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In Number 3th As a first article we present, *Agrotourism as an alternative for sustainable local development in the curve, Xalisco, Nayarit; Mexico. In the year 2017*, by FRANCO-LÓPEZ, Jazmín, JALOMO-AGUIRRE, Francisco and CAMELO-AVEDOY, José Octavio, with affiliation at the Universidad Autonoma de Nayarit, as the following article we present, *Effects of trends in the digital economy and technological factors in the Mexican labor market, (2011-2017),* by INZUNZA-MEJÍA, Patricia Carmina, with secondment at the Universidad Autonoma de Sinaloa, as follows, *Economic Growth and Natural Resources in Latin America: an application of the Stiglitz model*, by CUENCA, Andrea & OCHOA-JIMÉNEZ, Diego, with secondment in the Private Universidad Tecnica de Loja, as following article we present, *Capacitation and Educational Level and their Relation with the Teacher's Digital Skills*, by CANTU-BALLESTEROS, Lorenia, URÍAS-MURRIETA, Maricela , MANCINAS-MORALES, Massiel and FIGUEROA-RODRÍGUEZ, Sebastián, with secondment at the Instituto Tecnologico de Sonora, as the following article we present, *Industry 4.0 in manufacturing enterprises*, by MENDOZA-VALENCIA, Juvenal & HURTADO-MORENO, Juan J., with adscriopcion in the Instituto Politecnico Nacional, Mexico, as last article, *Local and Global productivity and their effects on value added in Mexico, (1993-2015): The case of industrial manufacturing sub branches*, by RÍOS-NEQUIS, Eric Israel, CONTRERAS-ÁLVAREZ, Isaí and BUSTOS-GUAJARDO, Ricardo, with secondment. Universidad Politécnica Metropolitana de Hidalgo

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Agrotourism as an alternative for sustainable local development in the curve, Xalisco, Nayarit; Mexico. In the year 2017

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Abstract

This document is intended to analyze and present research advances; regarding the economic and social situation of the locality called La Curva, located in the municipality of Xalisco in Nayarit, Mexico, where there is the potential to promote agrotourism activities; to be paid for the benefit of the inhabitants of the area as a sustainable local development strategy. The Methodology used at this work is mainly qualitative, where the social proposal of agrotourism has been obtain by interviews at the local actors. The theoretical framework used has been theories of Local Development with a hypothetical deductive research approach. This investigation formulated by the local people of La Curva has a main goal, to identify of the local resourses and at the same time, to promote the proposal made by themselves to apply the agrotourism activities as an alternative of the agriculture work.

Agrotourism, Sustainable Local Development, La Curva Xalisco, Alternative Tourism

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Introduction

With the environmental crisis that was highlighted at the international level in the decade of the 60's, after the publication Silent Spring by Rachel Carson, it has been evident that the development must have a new route of action different from the exclusive model capitalist development based purely on production and consumption, to move towards a way of life that respects customs and societies producing food, always in harmony and balance with the ecological environment.

Therefore, today it is necessary to diversify the way to take advantage of agricultural activities, under a notion not only of exploitation as a synonym of growth, but of sustainable local development, which compensates those communities that provide food to large population centers, opening opportunities to improve the living conditions of those who have dedicated themselves for several decades to harvest and cultivate the land.

This document talks about sustainable local development, since the simple concept of local development is not enough to build the theoretical scaffolding that sustains this study, since the economic and social problems of a territory must necessarily take into account the urgent need for care ecological, even more so when the rural territory and also what is produced there needs the preservation, conservation, rational use and sustainable exploitation of the natural resources.

Therefore, in this analysis sustainability is a relevant issue in the diversification of the productive activities of the agricultural environment of which a rural community is sustained.

Thus, the curve located in the municipality of Xalisco in the state of Nayarit in Mexico, is a rural area that bases its economy on agriculture that allow their still fertile lands and this, is the base that is intended to diversify, to address the crisis permanent activity that is lived to this day, as the families of the Curve have begun to look for alternatives to be employed and produce the necessary financial support for family maintenance.

It should be noted that this research does not intend to link the agrotourism activities of La Curva to another particular destination or a network of destinations. The main feasible market during this first diagostico process is the capital of the state and the municipal capitals of Xalisco and Compostela, due to its proximity.

For the above mentioned, the results presented here, where agrotourism is seen with the lens of sustainable local development, presents as an action strategy to diversify the activities of La Curva with a notion of empowerment of local actors, through a rational use of its natural resources, all of which will generate jobs and additional income for families, with responsibility and commitment to the ecological environment.

Agrotourism as a tool for sustainable local development

The economic initiatives of local development are designed for the creation of employment through the formation of small family or individual companies, cooperatives of trust (territorial economic groupings adhered to a productive system), they must be cooperatives of trust and cooperation for the association of agents of territory, to carry out various productive activities or for the formation of social networks with the aim of combating social exclusion.

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For this research this theory is shown as a small-scale strategy to mitigate the socio-economic problems of the community. Some of the approaches of authors that analyze local development, define it in different ways in which they coincide or resemble:

Local development is development, it is an endogenous process registered in small territorial units and human groups capable of promoting economic dynamism (Boisier, 2001), Díaz and Ascoli (2006), mentions local development as the one that gives real empowerment to the population to appropriate and decide on what concerns the solution of their problems.

It is an opportunity for local actors to take into their hands the possibility of facing the great transformations of the global economy and societies (Chauca, 2011). According to Cuervo (cited in Chauca, 2011) the local approach to development is a response to the problems of unemployment and economic disorganization caused by industrial decline and relocations (in Europe Local development is considered the response to the macroeconomic crisis)

According to Escribano Francés, (cited in Díaz & Ascoli, 2006), the concept of development is generally linked to the idea of economic and social progress that implies an improvement in the living conditions of individuals and groups of people and an expansion of their possibilities, development is therefore a permanent aspiration of the different collectivities regardless of the relative level that each one has reached.

Díaz and Ascoli (2006) mention that there is no single or predetermined model, but in the case of local development, it must present the reality and location of the actors and their interrelations from which a series of interactions at the same level of local development derive they are vital because they derive the processes that unify objectives, potentiate the resources and generate the improvement in the quality of life of a locality; Of course, that based on a set of values that form synergies that facilitate entrepreneurial strategies from the local, developing skills and innovative proposals. Ethically oriented development must be inclusive, humane, sustainable, participatory, equitable ethical, self-managed and comprehensive social.

Vázquez Barquero (cited in Mendoza, 2014), indicates that local resources play a decisive role in the economic and territorial dynamics. Local production systems have as an important factor the innovative capacity, where the productive skills of the individual (badly called human capital), social, cultural and natural are articulated to take advantage of potential spaces configured as potential for development and open a gap for adoption of more flexible forms of actor organization.

García and González (cited in Mendoza, 2014), argue that the initiatives are presented under a scheme of collaboration between local, state and federal governments that include elements such as a natural vision on economic development policy, state, municipal and federal policies focused on improvement of productivity and the formation of strategic alliances for the use of resources. Alburquerque (2004) mentions that, the local development strategy must be oriented, to ensure better living conditions of the local population, trying to focus fundamentally (although not always exclusively) on the best use of local resources, in order to promote new companies and local jobs.

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For this, the opportunities offered by new information technologies can be used, as well as the reorganization of local production processes according to the orientation towards markets. The construction of an appropriate territorial supply of production support services is an essential part of this local development strategy. Within the different conceptualizations that are presented in the local development, Di Pietro (2014) highlights the most important, expressing that local development must be centered on the following principles:

- Human: focuses on the material and spiritual progress of the person and the community. The benefit of local development focused on social welfare.
- Territorial: it is deployed in a space that operates as an intervention unit. Generally it coincides with some administrative political division (municipality or group of municipalities). Which for the present, refers to the territory of a specific rural community, as a unit of analysis and diagnosis for the present investigation.
- Multidimensional: it covers the different spheres of life in a community, municipality or region. The effects of development in the social, economic and ecological spheres.
- Integrated: articulates policies and vertical and sectoral programs from a territorial perspective, with which it is intended to support and sustain projects specifically for intervention.
- Systemic: involves the cooperation of different actors and the reconciliation of various sectoral interests.
- Sustainable: it extends over time from the mobilization of local resources, since by using resources for the benefit of the community, an interest is generated in caring for them.
- Institutionalized: establishes rules of the game, regulations, policies, organizations and local behavior patterns. Based on local participation systems, the relevant regulations are indispensable.
- Participatory: public agents, intermediate and grassroots organizations and companies actively intervene. The generation of synergies between the different institutions, actors or groups is indispensable for a better appropriation of the project.
- Planned: it is the result of a "strategic look" on the part of a concertation of actors that define procedures, goals and objectives. The present investigation is precisely the initial part; the identification, the recognition and the diagnosis, of which the opening to projects of intervention for the territory is presented.
- Identity: it is structured contemplating the collective identity of the community.
- Innovative: in terms of the management model, productive development, social participation. The promotion of alternative activities in the territory, which represent a new income generation system.

Under this conceptualization, local actors have been promoting initiatives as a response of localities and territories to the challenges posed to productive adjustment and increasing competition in national and international markets, for more than thirty years, while intensifying The process of global integration has emerged and many local development experiences have been developed in poor and late-developing countries in order to reduce poverty, create employment. Favor economic and social progress (Vázquez Barquero, 1988). Vázquez Barquero, also mentions that in other localities and territories the question is not so much in the differentiation of production or cost reduction as in finding new products for markets in which local companies can maintain their competitive advantages.

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This global trend of increased production and falling prices is combined with the indiscriminate opening of the economy itself, so it is not surprising that the global fall in prices leads to an increase in imports; but its deepest root lies in the structural weaknesses that make agriculture of low productivity and competitiveness. As long as this situation persists, the simple increase in public spending on agriculture will be insufficient and will have a very low productive impact.

According to Gutiérrez (2007), when in these approaches to local development the relevance of the territories' natural resources is mentioned, the idea of sustainable development was more striking with the Brundtland Report, which analyzed the situation of the world in that moment and showed that the environment was being destroyed and leaving more and more people in poverty and vulnerability. The objectives of sustainable development are mainly: to reactivate growth, change the quality of growth, meet human needs, ensure sustainable levels of population, conserve and improve the base of natural resources, reorient technology and manage risk, incorporate the environment to the economy in the decision-making processes. This is because not only the importance of strategies in the economic sphere is emphasized for the solution of social problems, but the environment takes an important role of local development in order to achieve sustainability.

The new approach from the United Nations Conference on Environment and Development in 1992 does not only speak of local economic development, but of sustainable local development. According to the "environmental sustainability program" (cited in Morales, 2006), sustainable local development is a local process of community and participatory government, which establishes an intense strategy of action for the protection of the environment, economic prosperity and social welfare within the local sphere.

So from this approach, it is feasible to engage the population of the territory, which is responsible for the use and protection of natural resources and the environment in which they perform their activities, making local actors protagonists of their own development .

Flores (2009), in the Sustainable Rural Development Law, defines sustainable development as the integral improvement of the social well-being of the population and of economic activities in the territory included outside the nuclei considered urban, ensuring the permanent conservation of resources natural resources, biodiversity and environmental services in that territory.

According to Alburquerque (1997) sustainable local development improves the local productive diversification and articulation, the introduction of technological and organizational innovation, the conservation of the local natural environment, the creation of new jobs and the improvement of the infrastructure. Due to the worldwide concern for the deterioration of the environment and the great echo in the subject of sustainability, it tries to be implemented in different theories and activities in order to use natural resources effectively and consciously; and in tourism, it was not the exception.

The emblematic elements characteristic of mass tourism have been the sun and the beach, this explains why most of the mass destinations in the world are those located on the coast. The conventional tourism model undergoes several transformations of global order, which today generates the interest of the tourist activity towards the search of a "healthy" natural environment, a more authentic tourist product, in such a way that the territory is conceptually approached with a new "tourist look":

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The natural and rural character of the space is valued differently; thus, parallel to the inevitable growth of conventional tourism, a different and complementary tourism model emerges: alternative tourism, which Smith and Eadnigton (cited in Bringas & González, 2004), define as tourism that is coherent and consistent with social values , natural and community that allow both the tourist and the local resident, enjoy an interaction based on a series of shared experiences between both.

From alternative tourism, other typologies emerge according to the needs of experiences sought by tourists, Boullón (2008) and different authors, classified as: adventure tourism, ecotourism and rural tourism, and so on. Being in the particular rural tourism that includes different modalities among which is the agrotourism, a category that has been selected in this study as a key, since it is the one best suited to the rural context that represents the town of La Curva.

However, although agrotourism is a derivation of rural tourism, it is necessary to point out that, although in some countries they are used as synonyms, some authors define them as two totally different activities, leaving the distinction between one and another category as follows:

– Rural tourism is that carried out by urban residents who own secondary residences in rural areas, who occupy them for the weekend or longer periods, or rent them out to tourists, as well as the tourism that stays overnight in resort-type facilities hotel or motel in rural area. Tourism in rural areas is usually supplied with inputs in urban areas, consequently its impact on the rural economy is rather scarce; In addition, although tourism in rural areas creates jobs in significant quantities, it can compete for labor in the season when it is required by agricultural work.

On the other hand, since the ownership of many of the real estate used in tourism in rural areas is usually in the hands of urban residents, the benefits generated by this activity migrate outside the rural area (Schaerer & Dirven, 2001). At the same time it is important to highlight the different types of tourism for which Barrera (cited in Pulido, 2008) includes in rural tourism: a) Agrotourism, b) Ecotourism, c) Cultural tourism, d) Adventure tourism, e) Tourism sports, f) Technical-scientific tourism, g) Educational tourism, h) Tourism and events, i) Tourism and health, j) Gastronomic tourism, k) Ethnic tourism l) Tourism in rural towns, m) Recreation and retirement communities.

– On the other hand, agrotourism is the activity or set of activities that are carried out within rural tourism, but which, nevertheless, by its nature, has its net livelihood in agricultural activity, as an economic activity that constitutes a survival factor (or resistance to marginalization in some rural areas) and therefore development, which in the face of the crisis situation of agricultural holdings in rural areas, has begun in recent decades to trigger a certain interest on the part of farmers to diversify their activities within and outside the farm, which is what they know best. Agrotourism therefore contributes to the strategy of revaluing local products, since most amateurs demand natural agricultural products or products manufactured in a traditional way, typical of the region, where agrarian interests and ecological protection are harmonized. Through an integrated management of the territory in which farmers have had and should continue to have a prominent role (Sayadi & Calatrava, 2001).

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With the aim of organizing the concept of agrotourism Phillip, Hunter & Blackstock (2010) proposed actions as a basis to define agrotourism. They are: The work on the premises (literal translation is farm, however differs this concept with the locations in Latin America where the activities of agriculture and activities related to the field are carried out), the natural contact between the tourist and the agricultural activity and the degree of authenticity in the tourist experience. The agrotourism relates a range of products and activities, which allows a more solid base in the classification of Agrotourism.

The range that can present the agrotourism has the following categories:

a. No work on the premises, its acronym in English (No Work Farm), which only offers the passive appreciation of an agricultural landscape.
b. Work in the direct contact field as a scenario (Work Farm Direct Contact Staged), which keeps the tourist in the farm stay and offers room and breakfast services.
c. Work in the passive contact farm (Work Farm Pasive Contact), this refers to outdoor activities within the premises, designed for tourist training and includes room and breakfast services and,
d. The work in the farm of direct contact and authenticity (Work Farm Direct Contact Authentic), are the activities of the agrotourism, in which there is no protagonism, it is real work in the crops.

In summary, the range of agrotourism, products and definitions are based on the 3 types of actions: work on the property, natural contact between tourists and agricultural activity and the degree of authenticity in the tourist experience.

From the above, relocation is taken into consideration, which is seen as a way to revitalize rural communities, reducing dependence on producers of subsidies. Relocation is the rediscovery of local traditions and environmental and cultural heritage as a means of improving welfare and authenticity, in general, the quality of life. The development of communities goes beyond the economic sphere, refers to a rediscovery of tangible and intangible resources, communities can look to tourism to revitalize rural areas, whose participants are not only agricultural producers, but providers of tourism services, artisans, artists and even local public administrations that promote and offer agro-tourism (Ammirato & Felicetti, 2013).

Although it is true that agrotourism bases its activities directly on agricultural land, it is also true that the tourist will not be obliged to carry out any activity, when the precise case is simply the appreciation of the rural landscape and its natural environment, so that the Taking care of this environment is essential for this activity. For this reason, agrotourism represents an alternative to implement the desired sustainable local development that has already been referred to in this text.

According to Pulido (2008), rural areas have an extensive list of natural resources that, taken advantage of in a sustainable manner, can be a factor for local development. The rural spaces present a magnetism that is based on a series of attributes that characterize them, as well as the positive response of rural spaces to demand stimuli continues, with a proliferation of public and private initiatives to put the heritage value on tourism natural and cultural of the rural environment. On the other hand, in the political-social commitment to revitalize the rural area, the tourism activity specifically the agrotourism is an opportunity for an optimal deconstruction of the development and the local scope

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Sustainable local development should be thought uniquely for each of the territories, locating in each of them their own characteristics such as economic, natural, social and cultural, so that sustainable local development poses different production possibilities, economic organization -social and collective consensus for the improvement of a community and the care of the natural environment.

Therefore, it is essential to empower the actors to go beyond the classical development that for political and centralization issues that keep the rural space relegated. According to Brunel (2009), local development through agro-tourism and the multifunctionality of the field, can be obtained from the capacity of each society to rescue elements and social practices from their empirical knowledge, and the possibilities of assimilating knowledge global scientists that will lead to the construction of schemes adapted to their way of living and producing, that take into account the natural limitations in search of sustainability.

Thus, after exposing the theoretical sustenance, where it is reflected that agrotourism is the action strategy that allows to put into practice the local development with a sustainable vision, in the next section we will try to situate the reader spatially and temporally, in the object and study area. Special emphasis is placed on the findings obtained through this research regarding the current social and economic structure identified in La Curva.

Background, contextualization and results found in the locality of the curve, Xalisco, Nayarit, Mexico, as an area of study: Agrotourism for the sustainable local development of a community

La Curva, Xalisco was formed as an Ejido on December 23, 1936, is located in the lower part of the municipality of Xalisco, in the valley of Matatipac. According to the count made in this research, it has a population of 810 people, 303 men and 301 women over 18 and 206 minors (men and women), which have been analyzed in family units, these being 253. From that this town was founded, its main economic activity (and the only one in a generalized way to say it) is agriculture and to a lesser extent, livestock.

The Curve is geoGraphicically located at the coordinates 104 ° 50'12.47 "to the east and north to 20 ° 21'38.59". Its access is by land, on the federal highway number 200 Tepic-Puerto Vallarta, at kilometer 15 is the deviation to the village 7 km inside, the road infrastructure is in excellent condition for easy access.

