutions
- Outsourcing
- Custom software
- Provision of software and hardware
- Custom build
- Customization

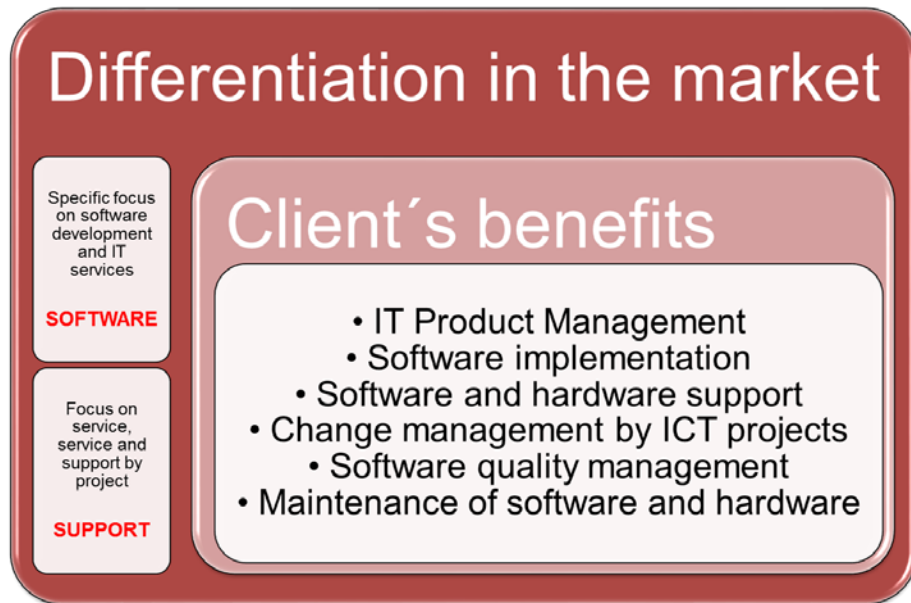


Figure 5.1 Cluster Value Proposition

**5.2 Recommendations Derived from the Analysis including Three Relevant Projects, including a Shared Value Project**



Figure 5.2 Recommendations Derived from the Analysis. Source: adapted from Competitive Advantage to Corporate Strategy.

In order for the cluster to grow and move to the next level of development, there is a need to work on 5 strategic lines of action (Figure 5.2):

1.- Integration with the IT cluster of Puebla: Look for an approach to cooperate with a cluster geographically close, with a similar profile and at the same level of development to create synergy and serve a larger regional market.

2. Development of competences: It is essential to structure executive development programs for the leaders of the cluster and of the member companies that help them to develop innovation, competitiveness, and entrepreneurship capabilities. The MOC program could be the basis of a series of efforts designed in conjunction with educational institutions, consultants and cluster members to ensure that business leaders have the same vision and alignment in relation to the work that must be done to increase the number of clients and regional coverage in the first instance and then grow as a national actor.

3.- Focus on the automotive sector: Seek business opportunities with the automotive sector taking advantage of the regional proximity and the institutional links of the cluster with support institutions such as Prosoft (Secretaría de Economía). The idea is to introduce itself with greater force in the value chain of the automotive sector, starting to create alliances to satisfy customer demands of that industry focusing on the management of long-term projects (logistic control software, ERP, administrative support).

4.- Continuous certification program: Establish a program to review and monitor companies in the cluster to achieve certification in the Mexican standard NMX-I-059-NYCE (MOPROSOFT) and establish an indicator of certified engineers per company in Personal Software Process (PSP)

5.- Focus on consulting and training services: Diversify services focusing on providing customers with courses to optimize the use of tools and not just software development projects

