Clusters and High Technology Industries in Mexico: A Theoretical Review

Ana Romo[1,*], Ángles Villalobos[2] & Alfredo Toríz[3]

[1]School of Mecatrónica, Universidad Tecnológica de Jalisco, Guadalajara, México

[2]School of Tecnologías de la Información y la Comunicación, Universidad Tecnológica de Jalisco, Guadalajara, México

[3]School of Doctorado en Planeación estratégica y dirección de tecnología, Universidad Popular Autónoma del Estado de Puebla, Puebla, México

*Corresponding author: School of Mecatrónica, Universidad Tecnológica de Jalisco, Guadalajara, México. Tel: 52-33-3110-0905. E-mail: aromo@utj.edu.mx

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Abstract

This work is part of a research into the design of a Knowledge Management Model (KMM) to develop investigation skills in high-tech companies in Mexico. The importance of these companies is that the type of goods produced are of high value as they focus on knowledge as a hub for scientific and technological progress, so that companies have a direct impact on economic and social development of a country that is measured by growth of different indicators internationally standardized as the Gross Domestic Product (GDP), the share of world trade, the productivity and competitiveness; and per capita income and the inhabitants welfare. However, given the dynamic economic and competitive context in which these companies globally work, in this document document are conceptualized and classified High Technology (HT) companies from the point of view of the type of production they generate related to international nomenclature for economic activities, the general characteristics that place them globally within that category, as well as their clustering that is geographically distributed in Mexico with the aim of defining strategies to improve the economic and productive potential to contribute to reduce regional inequalities.

Keywords: *clusters; clasification; high tecnology; industries in México*

1. Introduction

The lack of consensus on a generic definition of High Technology (HT) companies is due precisely to its changing nature and dynamism of the market in which they operate (McKenna, 1985; Moriarty & Kosnik, 1989) which requires to establish, rather than a boundary on them, their inclusion in schemes supported by the intensity of use of technology and the type of goods they generate and also are influenced by the economic system of a country derivative of tariff classification schemes and its customs nomenclature.

The first classification methodology was presented by The Organisation for Economic Co-operation and Development (OECD) and it includes industrial analysis for the period 1970-1980 (Molero-Zayas & Hidalgo, 2003), the list grouped the industries according to their technological intensity based on three indicators on expenditure on R & D: the first indicator related spending with the added value, the second with the production and the third with the types of technology that incorporates both intermediate goods as in investment for production.

In this first list companies were categorized into high (HT), medium (MT) and low (LT) technology and subsequently the OECD (1995) derived a division of the period 1980-1995 that segmented the medium technology into medium-high and medium-low technology and reclassified sectors of low technology segment. The classification criteria have had several updates; the first by Hatzichronoglou (1997) for the OECD and current classification is contained in the fourth revision of the International Standard Industrial Classification of All Economic Activities or ISIC (United Nations [UN], 2008). The section about *Definition of Technological Intensity*, which is calculated based on the analysis of global indicators on the manufacturing industry based on R&D activities, has kept the same categorization of industries from the 2001 edition to 2011 (OCDE, 2011a).

In addition to the criteria for classification on expenditures for R&D, in Von Glinow & Mohrman (1990) they consider that the proportion of specialized human capital plays in these industries should be higher than the industry average and these sectors potential growth is enhanced by the application of new technologies and the creation of new products.

Backed by these classification schemes Molero-Zayas & Hidalgo (2003, p. 5) suggest that high-technology sectors can be defined generically, "as those who, given their high degree of complexity, require continuous effort in research and a solid technological base" For the nomenclature of these industries, the Statistical Office of the European Union (2011) employs a correspondence between ISIC sectors with the Nomenclature of Economic Activities in the European Community (NACE). Meanwhile, Spain established the correspondence between the NACE classification and the National Classification of Economic Activities (CNAE) which includes as high technology companies Services technology, in categories 62 and 63 (CNAE, 2009), on programming, consultancy, information services and other activities related to computer science.

In Mexico, from a standpoint of view of product, the determination of foreign trade in High Technology goods (BAT) considers that:

> "They are the result of an intense process of research and technological development (RTD) and are characterized by frequent evolution, require heavy capital investments with high risk; have an obvious strategic importance and generate high levels of international cooperation and competition. The set of high technology goods includes consumer goods, intermediate goods and machinery and equipment used by industry (direct technology) "(National Council of Science and Technology [CONACYT], 2013, p. 327).