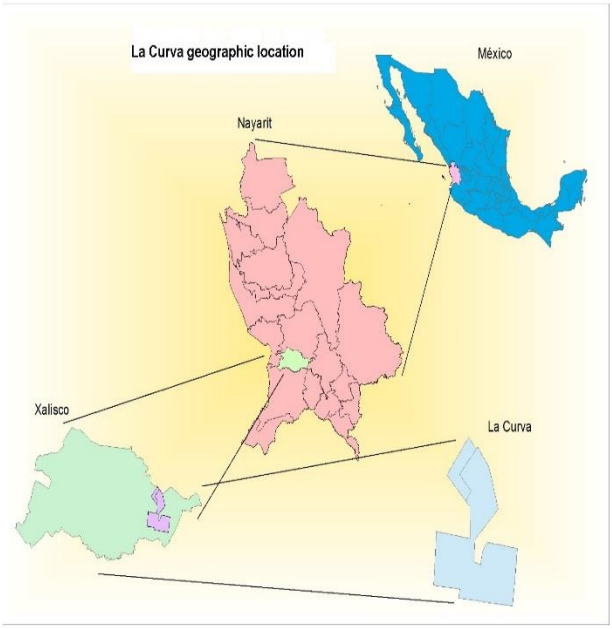

Figure 1 GeoGraphicical location of La Curva
Source: Self made

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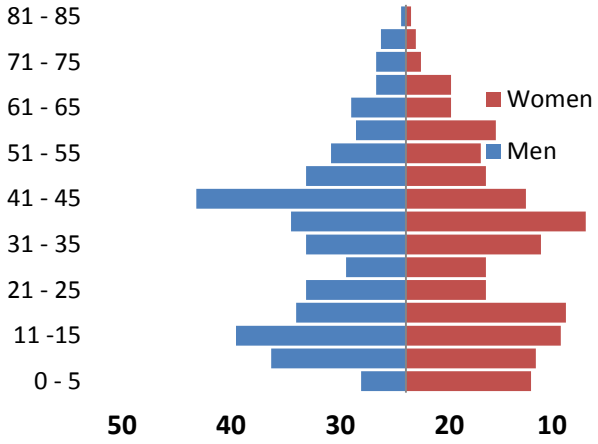
Since its inception, the community has maintained the agriculture of sugarcane and rice as the only form of livelihood for the population, either directly or indirectly, directly to the owners of the crops who obtain their profits from the commercialization of their product and indirectly to the laborers who work on the land receiving a salary for their labor. Currently their crops have been diversified by different issues, such as the productivity of the land and the type of soil, but above all by the search for products that are easy to market locally, due to the instability of prices in the external market. The main crops are: sugar cane, rice, corn, vegetables and recently the blackberry and jamaica.

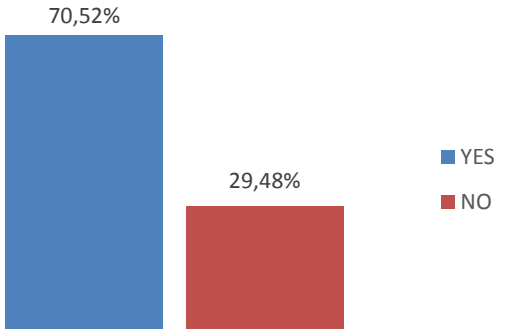


Graphic 1 Population pyramid 2016 La Curva, Xalisco; Nayarit
Source: Self made

The Curve has unique natural resources in the area, such as a salt lake "El Charco" which is visited by locals and people who happen to know about it; either because of the interaction with the town of La Curva, or because they observed it through internet computer tools -see figure 2-. Thus, through the fieldwork carried out for this study, it was possible to recognize the social disposition toward the tourist activity in the locality, through the information obtained through the application of in-depth interviews and the open questions of the surveys already worked.

Figure 2 Laguna "El pudco": an unparalleled attraction in La Curva, Xalisco.
Source: Own photoGraphicy

When applying the instruments in the community actors, relevant data were obtained in the sense of the identification of the resources for tourist activities and the recognition of activities conducive to these places.



Graphic 2 Perception of the population regarding tourism
Source: Self made

More than 70% of the families surveyed believe that tourism activities could be carried out in the community, maybe this is because in April 2017 an ecotourism project has been started, which although innovative, has not been an impulse in itself , of the economic activity in the locality. However, it is to be recognized that this family project is opening up in the search for new productive activities in La Curva, where agriculture is the only known means of production.

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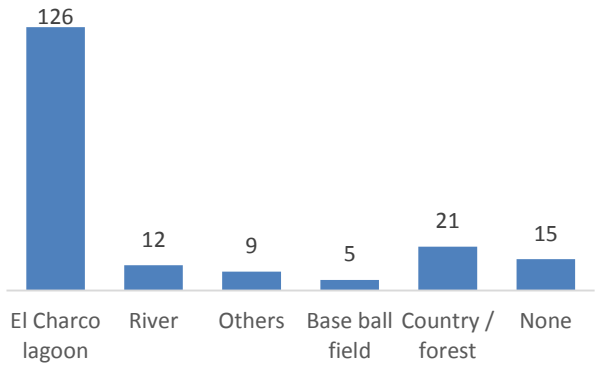
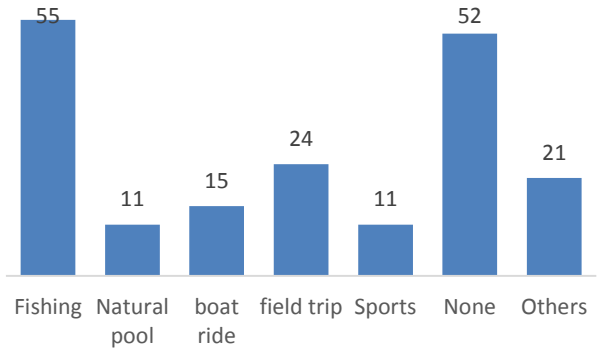


Graphicic 3 Tourist attractions according to the population
Source: Self made

The most mentioned places, which local people identify as a tourist potential, are mainly natural resources. However, it is important to highlight that in the in-depth surveys, another potential identified as unique among the other localities is the diversity of crops, undoubtedly essential elements for the activity of agrotourism.



Graphic 4 Type of activities to be carried out according to the inhabitants
Source: Self made

Considering the La Curva lagoon as a unique attraction, the activities were mainly focused on aquatic activities, in addition to comments in the survey, they mentioned that tourism is for the beach, which shows that this activity is related to the political discourse of large investments in the coastal area of the state of Nayarit.

In "others" they refer to local cultural and sports activities, such as patron saint festivals and baseball tournaments.
The activities in the agrotourism have been divided into two specifically for the town of La Curva: activities in agricultural crops and non-agricultural activities

1. In the crops

a. Zarzamora: The pruning of the plant and the harvesting of the product are unique activities in the town and the municipality, since this crop is only found in La Curva. The weather for pruning and preparation of the plant is from December to April, and the time of harvest is between May and November.

b. Jamaica: The activities in the cultivation as the preparation of the earth are carried out in the month of July, while the cutting of the flower and the drying of the same by means of an artisanal process occurs in the months of November and December.

c. Rice: the most attractive activities in this crop is sowing since it has to be carried out in the water and marshy lands. The sowing is the month of June and July, while the harvest is in November. Another interesting activity is to scare away the birds that pass through the grounds looking for food, without a doubt the owners say they have a lot of fun when they have to be running and shouting around the premises.

d. Corn: Admiring the landscape when these fields are cultivated is an attraction, since they are located in the mountains. The activities are the planting of the grain in the month of June and the harvest in September (three months after planting).

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e. Sugarcane: although the activity in these crops is intense and probably not very attractive to the locals (it is a monoculture in the municipality and a large part of the state of Nayarit), it is undoubtedly found between the vegetation and the green color of these lands, without doubt will be the enjoyment of the landscape and breathe the pure air of the countryside. It is planted in the rainy season between the months of July to October and the harvest is between the months of November to July, noting that the cane lasts a year to grow and mature, to be ready to be cut.

f. Vegetables: in the last year other crops such as avocado, nopales, cucumbers and organic backyard vegetables have been converted into locally marketable crops, and can be marketed with visitors who are looking for organic products or the closest to them. These crops could be produced throughout the year with the corresponding risks.

It should be noted that most of the crops previously identified in La Curva depend on the rainy season (from June to September, as can be seen in table 1), which means that for these to continue to occur, the care of the water the friáticos mantos and the economic saving of the producers to induce the irrigation by dripping, is an elementary task that must take into account to guarantee the continuity of these productive activities.

2 **Non-agricultural activities**

a. Activities in the "El Charco" lagoon, such as sport fishing, swimming and recreation. Access is all year.

b. Walk in the bush where you can find a diverse vegetation and extremely attractive landscapes. Access all year.

c. The villagers identified the festivities of the town as an attraction, being able the tourist to be a participant of the local traditions, these are made in the month of May on the 15th and 16th. They also mentioned the sport of preference in the locality, which is baseball, sport in which the local team remains in the first places of the state tournaments, which is why they are visited in La Curva, generating economic spillover in the shops. The games are held twice a month (on Sundays) throughout the year.

d. The elaboration and tasting of products made by local families, such as the preparation of blackberry jams, Jamaica and dairy products (cheese and yogurt). Elaboration during all weekends (Saturday and Sunday) of the year.

e. The agrotourism as an example of life, consists of learning the techniques that the own community implements to extend the knowledge and to avoid with it the loss of the local knowledge. Promote agricultural education to stimulate urban gardens for visitors to La Curva. Weekend workshops (Saturday and Sunday) could be generated once a month.

Pre-planting	months of the year
Zarzamora (manual): preparation of the earth	1 time every 5 years without date
Jamaica (manual): land preparation and brush removal.	June
Rice (mechanical): land preparation and boards for water containment	June
Corn (manual): land preparation and brush removal	June
Sugarcane (mechanical): preparation of soil and furrow	June
Vegetables (manual): Preparation of the earth	Any month
Conventional sowing (rainy weather)	months of the year
Zarzamora (cultivation with duration of 3 to 5 years)	without date
Jamaica	July
Rice	June and July
Corn	June and July
Sugar cane	from June to October

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Vegetables	Without date
Protection practices	Months of the year
For any crop, it is protected against pests and weeds, for which insecticide herbicides are used manually.	One or two applications per year from June to September
Harvest	Months of the year
Blackberry	from May to November
Jamaica	November and dicember
Rice	November
Corn (corn)	September and October
Corn (corn)	October and November
Sugar cane	from December to May
Vegetables	undated (two months after planting
Non-agricultural activities	Months of the year
Activities in the lagoon: swimming, boat ride, sport fishing and recreation	All year
Hike or hiking in the bush	All year
Festivities	May 15 and 16
Elaboration and tasting of artisanal products: blackberry and jamaica jams, and dairy products such as cheese and yogurt	Weekends (Saturdays and Sundays) throughout the year
Workshops of knowledge and elaboration of derivative products. Promotion of agricultural education.	One weekend (Saturday and Sunday) per month, all year.

Table 1 Calendar of agricultural and non-agricultural activities in La Curva, Xalisco
Source: Self made

Methodology

In this section, we will explain the methodological procedure that was followed throughout this investigation that allowed us to obtain the information through a mixed approach, with both qualitative and quantitative techniques and tools, to collect the analyzed data, which allowed exposing a series of conclusions on the subject studied, always observing the phenomenon studied with the lens that provides the sustainable local development, where the initiatives of agrotourism expressed and identified as alternatives that will allow to diversify the activities so far carried out in La Curva.

With a "bottom up" look, they will be able to construct action strategies designed from the perspective of the villagers in relation to the socio-economic structure and the potential of the locality with respect to the tourist activity, to achieve a development in said territory.

Thus, the work presented here was developed through three phases, mainly:

- In the first one, the theoretical elements of agrotourism were identified for the elaboration of an inventory of resources for this activity. The review of the literature is essential for this research, because the theme of agrotourism has not generated relevance in Mexico, and for the case of Nayarit mass tourism continues to be the only tourist activity. Although, it is true that the brand "magical town" has been implemented to intensify alternative tourism, it has not permeated rural communities. In order to detect key concepts and data collection, this first phase theoretically identified the useful resources in the agrotourism activity and through observation, the elaboration of an inventory based on these.

- Subsequently, the social groups involved in the economic activity of the town of La Curva were identified, through a population count which indicates the number of people in the locality, later the unit of analysis was designated, which was defined by houses inhabited. After determining the unit of analysis and the elaboration of the instrument, the procedure for data collection consisted of a survey, which established the current situation of the problem to be investigated and, at the same time, analyzed the potential of agrotourism with regarding the acceptance and proposal of the population.

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With a non-probabilistic sampling, intentional with replacement, (houses inhabited with a family nucleus consisting mainly of father, mother and children), a sample of 173 units was obtained where the logic of application of the surveys was the homogeneous distribution in the locality.

– Finally, it was possible to conclude by means of the collected data, regarding which agrotourism activities in the town of La Curva, based on the proposals of the community. The application of the in-depth interview as an instrument has the objective of identifying the social groups of the community so that, based on their experience and exchange of information and opinions, build the proposal of agro-tourism activities in the study area. It should be noted that the script of the interview did not present the activity of agrotourism as an alternative, since what was sought with this research is that the proposals arise from below, from the population. The sample for the application of this instrument is to selected people who share similar traits; it is induced under the criterion of representativeness and leadership in the persons to be interviewed. These actors were classified as institutional or local election leaders and cultural or social leaders, those who have no formal representation but the community identifies and consults in decision making.

Now, in the next section, local development will be addressed as a strategy of analysis and small-scale action to mitigate the socio-economic problems of the territory.

To show posterity the evolution of the tourism in question of its typology, until arriving at the agrotourism and the activities that in this are developed, and it will conclude with specifying how the activities of the agrotourism can propitiate the local development with a sustainable vision.

Discussion, conclusions and final reflections: agrotourism in the town of La Curva, Xalisco, Mexico, as an alternative to sustainable local development

This research identified the socio-economic aspects, which through the surveys presented the problem, mainly lack of opportunities to generate income for the family support which has been generating the migration of family members or in the lesser of the cases, the displacement to the nearest cities, which has not ended in social welfare, but on the contrary, manifests itself in family disintegration and school desertion.

At the same time, the information collected in the surveys indicated that the income of the agriculture activity is not enough to cover the basic family needs, even the data revealed that only 20 percent of the surveyed sample is completely dedicated to agricultural activities , the majority of the inhabitants having an additional activity according to their school level, which together with the opportunities of the labor supply in the nearest towns are mostly mason, domestic worker, driver, merchants, among others. .

Agrotourism is an alternative form of tourism, contributes to local development processes and matches Alburquerque's characteristics for these local initiatives. However, it should be noted that agro-tourism does not displace agricultural activity in any way, so the local workforce is not in a dilemma of choosing activity to perform.

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The proposal of this activity is mainly to diversify the opportunities and that the field (agricultural land) becomes multifunctional for the benefit of the people who live there. It is important to point out that neither rural tourism nor ecotourism (or any that come out of it) are the panacea for solving economic problems in rural communities, it should be made clear that they are not suggested as a single activity, but represent a complementary alternative that interacts with other traditional activities; so it is intended through tourism as agrotourism to maintain a multifunctional effect on the local economy, without giving any prominence, only the coupling to a multiplier effect committed to the environment.

The preliminary findings up to now, support with hard data the problems faced by the community. At the same time, the information obtained in the field has made it possible to identify, through the feeling of the local population living in La Curva, that the territory has elements that allow the generation of agrotourism proposals which could affect sustainable local development, generate opportunities for employment or self-employment in agricultural land that represents the main economic activity complemented by the multifunctionality of the field.

However, the information also showed that there are social limitations to propose agrotourism in this locality, such as: the lack of organization of the inhabitants and the indifference of the authorities to achieve it, which is a factor of relevance for the theoretical application of the local development, so it would be appropriate for it to be resumed by groups of people, and not by the entire community. The in-depth interview with the leading local actors pointed out that there is no solid structure among the local authorities, as these generally disagree or desist in obtaining such positions of authority for apathy,.

At the same time they showed interest by smaller groups of people to carry out secondary activities without the intention of obtaining any responsibility, which produces a disorganization since this propitiates the external intervention for the development of the agrotourism activity, and from an exogenous development it is put at risk, the of decisions of the local actors, generating dependency to the tourist activity or proposals of change of land use could be presented.

During the present investigation it was found the lack of support from the municipal, state and federal government for the consolidation of this tourist activity, so it is suggested that for future research the possibility of proposing government stays or the pertinent legislation towards agrotourism, for the corresponding advice, procedures, support and investments in the rural sectors with interest in the activity.

Another pertinent proposal for future research related to agrotourism is the advice to rural communities to move to a sustainable agriculture, respectful of the environment that allows locals and tourists to enjoy, conserve and make good use of the territory.

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Economic Growth and Natural Resources in Latin America: an application of the Stiglitz model

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Abstract

The development and the improvement of the use natural resources can greatly stimulate the economic development of a country. The aim of this article is to examine the effect of economic income on economic growth in nineteen Latin American countries. Based on Stiglitz´s model (1974), who proposes a segmented by high income, high middle and low income. In order to abide the mentioned objective, we use an econometric panel data, taking economic and independent growth as the dependent variable for natural resources. The results show that economic growth is statistically significant in aggregate form, the same that varies when it incorporates certain variables of control and the stages of development reached by the countries of the region. Wherever, in high-income countries, natural resources have a negative and significant effect on output, while in middle-income countries, the effect is negative and statistically insignificant. Finally, we find in low-middle income countries, the ratio is the same than in the countries with middle and high income.

Economic growth, Natural resources, Latin America

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Introduction

Developing countries that have abundant natural resources, were initially engaged in the simple exploitation and extraction of funds, in order to obtain the necessary foreign currency to acquire the goods that are not produced internally to the inefficient industrialization. Indeed, many underdeveloped countries play the role of suppliers of raw materials or natural resources, while the industrialized countries are dedicated to the generation of technical progress that make it possible to access the productive phases of higher added value.

However, the economic cycles and the technological advance experienced worldwide caused large fluctuations in the demand for natural resources and, consequently, in their prices. Natural resources are important in Latin America (AL), both for their share of GDP and for their contribution to exports, which make up 50% of the product (IDB, 2009). However, the income generated through them are serious consequences for economic development in the region. This means that the abundance of non-renewable natural resources does not generate sustained economic growth because their prices are highly volatile (Sachs and Warner, 2001).

We can affirm that the generation of natural resources with the account of a country does not have to exert a decisive influence on the historical resolution of its national income, as long as the country has possibilities of trade, what is needed for economic progress is a appreciable amount of capital and labor, an important part of that capital incorporated into the characteristics and social system that favors the improvement of production practices.

The RNR offer a source of national wealth throughout the world, since 1965 has an inverse relationship between economic growth and natural capital in the national wealth of all countries (Navarro and Macario, 2010).