### 5.2.1 Shared Value

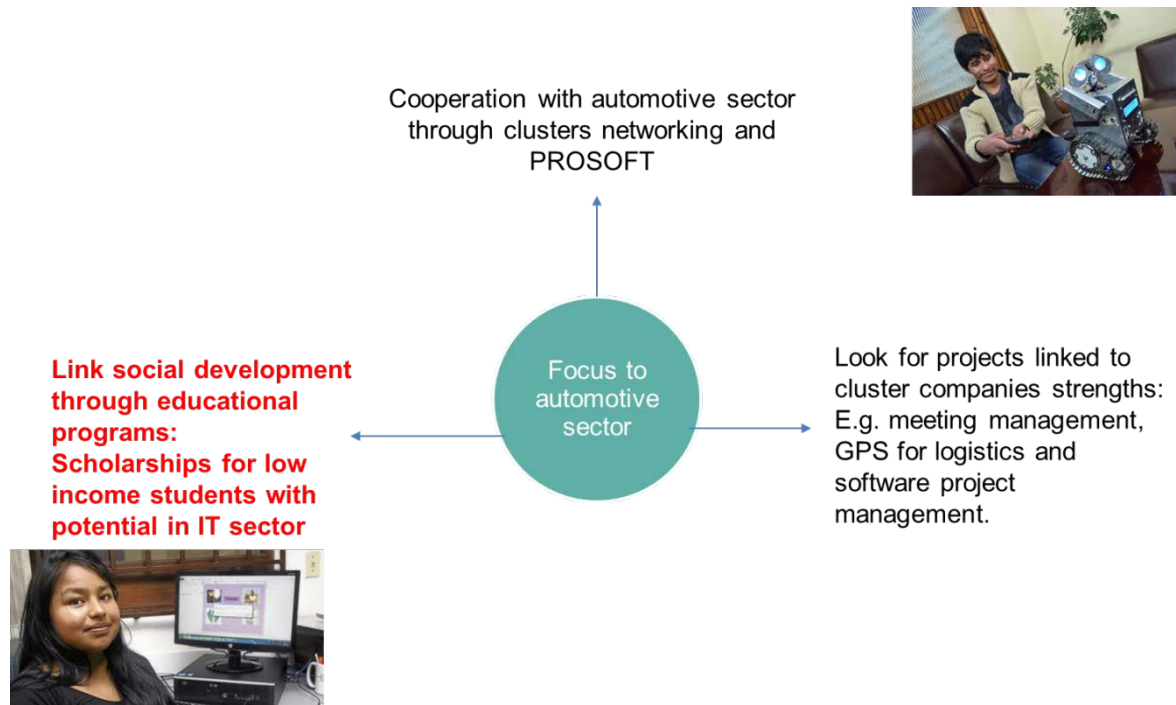


Figure 5.3 Shared value. Source: adapted from Competitive Advantage to Corporate Strategy

It is considered that the strategic line of approach to the automotive sector can be used to introduce projects of shared value (Figura 5.3).

This line would include a program for the identification of high school students in marginalized areas of the state of Tlaxcala who can receive scholarships to study in universities with the potential to insert them during their studies in the cluster. In this

program it is important to identify profiles with greater capacity for learning, orientation towards change, an impulse to grow personally and professionally. It is also important to find that curricula adapt to develop technological and business skills: for example, customer service and negotiation.

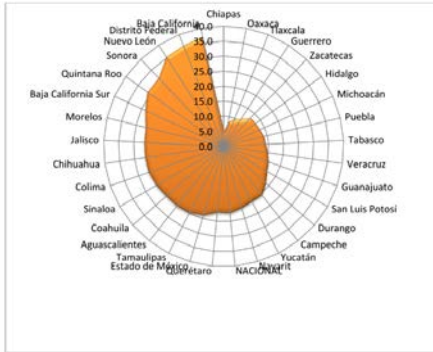
We consider as a reference of success, the UPAEP project "A bet for the future" (source/ [www.upaep.mx](http://www.upaep.mx)). The idea is not just to award scholarships, but to be in the IT sector and to seek a dual model that allows students to develop business and technological capabilities in the cluster while they have their academic activities.

Another important element is to ensure that students stay at least one year in their communities by proposing a development project linked to their university and cluster experience and to help the community create more productive jobs.

# Annex

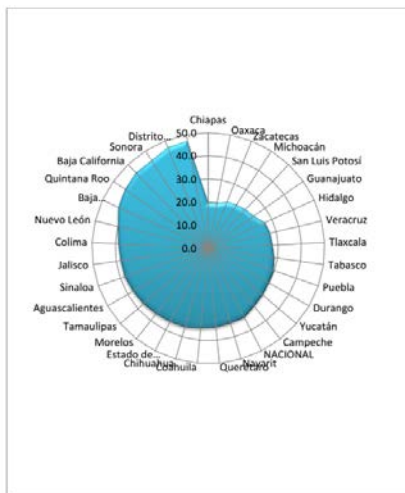
Annex 1 Homes with Internet, by Federative Entity, 2010.