Starting from this conceptualization we use the D*efinition of Technological Intensity* (Hatzichronoglou, 1997), the International Standard Classification of Commerce for all economic activity (ISIC), recommended by the United Nations (UN, 2008) for the use of nomenclature and its correspondence with the North America Industry Classification System (NAICS) of the (National Institute of Statistics and Geography [INEGI], 2013), thus allowing to establish the list of companies considered High Technology and generating BAT products within nine industry groups: aerospace, computers-office machines, electronics, telecommunications, pharmaceuticals, scientific instruments, electric, chemical machinery, non-electrical machinery and armaments.

Although the third revision of ISIC manufacturing industries over the analysis presented in OECD (2011a) consider companies in electronics and telecommunications as medium-high technology, in Mexico trade intensity and BAT products from electronics area flow with US makes them covered within the Technology Balance of Payments and are classified as part of the companies that produce High Technology goods.

Since the ISIC only considers the classification of manufacturing area industries, it is worth pointing out that the production value of trade in computers in manufacturing has been the only one with positive balance of trade in Mexico since 2009 (Secretary of Economy [SE], 2013a) and it is directly related to the activities of computer and cutting edge technology services to produce various devices requiring embedded systems (US Mexico Foundation for Science [FUMEC], 2013), so in this study, the sector IT services will also be consider as high technology as intangible assets generated can be classified as BAT.

2. Method

In this study a documentary investigation was performed with descriptive approach that addresses quantitative aspects for the analysis of high-tech enterprises through indicators that allow international comparison. It is based on document analysis (Alfonso, 1981) as systematic scientific process to inquiry data that contribute to construction of knowledge. The descriptive study (Hernández, Fernández-Collado & Baptista, 2010) allows data selection, measurement and collection to achieve the description of the phenomenon under study.

3. Results

The determination of the characterization of High, Medium and Low technology companies is regulated by the OECD (2011a) by analyzing information from the ANalytical Business Enterprise Research and Development (ANBERD) database on national accounts of OECD countries functioning as comparative to determine the technological intensity of industries. The information obtained is stored in the STructural ANalysis (STAN) database through a set of indicators grouped by the OECD (2011b) according to five major themes: international trade, industrial composition, research and business development, employment and productivity and investment. Table 1 shows the existing indicators that have established the technological intensity of industries to achieve their classification.

Table 1. STAN Indicators for International Trade

Type indicator:	**STAN Indicators**
International trade: Indicators based on exports and imports only	Intra-industry trade Contribution to manufacturing trade balance Export import ratio Trade balance Composition of total export of goods Composition of exports of manufacturing goods Composition of total imports of goods Composition of imports of manufacturing goods
International trade: Indicators based on exports, imports and production	Export share of production Import penetration
Industrial composition	Value added shares relative to total economy Value added shares relative to total manufacturing Value added share of production Intermediate consumption share of production
Business enterprise R&D	Distribution of R&D expenditures across industries for the total economy Distribution of R&D expenditures across industries for total manufacturing R&D intensity using value added R&D intensity using production
Employment and productivity	Employment shares relative total economy Employment shares relative total manufacturing Labour compensation per employment for the total economy Labour compensation per employment for total manufacturing Labour share of value added Labour productivity Unit labour cost
Investment	Investment intensity based on value added Investment shares relative to total economy Investment shares relative to total manufacturing

Source: OECD (2011b).

The STAN indicators relate directly with the International Standard Industrial Classification of All Economic Activities (ISIC/CIIU) (UN, 2008, p. 3) since the classification "provides a general framework in which economic data can be collected and disseminated on a format designed for purposes of economic analysis, decision-making and policy development."

The ISIC descending method uses a hierarchical structure comprising 21 sections (alphabetized), division, group, class and description. Currently the manufacturing industries are located in Section C, the information and communication industries in the J and scientific and technical activities in M. Classification of manufacturing industries into categories based on R & D intensities with the 4th revision of ISIC and its relationship to the North America Industry Classification System, Mexico or SCIAN (INEGI, 2013) are shown in Tables 2 and 3.