Latin America is a region specialized in the extraction of natural resources, such as Colombia, Venezuela and Ecuador. The extraction of oil from the country is made up of 51% for Ecuador and Colombia and 77% for Venezuela, which means that it is very dependent on this resource, a time that has allowed them to be affected by the price of this resource has declined drastically. On the other hand, Chile has 45% (23% copper and copper derivatives and 23% Gold), 3% Gold for the economy of Argentina, 15% of natural resources (15% copper) and gold derivatives iron ore and its derivatives, 8% Petroleum and 1% Gold) and finally Peru has 47% natural resources (18% gold content, 3% zinc minerals, 3% lead minerals, 13% in gold, 7% refined oil, and 3% in petroleum gas) (Hausmann et al., 2014). According to Bulmer-Thomas (2003) in LA there is a decreasing trend in the primary sector, however, currently this sector represents two thirds of total exports.

Likewise, there are manufacturing activities linked to the external sector that are based on the exploitation of natural resources. That is why the facts in this study did not modify the traditional sectorial process of primary-exporter collection, based on the exploitation of natural resources. There is no doubt that natural resources present distinctive characteristics that distinguish them, but, just as there are countries that suffer their abundance as a "curse", the fact that for others represents a "blessing" shows that the problem is not peculiarities but the way in which each society manages to organize the exploitation of those resources. From the economic point of view, natural resources are simply a part of the capital stock of a country; they must be considered as "equipment" that provides productive services. Hence, in equal conditions, the more resources a country has and the better quality, the better its situation (Gylfason, 2001).

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In the long term it is mentioned that there is a positive relationship between natural resources and economic growth, not only because of the volatile prices that exist, but also because there are other variables that can explain this effect such as corruption, investment, the terms of exchange and schooling, it is important to mention that natural resources are important for a country since with the help of institutions can be implemented public policies capable of making the maximum benefit from them in a sustainable way (Kronenberg, 2004).

The abundance of natural resources can not directly generate a contraction in growth, that is to say, that a greater wealth in this type of goods does not reduce the efficiency with which the factors in the production are combined and the only thing that could generate is a cheapening of the inputs (Morales, 2011). For this reason, there must be intermediate elements or more complex transmission mechanisms through which the richness of natural resources leads to lower growth rates.

In this context, this research examines the relationship between primary income and economic growth in 19 Latin American countries during the period 1980-2015 based on panel data econometrics. Several regressions were estimated in aggregate form (AL), for high income countries (PIA), upper middle income countries (PIMA) and for low middle income countries (LMIC). The same grouping is based on the national per capita income level through the Atlas method of the World Bank. (World Bank, 2017)[1].

An expanded function was estimated, the dependent variable is the logarithm of GDP and the independent variables are logarithms of natural resources, technological progress, capital and employment of country i (i = 1,2, ..., 19) in the period t (t = 1980,1981, ..., 2015), respectively. In order to capture the productive structure of Latin America and the effect of other factors suggested by the theoretical and empirical literature on economic growth, certain control variables were added. In practice, the effect between natural resources and economic growth cannot be expected to be the same in an economy with a high capacity for technological absorption than in a country that is in the initial stages of development (Stiglitz, 1974; Sachs & Warner, 1997).

The aforementioned, has given rise to mention that the relationship between growth and income of natural resources for the countries of Latin America allows the GDP to be very volatile in relation to the prices of commodities; With this background the present article has been developed with the purpose of determining this analogy, with the objective of examining the relationship between primary income and economic growth and therefore responding to it to finally corroborate the established hypothesis "Growth in Latin America depends on the income of raw materials ".

To answer the question and verify the hypothesis, the present investigation has been structured in four sections: the second section refers to the revision of the theoretical framework and the empirical evidence. The third section represents the data and the econometric model is presented.

[1] It is a method that aims to determine a conversion factor, to reduce fluctuations in the exchange rate between countries, for which, it uses gross national income (GNI). The conversion factor of the Atlas method for any year is the average of the exchange rate of a country for that year (t) and its exchange rates for the two previous years (t-1 and t-2), adjusted by the difference between the inflation rate in the country and international inflation.

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In the fourth section we discuss the results obtained, the same ones that were contrasted with the theory and literature mentioned, and finally, the fifth section the conclusions.

Theoretical framework and empirical evidence

Interest in the link between economic growth and natural resources has increased in recent years, due to the deindustrialization of developed countries and the internalization of production, it is here that the economy of natural resources and the environment The environment has been characterized by the exploitation and use of these, offering a service of human needs and social welfare (Labandeira, León, & Vasquez, 2008).

In the theoretical literature, growth models weakly explain the role of natural resources in economic growth, which is associated to some extent with an increase in technological capital. Hotelling (1931) raises the need to study the exploitation of resources, by establishing the form of socially and economically more profitable exploitation of non-renewable resources, before the depletion of mineral supplies and other natural assets that can not be recovered, which has led to a demand to regulate its exploitation through control measures.

A precedent that was previously corroborated by Jevons (1865), in his theory on the exhaustion of resources which raises the extraction of coal as one of the main constraints in the economic development of England, where it is established that rapid industrialization was depleting the reserves what makes the final product more expensive. Similarly, Kuznets and Murphy (1966) mention the relationship of environmental degradation and per capita income when explaining that initially when economies are growing they do so with greater environmental damage.

But as they reach sufficient wealth they use part of that growth for greater environmental protection and this degradation decreases. Mill (1951), raises the idea that the mining sector is characterized by an exchange between present and future productivity, which suggests an optimal planning of these resources, for which it proposes two scenarios to explain the extractive sector: the natural functioning of the The sector leads to diminishing returns and the discovery of new deposits decreases the price of commodities with a higher cost and lower yield. In addition, it states that growth in nature can not be accepted as an unlimited process, so that growth dependent on this sector is not sustainable over time.

From this perspective Pigou (1932) in his theory on welfare economics establishes a series of regulations in case of externalities generated by economic activity, where government intervention is required either with a tax in case of negative externality or a subsidy in case of positive externality. Thus, economic growth has been evolving since a few years ago as much as economic thought. One of his early classics Smith (1776), Ricardo (1817), Malthus (1798), who studied the term and introduced some concepts that helped the study as the diminishing returns and its relationship with the accumulation of physical or human capital, the relationship between technological progress and the specialization of work, in this way new twentieth-century classics emerged such as Ramsey (1928), Young (1928), Knight (1921) or Schumpeter (1950), contributing their knowledge to the determinants of the rate of growth and technological progress (Sala i Martin, 2000). The main economic growth models have initially started from the production function of the Cobb-Douglas type or the same function of fixed coefficients. According to Frankel (1962), this function has been widely used because it leads to relative stability in relationships such as work and capital, one of the facts from which economic growth starts.

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Nordhaus (1992) characterizes a closed economy through a production function of the Cobb-Douglas type which includes natural resources and land as determinant variables of growth, the model allows to conclude that the presence of a fixed supply of land, a The allocation of other scarce natural resources and a continuously growing production can generate a level of pollution and destruction of the environment that puts an end to the growth process.

Making reference to natural resources and economic growth Stiglitz (1974) proposes a new model, introducing the variable of natural resources in the main function of production, with the purpose of knowing what is the effect of that variable on economic growth and counteracting with the hypothesis of the curse of natural resources, that those countries that have the least amount of resources are those that grow much more than countries that are abundant in resources.

There are at least three economic forces that compensate for the limitations imposed by resources: technical costs, substitution of the actors of production (capital) for natural resources and returns to scale. Stiglitz (1974) proposes a model of economic growth in which natural resources are exhaustible, in limited quantities, and is essential for production.

Where the model is considered as the first reasonable approximation, not only is a sustained growth in per capita consumption, it is feasible but the optimal resource utilization rate for the reasonable values of the parameters is of the order of magnitude observed during many resources natural This model is applicable for Latin America due to the importance of natural resources in the region, and the fact that these economies are dependent on it.

The empirical literature on the effect of natural resources on economic growth shows results that there is indeed an inverse relationship. For example, Sachs and Warner (1997) found a negative relationship between the growth and abundance of resources in a sample of 35 developed countries, further sustaining that the effects of the abundance of natural resources in a country depend on the economic rents of these resources and therefore there is a difference in the growth rates of countries with a high presence of mineral resources that maintain high incomes, compared with those with an abundance of agricultural resources, whose rents are lower.

Which, in turn, drove the idea that many countries with abundant resources tend to have high prices and as a result stagnate waiting for growth driven only by exports. On the other hand, a similar study of Ding and Field (2005) which indicates that there is an inverse relationship between the study variables, which apparently confirms the results of the so-called "resources curse".

The work done by Meza, Barrón & Gómez (2011) which aims to analyze the participation of natural resources in economic growth in states of Mexico using a methodology based on the MCO for the period 1993-2003. The results tend to confirm a negative and significant relation with the GDP per capita, indicating that the states are below the 10% of participation with respect to the GDP. This conclusion is similar to the results found by Morales (2011) who verifies the effect of natural resources on economic growth using dynamic estimates for a sample of 152 countries in the period 1962-2000. The results show an inverse relationship between the abundance of natural resources and economic growth, typical of mining varieties and attributable mainly to institutional reasons; forest resources seem, on the contrary, to correlate positively with the growth of nations.

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Finding the same result of an inverse relationship between natural resources and economic growth, the study proposed by Papyrrakis & Gerlagh (2004), using a sample of the states of the United States, adding that states with limited resources have a comparative advantage compared to states with abundant resources, in addition to the abundance of natural resources decreases investment, schooling, the opening of spending on R & D. Sala i Martin & Subramanian (2008), obtain the same conclusion for the case of Nigeria, natural resources such as oil and certain minerals exert a negative and not significant impact on growth, a result that is very robust, as well as waste and the corruption of oil mean that there is poor growth performance in the long term.

There is empirical research that shows a positive influence of resources on the product. Chambers & Ting Guo (2007), developing an endogenous growth model, natural resources constitute a factor of production and a measure of environmental quality, resulting in the economic growth rate being positively related to the steady state level of the use of natural resources in production. A similar result is that of Brunnschweiler (2008), which, by using new measures of resource endowment and considering the role of institutional quality, found a direct relationship between the abundance of natural resources and economic growth by incorporating this variable.

Natural resources are not only associated with economic growth but also with other variables. Stijns (2006), analyzes the abundance of natural resources and the accumulation of human capital measured by education, finding a positive and significant relationship, through the estimation of a VAR panel model, indicating that before the increase of one dollar in the income from natural resources generates an increase of 5% in educational spending.

Likewise, recent studies where this effect was analyzed, the work done by Ji, Magnus and Wang (2014), where they analyze the interaction between the abundance of resources, institutional quality and economic growth for a province of China applying different models of coefficients. The results indicate that the abundance of resources has a positive effect on economic growth at the provincial level in China between 1990 and 2008 and a negative effect on institutional quality.

On the other hand, Joya (2015), through input-output data, built an indicator that captures the diversification of the production structure of the economy and the density of interindustry links. The results show that the abundance of resources exerts a negative impact on growth through the volatility channel. Although the direct effects of natural resources on growth are positive, their indirect adverse effects through volatility could be greater.

Jović, Maksimović & Jovović (2016), investigated 5 natural resource rents to determine which of the rents of natural resources has the greatest influence on economic development. The economic development was analyzed based on the gross domestic product (GDP), using coal revenues, forestry rents, mineral rents, natural gas rents and oil rents. The results showed that forest revenues have the highest prevalence in GDP, that is, GDP has the greatest variation with small changes in forest income. A similar result that of Ouoba (2016), mentions that resource funds have a negative and significant effect on growth and that this finding is robust under alternative estimation techniques. On the other hand, the results do not validate the resource curse hypothesis due to the positive effect of resource dependence on growth. Badeeb and others (2017) examine the curse of natural resources, through which the richness of resources can slow down economic growth and empirical studies that prove a global effect or factors associated with growth.

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The results obtained showed that the dependence on resources negatively affects growth, particularly working through factors closely associated with growth in developing countries. Recent contrary studies show that future research should better address the endogeneity of the dependency measures and extend the years of study and the range of empirical methodologies used.

Finally, Leff (1995) mentions that the overexploitation of natural resources and the degradation of the environment have been the result of economic rationality, as well as that the environmental costs and the valorization of recourses depend on cultural perceptions, because this Production depends on the cultural styles and social interests that define the forms of appropriation, transformation and use of esotos, which are established through power relations between the market and societies.

Because natural resources are scarce, the importance of this is that economies obtain greater welfare, which means that any economy will decide how to make use of its production factors such as human capital, physical capital, resources such as forests, land, water and minerals (Riera, 2005). Natural resources are a source of wealth, however, experience shows that natural wealth is neither necessary nor sufficient for economic prosperity and progress Meza, Barrón and Urciaga (2012)

With this theoretical and empirical background, we verify the Stiglitz model in Latin America is important because by means of it we can know the degree of complexity that these variables have and at the same time corroborate with the results found in the different studies, where it is concluded a negative relationship.

Data

With the purpose of empirically determining the effect that the entry of commodities has on economic growth, we use data obtained through the World Bank (2016). The present investigation is based on the application of the Stiglitz model, for nineteen countries that make up Latin America for the period 1980-2015. The countries included in the research are: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, El Salvador, Guatemala, Mexico, Peru, Dominican Republic, Uruguay and Venezuela. The restriction of statistical information caused the elimination of the rest of the countries belonging to this region. This research focuses on examining the effect of the income of natural resources on economic growth, in this way the logarithm of GDP will be taken as a dependent variable, as an independent variable the income of natural resources, they are measured at constant prices of 2010, apart from that certain control variables provided later were inserted.

Model

Stiglitz (1974), determines a function of aggregate production, which takes into account capital, labor and natural resources as perfect substitutes. Stiglitz based on modifications of the production function of Cobb & Douglas (1928), proposed the model. In this estimation both authors include natural resources in order to analyze the consequences of these on their postulates and in turn with the theory of distribution (Granda, 2006). It can be deduced that the Stiglitz Model is a continuation of the Cobb - Douglas function, based on the theory of sustainable growth.

The generalized form of the function was estimated as follows:

$$Y = AK^{\propto}L^{1-\propto}R^{\beta}\ e^{e} \quad (1)$$

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Where Y_it represents the gross domestic product of the country in the period t (t = 1980,1981, ..., 2015), A is the state of the technology that is assumed constant, K is the physical capital, L is the labor force, R natural resources and e is the error term distributed with zero mean and with variance σ. In addition, it is worth mentioning that α measures the ratio of K to Y, (1-α) measures L in Y, and β measures R in Y. However, the model proposed by Stiglitz (1974) requires an expansion allowing the effect to be captured that has other variables have on economic growth, some of these: gross fixed capital formation, exports, direct foreign investment, and employment, among other factors that help the behavior of the economy. Adding these variables, you get an expanded economic growth model:

$$lnY_{it} = f(A_{it},\ K_{it},\ L_{it},\ R_{it},\ lnExp_{it}, lnInv_{it}) \quad (2)$$

$$lnY_{it} = f(lnA_{it} + lnK_{it} + lnL_{it} + lnR_{it} + lnExp_{it} + lnInv_{it} + lnAgr_{it} + lnMan_{it} + lnSer_{it} + \varepsilon_{it}) \quad (3)$$

This expansion allows capturing the effect of the productive structure of the region and other factors that influence economic growth according to the theory and empirical evidence. In addition, it is worth mentioning that the estimate of the Stiglitz model will be through panel data, in which they will be applied to independently treat the data set of an individual over time, making the necessary transformations to the variables to express them in the same unit. Through the Hausman test (1978) it will be determined if the data are fixed or random, to consistently estimate the model, in the same cointegrated panel will be applied in order to see if there is a relationship in the long term. As part of the methodological process, the test of stationarity of the variables will be carried out through the Levin, Lin and Chu (2002) test by levels.

First differences and, if necessary, second differences to observe the behavior of the variables will determine through the tests of Kao (1999) and Johansen (1988) if there exist cointegration vectors that are explained in the determined series. The results obtained are discussed in the following section.

Discussion and results

The equation (2) for Latin America was estimated jointly, later we estimate the same effect by group of countries classified in PIA, PIMA and PIMB, the same ones that are based on the level of gross national income per capita. First, the Hausman test (1978) indicates that a random effects model is appropriate for estimating the effect of natural resources on the product of Latin America, with the Chi-squared probability of equation (2) p = 0.0000.

On the other hand, the logarithms of physical capital and labor have a positive and highly significant effect on growth in AL, PIA and PIMA. In the same sense, the logarithm of natural resources has a positive and significant effect on economic growth in LA, in high-income countries, in upper-middle-income countries, while in LMICs the effect is not significant. Regarding technological progress in LA, PIA and in the PIMA, there is a negative and not significant effect, while in the PIMB the effect is positive and not significant.

Var	AL	PIA	PIMA	PIMB
Logrn	0.03*** 3,80	0.12*** 4.88	0.02*** 3.37	0.01 0.56
Logk	0.97*** 76.63	0.50* 2.14	1.00*** 76.95	0.20 0.93
LogA	-0.00 -1.22	-0.00 -0.01	-0.00 -1.58	0.54* 2.55
LogL	0.01*** 3.28	-0.00 -0.92	0.01** 2.75	-0.00 -0.59
Cons	0.62*** 6.57	4.68*** 20.93	0.30** 2.98	3.16*** 11.41

*Note: *p<0.05, **p<0,01, ***p<0,001*

Table 1 Baseline regression

In order to make the estimators of Table 1 robust and unbiased, we proceeded to incorporate control variables provided in equation (3) individually. The introduction of the variables individually is done with the purpose of avoiding the composition effect of the sectoral VABs and the colinearity of the same. The results obtained show that the effect of physical capital, technological progress and employment in economic growth are stable by adding different control variables, such as exports and investment.

The coefficients of exports have the expected signs theoretically and are statistically significant for LA and the classification of them, on the other hand, in terms of investment was found a negative and significant effect for LA and for upper middle income countries, while in high-income countries it is not significant, finally for low-middle-income countries the effect is positive, but not significant. The strong dependence of the region on the primary export model could explain this result.

Var	AL	PIA	PIMA	PIMB
Logrn	0.03*** 4.00	-0.01 -2.26	0.03*** 3.93	0.07** 2.89
Logk	0.93*** 61.40	0.08 0.90	0.97*** 62.70	0.30 1.93
LogA	-0.00 -1.40	0.17 1.83	-0.00 -1.70	-0.02 -0.14
LogL	0.01*** 3.25	-0.00** -3.01	0.01** 2.69	-0.00 -1.44
Logx	0.04*** 4.73	0.43*** 18.24	0.03** 3.86	0.32*** 3.63
LogInv	-0.00* .2.25	-0.00 -1.03	-0.01 -2.65	0.00 0.90
Cons	0.61*** 6.53	3.96*** 39.24	0.31** 2.90	3.89*** 13.08

*Note: *p<0.05, **p<0,01, ***p<0,001*

Table 2 Latin America -PIA-PIMA and PIMB results with control variables

The results obtained in Table 2 confirm the initial effect of natural resources on economic growth, which is positive for LA, upper middle income countries and low middle income countries, while for high income countries the effect is negative and not significant.

This result does not agree with the theory, but it is in accordance with the context of the countries where the research is carried out. Although in Latin America the economies are oriented to the exploitation of certain natural resources, the same ones that are oriented to the external market and to a lesser extent in the manufacturing activities or services. On the other hand, the level of human capital in the region is low, which decreases the absorption capacity of technology in the countries under study (IDB, 2009).