Sourced: INEGI



Annex 2 Internet users, by Federative Entity, 2010 (%).

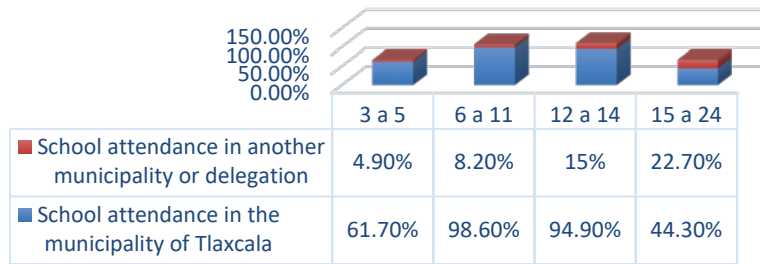
Sourced: INEGI



Annex 3 School attendance and mobility by age group

Source: Own elaboration

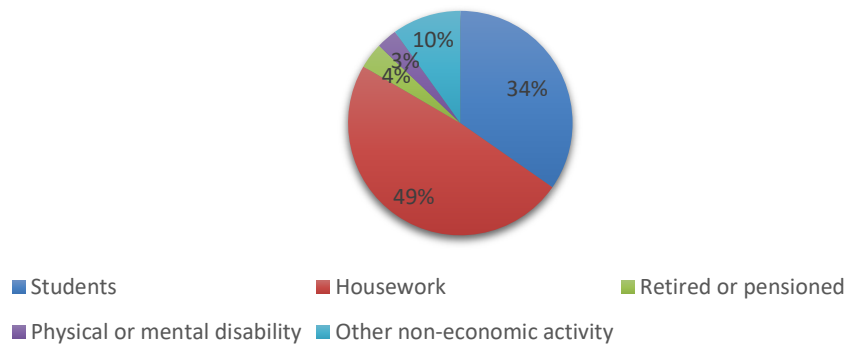
### School attendance and mobility by age group