Table 2. List of High Technology Industries with Industrial Classification Systems

Definition of technological intensity (OCDE, **2011a)**	Description	**ISIC** 2008 Rev. 4	SCIAN 2013
High Technology Industries	Manufacture of aircraft and spacecraft	Group 303	3364
	Pharmaceutical industry	Division 21	325411
	Manufacture of office, accounting and computing*	Division 26	3341
	Manufacture of radio, television and communication equipment and devices **	Group 263	3342
	Manufacture of medical, optical and precision instruments *	Division 26X	3345

Source: Own calculations based on (OCDE, 2011a; UN, 2008; INEGI, 2013)

* Updated to: Manufacture of computer, electronic and optical products

** Updated to: Programming and broadcasting activities and telecommunications

Classifiers updates generate different modifications on codes of industries and titles for its definition, which requires the reformulation of descriptions in some of the categories that must remain within the limits of the sectors to allow comparison between countries.

Table 3. List of Medium-high Technology Industries with Industrial Classification Systems

Definition of technological intensity	Description	ISIC 2008 Rev. 4	SCIAN 2013
Medium-High technology	Manufacture of electrical equipment previously uncategorized	Division 27	3344
	Manufacture of motor vehicles, trailers and semitrailers	Division 29	3362
	Manufacture of chemicals and chemical products	Division 20-21	325412
	Manufacture of railway material and other transport equipment	Groups 302, 304, 309	3365, 3361, 3362
	Manufacture of machinery and equipment previously uncategorized	Division 28	333-3336

Source: Own calculations based on (OCDE, 2011a; UN, 2008; INEGI, 2013)

In Table 3 the description of the industries considered Medium-high technological intensity is presented. The activities related to computer and technology services, are classified in Divisions 62 and 63 of SCIAN 2013 (INEGI, 2013) called Computer programming, consultancy and related activities, information service activities, respectively.

In Mexico, the (National Development Plan 2013-2018 [PND], 2013) intended by Objective 4.8. "Develop the strategic sectors of the country" and the Strategy 4.8.1. "Reactivating an economic development policy focused on increasing the productivity of the dynamic and traditional sectors of the Mexican economy, regionally and sectorally balanced ", while the Innovative Development Program 2013-2018 (PDI) of the Secretary of Economy (2013b) has sectorial objective 1 "Develop a policy of industrial development and innovation to promote balanced economic growth by sectors, regions and enterprises." Sectorial objective 1 strategies are summarized in Table 4.

Table 4. Strategies of Innovative Development Program 2013-2018 of Mexico and Related Sectors

Mexico's PDI Sectorial objective 1 strategies	Sectors	Transversely
Strategy 1.1. Boost productivity in mature industries.	Mechanical Metal and Steel Industry etc.	Strategy 1.6. Promoting innovation in sectors under the scheme of participation of academia, private sector and government (triple helix).
Strategy 1.2. Increase the competitiveness of the dynamic sectors.	Automotive and Parts, Aerospace, Electrical, Electronic and Chemical.	
Strategy 1.3. Attract and promote emerging sectors.	Biotechnology, Pharmaceutical, IT, Creative industries, medical equipment,	
Strategy 1.4. Encourage the development of procurement, to integrate and strengthen value chains that contribute to the creation of clusters.	Automotive, Aviation Electronics, Electrical	

Source: (SE, 2013b)

The Directorate General of Heavy Industries and High Technology of the Ministry of Economy is responsible for the Program for Technological Development of High Technology Industry (PRODIAT), maintains a national scope to support companies classified in the sub-sectors 333-336 of CNAE (2009).

Goods produced by firms achieve an industry position within the categorization of High, Medium or Low technology. It can be observed, through measurement with STAN indicators, the impact they have on the economies of the countries in its trade balance and social benefits generated by exports, added value and employment and productivity. It is also clear that the link between different industries has been narrowed increasingly and this has forced the continuous updating of industrial classification systems. The various activities related to technology companies such as expenditures on research and development and high investment required to remain competitive globally impel them to work on complex collaboration schemes so companies often integrated into clusters of high technology.

3.1 Mexico's High Technology Clusters

The benefits obtained by the firms of an industry to face global competition to maintain liaison and cooperation between the various actors who make up a sector have been widely discussed from various perspectives, by (Arikan, 2009; Cummings & Teng, 2006; Porter, 1990; Saxenian, 1994).