Var	AL	PIA	PIMA	PIMB
Logrn	0.03*** 3.86	-0.01 -0.78	-0.00 -1.56	-0.00 -1.15
Logk	0.91*** 59.13	0.10 0.99	0.10*** 8.43	-0.01 -0.74
LogA	-0.00 -0.92	0.10 0.91	0.00*** 9.22	0.01 0.88
LogL	0.01** 3.15	-0.00* -2.20	-0.00 -1.36	-0.00 -1.21
Logx	0.39*** 4.37	0.49*** 12.76	0.00 1.66	0.00 0.37
LogInv	-0.00** -.2.92	-0.00 -1.19	-0.00 -1.89	-0.00 -0.89
Logvaba	0.10 1.25	-0.24*** -4.31	0.17*** 7.49	0.30*** 8.63
Logvabi	-0.05 -0.66	0.22*** 4.97	0.75*** 30.18	0.38*** 13.85
Logvabs	-0.00* -2.53	0.00 0.07	0.00*** 5.31	0.36*** 13.09
Cons	0.54*** 5.49	3.75*** 28.03	0.16*** 7.18	0.01 0-13

*Note: *p<0.05, **p<0,01, ***p<0,001*

Table 3 Latin America -PIA-PIMA and PIMB results with control variables

In order to decompose the effect of natural resources on the economic growth of the nineteen countries involved in this research, which were grouped by the level of development, the regression provided with the control variables was performed. The first group where equation (3) was estimated was for the PIAs of the region being: Chile and Uruguay the largest copper and gold generators respectively. The results shown are shown in table 3.

Assuming that high-income countries have greater technology capacity, the effect of Natural Resources on the product should be positive, however, this result is contradictory and in turn differ from those obtained in table 1. The effect in this group of countries is negative and not significant. Also, α varies between 0.003-0.03. This result found in the PIAs differs for AL, this effect could be explained because although the economy of these countries is based on the extraction of large quantities of gold and copper, they are exported. A particular point in this group of countries is that, when the covariates are exports, the gross added value of industry and services the coefficient is positive and statistically significant, in other cases the coefficient is not significant at 1%.

With regard to the PIMA, the results obtained, as in the PIAs, have the effect for this group of countries that includes the four largest and most industrialized economies of Latin America: Brazil, Mexico, Colombia and Argentina, it is the same, negative and not significant with respect to LA, likewise employment and investment have the same effect, in the other cases the effect is positive and statistically significant at 1%, which contradicts the results of table 1 that by not inserting the variants control, giving a positive initial effect and statistically significant, however, the elasticity of exports with respect to the product is only 0.003, being lower than that found in the PIA (0.49).

In low-middle income countries, the effect of natural resources remains negative as in the PIAs and PIMAs. This implies that natural resources do not play a relevant role in determining the levels of production in these countries in the period 1980-2015, in some cases they may decrease it. It could also be said that the low capacity of technology and low human capital could explain this result.

In summary, the results found indicate that in the first instance, since no control variables were inserted in the initial model (Table 1), there is a positive and significant relationship in LA. When these are incorporated and in turn the regressions are carried out by level of development of the countries (table 3), natural resources have a negative effect for high-income countries, on the other hand, in high-income countries, the The result is similar, negative effect and not significant, while for low middle income countries it is negative. The results presented in this research give us an initial look at the relationship between natural resources and growth in Latin America.

One point that has been taken into consideration for this research is that the estimated panels can follow non-stationary causes, which can imply that they are spuriously correlated, that is why it is necessary to verify that the series are not stationary, that is to say that present unit root. In this context, it is important that a random and stationary process is fulfilled, where the distribution of its probability is not dependent on time. To verify this condition, the Levin-Lin-Chu test (1993) is used for the variables of this investigation. The results obtained are shown below:

Niveles			
Intercept		**Trend and intercept**	**None**
Variable	*t-stadistic/prob*	*t-stadistic/prob*	*t-stadistic/prob*
Increase	3.08 (0.99)	-4.91 (0.00)	8.42 (1.00)
Nat resources	0.14 (0.55)	-0.01 (0.49)	2.01 (0.97)
Technology	1.76 (9.96)	-3.69 (0.00)	3.37 (0.99)
Investment	-3.85 (0.00)	-7.32 (0.00)	1.94 (0.97)
Capital	1.90 (0.97)	-3.21 (0.00)	3.50 (0.99)
job	214.33 (1.00)	933.56 (1.00)	-3.23 (0.00)
Exports	-5.30 (0.00)	-61.20 (0.00)	8.99 (1.00)
VAB agriculture	2.25 (0.98)	-2.74 (0.00)	9.78 (1.00)
	1.25 (0.89)	-3.52 (0.00)	6.17 (1.00)

VAB industry VAB services	4.00 (1.00)	-5.75 (0.00)	8.24 (1.00)
In differences			
	Intercept	**Trend and intercept**	**None**
Variable	*t-stadistic/prob*	*t-stadistic/prob*	*t-stadistic/prob*
Increase	-6.68 (0.00*)	-5.29 (0.00*)	-5.52 (0.00*)
Natural resources	9.99 (0.00*)	-9.40 (0.00*)	-15.16 (0.00*)
Technology	-9.37 (0.00*)	-7.90 (0.00*)	-12.10 (0.00*)
Investment	-24.35 (0.00*)	-23.62 (0.00*)	-25.44 (0.00*)
Capital	-10.30 (0.00*)	-8.89 (0.00*)	-13.48 (0.00*)
job	2046.63 (1.00*)	2332.30 (1.00*)	-7.11 (0.00*)
Exports	2096.49 (1.00*)	2316.10 (1.00*)	-7.11 (0.00*)
VAB Agriculture	-137.81 (0.00*)	-123.05 (0.00*)	-98.11 (0.00*)
VAB Industry VAB services	-9.42 (0.00*)	-8.03 (0.00*)	-9.01 (0.00*)
	-6.86 (0.00*)	-5.58 (0.00*)	-8.31 (0.00*)
	-6.62 (0.00*)	-5.94 (0.00*)	-5.17 (0.00*)

*Note a: The hypotheses for the stationarity test are the following: H_0: The non-stationary series and H_1: The series is stationary b: * first differences, ** second differences*
c: the probabilities are shown in parentheses

Table 4 Unit root test (Levin-Lin-Chu**)**

In the first instance, the test was carried out by levels, which is measured by intercept, trend and intercept and none. The results obtained were that, through the test by levels, we find a probability close to 1 or what is equal to the series that are stationary, that is, the series follows a trend. However, when performing the Levin-Lin-Chu test in first and second differences for the case of the investment variable, we obtained that the series are non-stationary, that is, the series has a unit root and is integrated in order 1, for the case of the investment, despite having made the second differences, the probability remains the same, however, the coefficient decreases.

Given that the model series are stationary in order one, the cointegration analysis can be considered to determine a balance of the economic model that is stable in the long term. In this perspective, the starting point is to perform tests based on residual estimation and application of unit roots (Kao, 1999).

Equation		**t-stadistic**	**Prob**
Equation 1	ADF Varianza Residual HAC varianza	-7.77 0.00 0.00	0.00
Equation 2	ADF Varianza Residual HAC varianza	-8.61 0.00 0.00	0.00
Equation 3	ADF Varianza Residual HAC varianza	-8.40 0.00 0.00	0.00

Table 5 Results of the Kao test

The results found indicate that when estimating Equation (1), the cointegration hypothesis is met since the probability is 0.0000, that is, there is a long-term relationship between the variables that make up the same. When the regressions incorporate certain control variables, Equation (2) and (3) the effect does not change, the hypothesis is still fulfilled when making use of these, there is a joint movement between the variables over time, we could talk about a long-term balance in the series.

Equation Inicial		
Hypotesis	Statistical Fisher-trace test/ Prob	Statistical de Fisher-max-einge value test/Prob
None	164.4 (0.00)	126.9 (0.00)
At least 1 vector	68.84 (0.00)	40.63 (0.01)
Equation 2		
Hypotesis	Statistical Fisher-trace test/ Prob	Statistical de Fisher-max-einge value test/Prob
None	429.5 (0.00)	227.6 (0.00)
At least 1 vector	210.7 (0.00)	103.4 (0.00)
At least 2 vectors	122.1 (0.00)	63.17 (0.00)
At least 3 vectors	76.09 (0.00)	36.56 (0.04)
Equation 3		

Hypotesis	Statistical Fisher-trace test/ Prob	Statistical de Fisher-max-einge value test/Prob
None	1636 (0.00)	360.8 (0.00)
At least 1 vector	3161 (0.00)	438.6 (0.00)
At least 2 vectors	691.3 (0.00)	245.7 (0.00)
At least 3 vectors	432.0 (0.00)	141.7 (0.00)
At least 4 vectors	327.9 (0.00)	104.1 (0.00)
At least 5 vectors	228.6 (0.00)	81.67 (0.00)
At least 6 vectors	166.1 (0.00)	72.69 (0.00)
At least 7 vectors	113.2 (0.00)	56.70 (0.00)
At least 8 vectors	80.59 (0.00)	51.16 (0.00)
At least 9 vectors	59.02 (0.00)	59.02 (0.00)

Table 6 Results of the Fisher Johansen test Note: the probabilities are shown in parentheses

On the other hand, under the conception of the Fisher Johansen test, the same one that determines the number of cointegration relationships in the system, it was determined that in the Equation (1) there is at least 1 cointegrating vector that gives indications that a relationship exists of long-term cointegration in the series, in the same way when determining the Equation (2) incorporating certain control variables such as exports and investment, it is observed that there are at least 3 cointegrating vectors in the presented series, finally when estimating the Equation (3) with the vabs we see that the series presents at least 9 cointegrating vectors, that is, the whole estimate presents a balance in the long term since the probabilities are less than 5%, therefore the cointegration hypothesis is fulfilled.

In summary, it can be concluded that the results about the main variables of the model are quite robust using the Kao and Fisher Johansen's test, it was found that there is a cointegration relationship or what is the same a long-term relationship between the variables.

So also that natural resources alone do not ensure sustained development and growth, they simply offer an opportunity that any economy should take advantage of (Ramos, 1998).

Conclusions

The strong dependence on natural resources, the internalization of production processes and the need for raw materials have caused economic growth to increase in recent decades. Literature in a theoretical and empirical context has tried to answer the question, studying if this effect generates benefits or losses for the recipient countries. The results with the empirical evidence are fulfilled for LA whereas for the classification of the countries by level of income per capita they are contradictory in certain cases. The econometric regressions consider the level of development based on the level of per capita income reached by the countries of the region through the World Bank classification.

The main results show that natural resources have a positive effect on the growth of Latin America compared to high income countries. The effect is negative and not significant, in high middle income countries and in low middle income countries the effect continues being the same when incorporating control variables such as exports, investment and GVA, this implies that natural resources do not play a relevant role in determining production levels in these countries in the investigation period.

These results are compatible with the conclusions presented by Sachs & Warner (1997) when finding a negative relationship between growth and abundance of resources. On the other hand, certain studies find a positive relationship such as Chambers & Guo (2007) and Brunnschweiler (2008), because when incorporating variables of an institutional nature, the results vary.

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It is worth mentioning that different tests have been applied such as: Kao, Fisher and Johansen which allow to establish the existence of cointegrating vectors, in this sense one can observe balance of the variables in the long term, which leads to a positive relationship between natural resources and economic growth, not only because of the volatile prices that exist, but also because of the existence of other variables that can explain this effect such as corruption, investment, terms of trade and schooling.

Likewise, taking Ruiz as reference (2007), it is pointed out that natural resources are being subjected to ever greater pressure, since the economies of the world are making use of these resources, which implies that time is limited so that they are regenerated, it is important to mention that natural resources are important for a country because with the help of institutions, innovation in technology can be implemented public policies capable of making the most of them in a sustainable way and therefore have a sustained growth based on the extraction of these.

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Effects of trends in the digital economy and technological factors in the Mexican labor market, (2011-2017)

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Abstract

The digital economy has come to remain a convergent trend and a people-centered approach, with the multi-purpose of boosting productivity, innovation, growth and employment; although it is estimated that it is detrimental to jobs and the labor market. The objective of the article is to analyze from a theoretical and empirical perspective, the effects of technological factors on labor structures in Mexico as well as areas of opportunity to consolidate the labor market and achieve goals that are useful for the country's economic development. Under a qualitative methodology with an explanatory and correlational approach that allows determining the causes and conditions that generate the labor detriment before the validity of the digital economy. Finally, the implications of ICT in the digital economy and the labor market are determined by the link between people and digital processes according to their status of work activity. In addition, with national statistics data, presents itself evidence of the basic indicators linking ICT with the labor market and their correspondence with the ICT activities carried out by employees in Mexican companies with 20 employees.

Digital Economy, Technological Factors, Labor Market, Mexico

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1. Introduction

From a digital economy perspective, citizens of the world have seen the birth and development of various information and communication technologies (ICT) that have almost immediately become part of their daily activities. ICT have opened the door to a new way of working and relating in the economy and in a society that skips borders and hierarchies in the effort to transmit information. The use of ICT in general; and in particular, the use of the computer and the internet, occurs more frequently in work activities, in educational processes, and as a means of entertainment and leisure.

It is recognized; for example, that there is a positive relationship between the access and availability of a computer or a telephone line connected to the Internet, and the welfare situation of economically active persons, by virtue of which they facilitate work activities, while maintaining family communication and the timely attention of emergencies that minimize and identify risks for workers and their families.

Despite the constant and overwhelming concern about the prospect of the future work before the arrival of technologies and robots, ICT drastically modify the ways of relating of workers, employers and customers. However, it is important to highlight that the main benefits of the use of ICT to the economically active population (EAP) in developing countries such as Mexico, is the digital inclusion approach that is generated under the influence and development of digital competencies.

In this sense, the ILO (2017: 48), emphasizes that the skills and abilities of the future, includes not only generic competences that will allow the daily use of ICT.

But also specialized skills in products and services based on digitization and technologies, in addition to a wide range of complementary competencies such as information processing, data analysis, problem solving, statistics, research, communication and strategic planning.

Institutional pronouncements are given with clarity and strength to highlight the competencies and skills for the 21st century labor market, to generate conditions for competencies that allow the development of skills and abilities for the creation of sustainable societies, based on equality and inclusion, as well as respect for the care and protection of the environment, accompanied by certification processes that validate learning and the benefit of the use of ICT.

Cristofani (2017: 94) also highlights that the working class that concentrates the EAP, are the first recognized sources of influence and contagion for labor cohesion in direct work relations, given that "the benefits of ICT among work collaborators, consists of the simplification and automation of processes, optimization of management times and decrease in the load of operational tasks".

Also for Mexico, Hernández Rodríguez, et al. (2017: 45), considers that "the development of ICT work skills, became a nodal and strategic aspect, where employers allow their workers to be part of the intellectual capital that adapts, learns, competes and generates market value through of the use of ICT". Therefore, it is considered that the use of ICT in the EAP, means the development of digital competencies under a strategic field that potentiates functional networks and allows the identification of collaboration benefits in diverse labor contexts that generate knowledge.

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Hence, Medina and Ortegón (2006), recognized that the development of ICT skills as strategic and functional knowledge at work, generate value of knowledge from the economic and digital inclusion approach under a social approach, since they provide opportunities and benefits for the welfare and quality of life of workers.

One of the greatest benefits associated with the use of ICT is the growth of the labor market through the application of digital platforms; given that, they generate value on the basis of network economies, on the side of demand (network effects), in the context of multilateral markets (multi-sided markets). This business model allows them to move quickly from local businesses to expansions on a global scale, reaching sizes that open up more employment opportunities. According to ECLAC (2016b), the United States has the largest number of digital platforms (including Apple, Google, Facebook, Amazon, Microsoft and Uber), whose market capitalization value is 3.35 billion. of dollars to 2016. Likewise, a labor platform based on the OECD (2016), is defined as a means that allows employers and workers to connect with each other; through the digital platform.

A recent report by the International Labor Organization (ILO) and the Economic Commission for Latin America and the Caribbean (ECLAC, 2013) warns us about a structural crisis for labor markets in the digital economy for 2016-2017, which It forces us to reflect on How are we doing in the labor market? and how competitive are we? This means that the labor market is a link in the labor value chain of the digital economy. In relation to this, a study of the OECD (2016) is restated, which states that the technological specialization and the digitalization of the organizations will set the pattern of the main niches of qualified employment during the next ten years.

However, the global information technology report of the World Economic Forum (2016) is not so optimistic in making it clear that more jobs will be lost than those generated. Although, worldwide, there is a widespread demand for ICT specialists in all economic sectors, at present, it is committed to new occupations for the future, so that an adequate training process would allow the vast majority to find employment; hence, studying the effects of ICT in the labor market, is increasingly relevant and effective because of the important contribution of ICT to employment, since according to the report of the OECD (2016), in the sector of ICT work more than 14.2 million people, a figure that is equivalent to almost 3% of total employment of the OECD, generating a great labor polarization.

In short, there is one of the greatest revolutions in the way of working, which affects senior executives, qualified professionals, certified technicians, and young people just graduated from higher education who are looking for their first job. Although Mexico ranks 76 out of 139 OECD countries that use ICT, there are 1.9 million unemployed in the second quarter of 2017 (INEGI, 2017), the National Population Council (CONAPO) estimates that by the year 2030 600,000 jobs that could be left uncovered by the ICT sector will be required.

It is also observed that from the second decade of the 21st century, the demand for new professionals in areas such as Big Data, Smart Cities or cybersecurity are growing. With the exponential growth of technological factors, processes, data, objects and subjects connected to the Internet, digital transformation has the potential to restore labor structures and recreate the labor market with surprising immediacy.

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Given this scenario, the Mexican government is increasingly aware of the needs of the development of the digital economy, to extend its benefits and respond to its fundamental challenges such as reducing unemployment and reducing poverty; Therefore, the importance of conducting this research lies in the fact that an information gap was detected that records the analysis of the use of ICT in work activities in different professional areas and jobs, since at this level of studies is where more money is invested to obtain a better performance in the labor market.

1.1 Link between the digital economy and the labor market

With the aim of analyzing (in the context of the digital economy) the current conditions of employment in Mexico, and the effects of technological factors on labor structures, the link between people and labor processes with ICT and labor market will be reviewed. Due to the above, the central questions are: What are the implications of ICT in the digital economy and the labor market? What are the technological factors central to the new labor structures? What will be the patterns of labor specialization for the next ten years?

The problem is not limited only to theoretical analysis, but to the study and observation of economic and social activities that are constantly changing, which makes it necessary to have knowledge of digital metamorphosis as a determining factor in the future of work and the labor market. On the other hand, the narrow and fragile economic base that the country has, slows down the pace of job creation. In this sense, given that technological change is a non linear and progressive process that affects employment, it is understood that the link with educational aspects would be the basis that would potentiate the benefits of this technological changes, affecting the digital economy in the labor market.