### Annex 4 Non-Economically Active Population (PNEA)

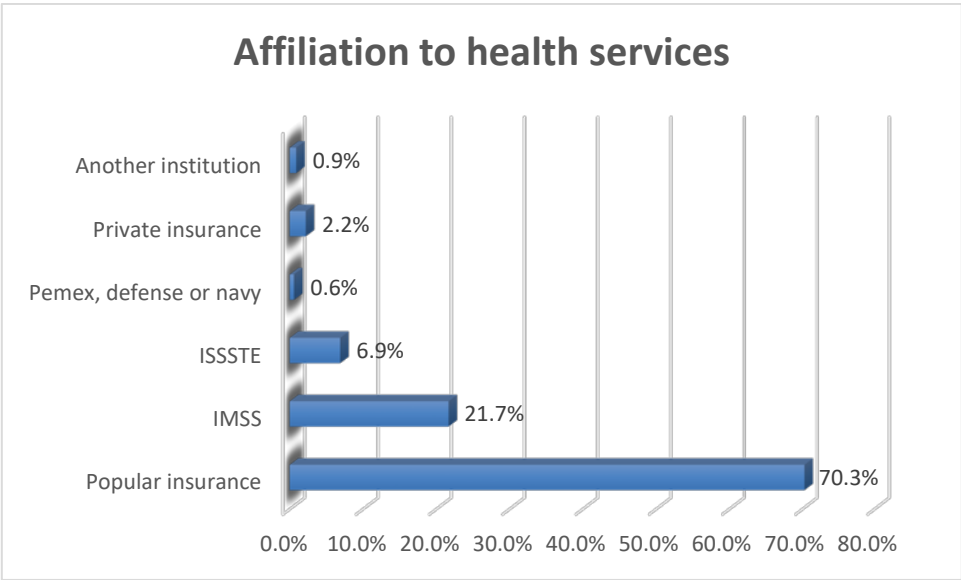
Source: Own elaboration

### Non-Economically Active Population (PNEA)



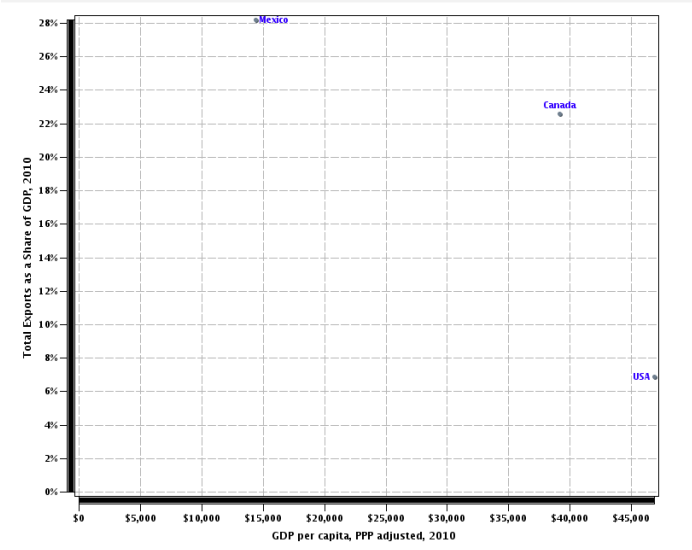
### Annex 5 Affiliation to health services

Source: Own elaboration



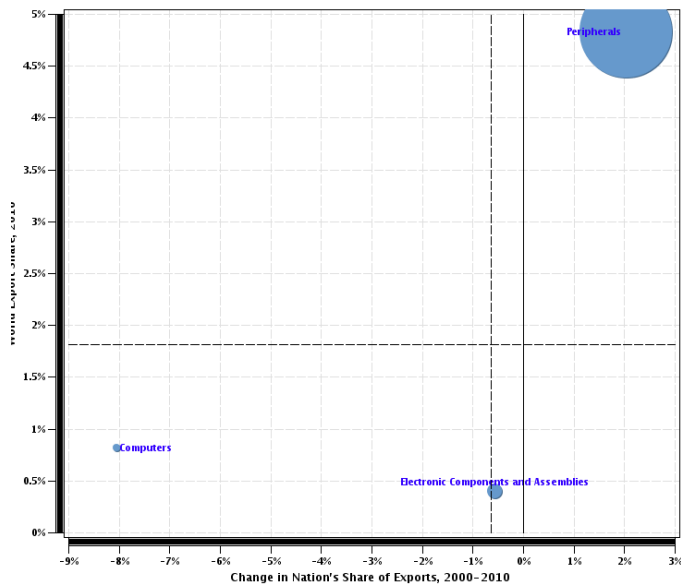
**Annex 6 Total Exports as a Share of GDP**

Source: Prof. Michael E. Porter, Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School; Richard Bryden, Project Director. Contributions by Niels Ketelhohn, Alfonso Mendoza, Martha Cabanas, and Pablo Nuño, (UPAEP University).



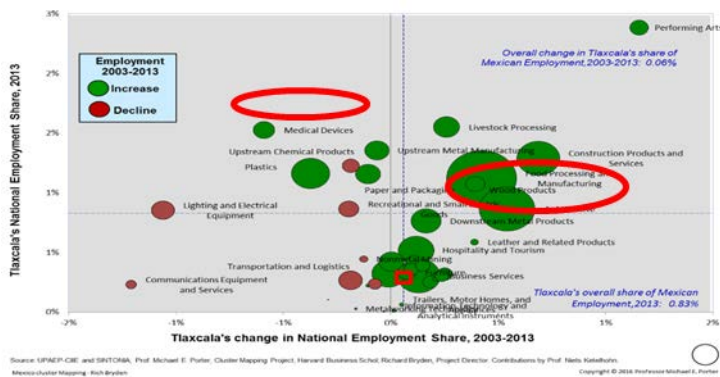
## Annex 7 Information Technology Cluster

Source: Prof. Michael E. Porter, Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School; Richard Bryden, Project Director. Contributions by Niels Ketelhohn, Alfonso Mendoza, Martha Cabanas, and Pablo Nuño, (UPAEP University).