The conceptualization based on the agglomeration of economic activities in Porter (1998) on the clusters was presented by Marshall (1920) states that geographic clustering of companies and institutions interconnected in a particular field is used as a strategy by arguing companies are more competitive when not working in isolation.

To Montana and Nenide (2008) clusters are part of government strategies for sustainable regional development that enables businesses to compete internationally and analyze employment trends both their quality and productivity within clusters. Felzensztein, Gimmon and Aqueveque (2012) consider a company within a cluster obtains higher yields when products are marketed through cooperation with various actors, understanding actors as categorized by Sölvell, Lindqvist and Ketels (2003) as companies, government, academia, financial institutions and collaboration.

Engel and del Palacio (2009) emphasize the use of innovation networks in clusters, mobility of resources and processes of entrepreneurship in the global context, this because attracting highly qualified staff who are able to concentrate foster the exchange of ideas and knowledge (Camagni, 1991) identify mechanisms to facilitate knowledge sharing within a cluster and its effect are treated by Connell, Kriz, and Thorpe (2014), concluding that efficient linkage capability between organizations are seen as a key management strategy for contemporary innovation.

The proposed theoretical model for transforming industrial clusters in dynamic cluster exposed by McDermott, Coraredoira and Kruse (2009), whilst providing the advantages of clusters is based on the assumption that the economies of emerging markets are not uniform because they are characterized by different organizational structures depending on the regions, which can have a negative impact on the economy and increase social inequalities if there is no coordination between businesses and the local economy, so you should consider regional economic specialization.

The distinctive economic specialization of a conglomerate influences the micro and macro economic policies of a country or region, in the case of Latin America, the analysis of the Science and Technology Parks (PCT) presented by Rodríguez-Pose (2012) to the Inter-American Development Bank (IDB) argues that the problems for these clusters are related to the demand for technology, certifications, lack of investment in research and promote innovation as well as excessive institutional regulations. In the analysis, Brazil is positions as the country with the largest number of PCT and Mexico in the 2nd. place with a "total of 35 parks, of which 21 are operational seven under implementation and seven in the project" (Rodríguez-Pose, 2012, p. 21).

The updated data in Mexico (González, 2012) to the National Chamber of Electronics, Telecommunications and Information Technology (CANIETI) establish an advance of 38 centers of high technology related to IT, these clusters agglutinate together more than a thousand technology companies in 28 of the 32 states of the country where there are more than 900.000 jobs related to the industry of Information Technology and Communication (ICT) and 400.000 software specialists, clusters per entity are shown in Table 5.

Table 5. List of Mexican IT Conglomerates by State

No.	State	IT Cluster Name	Quantity
1	Aguascalientes	Clúster de Tecnologías de la Información de Aguascalientes A.C (INNOVATIA)	1
2	Baja California	Clúster de Tecnología de la Información de Baja California A.C. (IT@Baja)	2
		Centro de Tecnologías de la Información de Baja California A.C (CTI)	
3	Campeche	CITI Campeche	1
4	Chiapas	Clúster de Tecnologías de Información de Chiapas (en proceso de legalización de asociación de 5 empresas)	1
5	Chihuahua	Clúster de Información y Telecomunicaciones de Chihuahua	2
		Dinformática 21	
6	Coahuila	Consejo de la Tecnología de la Información de la Laguna (CTI Laguna Coahuila)	3
		Clúster de Tecnologías de la Información de la Región Sureste de Coahuila	
		Coahuila IT Clúster	
7	Colima	Asociación de la Industria Electrónica y Tecnologías de la Información	1
8	Distrito Federal	Dsoftware	1
9	Durango	Corporativo MiPYME de Alta Tecnología	1
10	Estado de México	Prosoftware A.C	1
11	Guanajuato	Clúster de Software ITESI	1
12	Guerrero	Clúster Informática y Telecomunicaciones del Estado de Guerrero	1
13	Jalisco	Consorcio de Exportación de Tecnologías de Información CTI Jalisco	2
		Instituto Jalisciense de TI (IJALTI)	
14	Michoacán	Clúster de Tecnologías de la Información y Comunicaciones de Michoacán	2
		Clúster para desarrollo de Software en ANADIC Michoacán	
15	Morelos	Asociación de la Industria del Software A.C	1
16	Nayarit	Instituto Nayarita de las Tecnologías de la Información	1
17	Nuevo León	Monterrey IT Clúster	3
		Consejo para el Desarrollo de la Industria de Software de NL	
		Consejo para el Impulso de la Industria de Medios Interactivos	
18	Oaxaca	Clúster TI Oaxaca	1
19	Puebla	Clúster para la Innovación en tecnologías de la Información	2
		Arquitectos de Software	
20	Querétaro	InteQSoft Clúster de Tecnologías de Información de Querétaro	1
21	Sinaloa	Código TI	2
		Clúster Mochis CODESIN Zona Norte	
22	Sonora	Parque Tecnológico SonoraSoft	1
23	Tabasco	CITI Tabasco	1
24	Tamaulipas	Clúster de Tecnologías de la Información Tamaulipas	1
25	Tlaxcala	Clúster de Tecnología de Información Tlaxcala	1
26	Veracruz	Clúster Veracruz Ver@Cluster	1
27	Yucatán	Consejo de la Industria de la Tecnología de la Información de Yucatán	1
28	Zacatecas	Clúster de Zacatecas	1
		TOTAL	38