Therefore, the labor and educational perspective goes back to the effects that ICT now has on people's work and well-being, recognizing their strong penetration in robotization and automation of processes that affect people's future work. Hence, despite the mismatch of the labor market, it is estimated that the development of ICT skills will be useful for job placement. For this reason, it is important to have information about the change of the working environment in the medium and long term to make decisions about the future of many professionals, given that the information technology services, together with the telecommunications sector, have a 80% of employment in the ICT sector among OECD member countries.

1.2 Structural elements of the employment-economy digital relationship

The structural elements play a central role in the incidence of job creation. Poor economic growth limits the generation of quality and well-paid jobs. In Mexico, there are several structural obstacles that prevent the creation of quality jobs and salary increases. Among the most noteworthy are the reduced productive and technological investment and the deep socioeconomic inequalities that, based on information from the ILO (2017), are a powerful barrier for people to access decent work and achieve a stable employment relationship through productive employment, quality, with better income, access to rights and social protection.

Structural constraints, such as inequality in income distribution, limit productivity growth to have a direct impact on increasing job opportunities and reducing poverty. Well-paid employment is especially important in the majority of the poorest households in Mexico.

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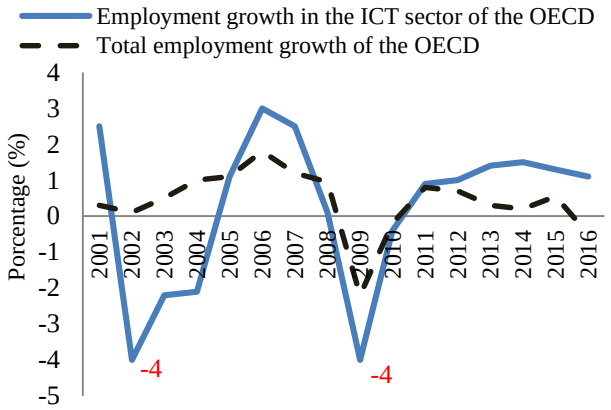
1.2.1 Context of the digital economy and the labor market

As can be seen in graphic 1, the growth of employment in the ICT sector of the OECD countries marks a downward trend, this can be explained because the contribution of ICT in the labor market declined in countries with a large ICT sector and increased in countries where its dimension is smaller. One possible explanation for these events is that the crisis led to technological rationalization in countries with large ICT sectors and favored ICT companies located in countries with low labor costs.



Graphic 1 Year-on-year growth in the ICT employment sector in the OECD
Source: OECD (2017a): www.oecd.ilibrary.org/statistics. Note: Database information of national accounts of 27 countries that had complete data series, Mexico is not included due to lack of that report

The evidence from the OECD (2017a) shows that while developed and highly productive countries such as Germany, the Netherlands, Norway and Denmark, resort to a lower number of hours worked throughout the year; Mexico is the country in which the highest number of average hours are used per worker, which explains that the repercussions of technological progress and globalization in the Mexican labor market in the last two decades, has focused on the polarization of employment and deindustrialization.

These events have generated concern among entrepreneurs, academics and union leaders in Mexico, which justified that in September 2016, the Expansion Forum "Digital Economy 4.0" was held, where Mexico's challenge to access the digital economy and the immersion of the fourth industrial revolution, which will lead to change and rethink the concept of labor specialization, since INEGI (2017) records that in Mexico there are more and more Internet users, considering that individuals of or more years, that in an eventual or daily basis, and independently, they have carried out some activity on the Internet in the last three months.

Year	Total		Economically active		Economically inactive	
	Absolute	%	Absolute	%	Absolute	%
2001	**6 760 703**	**100.0**	3 175 231	47.0	3 585 472	53.0
2002	**10 305 883**	**100.0**	5 111 245	9.6	5 194 638	50.4
2004	**12 137 273**	**100.0**	6 698 005	55.2	5 439 268	44.8
2005	**15 325 621**	**100.0**	8 246 984	53.8	7 078 637	46.2
2006	**17 198 302**	**100.0**	9 273 968	53.9	7 924 334	46.1
2007	**19 239 971**	**100.0**	10 222 797	53.1	9 017 174	46.9
2008	**20 715 302**	**100.0**	11 259 149	54.4	9 456 153	45.6
2009	**22 930 093**	**100.0**	13 705 446	59.8	9 224 647	40.2
2010	**27 041 220**	**100.0**	16 048 777	59.3	10 992 443	40.7
2011	**30 374 791**	**100.0**	17 925 677	59.0	12 449 114	41.0
2012	**33 202 186**	**100.0**	20 170 912	60.8	13 031 274	39.2
2013	**37 082 542**	**100.0**	22 814 795	61.5	14 267 747	38.5
2014	**37 930 086**	**100.0**	23 047 648	60.8	14 882 438	39.2
2015	**51 247 320**	**100.0**	32 070 094	62.6	19 177 226	37.4
2016	**52 456 769**	**100.0**	35 315 851	67.3	17 140 918	32.7

Source: INEGI (2017). From 2001 to 2014: INEGI. Module on Availability and Use of Information Technologies in Homes. From 2015 to 2016: INEGI. National Survey on Availability and Use of ICT in Households, NSAUICT.

Chart 1 Internet users, according to the condition of economic activity, 2001 a 2016

The activities can be, among others, to perform school tasks; those related to work; of communication, including emails or written conversations (Chat); training or distance training through videoconferences; of entertainment, such as downloading or playing video games or computer programs on the web, such as music. In table 1, it can be observed that of 6 million 760 thousand 703 registered users to 2001, it has gone to 52 million 456 thousand 769 users for the year 2016, increasing in this way slightly more than 12% in recent years the total of users of this TIC.

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We also see that the incidence of ICT in the labor market is recorded by the users who are part of the economically active population (EAP), who are persons of 15 years of age or older who during the reference period carried out an economic activity in the labor market (employed population) or actively sought to do so (open unemployed population), as long as they have been willing to work at least one hour of work in the reference week. As can be seen, the EAP indicator, the number of Internet users increased from 2001 to 2016, from 3 million 175 thousand 231 Internet users of the EAP to an absolute number of users of 35 million 315 thousand 851 Internet users of the EAP.

In this approach that allows us to contrast with the theory, the general hypothesis can be verified and we observe that to the extent that the EAP increases its use of ICT to develop some economic activity, communication, commerce or information, related with work activities or not, it is understood that ICT and internet are a means that relates the digital economy to the labor market, allowing the development of a collaborative economy that generates positive implications for workers, which increases their ICT skills and generates more benefits economic

The Survey on Information and Communication Technologies (ENTIC 2013), aims to obtain information on the availability and use of information and communication technologies in companies during the year 2012, to generate statistical information on labor and other matters related to business activity. In table no. 3, 11 basic activities are required that are related to the activities carried out by employees of companies with 20 or more employees. As shown by the ENTIC (2013), the most representative activities are the work activities in which the use of the computer is required in a total of 50 thousand 195 companies that represent 97.5% of the total of mining activities, manufacturing, construction, electricity, services and commerce.

While for 2012, the number of companies analyzed reached 138,881, this is explained given that companies with 10 or more employees were considered for the activities of mining, manufacturing, construction, electricity, transport and communications, services and commerce, which represented 88.7% of the total number of companies.

Likewise, the other representative activity is in which the internet is used, registering for 2012 a total of 48 thousand 266 companies, corresponding to 92% of the total number of companies consulted; as well as for 2012 there were a total of 132 thousand 573 companies that represent 84.6%.

The third most important basic activity corresponds to the use of fixed broadband internet, with 26,818 companies in 2008, and 124,272 in 2012, corresponding to 55.6% and 93.7% respectively. As it is evident, with these data it is certain that the link between people and digital processes within the labor market is determined by the use of ICT and especially by the use of the Internet, with which one can verify one of the hypotheses raised about the fact that the internet is a means that links the digital economy with the labor market, allowing the development of a collaborative economy, given that there is a greater number of people who use the internet, and that it generates positive implications for workers in their work activity.

Indicator	**Total bussiness**		2008[a]	2012[b]
	2008	2012	%	%
Use computadora[c]	50,195	138,881	95.7	88.7
Use Internet[c]	48,266	132,573	92	84.6
Have web page[c]	26,126	64,920	49.8	41.5
Use intranet[c]	20,014	46,135	38.1	29.5
Sell on Internet[c]	4,555	11,407	8.7	7.3
Buy on Internet[c]	7,068	22,224	13.5	14.2
Narrow band internet[d e]	17,745	21,159	36.8	16
fixed broadband internet[d f]	26,818	124,272	55.6	93.7
mobile internet broadband[d g]	8,927	29,758	18.5	22.4
LAN[c]	39,609	103,126	75.5	65.8
Extranet[c]	4,319	10,781	8.2	6.9

[a] The information refers to companies with 20 or more employees of the activities of mining, manufacturing, construction, electricity, services and commerce.

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[b] The information refers to companies with 10 or more employees of the mining, manufacturing, construction, electricity, transport and communications, services and commerce activities.
[c] The percentage figure refers to the total number of companies in the target population.
[d] The percentage figure refers to companies that use the internet.
[e] Includes analog modem (Dial Up) and RDSI.
[f] With download speed equal to or greater than 256 Kbit / s (Includes ADSL, cable modem, satellite and wireless networks (WLAN, Wi-Fi, WiMAX, LMDS) .For 2008 includes cellular and excludes wireless networks.
[g] With download speeds equal to or greater than 256 Kbit/s through cellular telephony. For 2008 includes satellite.

Table 2 Basic indicators that relate ICT to the labor market (2008 y 2012)
Source: INEGI (2013) National Survey on Availability and Use of ICT in Households, NSAUICT

We can also see it in the following graph 2, which shows the evolution of the indicator of Internet users who are part of the economically active population. It is clear that its displacement in the annual percentage indicator tends to be increased. To identify what is the link between people and digital processes within the labor market, we can see that the Internet is present every day in the largest users and in practically all aspects of daily life. ICT and properly the internet is an outstanding and widely used tool to stand out in the labor market, favoring the growth of entrepreneurs (self-employment) and companies of all types and sizes, which implies a strong and growing link between people and companies. ICT and digital processes.

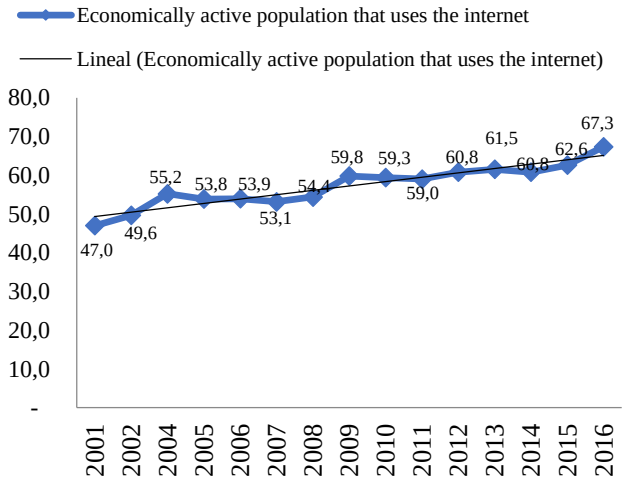

Figure 2 Mexico: Internet users of the Economically Active Population (2001-2016)
Source: INEGI (2017) NSAUICT

2. Theoretical and empirical discussion

The demand for ICT specialists has continued to increase in all economic sectors, in the face of technological disruption. With the digital strategy of Mexico, it is intended to place the country "as the first country in digitalization in Latin America, with a level similar to the OECD average in 2018." This strategy is aimed at fostering innovation and entrepreneurship in the digital economy, raising the quality of education through ICT, contributing to the transformation of public administration, guaranteeing universal access to health services and promoting participation. citizen under the following strategies proposed by the OECD (2016).

Replicating the analysis made by Torres García (2016), documented in economic theory, it is understood that human capital is in need of incorporating this reality, given that the skills of people to use ICT, determine their insertion into the market labor in better or worse conditions; and even, they determine the type of work and its remuneration, in virtue that the digital economy is developed through the use and access to ICT.

Área	Objective Prosoft 3.0
Digital Market	Stimulate the market, linking the demand of economic sectors with the supply of ICT goods and services in Mexico.
Business Innovation	Promote the culture of innovation and specialization among companies in the ICT sector.
Talent	Promote the development and identification of skills, skills of personnel in the ICT sector.
Globalization	Promote local business opportunities abroad and attract investments in the ICT sector.
Financing	Expand the options and possibilities of access to financial resources for companies in the ICT sector.
Intelligent Regionalization	Encourage smart specialization to consolidate competitiveness based on specific niches of high value in the ICT sector.
Legal Framework	Facilitate the adoption of a legal framework that encourages the production and adoption of ICT.
Gobernance	Coordinate and integrate the actions and the actors of the ICT ecosystems.

Table 3 Strategic areas of the Mexican program Prosoft 3.0
Source: Own preparation with information from the Ministry of Economy

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The Mexican government, to reach the objectives set in the digital agenda, focuses its actions on these eight strategies with specific objectives by 2025; However, these objectives have not been fully met. In this regard, the argument of Lombardero (2016) is shared, explaining that the digital economy does not correspond only to one sector, but to the incorporation of digital activities in a transversal way, and to the organizations of the different economic and social sectors to promote the growth of GDP and the generation of employment.

As can be seen, some national digital strategies emphasize the use of open data whose main benefit is greater interoperability. In this sense, Arntz, Gregory and Zierahn (2016), argue that a substantial part of jobs is in "computerization risk" due to the so-called interoperability of the fourth revolution that will change the concept of labor specialization in the digital economy from Mexico .

For his part, Marc Fortuño (2017) states that we are witnessing a new era, in which robots and computers will be the main actors of routine activities, replacing physical work, much more efficiently than human beings, which will lead to the interoperability and automation of production processes.

In this sense, the technological specialization and the digitalization of the companies will mark the guideline of the main niches of qualified employment during the next ten years, foresees a study of the OECD (2016); hence, as has been demonstrated throughout history, with the different industrial revolutions, technological advances have offered a greater degree of productivity, implying improvements in social welfare, which has meant fewer hours worked annually.

2.1 Digital strategy and employment

In the analysis of the digital economy and the labor market, it is generally highlighted that since the 20th century, and especially in the last decade, we have sought to link information and communication technologies with employment, productivity and labor specialization patterns. At the international level there is more evidence, while for Mexico, it is very scarce; Although, on an international level there is considerable discussion on the subject in particular, in Mexico there are few occasions that have been treated in a scientific and comprehensive manner.

However, with this review of the state of the question, the different perspectives that academics, businessmen, politicians and union leaders have about the technological factors that determine the future of employment are analyzed. In this regard, Novo-Corti and Barreiro-Gen (2017: 392), argue that "digital communication and social networks have become crucial elements in socialization" and are expected to continue in force in the next ten years. that people in conditions of digital isolation, lose the possibilities of staying able to find a job, due to the loss of "digital skills".

On the other hand, Graham, Hjorth, and Lehdonvirta (2017: 136-137), based on a study of several years with digital workers in Southeast Asia and sub-Saharan Africa, state that "governments and organizations turn to the economy smart and digital work, as a strategy of economic development to create jobs in places that need them ", recognizing that the digital economy is important to better understand how it could influence the means of working life of workers. In addition, four main concerns of the workers stand out: 1. bargaining power, 2. economic inclusion, 3. intermediate value chains, and 4. updating-training, the latter two being those most linked to the labor market.

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Graham, Hjorth, and Lehdonvirta (2017), show that although with the digital economy, there are important and tangible benefits for a number of workers, there are also a series of risks and costs that unduly affect the livelihoods of digital workers. On the basis of these concerns, they conclude with a reflection on four general strategies: 1. certification schemes, 2. the organization of digital workers, 3. regulation strategies and 4. democratic control of online work platforms , strategies that could be implemented to improve the conditions and livelihoods for digital workers.

Similarly, for Boes, et. to the. (2017: 133), "the strategies of cloudworking and crowdsourcing revolutionize the world of work and assume that its development has a significant impact on work and society"; by virtue of which, they represent a global information space that allows companies to expand the scope of their value production, far beyond their physical and formal limits, influencing the integration of forms of work.

These researchers put on the table discussion, the relationship of employment with the digital economy, highlighting a new stage of capitalism "Landnahme". The novelty of this type of colonization strategies in the information space (cloudworking and crowdsourcing), is that they strive to make the work mutually interchangeable inside and outside the formal limits of the organization (government, family or company), on the basis of computerized and industrialized production structures.For its part, Postigo (2016: 334), analyzes the socio-technical architecture of digital work and redefines the concept of "digital work architectures." The concept draws attention not only to the social practices involved, due to the activities of position between work and leisure in a commercial framework, and also to technological platforms that make it possible in a seemingly invisible way.

Gleeson (2016), highlights that social media based on platforms such as Facebook and Twitter are increasingly used by women around the world as a way to capture and take advantage of a wider audience and draw their attention to campaigns and individual promotions that approach social problems. Her study is based on data from interviews with representatives of three contemporary feminist campaigns based in Australia in order to demonstrate that feminist activists within online feminist campaigns can undertake a form of digital work and examine the effects of this human resource and manpower. With respect to the labor market, it is observed that these works are framed in activist activities as a form of digital work, where those changes that trigger the labor market, are needed.

2.2 Development of labor polarization

The OECD (2017b) states that in recent decades, almost all member countries have experienced labor polarization; that is, a decrease in the percentage of total employment attributable to semi-skilled jobs with medium-level salaries, which is offset by increases in the percentages of both skilled jobs and low-skilled jobs, where a third of the increase in labor polarization it reflects a change in employment, the manufacturing industry is left to integrate into services; while the other two thirds reflect the occupational changes within industries as a product of technology, which means a strong relationship with polarization and deindustrialization. In this regard, Rosa Soto (2017), says that technological advances in the robotics sector have not only generated the polarization of employment, but have also allowed the development of machines capable of carrying out heavy mechanical activities, typical of chains of mounts, but also more complex ones that require greater precision and risk, such as surgery.

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Hence, the ICT sector will be led by robotics. The introduction of robots in the labor market puts in check the low-skilled or repetitive jobs, while the most creative professions would be, for the time being safe. The impact of robots on the economy and in various professional sectors detonate labor polarization, although the economic precariousness is increasing, the demand for employment in qualified sectors is increasing. It is expected that this disruptive technological trend will continue during 2018 in demanding organizations of more and better skills.

Coinciding with Lombardero (2016), the application of science, technology, mathematics and engineering, will be basic skills to work in the next ten years, giving rise to new professions with diverse profiles that feed back from a broad knowledge of technologies , to develop digital cities and smart factories, in addition to hiring statistical data scientists, algorithms, marketing, digital content and cybersecurity.

The changes in the dynamics of the labor market are denoted demographic and socioeconomic, being the changes in the nature of the digital and flexible work, the most significant by the impulse of the technology in the cloud, the mobile Internet, the increase of the force of the " big data "and the internet of things. Given this, in the immediate future it is visible that three major job profiles will govern the labor market over the next three years (2020), engineers, ICT professionals and specialists in data analysis (big data). However, under consideration that technology is a determinant of new jobs, in counterpart, the discussion of the World Economic Forum in Davos, a turn around the destruction of professions and the uncertainty that this is much greater than the capacity that exists worldwide to generate new jobs, World Economic Forum (2017).