## Annex 8 World Cluster Status

Source: Prof. Michael E. Porter, Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School; Richard Bryden, Project Director. Contributions by Niels Ketelhohn, Alfonso Mendoza, Martha Cabanas, and Pablo Nuño, (UPAEP University).



Annex 9 Tlaxcala's Higher Education

Source: Department of Statistics of the Educational Services Unit of the State of Tlaxcala

Tipo / Institución	Majors	Students	Comp.	Grad	PhD
<b>Higher Education</b>	271	30,066	5,033	3,335	2,961
<b>AUTONOMOUS</b>	61	12,960	1,933	1,429	1,527

<b>UNIVERSIDAD AUTONOMA DE TLAXCALA</b>	61	12,960	1,933	1,429	1,527
<b>DESCENTRALIZED</b>	3	159	28	0	25
<b>INSTITUTO DE ESTUDIOS SUPERIORES DEL MAGISTERIO</b>	3	159	28	0	25
<b>STATE</b>	2	663	282	238	56
<b>CENTRO DE ESTUDIOS SUPERIORES DE COMUNICACION EDUCATIVA EN TLAXCALA (CESCET)</b>	2	663	282	238	56
<b>TECHNOLOGICAL INSTITUTES</b>	30	4,337	314	276	301
<b>INSTITUTO TECNOLOGICO DE APIZACO</b>	17	3,094	228	184	198
<b>INSTITUTO TECNOLOGICO DEL ALTIPLANO DE TLAXCALA</b>	5	711	36	63	62
<b>INSTITUTO TECNOLOGICO SUPERIOR DE TLAXCO</b>	8	532	50	29	41
<b>NATIONAL POLYTECHNIC INSTITUTE</b>	4	69	16	12	8
<b>CENTRO DE INVESTIGACION EN BIOTECNOLOGIA APLICADA CIBA-IPN</b>	4	69	16	12	8
<b>NORMAL</b>	6	1,849	565	554	141
<b>ESCUELA NORMAL EDUCACION FISICA REVOLUCION MEXICANA</b>	2	368	157	147	27
<b>ESCUELA NORMAL LEONARDA GOMEZ BLANCO</b>	1	247	62	62	13
<b>ESCUELA NORMAL PROFA. FRANCISCA MADERA MARTINEZ</b>	1	410	127	124	34
<b>ESCUELA NORMAL RURAL LIC. BENITO JUAREZ</b>	1	332	71	71	36
<b>ESCUELA NORMAL URBANA FEDERAL EMILIO SANCHEZ PIEDRAS</b>	1	492	148	150	31
<b>PARTICULAR</b>	136	3,877	687	302	656
<b>CENTRO DE ESTUDIOS SUPERIORES DE TLAXCALA</b>	6	368	85	72	36

<b>CENTRO DE ESTUDIOS SUPERIORES DEL BOSQUE, A.C.</b>	5	139	31	20	21
<b>CENTRO DE REHABILITACION INTEGRAL</b>	1	166	29	5	10
<b>CENTRO ESCOLAR COLEGIO ESPAÑOL DE TEPEHITEC, S.C.</b>	0	0	0	0	0
<b>CENTRO SUPERIOR DE ESTUDIOS EMPRESARIALES Y DE NEGOCIOS</b>	1	13	3	0	11
<b>COLEGIO DE ESTUDIOS SUPERIORES INTERCONTINENTAL</b>	2	48	5	0	16
<b>COLEGIO HUMANISTA DE MEXICO, S. C.</b>	4	94	22	16	21
<b>EL COLEGIO DE TLAXCALA, A.C.</b>	1	23	8	8	0
<b>ESCUELA DE ARGUMENTACION JURIDICA</b>	1	158	31	0	25
<b>ESCUELA DE ENFERMERIA FLORENCIA NIGHTINGALE</b>	1	96	0	0	13
<b>ESCUELA DE ENFERMERIA ISABEL DE HUNGRIA</b>	2	162	0	0	21
<b>ESCUELA MEXICANA DE PUEBLA</b>	3	68	7	0	9
<b>ESCUELA SUPERIOR DE DERECHO DE TLAXCALA</b>	1	132	8	0	29
<b>ESCUELA SUPERIOR DE TURISMO INSTITUTO BRITANICO, A. C.</b>	2	146	29	28	17
<b>ESCUELA SUPERIOR MIGUEL ALEMAN DE TLAXCALA, S. C.</b>	1	80	24	5	19
<b>FACULTAD LIBRE DE DERECHO DE TLAXCALA, A. C.</b>	3	89	0	0	24
<b>INSTITUTO DE CIENCIAS E INVESTIGACION EN LEGISLACION Y JURISPRUDENCIA S.C.</b>	1	11	0	0	10
<b>INSTITUTO DE CIENCIAS UNIVERSITARIAS MUNDIAL A. C.</b>	4	22	0	0	6
<b>INSTITUTO DE COMPUINGLES DE ORIENTE</b>	0	0	0	0	0
<b>INSTITUTO DE DESARROLLO EDUCATIVO</b>	1	19	0	0	8