Source: González (2012)

The exercise of citizen participation and accountability Prosoft Fund 2014 (SE, 2014a) conducted by the Directorate General for Innovation, Services and Interior, the Ministry of Economy Trade, said 25% of companies from the IT sector exports with a value of exports accounting for between 7 and 27% of sales, however, over 50% of companies have problems recruiting qualified staff.

Besides IT clusters, technology parks registered in Mexico according to (Scientific and Technological Consultative Forum AC [FCCyT], 2013) based on the 2009 Report on Science Parks of the Ministry of Economy, said there are a total of 28 parks industry in 19 states according to the list shown in Table 6.

Tabla 6. List of Technology Parks by State

No.	State	Technology Park Name	Quantity
1	Aguascalientes	Parque industrial Tecnopolo Pocitos	1
2	Baja California	Parque de Innovación Tecnológica del Centro de Investigaciones Biológicas del Noroeste (BioHelis-Cibnor)	3
		Frontera del Silicio (Silicon Border)	
3	Chihuahua	Parque Tecnológico Universidad Autónoma de Chihuahua	1
4	Distrito Federal	ITESM, Parque Tecnológico campus Ciudad de México	4
		TESM, Parque Tecnológico campus Santa Fé	
		Tec Milenio, campus Azcapotzalco, Prosoft Milenio Ferrería	
		Tecnoparque Azcapotzalco	
5	Durango	Hi-Tech Laguna Park	1
6	Hidalgo	CIIMMATH	1
7	Jalisco	Parque de Software en Ciudad Guzmán (Green IT Park)	4
		ITESM, PCITEC Guadalajara	
		Tec Milenio, campus Guadalajara	
		Parque del Instituto Tecnológico y de Estudios Superiores de Occidente	
8	Michoacán	Parque Tecnológico Agroindustrial para el Estado de Michoacán	1
9	Morelos	ITESM, Parque Tecnológico campus Cuernavaca	1
10	Nuevo León	Parque de Investigación e Innovación tecnológica (PIIT)	3
		ITESM, campus Monterrey (CTI)	
		Tec Milenio, campus Las Torres	
11	Oaxaca	Parque Tecnológico de la Mixteca	1
12	Puebla	ITESM, Parque Tecnológico de Puebla	1
13	Querétaro	ITESM, Parque Tecnológico campus Querétaro	1
14	Sinaloa	Tec Milenio, campus Culiacán	1
15	Sonora	ITESM, campus Sonora Norte (Hermosillo)	1
16	Tabasco	Tec Milenio, campus Villahermosa	1
17	Tamaulipas	Parque Científico y Tecnológico Tecnotam	1
19	Yucatán	Parque Científico Tecnológico de Yucatán	1
		TOTAL	28

Source: FCCyT (2013).

Is important to mentioned that in the original conceptualization of the Technology Parks (Pardo, 2013) are considered as spaces focused on industry output not necessarily establish priority relations with university, but in Mexico, most of them are initiatives private higher education institutions as can be seen in Table 5, they are physically immersed in the spaces of the institutions where academic staff can offer most consulting services and technology consulting in the projects requested by companies, projects are also supported by students of different educational levels with the aim of forming specialized human capital.