What the report reveals is that technological and demographic changes will destroy more than seven million jobs by 2020, of which it is estimated that two thirds would correspond to jobs and jobs related to office activities and business administration. It was also discussed that the jobs related to industrial production will have a tendency to decrease, but it is also considered that they would have a little more margin to improve their qualification, so they could opt for a conversion through the use and management of the TIC.

On the other hand, it was also highlighted that those who minimize scientific procedures and practices will see a crude and inaccessible working future, given that it is estimated that there are four main occupations that will be hired in the near future. One of the main occupations will be the scientific data expert (data analyst), standing out the scientist in the statistical management, expert in the management of algorithms, expert in digital marketing and cybersecurity expert.

Therefore, organizations (government, companies and families) will increasingly demand digital-oriented capabilities. Thus, the market will follow the main labor trends, for example, in 2016, 23% of job seekers, were already looking for engineers, although with an increasing orientation in the digital processes. In this way, companies will continue to demand developers, Java and dot-com analysts, and telecommunications and computer engineers..

2.3 Implications of ICT in the digital economy and the labor market

ICTs are changing the sectors of the economy at an accelerated rate, having an important impact on the labor market. The current time we are living is marked by apprehension and uncertainty, given the interference of ICT in the activities that people develop in their working life.

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Which leads to a demotivation of the use of ICT in the workplace; that is, faced with the fear of being replaced, people are reluctant to use ICT in the labor market. However, in line with what was reported by Arreola (2017) and the World Economic Forum (2016 and 2017), at the international level the fall in unemployment in some countries is also influenced by the fact that some people give up finding a job because of their digital illiteracy.

The impact of ICT in the labor market has marked a trend in its use and fundamental access in the digital economy, which has unleashed the labor market has inherent uses from supply and labor demand, experiencing pressure points in workers , mainly due to the automation and technological evolution that is forcing employees and companies to continuously change.

According to Arreola (2017), if there is no change towards the use of ICT, one of the parties (employees or employers) will open labor gaps and gaps in relevant labor skills and competences. This fact, sometimes connected with unemployment and others with the digital economy, shows that the lack of qualified people for certain positions specialized in the use of ICTs is outside the labor market.

Undoubtedly, these aspects are significant when looking for and developing a job, given that they mark the trend of new professional training and the development of job skills, which forces us to rethink the restructuring of plans and programs of study, in function of the questions with a futuristic technological perspective What will be the jobs of the future? What demands will the labor market have?

Among the main answers, are the arguments and approaches of the World Economic Forum (2016 and 2017), ECLAC (2017a), Graham, Hjorth and Lehdonvirta (2017), Boes, et. to the. (2017), Volpentesta (2017), the H. Chamber of Deputies (2017), Mahmoudi, and Levenda (2016), Postigo (2016), Ruberg (2016), Valerio, Castro López, and Herrera Murillo (2016), García Irigoyen, Torres García (2016), Tabares (2016), Krull (2016), Palos Sánchez (2016), ECLAC (2016), Mokyr, Vickers, and Ziebarth (2015), Mochón, Gonzales, and Calderón (2014), among other scholars of the digital economy and the labor market, arguing that it can be verified that "ICT and the Internet are central elements of technological change under digital interoperability that determines the context or environment of a digital economy", highlighting that digital ecosystem It imposes a new way of working and a new structure of the labor market.

Therefore, it should be noted that the changes that force us to use ICT in an increasingly digitalized economy, emphasize that we will live more quickly and there will be shorter technological updates. For the person with scarce economic resources, the most important technological change will be around the concept of digital skills and competences.

While currently seeking the highest number of professional credentials (documents that recognize and testify the authenticity of knowledge, skills and competencies). These professional credentials are considered as the official titles and certifications to perform a job with certain order and systematics, business area, labor structure, and business title; However, in a few years (we consider that no less than ten years), having such professional credentials will not be enough to apply the requirements of the labor market; therefore the search and development of a good job will be more challenging each day.

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3. Methodology: materials and methods

This descriptive and correlational research begins with the description and contextualization of the link between the digital economy and the labor market, highlighting the problem of the lack of decent and well-paid jobs, and the labor perspective that will be faced with the dizzying technological changes, reaching Address the impact of the digital strategy on employment and the prevailing labor polarization.

Statistical data were analyzed from the National Survey on Availability and Use of ICT in Households and the Survey on Information and Communication Technologies to correlate the use of ICT by the EAP and its correspondence with labor activities of business units that use ICT from different activities linked to work to identify their correspondence with the digital strategy of the country.

The study of the issue related to the central theme was developed and the different inferences of analysis were determined, emphasizing that in the face of the discouraging scenario of unemployment in positions that demand technological competences, and in face of the threat of the possible replacement of people by ICT In the labor market, it is important to determine the link between people and digital processes within the labor market.

It is recognized that the world population is immersed in the digital revolution, connected by all corners of the world, thanks to systems and technologies that allow it to reach the link of globality. Hence, this link is strengthened from the moment we use information and communication technologies to be informed and communicated. The new generations are born driving smartphones and connecting to the Internet from an early age, thus marking the pace of technological progress for the rest of the generations.

3.1 Technological factors of labor structures

Innovations in technology, in particular the technological factors of labor structures and the application of digital media, are increasingly changing the way ICT is used in companies and in work processes. More than this, technology as a factor that determines the labor and organizational structure in companies and organizations, alters the very structure of work and business life. However, by identifying the technological factors of the new labor structures, it was possible to identify that ICTs work as a tool that would favor the development of labor actions, in addition to determining the form and systematized structure of how to work. ICT represent the essential conditions to develop many administrative and operational tasks in companies and other organizations.

A framework to explain these facts that suggests the fourth industrial revolution, within which certain key technologies have been identified as technological factors that impact on labor structures. These factors are identified as digital strategies, depending on the need of the company or organization and the job offer of the employees, according to their digital capabilities.

According to the World Economic Forum (2017) technological factors are identified as the digital pillars in the economic and social order: 1. Artificial intelligence, 2. Internet of things, 3. Robotics and mechatronics, 4. 3D printing and in advance and 4. Virtual Reality, factors that have affected not only the labor market, but also in the digital economy and in all the structures of society. The surprising thing is that these areas of innovation have existed for a long time, and certain advances of recent years unleashed their potential.

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When applying these technologies, the key to production goes beyond the development and labor exploitation, since in the work includes the entire value chain that goes from the conception of the idea, the diagnosis of needs, scientific research, processes of design, production, purchase-sale, delivery, collection and consumption. This substantially alters the labor structures and the traditional business model; as well as the speed of the technological changes, it is surpassing the capacity of adaptation of the workers and of the population in general.

However, the strategies that determine the labor structures are very much related to the digital economy; since ICT, influence determinantly in the ways of acting and even in the determination of commercial policies of purchase, sale, credit and online collection, which create an environment and digital thinking.

In this context of continuous advances in the use of ICT within the labor market, there are not many alternatives, or companies and workers adapt to the digital economy and the use of ICT; or adapt. Those workers who do not adapt to the technological needs of the company, the customers and markets of the company, will be condemned not to be hired and therefore will be jobs that will be lost. Therefore, it is crucial to understand the functioning of technological factors and their real impact on the labor market, business, the competitiveness of companies and the productivity of workers.

The World Economic Forum (2017), emphasizes that the adaptation of workers to technological factors (due to the demands of online customers, the offer of competitors through the network, market strategies through the Internet, among others), will represent the progress and development of workers and entrepreneurs It also involves breaking down the obstacles that surround the use of digital media in the work structure.

As we can see in the following table no. 4, it is observed that of the total number of employees consulted by the companies determined by the Survey on Information and Communications Technologies (2013), in 2008 there was a structure of 2 million 620 thousand 996 employees in companies of 20 employees plus mining activities, manufacturing, construction, electricity, services and commerce, increasing for 2012 to a total of 3 million 421 thousand 427 companies with these characteristics, which represented 26.4% to 30.5% respectively for those same years.

Indicator	**Total employees**		2008[a]	2012[b]
	2008	2012	%	%
use computer[c]	2,620,996	3,421,427	26.4	30.5
use Internet[c]	1,769,034	2,793,463	17.8	24.9

[a] The information refers to companies with 20 or more employees of the activities of mining, manufacturing, construction, electricity, services and commerce..
[b] The information refers to companies with 10 or more employees of the mining, manufacturing, construction, electricity, transport and communications, services and commerce activities.
[c] The percentage figure refers to the total number of employees of the companies in the target population.

Table 4 Uso de TIC por los trabajadores (2008 y 2012)
Source: INEGI (2013). Survey on Information and Communications Technologies

More and more workers are located in companies with 20 workers or more that develop activities related to the use of ICT (use of computers and internet); showing that part of this research is aimed at analyzing the digital environment in society, with the purpose of emphasizing the basic activities that include opportunities offered by ICT to the labor market.

In this report of results, it is verified that the impact of ICTs in the digital economy and the labor market in Mexico has been achieved through research strategies that allowed to establish a theoretical and empirical debate about the importance of technological factors; as well as.

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The limits and perspectives of the digital economy in labor activities, in such a way that the relationship of ICTs with the digital economy and the labor market can be identified, to the point of also pointing out the possible negative consequences that need to be addressed in subsequent investigations.

It has been shown that, with the proper use of ICT, companies are allowed to produce more work, of better quality and more flexible over time. For workers, this translates into more free time. In the same way, the use of ICT has a direct impact on customers, suppliers and workers and their relationship with the company. Thus, all those involved are favored with the use of ICT in a company, as long as it uses them in a good way. In the following graph 3, you can see the main activities by internet use to 2016 in Mexico.

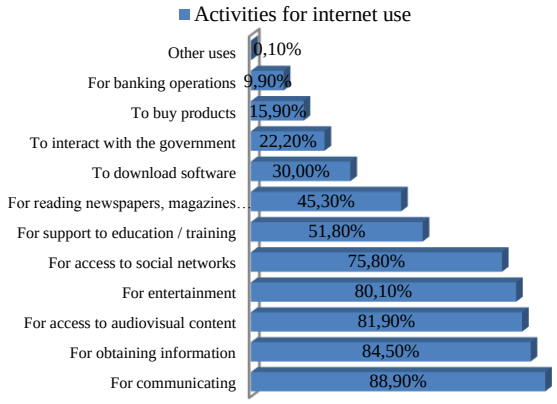

Figure 3 Activities for internet use by the EAP, 2016
Source: INEGI (2017), Survey on Information and Communications Technologies 2016

In this part, it can be highlighted that ICTs have not only determined the ecosystem of the digital economy; but they have changed the environment of the labor market, from the perspective of communication between all the integrated elements of the labor market (worker, work, employer, salary).

Which go beyond the production process and which increases its importance in other areas of professional and personal life This confirms that the concepts and categories of the digital economy, as well as the representation of empirical regularities, confirm the hypothesis that ICT and internet are means that are increasingly used by the economically active population, however, their main use is to communicate with 88.90% of the population by 2016, to obtain information with a record of 84.50% of the population; however, there are activities that are properly of interest to people from 18 to 55 years of age and over.

These activities are: support for education and training with 51.80%, to buy products with an intervention of 15.90% of the population and to carry out banking transactions with 9.90% of the population at the end of 2016; what we assume are activities carried out by those people who are part of the economically active population.

Category SCIAN	Productive Sector	Average
21	Mining	4 410
22	Generation, transmission and distribution of electrical energy, water and gas supply by pipelines to the final consumer	4 219
23	Construction	7 406
31-33	Manufacturing Industries	113 697
43-46	Commerce	64 793
48-81	Services	188 627
	Total	**383 153**

Table 5 Use of ICT by workers (2008 y 2012**)**
Source: INEGI (2013) Survey on Information and Communications Technologies

On the other hand, with the information presented in Table 5, it is possible to corroborate the hypothesis, that the letter states that "ICT and the internet are a means that is used optimally to find work, since it offers jobs, services, business and in general to connect companies with workers (crowd working)".

For this, the average of the total number of employees (dependent and non-dependent) of the productive sector that performed remote work, by type of SCIAN classification in the country during 2012, is presented.We see that the sector that most employ workers to carry out activities remotely and commonly online is the service sector, followed by the manufacturing sector. In the table we can see that the activity with the fewest workers that carry out activities in the distance, was the services sector, followed by the manufacturing industry.

The results help in the construction of the empirical evidence and the theoretical discussion, giving the nuances that were found in the statistical data, in correspondence to the methodological strategy, for which a document that shares the ethos of scientific research is recorded which means the production and generation of knowledge that has been generalizable to facts, events, historical aspects, concepts and processes of the behavior of the digital economy.

4. Analysis of results

The digital tendencies for the search and development of a work, guide the answer to the research question: What use is given to the TIC for effect of the search and development of a work? We find that the International Trade Organization estimates that before 2020, up to 500 million jobs will have been created, which will be occupied mainly by young people -the generation with the highest unemployment rate- that, at the same time, would be concentrated in the majority population group of the productive force.

According to the Report on the future of jobs of the World Economic Forum (2016), the effects that are already felt and some that are about to reach the business models and impact on the labor market are:

a. The current geopolitical volatility, cloud technology and mobile internet, advances in processing capacity and Big Data, shared economy through digital platforms, increase in interconnected youth, increase in Internet users, increase in job performance, more workers communicated, more online training and multimedia classes in emerging markets, rapid urbanization, change in the working environment and labor flexibility for its realization, in the transformation to an increasingly digital economy.

b. Since the last three years, great inventions have been observed in terms of energy supply and technology, internet of things, cutting-edge manufacturing, slow decline and longevity of society, new consumer concerns about cyber security issues, data protection and privacy, and increase in the aspirations and empowerment of women in the economic and productive order.

c. It is specified that the next five years, we will see among us advanced robotics and the autonomous transport and free of use of carbon fuels. It is considered that in the near future, employment trends will be marked by artificial intelligence and automated and remote-controlled learning, an environment where advanced materials prevail, a weakening of biotechnology and a resurgence of genomics and nanotechnology.

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Thus, the labor requisition in the characteristics of digital competence, will be given by a multitude of skills that require the generation and application of knowledge, social peculiarities and useful qualities difficult to automate, hence, strategies such as social networks as integrated platforms that include everything to give the service of purchase and sale (XaaS everything as a service, workplace as a service, cybercrime as a service, analytics as a service), will require data analysis, management of digital platforms and cybersecurity services as new digital trends.

According to the report of the World Economic Forum (2016) and the CEPAL reports (2017a), the most important skills and competencies that the labor force will demand for the development of a job in the year 2030 will be: Resolution of complex problems, critical thinking, creativity and innovation, people management, administrative coordination, emotional intelligence, decision making, service orientation, negotiation, cognitive flexibility and use of ICT.

On the other hand, all jobs will have a minimum digital component, which in the words of the operating business center of Microsoft does not mean that all people have to have a computer training or automated systems; rather, even the low-skilled population will have to manage and operate ICT. Successful organizations will be those that have a business model that allows them to go through all the options of technological factors and continuously move the work as necessary. Hence, many "new jobs", including international business, fiscal public accounting, agro-technology business, business graphic design, and other executive areas, will be generated and developed through the digital platforms that drive the economy "gig". This implies that flexible and short-term contracts prevail in the labor market and that permanent or basic jobs (freelancing) tend to disappear.

With all this, there will be both supply and demand for labor with characteristics of ubiquity in time and space for different organizations, at different times and from different places to the place where they are employed. In addition, most jobs will be made through the use of ICT and interaction with employers, customers, colleagues and other economic agents at the same time, which means that people connect with a workforce and a labor market that neither they were not even imaginable 10 years ago. This means that the search and generates.

5. Conclusions

This document is a modest approach to the study of ICT and its relationship with the digital economy and the labor market. It is aimed at the student, academic, labor and business sectors, hence the importance of doing it; It allows to be a bridge to travel through the intersectorial digital strategies of Mexico, which by their nature, are designed and applied to boost the competitiveness, economic growth and social welfare of the country.

In general terms, the analysis confirms that digital identity in the labor market implies great challenges for society. The social system of work undergoes a reconstitution process that violates the foundations of our current labor regulation system, both in society, in school and at the company level; since the most representative activities are the labor activities in which the use of the computer and the internet are required, with an international business graph of 97.5% of the total of mining, manufacturing, construction, and electricity activities, services and commerce.

From the trends of the digital economy it is concluded that ICT for the labor market brings benefits and offers areas of opportunity for jobs with high technological demand, this in comparison with traditional jobs.

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However, on the other hand, the propagation of digital business models and the digital scenario that exists in the labor market, has far-reaching effects that could be unhelpful, as in the case of the labor market where most of the jobs the "gig" economy (new form of employment) does not offer the benefits or the essential social security offered by traditional jobs.

In addition, that technological changes alter the economic and social life of people, where the country's digital agenda is one of the main elements to promote economic and social growth, and thus promote employment and electronic inclusion in the workplace, It is recognized that educational systems must adapt their training processes and guide them to the demands generated by the accelerated changes of the fourth revolution, which require the development of ICT competences and skills.

In this sense, the country's digital agenda would be the guideline to extend the benefits of the digital economy and ICT at work; in such a way that the citizens receive an education, formation and qualification in the matter of TIC that allows them to develop capacities of answer and adaptation to the technological advances, and at the same time generate the necessary competences to use these technologies and to manage the risks that the development implies of own online economic and social activities.

From the tendencies of the digital economy and the labor market it has been argued that there are different discussions about this, mainly about the transformations in the organizations and in the realization of the work, given that advances in robotics, artificial intelligence, reality virtual are linkages that have changed everyone's daily life.

However, the main changes are to begin by preventing it from being called "the new economy", given that the digital economy has ceased to be a novelty in order to be part of people's daily lives, and in the labor market benefits and offers areas of opportunity for jobs of high technological demand, this compared to traditional jobs. Moreover, the spread of digital business models and the digital scenario that exists in the labor market, has far-reaching impacts that could be unhelpful, such as:

a. In the labor market, most jobs in the "gig" economy do not offer the benefits or the essential social security offered by traditional jobs.

This means new challenges for the government, since it represents facing a series of challenges that would imply a great effort for the labor secretary and the institutions related to the country's labor market to close the social protection gap as deemed necessary; therefore, public policies that contemplate digital environments and ecosystems for the benefit of Mexico's economic and social sectors would have to be redesigned. The possible government policies should include a new legal structure that orients and orders the labor market, from the consideration of a social security infrastructure that contemplates ICT, a general minimum income that is estimated based on skills and competencies, and labor laws that give workers benefits, protection and collective bargaining rights.New generations of the labor force, among them the Millennials and the Generation Z, will take control of the decisions from the year 2030, so they will bring in their thinking and culture, that to develop their work, they will not need to be seated in an office or doing heavy work for a full day of 8 hours, otherwise, in their mentality will bring pre-conditions that encourage them to work for more than 8 hours, but they will require freedom and work flexibility in time, space and time.