<b>INSTITUTO DE ESTUDIOS DE POSGRADO EN TLAXCALA</b>	0	0	0	0	0
<b>INSTITUTO DE ESTUDIOS SUPERIORES BENITO JUAREZ</b>	4	49	2	0	14
<b>INSTITUTO DE ESTUDIOS SUPERIORES DANTE ALIGHIERI DE TLAXCALA, A.C.</b>	1	102	30	12	5
<b>INSTITUTO DE ESTUDIOS SUPERIORES SALVADOR ALLENDE</b>	1	19	0	0	3
<b>INSTITUTO FRANCISCANO DE ORIENTE</b>	4	47	16	0	22
<b>INSTITUTO LIBERAL DE ESTUDIOS SUPERIORES</b>	0	0	0	0	0
<b>INSTITUTO LUISA SCHEPPLER S. C.</b>	1	107	0	0	10
<b>INSTITUTO MEXICANO DE VALORES, S. C.</b>	2	34	14	0	25
<b>INSTITUTO TECNOLOGICO DE TLAXCALA</b>	7	137	63	17	34
<b>INSTITUTO UNIVERSITARIO QUIROGA, A. C.</b>	2	25	0	0	6
<b>UNIVERSIDAD ABIERTA DE TLAXCALA, A. C.</b>	19	199	77	0	0
<b>UNIVERSIDAD DEL ALTIPLANO</b>	11	305	47	90	46
<b>UNIVERSIDAD DEL VALLE DE TLAXCALA</b>	16	482	135	25	89
<b>UNIVERSIDAD HISPANOAMERICANA</b>	0	0	0	0	0
<b>UNIVERSIDAD METROPOLITANA DE TLAXCALA</b>	7	366	12	4	56
<b>UNIVERSIDAD POPULAR AUTONOMA DEL ESTADO DE TLAXCALA, A. C.</b>	0	0	0	0	0
<b>UNIVERSIDAD SANTANDER</b>	0	0	0	0	0
<b>UNIVERSIDAD VIRTUAL HISPANICA DE MEXICO, S. C.</b>	18	153	9	0	34
<b>UNIVERSIDAD XICOHTENCATL MESOAMERICANA</b>	3	18	0	0	16
<b>POLYTECHNIC UNIVERSITIES</b>	10	3,358	431	380	137

<b>UNIVERSIDAD POLITECNICA DE TLAXCALA</b>	7	3,126	431	380	123
<b>UNIVERSIDAD POLITECNICA DE TLAXCALA REGION PONIENTE</b>	3	232	0	0	14
<b>TECHNOLOGICAL UNIVERSITIES</b>	13	1,620	563	55	40
<b>UNIVERSIDAD TECNOLOGICA DE TLAXCALA (UTT)</b>	13	1,620	563	55	40
<b>NATIONAL POLYTECHNIC UNIVERSITY</b>	5	948	200	71	57
<b>UNIVERSIDAD PEDAGOGICA NACIONAL UNIDAD 291 TLAXCALA</b>	5	948	200	71	57
<b>TLAXCALA EDUCATIONAL SERVICES UNIT (USET)</b>	1	226	14	18	13
<b>CENTRO DE ACTUALIZACION DEL MAGISTERIO</b>	1	226	14	18	13

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