As part of the strategy in Mexico to increase the competitiveness of the dynamic sectors, the automotive sector included, in the First Report of innovative development program 2013-2018 (SE, 2014b, p.3) specifies that made specific economic supports with an investment of $ 1.300 million in 2013. Table 7 shows the relationship of plants for light and heavy vehicles as well as auto parts by state.

Table 7. List of States with Plants for the Automotive and Auto Parts Industry

No.	State	Light Vehicles Plants	Heavy Vehicles Plants	Auto parts
1	Aguascalientes	X		X
2	Baja California	X	X	X
3	Chihuahua	X		X
4	Coahuila	X	X	X
5	Distrito Federal			X
6	Durango			X
7	Estado de México	X	X	X
8	Guanajuato	X	X	X
9	Hidalgo		X	
10	Jalisco	X		X
11	Morelos	X		X
12	Nuevo León		X	X
13	Puebla	X	X	X
14	Querétaro		X	X
15	San Luis Potosí	X	X	X
16	Sinaloa			X
17	Sonora	X		X
18	Tamaulipas			X
19	Tlaxcala			X

Source: own from (ProMéxico, 2013a)

The data in Table 6 can identify that over 50% of the 32 federal entities operating in this sector.

Another growing sector of high technology companies located in the country is aerospace sector. 197 companies mainly concentrated in several states bordering with US according to Table 8 are identified.

Table 8. States with Aerospace Cluster and Research Centers (RC)

No.	State	Number of companies in the sector	Research Centers (RC) with studies in aeronautical
1	Baja California	49	
2	Chihuahua	29	
3	Distrito Federal		2
4	Estado de México	10	
5	Jalisco		1
6	Nuevo León	25	4
7	Querétaro	30	3
8	Sonora	43	
9	Tamaulipas	11	

Source: ProMéxico (2013a)

The relationship of clusters of High Technology in Mexico by state is shown in Table 9.

Table 9 allows us determine that Mexico is currently focused on consolidating high technology industries as Quintana Roo is the only state not engaged in these sectors directly related activities. States with more than one specialized sector in high technology are Baja California, Chihuahua, the State of Mexico, Jalisco, Nuevo León, Puebla and Queretaro; and they took the top ranking state competitiveness according to (Mexican Institute for Competitiveness AC [IMCO], 2013).

Industrial Policy in Mexico focuses on strengthening existing or being formed clusters, aims to improve the business environment and attracting investment capital and innovation and human capital identifying technological and human capacities of each sector were found on academia, industry and government. It is used to achieve this goal a strategy to establish networks for creating and maintaining linkage among stakeholders in order to achieve the promotion and positioning of national conglomerates internationally.

Table 9. Concentrate of High Technology Clusters per State in Mexico

No.	State	IT Cluster	Technology Park	Light Vehicles Plants	Heavy Vehicles Plants	Auto parts	Aerospace Cluster	Aeronautical Studies RC*
1	Aguascalientes	X	X	X		X		
2	Baja California	X	X	X	X	X	X	
3	Campeche	X						
4	Chiapas	X						
5	Chihuahua	X	X	X		X	X	
6	Coahuila	X						
7	Colima	X						
8	Coahuila			X	X	X		
9	Distrito Federal	X	X			X		X
10	Durango	X	X			X		
11	Estado de México	X		X	X	X	X	
12	Guanajuato	X		X	X	X		
13	Guerrero	X						
14	Hidalgo		X		X			
15	Jalisco	X	X	X		X		X
16	Michoacán	X	X					
17	Morelos	X	X	X		X		
18	Nayarit	X						
19	Nuevo León	X	X		X	X	X	X
20	Oaxaca	X	X					
21	Puebla	X	X	X	X	X		
22	Querétaro	X	X		X	X	X	X
23	San Luis Potosí			X	X	X		
24	Sinaloa	X	X			X		
25	Sonora	X	X	X		X		
26	Tabasco	X	X					
27	Tamaulipas	X	X			X		
28	Tlaxcala	X				X		
29	Veracruz	X						
30	Yucatán	X	X					
31	Zacatecas	X						

Source: Own elaboration with data from (González, 2012; FCCyT, 2013; ProMéxico, 2013a; ProMéxico, 2013b)

* Research Center

3.2 Organizational Structure in High Technology Companies

Organizational theory (Daft, 2013) can explain current events from the past behavior to achieve predictions required for the proper and effective management of organizations based on identifying patterns of organizational design and behavior considering the environment.