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However, for some people, this will seem to have a job, meaning that activities or tasks of other people should be integrated into the production processes (loading and unloading maneuver, displacements, purchases, sales, marketing, compensation, consultancies, others), which will generate a collaborative labor market, in which commissions or fees will be charged, instead of fees or salaries and salaries. For other people, the labor market in the digital ecosystem means that basic and full-time jobs will be extinguished with a schedule of 8 to 10 hours, to be used in short-term jobs that will be carried out at any time, even these digital environments will provide conditions for traditional employers to become micro entrepreneurs or entrepreneurs who fix and adapt their working hours, work space and income.

Of course, these workers must have technological knowledge and skills to gain respect and build on the resolution of a problem, which will generate an expectation in their customers and thus negotiate better working conditions and collaboration. Regarding vocational training for the labor market, it must correspond to a digital ecosystem; that is, to the digital economy. It is a new issue that encourages us to continue with topics of study like this, given that ICTs mark an insurmountable trend not only in the economy, but also in education.The recent current educational model promotes with greater emphasis the development of static skills, where the student is the passive part and it is only the teacher's educational work that prevails, to later apply dynamic activities; therefore, it is necessary to adapt to an educational scheme by research-oriented competencies, where the student is the active and dynamic part, as well as in the case of the modular system by object of transformation that is developed and applied in the Faculty of Economic, Administrative and Technological Sciences of the Autonomous University of Sinaloa.

It is clear that from basic education, an instruction is required focused on the development of scientific competences about fields of study such as mathematics, humanities and computer science, but also on developing soft skills to compete in the new digital markets. For what could be analyzed with this research, to orient the learning processes towards scientific research, is undoubtedly one of the most important resumes that the educational system has and the new generations that will have to prepare themselves to satisfy the skills raised previously, for what, in addition to formal education, they will have to think about a permanent and proactive training that allows them to have multidisciplinary and different professional profiles throughout their professional life, as well as different simultaneous work positions; in order to achieve professional and job adaptation in the digital economy.

Finally, the effects of the relationship of ICT in the digital economy and the labor market represent the signs of a constant labor change, due to its strong involvement in the labor market. A high weighting of work activities is done with the use of ICT, where the technological factors central to the new work structures are the Internet of things, big data, cloud computing and social networks, highlighting that the future professional that aspires to insert in the labor market, must have a technological expertise, scientific, statistical and resilient knowledge.

In short, it was verified that people with skills and abilities in ICT management have greater opportunities to find a job in the labor market, so the supply of skilled labor has as a consequence the increase in salary bases. However, it is also recognized that in a short future, employment and the labor market will suffer changes in the loss of thousands of jobs, but also when new labor demands arise.

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For all this, considering that Mexico is a country with a fairly fragmented productive structure, limited investment in innovation, growing levels of informality in employment, high socioeconomic inequalities coupled with the constant technological changes that condition the improvement of working conditions for workers, the obligation and concern to continue investigating aspects that refer us to the serious reflection of How to adjust the educational and work conditions to the new technological realities and demands generated by the activated metamorphoses of the fourth industrial revolution, remains? What skills and tools will be necessary for young people to be authentic agents of productive change and promoters of sustainable development?

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Capacitation and Educational Level and their Relation with the Teacher's Digital Skills

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Abstract

The objective was to identify the perception of full-time school teachers (ETC, for its acronym in Spanish) about the development of their digital skills and their relationship with the capacitation variables in the pedagogical use of information and communication technologies (ICT) and the educational level of the teacher. The approach was quantitative with a cross-sectional survey research design for two or more groups. The non-probabilistic sample was integrated by 88 teachers who teach classes in fifth and sixth grade of 32 public schools in two cities of Sonora. With a test of analysis of variance (Anova) of repeated measures it was found that the digital skills of critical thinking, problem solving and decision making, digital citizenship and operations and concepts of ICT, were significantly more developed than communication and collaboration; creativity and innovation and research and information management. On the other hand, the carried out statistical tests revealed significant differences between the different digital skills in terms of the variables capacitation in the pedagogical use of ICT and the teacher's educational level. It is concluded that is necessary to promote schemes of continuous capacitation and professional improvement, as well as strategies that support teachers to develop digital skills.

Digital skills, basic education, teachers, information and communication technologies, full-time schools

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Introduction

Choosing ICT as a topic of study acquires a strategic perspective when this represents better opportunities for individuals and communities (Britos, Cáceres, & Acosta, 2012). The ubiquity that characterizes them is a duality that presents both opportunities and challenges, and at the same time, imposes the task of finding meaning and use to achieve greater inclusion and social impact, a reduction of the digital gap and higher levels of development (United Nations Educational, Scientific and Cultural Organization [Unesco], 2014).

Due to the above, many countries make economic efforts to incorporate ICT in the social space, particularly in education (Pulfer, 2014; Unesco, 2014), as the only way to ensure that students, their families and communities can have access to them (Vacchieri, 2013) and thereby achieve more and better education for the population (Pulfer, 2014). However, the gaps that persists in relation to who access the technologies, who has connectivity and who use them significantly, are just some examples of the magnitude of the efforts that must be made when incorporating ICT into the education system (Cabero 2015a; Pulfer, 2014).

Faced with this, reasons of both social and pedagogical relevance justify the importance of their inclusion in education and, consequently, their development and research (Pedró, 2011, Poggi, 2014). The first, because it serves the democratization of knowledge, greater social justice and quality education; and the second, because it opens the opportunity generated by ICT for the revision and transformation of educational practices in accordance with the requirements of the 21st century (Poggi, 2014).

On this last statement, Unesco (2008) argues that continuous use of ICT in educational processes allows students to acquire skills to be competent in the search, analysis, evaluation of information, in the approach, problem solving and decision making. It also enables them to be creative, innovative, and capable of communicating, collaborating, publishing and producing knowledge.

In this order of ideas it is necessary to explore, in addition to the issues of availability of equipment and connectivity, those that have to do with the development of the digital skills of teachers and their impact on learning (Unesco, 2014). However, some researches report that teachers of primary education have a low level of ICT skills or a limited development of technological and pedagogical competences (Almerich, Suárez, Jornet, & Orella, 2011;

Suárez, Almerich, Gargallo, & Aliaga, 2010); as well as a low development of digital competences, mainly for communication with students, simulation of scenarios and advanced ICT actions (Vargas-D'Uniam, Chumpitaz-Campos, Suárez-Díaz, & Badia, 2014). In Mexico at least two studies identified at national level corroborate this, one for elementary school teachers who are located at a level of "none and little knowledge of ICT" (Ramírez, 2012) and another one for junior high school teachers who feel digitally competent in the Instrumental and Cognitive factors and not competent in the Didactic-Methodological (Mortis, Valdés, Angulo, García, & Cuevas, 2013).

For the above, and to deepen these results, some studies include the identification and analysis of sociodemographic, academic or contextual variables that relate or influence to the development of digital skills.

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Emphasizing that age, sex, frequency of use of the computer, educational level, use of a media classroom, Internet and capacitation received in the use of ICT; among others, they present significant relationships (Almerich et al., 2011, Suárez et al., 2010, Ramírez, 2012, Mortis et al., 2013, Villegas, Mortis, García, & del Hierro, 2017).

In this context, Unesco, the International Society for Technology in Education (ISTE) and the Ministry of Education of Chile, among others, have developed standards in the use of ICT for teachers, students, administrators and directors. For this reason, the Secretary of Public Education (SEP, for its acronym in Spanish) in Mexico believes that no educational reform can evade digital skills standards as they become "descriptors of the knowledge and know-how of students when they use technology and are the fundamental basis to develop competences throughout life and promote insertion in the knowledge society "(SEP, 2011, p.57).

Therefore, the SEP presents a proposal of digital skills standards aligned with organizations such as ISTE and Unesco and specifies a description that refers to: a population that uses digital media and environments to communicate ideas and information and interact with others, this implies understanding of concepts, systems and operation of ICT; in other words, use digital tools to solve different types of problems and organize them into six categories: a) creativity and innovation, 2) communication and collaboration, 3) research and information management; 4) critical thinking, problem solving and decision making; 5) digital citizenship; and 6) operations and concepts of ICT (SEP, 2011).

In the same direction, the ETC program deploys a line of work called digital skills development, with the intention of making the most of the technological resources available to schools, analyzing the advantages they offer to support the treatment of learning content and developing life skills. The purpose is that each time the teacher chooses an ICT to work with the students, its use and purpose from the pedagogical point of view is analyzed in order to reach the digital skills standards promoted for basic education in Mexico (Rodríguez & Ramírez, 2009).

In order for the ETC to promote what has been said in advance and to be able to account for a transformation that makes a difference in relation to a normal working day school, its teachers and the school itself will have to develop their capacities and potential (Poggi, 2009). Mainly because the full-time day becomes an option for the school community to try learning opportunities with ICT and make better use of what they have. In this regard it is emphasized that basic education schools have resources and technological tools to expand and strengthen children's learning, develop digital skills and create more attractive, interesting and flexible scenarios for teaching the different subjects that make up the national curriculum. (Martínez, 2009; Tenti, 2010).

Regarding the last statement the state of Sonora, according to data from the National Institute for the Evaluation of Education (INEE, for its acronym in Spanish, 2015), maintains a privileged position over other states of the Mexican Republic because 76.7% of public basic education schools have at least one computer for educational use and 81.2% of them have Internet connectivity. In both cases the value obtained for the 2013-2014 school year is much higher than that achieved at the national level, which is 39.6% for the first indicator and 37.0% for the second (INEE, 2015).

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Additionally, Sonora was selected in 2013 to participate in the Digital Inclusion and Literacy Program (PIAD, for its acronym in Spanish) through the Mi CompuMx project, through which portable computer equipment with pre-loaded educational materials is distributed to all students and teachers on the fifth grade sixth grades; as well as to the directors, supervisors and heads of zone. In addition it is accompanied by strategies for teacher capacitation (SEP, 2014a). With this same program, in 2014 a digital tablet is delivered to all teachers and students of the fifth grade and is provided with a solution for the classroom that includes: a router, a dongle, a white board and a projector (SEP, 2014a, 2014b). On the other hand, the schools receive: a server, a switch and an energy support team (SEP, 2014b). In this continuum and in order to make the study processes more effective and personalized, in 2015 tablets are added as a didactic resource, as well as textbooks and other educational materials (SEP, 2015).

With this panorama, addressing the issue of teachers' digital skills is very relevant, firstly because empirical studies in the Mexican context, and in the State of Sonora, are scarce for primary education and especially for ETC. Every time we have as starting point the inclusion of the digital skills standards in 2011, the incorporation to the PIAD in 2013 and the rebound of the ETC program in the same year. For this reason and four years after the implementation of two important initiatives to promote the development of digital skills, the ETC program and the PIAD, arises the need to identify: What is the perception of ETC primary teachers about the development of their digital skills: creativity and innovation; communication and collaboration; research and information management; critical thinking, problem solving and decision making; digital citizenship and operations and ICT concepts and in which of these dimensions are statistically significant differences presented?

Are there statistically significant differences between teachers' perception of the development of their digital skills and the variables: capacitation in the pedagogical use of ICT and the teacher's educational level?

Consequently, the general objective is to identify the perception of elementary school teachers of ETC on the development of their digital skills and their relationship with the variables capacitation in the pedagogical use of ICT and educational level.

The article is organized in the following sections: the first is the methodology; where the research design is described, the study participants, the instrument, its validity and reliability; the second is the procedure followed to recover the information; the third is the analysis of data, where the type of statistics used, the tests and the support software for the processing of the data are described; the fourth is the results, where the findings are presented and a proposal to contribute to the development of digital skills of elementary education teachers; the fifth, and last, are the conclusions and discussions, where the results are compared with those of other authors and the main findings are concluded.

Methodology

Research design

A cross-sectional survey research design was used to compare two or more groups on the development of teachers' digital skills and their dimensions, based on the capacitation received in the pedagogical use of ICT and the educational level of teachers, in order to be able to make inferences about the data (Creswell, 2012).

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Participants

The population of the study was composed of 120 teachers of fifth and sixth grade of 35 primary schools of general modality and complete organization, belonging to the cities of Obregón and Navojoa of the state of Sonora, who were registered for at least one year in the ETC program from the 2015-2016 school year.

The sample consisted of 88 teachers from 32 ETC and was selected through a non-probabilistic sampling of voluntary participation (Hernández, Fernández-Collado, & Baptista, 2014). Its main characteristics are presented below:Of the participants 55.7% (49) were women and 44.3% (39) were males, the ages ranged from 24 to 52 years with an average of 35 (7.66) and 87.5% (77) indicated having a fixed work place, while a 12.5 % (11) internship.

Regarding the variables of interest for the study, 68.2% (60) placed their educational level in undergraduate and 31.8% (28) in postgraduate. For its part, the capacitation received in the pedagogical use of ICT in the last two years referred a minimum of zero and a maximum of eight courses, with an average of 2 (1.43).

Measures

Teachers' digital skills (TDS). The scale was developed for the study from the set of standards and competences ISTE's ITC (2008), established by the SEP (2011) and Unesco (2011). In this self-report instrument the professors referred their perception about their digital skills. It consisted of two sections, one with 18 items of general data and the other with 29, which reflected a set of assessment criteria for the use of ICT as a tool for teaching and learning; these were answered with a Likert scale with five response options: 1 (*never*), 2 (*almost never*), 3 (*sometimes*), 4 (*almost always*) and 5 (*always*) and structured in six subscales:

1. Creativity and innovation. Use of ICT to stimulate students' creative thinking and the development of innovative products (example of indicator: "I assign my students the creation of short animations about characters created by themselves").

2. Communication and collaboration. Use of digital media and environments to communicate and interact with students, teachers and parents. Encouragement of collaborative work among students (example of indicator: "I use digital media to communicate with my colleagues").

3. Research and information management. Use of digital tools to support students in the search, selection, analysis, evaluation of information, data processing and communication of results (example of indicator: "I support my students to organize and systematize the information selected for research using digital tools").

4. Critical thinking, problem solving and decision making. Use of ICT to support students to develop critical thinking to plan, organize and carry out research, manage projects, solve problems and make decisions based on information (example of indicator: "I guide my students so that localized information on the Internet allow them to answer the fundamental question of the problem").

5. Digital citizenship. Support the students in the understanding of human, cultural and social issues related to the use of ICT and in the application of ethical, legal, safe and responsible behavior related to their use (example of indicator: "I pose to my students topics on real situations of the use of technology related to authors' rights and intellectual property ").

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6. Operations and concepts of ICT. Support students in the understanding of concepts, systems and operation of ICT to use them productively and to transfer their knowledge to learning new ICT (example of indicator: "I support my students to access the Internet on their tablet").

Validity

The instrument was subjected to a process of content validity through the trial of five experts, which was based on the proposal of Escobar-Pérez and Cuervo-Martínez (2008). It was decided to keep 30 out of 49 items, taking into account concordance between judges with content validity coefficients (CVC) greater than .80. The questionnaire reached a total CVC of .92 considered excellent for values greater than .90 (Hernández, 2012).

Reliability

Reliability was measured using the Cronbach's Alpha coefficient; it was concluded with 29 items and a global index of .94. The data by dimension were: creativity and innovation (.86, 4 items), communication and collaboration (.89, 6 items), research and information management (.88, 5 items), critical thinking, problem solving and decision making (.83, 4 items); digital citizenship (.82, 4 items) and operations and concepts of ICT (.88, 6 items).

Process

For the TDS scale administration, authorization was requested to the directors for access to the institutions. The professors were invited, who were informed of the purpose of the study, the importance of their participation and the confidentiality of the information they contributed.

Data Analysis

Descriptive statistics were used by means of frequencies, means and standard deviations to know the characteristics of the sample. For the validity of the instrument the CVC was used (Hernández, 2012) and for reliability the Cronbach's Alpha coefficient (Bojórquez & López, 2013). Finally, to establish the differences between groups were worked with inferential statistics, using the Student's t-test for independent samples and one-way Anova and repeated measures with post-hoc Bonferroni test. Analyzes were carried out with the support of the statistical package SPSS 22.0 and Excel 14.6.1.

Results

To identify the perception of the teachers' digital skills the TDS scale was used, which was designed for the study and by means of an one-way Anova of repeated measures, the scores obtained in the six dimensions were compared.

The results suggested statistically significant differences in the perception of the development of the diverse digital skills of the teachers (F [5,82] = 171.30, p <.001, η^2 = .82); therefore, through Bonferroni's post-hoc test a better development in critical thinking was identified, problem solving and decision making; digital citizenship and operations and concepts of ICT, since the means were significantly higher than those of the other dimensions without showing differences between them. In addition, research and information management showed a medium and significantly greater advance than creativity and innovation and, in turn, communication and collaboration, the latter obtaining the lowest means and the least development, see tables 1 and 2.

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Dimensions	*M*	*DS*
Creativity and innovation.	2.47	0.64
Communication and collaboration.	1.77	0.59
Research and information management.	3.46	0.87
Critical thinking, problem solving and decision making.	4.10	0.69
Digital citizenship.	4.07	0.74
Operations and concepts of ICT.	4.05	0.80
General	3.32	0.57

Table 1 Means and standard deviations of the TDS scale dimensions

Reference dimension	**Compared dimension**	**Difference of means**	***p***
1	2	0.70*	<.001
	3	-0.98*	<.001
	4	-1.63*	<.001
	5	-1.6*	<.001
	6	-1.58*	<.001
2	1	-0.70*	<.001
	3	-1.68*	<.001
	4	-2.33*	<.001
	5	-2.30*	<.001
	6	-2.28*	<.001
3	1	0.98*	<.001
	2	1.68*	<.001
	4	-0.64*	<.001
	5	-0.61*	<.001
	6	-0.59*	<.001

Note: 1 = creativity and innovation; 2 = communication and collaboration; 3 = research and information management; 4 = critical thinking, problem solving and decision making; 5 = digital citizenship; 6 = operations and concepts of ICT.
*p< .05

Table 2 Comparisons of means by pairs of the dimensions of the teachers' digital skills, through Bonferroni's post-hoc test

Likewise, to identify differences between the teachers' digital skills in relation to the number of capacitation courses received in the last two years in the pedagogical use of ICT and the teachers' educational level the one-way Anova and Student's t tests were used, respectively. For the first variable of contrast, three groups of teachers were considered from the average obtained (2 courses). The first included those who reported less than two courses (low capacitation); the second to those who indicated two (average capacitation) and the third to those who participated in more than two (high capacitation).

The test suggested statistically significant differences in the dimensions of creativity and innovation; research and information management; and operations and concepts of ICT. Therefore, a Bonferroni's post-hoc test was conducted that showed that in creativity and innovation; and operations and concepts of ICT, the low capacitation group was the one that established the differences with a lower mean compared to the other two groups (1<2, 3). For research and information management, the low-capacition group showed a significant difference with the high-capacition group (1<3). In all cases, the average was higher for teachers who took two or more courses, respectively, on the pedagogical use of ICT (see table 3).