The identification of the dynamic and unpredictable environment that companies are subject from the 80s helped to raise new paradigms of organizational configuration (Mintzberg, 1981, 1994; Morgan, 1990).In the different paradigms (Grisales, 2012; Pedrozo & Rodriguez, 2013; Rodrigues-Filho, 2013) the removal of the mechanistic conception arises and increasingly value the functional organizations (Lawrence & Lorsch, 1986) by flexibility, reduced or flat structure and organizational learning as a key element in ensuring the efficient performance.

Studies addressing learning organizations as in (Bui & Barch, 2010) seek to link the variables in organizational learning to competitiveness and focus on technological capabilities as a strategic element (Tapias-García, 2005) from the evolutionary and constructivist perspective in (Figueroa, 2011) states that the only sustainable source of competitive advantage is the ability to learn faster than competitors and addresses the importance of changing organizational behavior as a basic learning mechanism.

Organizational behavior as a scientific discipline is treated by Alles (2013) stating that positive change can be achieved through management skills and knowledge contributes steadily in both scientific advances and conceptual advances.

In line with the theory, organizational structure in enterprises has been adapted by reorganizing three key components: the formal reporting relationships, grouping of individuals by departments throughout the organization and communication, coordination and integration systems (Child, 1984). These three components allow organizational activities grouped into functional, divisional, matrix, horizontal structures, or hybrid virtual network (Daft, 2013, p. 90), in the definition of the structure is necessary to consider the stability and complexity of the environment.

In stable environments with low or moderate uncertainty structure tends to be mechanical and formal, but unstable and complex environments with high uncertainty, as in high technology companies, the structure tends to be organic, teamwork, participatory and decentralized (Brews & Purohit, 2007) and interorganizational relationships tend to be structured through networks of collaboration (Osma, Puertas & Rodríguez (2013).

In this same sense, the proposed Láscaris (2002) for Latin America on a system for generating knowledge, points out that "must be done from the perspective of unification and consistency in relation to the global problem of development" and "grounded on a set of policies that favor the development of endogenous scientific-technological capabilities" to achieve strengthen the productive sectors of the countries.

Although for proper operation each company can set its own organizational structure and strategic management intends to achieve economy in the area of human resources, high technology companies require the integration of research and development with finance, production and operation through schemes that strengthen teamwork in a participatory and decentralized manner.

The correct definition of mechanisms for the generation of networks of collaboration between various actors provides access to programs to promote innovation and development in industry and obtaining investment through venture capital to maintain sustained growth companies (FUMEC, 2014). This growth is achieved by generating innovative products whose development time can be above average due both to the organizational structure of enterprises and human capita skills in the area of research and development.

4. Discussion

Correct identification of high technology companies and identifying cluster allows the analysis of indicators to establish the relationship between the activities of Science, Technology and Innovation and determine the standard of living of the inhabitants. Currently there is a consensus in Latin America and the Caribbean on the importance of proper measurement and construction of accurate statistics to understand the complex and dynamic social reality to meet the challenges of new forms of learning, the application of micro and macro economic policies and the resource planning.

The challenges facing companies to enhance the skills and capabilities of Mexican researchers, has implicit commitment to the promotion and participation in Research and Experimental Development in order to become competitive in a globalized society that used as intangible resource the generation and exploitation of knowledge.

The schedule of activities in Science, Technology and Innovation, spending on research and experimental development and consolidation of the critical mass of researchers will focus on the areas and priorities set for Mexico and the degree of articulation having with the public sectors private and social may be measured by the indicators.Acknowledge the limitations of your research, and address alternative explanations of the results. Discuss the generalizability, or external validity, of the findings. This critical analysis should take into account differences between the target population and the accessed sample. For interventions, discuss characteristics that make them more or less applicable to circumstances not included in the study, how and what outcomes were measured (relative to other measures that might have been used), the length of time to measurement (between the end of the intervention and the measurement of outcomes), incentives, compliance rates, and specific settings involved in the study as well as other contextual issues.

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