D	**Low capacitation**			**Medium capacitation**			**High capacitation**		***F* (2,85)**	***p***	**η^2**
	M	*SD*		*M*	*DE*		*M*	*DE*			
1	2.16	0.67		2.55	0.58		2.73	0.56	6.42	.003	.13
2	1.61	0.46		1.76	0.58		1.98	0.70	2.69	.074	.06
3	3.12	0.89		3.49	0.85		3.82	0.71	4.76	.011	.10
4	3.93	0.66		4.16	0.68		4.23	0.73	1.50	.228	.03
5	3.90	0.79		4.09	0.73		4.24	0.69	1.41	.251	.03
6	3.65	0.88		4.20	0.69		4.34	0.65	6.69	.002	.14

Note: D = dimension; 1 = creativity and innovation; 2 = communication and collaboration; 3 = research and information management; 4 = critical thinking, problem solving and decision making; 5 = digital citizenship; 6 = operations and concepts of ICT.

Table 3 Comparisons of teachers' digital skills scores through capacitation in the pedagogical use of ICT

For the second variable, the first group included teachers with a bachelor's degree and the second with a postgraduate degree. The test revealed statistically significant differences in three of the dimensions of digital skills. In all cases, the average obtained was higher for teachers with postgraduate studies (see table 4).

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D	**Bachelor's degree**			**Postgraduate degree**		***t (86)***	***p***	***d***
	M	*SD*		*M*	*SD*			
1	2.37	0.67		2.69	0.52	2.27	.026	.54
2	1.70	0.57		1.92	0.61	1.62	.108	.37
3	3.31	0.87		3.75	0.79	2.26	.026	.53
4	4.06	0.68		4.17	0.73	0.65	.514	.15
5	3.95	0.75		4.32	0.68	2.25	.027	.52
6	3.98	0.82		4.19	0.76	1.16	.250	.27

Note: D = dimension; 1 = creativity and innovation; 2 = communication and collaboration; 3 = research and information management; 4 = critical thinking, problem solving and decision making; 5 = digital citizenship; 6 = operations and concepts of ICT.

Table 4 Comparisons of teachers' digital skills scores by educational level

Based on the previous findings, and in order to contribute to the development of the digital skills of the fifth and sixth grade teachers of the ETC, a strategy called: Padagogy Wheel V5.0 for Android in Spanish was proposed (Carrington et al., 2016), which can be consulted at http://bit.ly/AndroidSPAV5Print. This strategy was intended for the teacher to use support from planning to implement their activities in the classroom with the specific use of the Android tablet delivered by the PIAD.

The Wheel is composed of a series of concentric circles and organized from the third in the six categories of Bloom's taxonomy for the digital age, reviewed by Anderson and Krathwohl (2001). In the fourth and fifth circle there are 185 action verbs and 107 activities, respectively, for the digital age, proposed by Churches (2008). In the sixth, 188 Android applications linked to Google Play are presented and the seventh relates the previous levels to the Substitution, Increase, Modification and Redifinition (SAMR) model of Puentedura (2014a, 2014b). This tool was developed and valued by a group of national and international researchers and from the 2017-2018 school year it was deployed through capacitation to teachers through the Teaching Formation Institute of the State of Sonora (Ifodes). Work is currently being done to assess how it is contributing to the development of teachers' digital skills.

Conclusions and Discussion

The objective of this study is to identify the perception of ETC elementary teachers about the development of their digital skills and their relationship with the variables capacitation in the pedagogical use of ICT and the teacher's educational level.

Regarding the first research question: What is the perception of ETC primary teachers about the development of their digital skills and in which of these dimensions are statistically significant differences? It is found they are digitally skilled in the development of critical thinking, problem solving and decision making; digital citizenship and functioning and ICT concepts.

The findings that are found on critical thinking, problem solving and decision making, differ partially from what Almeida (2014) presents by placing teachers at null and basic levels, however, it stands out as the second dimension with the highest proportion of professors between the intermediate and advanced levels. The differences between the two investigations can be associated to the period of time between the delivery of equipment by the SEP program and the teachers' self-reports of their digital skills, which can serve as a favorable element in the levels reached (Sáez, 2012).

The results on the skills to operations and concepts of ICT; coincide with the previous study by Mortis et al. (2013), who find professors competent in the Instrumental factor (examples of indicators: "use of basic software and hardware components", "free educational software" and "Internet browsing") and with those of Santiago and Sosa (2012), which expose on the development of technical skills, mainly the instrumental type of ICT.

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On the other hand, the findings for digital citizenship are similar to those presented by García, Cuevas, and Ruíz (2015), where teachers show an excellent command in the dimension of computer ethics (examples of indicators: "know and apply rules of digital etiquette" and "manages the Internet responsibly and ethically").

Research and information management is the dimension in which teachers perceive themselves in a medium development of their digital skills, a fact that coincides with the work of García et al. (2015) and Pérez and Rodríguez (2016). In the first case, the teachers show a good command in the dimension of search and management of electronic information (example of indicators: "search information on the Internet about class topics"). And in the second, the participants are located at a level of sufficient (above the average) in the information competence (examples of indicators: "identifies and searches for information in search engines, meta search engines, databases" and "organizes and analyzes digital information to evaluate its purpose and relevance").

Although part of a development in this dimension, it is important to strengthen it in the context of an abundance of information on the Internet, which needs to be used critically and responsibly to transform it into knowledge (Vivancos, 2014). Therefore, it is important to establish differentiated capacitating strategies (Mortis, et al., 2013) and / or to develop teacher support mechanisms that allow them to easily incorporate technology (Luque, 2013).The dimension of creativity and innovation, which exhibits low development, shows a similar behavior to previous studies. Almerich et al. (2011) places teachers slightly above 2 points; that is, with little attention to integrate ICT in the creation of environments and innovation, meanwhile Almeida (2014) places the 71% amid the null and basic levels.

The foregoing confirms Area's (2010) approach to the fact that the inclusion of ICT in schools does not necessarily generate a pedagogical innovation in the practices of teachers. Cabero (2015b) reports that ICT are still used to reproduce what was previously done without them instead of being used in innovative learning practices. Therefore, it is very important to promote strategies to strengthen the development of these skills because, as Kozma (2008) points it out, as advances are made in the capacities to use ICT the teachers will demand preparation in higher skills, transcending the instrumental ones.

For the dimension of communication and collaboration the situation is different because the development of this skill is practically null. This finding supports other studies that indicate an insufficient proficiency level of teachers in the communication section (Ramírez, 2012); collaboration and communication is null and basic (Almeida, 2014) or lower proportion of the use of ICT to enhance communication by technological means (Sigalés, Mominó, Meneses, & Badia, 2008).

Although it is necessary to deepen the subject, the above may be due to the lack of Internet service in schools and the limited capacitation received in the pedagogical use of ICT, both problems reported by Beltrán, García, and Ramírez (2015a, 2015b) and Almeida (2014). The importance of the dimension of communication and collaboration is seen in the study by Cabero (2015b), who positions ICT as instruments for participation and collaboration between teachers and students, broadening the perspective of learning from an individual to a social vision, where you learn in community and you are able to interact and collaborate to build knowledge. Whereas learning is increasingly ubiquitous it is essential that the school and teachers advance to a more focused approach to connectivity, where teachers design their own learning spaces using technology as a mediator.

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Likewise, Pedró (2015) states that social contexts to communicate and collaborate promote the development of more complex competencies than when working individually, promoting the emergence of dynamics of comparison, analysis, discussion, critical thinking and decision-making, among other.

For the above reasons, it is a priority not only to advance in sustainable connectivity schemes for basic education (SEP, 2016a) (since without Internet service in the classroom, teachers and students are limited to generating changes in pedagogical practices for the construction of knowledge and social interaction) but also in the implementation of mechanisms or strategies that support the teacher to empower students in the use of technology they have.

For the second research question, are there statistically significant differences between the teachers' perception of their digital skills and the variables: capacitation in the pedagogical use of ICT and the teacher's educational level? The following was found:

The capacitation variable in the pedagogical use of ICT supports the importance it has for the development of the digital skills of teachers. The statistically significant differences are identified for the dimensions of: creativity and innovation; research and management of information and operations and concepts of ICT, being for all cases the highest average for those who received more capacitation. These findings are similar to those of Mortis et al. (2013) who reported significant positive relationships with the number of courses taken in the teacher's cognitive skills.

Due to the above, it is convenient to implement relevant strategies that increase teacher capacitation, considering that this points towards elements that allow students to promote the skills of the 21st century (Binkley et al., 2012), mainly for those dimensions that showed less development; creativity and innovation, implicit in the potential of ICT (Coll, n.d.), and communication and collaboration, which contribute to the development of more complex competencies (Pedró, 2015).

In this sense, the SEP (2016b) indicates that the capacitation that is carried out should be on the equipment used by the teachers, timely, totally practical and preferably with accompaniment models. Similarly, Severín and Capota (2011) argue that the support strategies must be consistent with the electronic devices used and the pedagogical methods of using technology at the classroom level.

For the contrast variable educational level of the teacher, statistically significant differences are found for the dimensions: creativity and innovation; research and information management and digital citizenship. It should be noted that the investigation of Mortis et al. (2013) also show differences and higher scores in the digital competences of professors with postgraduate studies; like the one of Díaz-Maroto and Casales (2015) and Ramírez (2014) for professors with master degree.

These results point to assess the importance of continuing education and professional improvement of teachers of basic education as a means to achieve the goals of citizens prepared for the 21st century (Vacchieri, 2013) as they become one of the main strategies for develop new knowledge in professional practice.

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Continuous training through capacitation addresses innovations in the education system; among these are the technological ones, which include, for example, the program of digital skills for all (HDT) and PIAD. The professional improvement, through specialty, masters and doctorate, are destined to reach higher levels of habilitation. Therefore the problems that arise in this area must be address; such as limited supply and endogamic character, among others (SEP, n.d.), since Díaz (2014) and Johnson et al. (2013) point out that teacher training continues to be one of the biggest challenges to be solved in order to incorporate ICT into the education system.

It is concluded that even when there is a greater development in the digital skills of critical thinking, problem solving and decision making, digital citizenship and operations and concepts of ICT, there are still dimensions that need to be addressed. The variables communication and collaboration and creativity and innovation stand out prioriety, and to a lesser extent, research and information management. In two of the three cases, the capacitation in the pedagogical use of ICT and the teacher's educational level (except in communication and collaboration) are statistically significant to a greater number of courses and educational level obtained by the teacher.

Therefore, first of all, it is necessary to investigate what elements are involved in the low development of the aforementioned digital skills and secondly to strengthen the continuous capacitation and professional improvement in order to advance in the development of these digital skills. Although the study provides relevant information about the development of digital skills in ETC elementary teachers, it also has limitations that make these results should be taken with caution.

In the first place, the sample size is limited, which makes it difficult to analyze the validity of the internal structure of the TDS scale and the generalization of the results; therefore, it is recommended for future investigations to expand the size of it. Secondly, other variables that can affect the development of teachers' digital skills are not considered in the study, this implies the need to include aspects such as technological equipment, connectivity and barriers to the integration of technologies in ETC, among others, this will undoubtedly allow the investigations to move towards the use of multivariate statistical methods.

It is considered that with the above suggestions, the instrument will be strengthened and the topic of teachers' digital skills can be addressed simultaneously from different variables. Likewise, it is suggested that the proposal be followed up in such a way that alternatives are still sought to contribute to the development of digital skills in elementary school teachers.

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Industry 4.0 in manufacturing enterprises

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Abstract

In today's world, which is characterized by a constant industrial revolution, where the factors of production: Work, technology and organization, are subject to constant changes, these are intended to bring goods to consumers in a more personalized, which implies a great challenge for many companies. One of the biggest challenges that companies face is the elimination of paper throughout its value chain, with the sole purpose of having a transparency in it, resulting in the disappearance of the black boxes, the same we can describe as those areas where direction and management lose control and only see their results once the goods appear, so they are ineffective. To achieve such a challenge that represents the real-time control of the entire value chain, it becomes necessary to take the concept of industry 4.0, which emphasizes the use of an electronic coding system, which has the characteristic that you can define all the stages within the value chain and through the use of wireless networks, these are recording the different phases that the product is going through, which on the one hand gives coded information to the master production program And contrasts it with what happens in the plant through the information system, compare results to take the respective measures in time, getting the job Just in Time.

Industry 4.0, Value chain, Just in time

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The human resource and the internet

The human resource and the internet in any organization people occupy a primordial place, therefore, the motivation to commit in the work is fundamental to achieve the productivity of the company; For it is necessary that they are in a pleasant working environment, that they can develop a project of life within the company, seek self-realization through work, be happy and be able to know themselves.

This is a necessary requirement for the company to function well and have a future; but how has the new technologies of information and communication shaped this qualified personnel?, in its way of being inner, What is to be postmodernists? Lipovetsky (2015) the people of this time are more concerned with personal enjoyment and little interest in what happens around them, if they feel good the world is well, make use of mobile devices at all times to stay connected no matter the place where they are, when you call their attention they respond with a smile and leave the cell phone for a moment and in a few minutes they return to it with the same enthusiasm, they learn of the news and sites of interest through the internet, they mold their opinion to through social networks, have relevant information through internet search engines, like to study and train through ICT (Information and Communication Technologies), etc.

The values of the Postmodernists are: Freedom, equality, fraternity, caring for the environment, health care, individualism, trust in the future, searching for original ideas, designing religious concepts made Measure, enjoyment as a way of life, not to commit to ideas that do not share, etc.

Faced with this new reality of human resources, productive organizations have to anticipate how to adjust their labor requirements, in order to try to eliminate excessive turnover, take care that the personnel that worked with the company qualify us as boring, with no future and with null Possibilities of self-realization; If this were the case we would be doomed to have workers who only seek temporary income and zero effort, which would generate low productivity, and we could never compete in areas of high technology, only in mass production activities where the price and design of the product are set by the market, where the central objective is to have individuals who do not think and only obey orders.

As we are immersed in a process of globalization, competition between companies is increasingly fierce, and direction and managers have no way to solve their problems of low costs, profits and high turnover, so it seems that not There is a possible solution just to wait for the competition to fail and leave the field free to be winners over time. It may also be the case to seek alliances with local, state and national governments to support their national industry and thereby their work. But on the contrary we have that the workers are dissatisfied and have very unfavorable opinions of the company, resulting in the elimination of this possibility.

It is therefore essential to rediscover how this new dynamic of labor relations, the internet and the motivations of the workers moves; The question is how to make the working group have the same objectives and goals, share the same vision and mission, the solution to it is the one that will allow the permanence or disappearance of the company.

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To solve the problem, the company needs to have Kim and Mauborgne (2016) pioneering products (novelty that uses new technological developments, informatics, materials, etc.), migrants (with some innovation that adapts to a requirement of a particular niche market) and settlers (little or no innovation, that is, massive products for the general population), know where the company is located, if in competitive markets (red oceans, products that serve mass markets where the technological development to produce them is in the area of maturity or obsolescence), little competition (blue oceans, products that are in the curve of technological development and therefore are possible customize them).

With this stratification of the goods to produce, managers can look for human resources that adhere to the new technological reality, where we will find individuals with a lot, medium and little initiative, over time they will get to know them and place them in the place where they sit More committed, where the motto of the company is to greater challenges greater economic and social retribution.

With this the company would be taking advantage of the human talent that has at its disposal and could define specific requirements and look for them in the technological institutes, in such a way that over time could be given the double helix relation academia industry, with the profit on one side of open the doors to human talent that promises a lot and is given the means to develop and ultimately integrated with the company; In such a way that for the personal reasons that he himself had to leave the company he would leave behind him able and willing members to continue the task. So the situation changes completely for the company, from just trying to survive (level of much uncertainty), to another where globalization is used to find what has the greatest knowledge and can be made products tailored to the client, with the quality and time required.

For this purpose we have personnel with objectives, goals, mission and vision aligned with the company, because it is part of your life project.

New smart devices in the value chain

We continue with the computerized technological development and with each passing day new challenges and scenarios are established where the intelligent machines can act, the fourth industrial revolution Schwab (2016), opens a world of possibilities where we go from repeating one program to another where the devices are able to search the client's requirements and self-program, which facilitates their application in many areas restricted to people, such tasks in most cases were unpleasant for them as work: night, vigilance, risky, monotonous, unhealthy, customer service, security, crime fighting, customs control, mining, etc .; generating new possibilities those individuals and companies that know to take advantage of this new technological potential, will enjoy its benefits.

In the more than 200 years of industrial revolution the emergence of new technological devices has always been a challenge for society and companies, not know what to do with it, the most classic example was the discovery of the electric motor, spent more than 20 years for someone to know how to apply it, once that was done, there were endless uses. The same can be thought of the new intelligent machines that will invade our industry, offices and homes in the next 10 years, there will be people who dislike it and many who like it, so it is necessary to prepare the way for this new technological transition make as smooth as possible, let the positive and not the negative be seen.

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If we look at the new industrial field, it is thought that many of the monotonous and repetitive works can be done by the Smart machines Ross machines (2016), the factories of our time will be dominated by an intensive use of technological equipment, new ways of organizing human activities so that they are compatible with their nature, which seeks to be in a working group in order to interact and thus prevent it from losing its emotional balance.

If the future is the fully automated, computerized and integrated factory, it will be at all times communicated with society through the different networks, so that the pace of work, which to produce and when it has to be delivered, will determine the market, being able to adapt perfectly to a dynamic production, where chance is what determines the operation of the same, no matter how much it changes, will always have a response to the demands of customers; The only limitation is its production capacity.

In the case of the client must be aware that at the time of requesting a good, it will be produced following a master production program, so it can not receive immediate delivery expectations, will be determined by the number of requests made in advance, somehow today we live when we buy a product online, the system tells us the range of time in which we can receive, unconsciously we are educating.

In the case of companies with their suppliers is the same situation, you have to plan in advance all your production logistics, so that they can react in time and their production program is anticipated to only one day and deliver in packages of 2 Hours of consumption to the line at most, making a flow; the same in the distribution part, fill the means of transport with routes that maximize delivery and arrive at the time agreed with the customer.

If we consider that these will be the new requirements in which open markets will be the norm and not the exception, information management and systems integration will be vital to avoid a lack of coordination of activities, which necessarily leads to a stoppage of production, for Lack of inputs; this should not worry the direction and managerial, in any process that goes from linear to dynamic activities, there is a learning curve to achieve that transition, and only with trial and error will the system be tuned and making those who participate In which they can learn, the problem that must be considered is how to organize the resources with which the company has to achieve synchronization.

The fact of developing intelligent factories is a great challenge for those who participate, operate and design this one, you have to have a great vision, because you have a background, and every step you take will be plagued by uncertainty and errors, which must be resolved, with the participation of brilliant minds, who can make use of technological and organizational resources, can define the areas where they can work without human attention and the areas where they are required to be all day or part of it, so that they can make operational, tactical and strategic decisions.

Industries 4.0 and its new potentialities

The manufacturing boom in the West has declined over the past 40 years. In contrast, Oriental products have been increasing by the application of Lean Manufacturing (We must understand it as a business strategy that seeks the elimination of waste throughout the chain of Value, its three guidelines is quality, variety and delivery time); If all is known What is the reason why it is not applied is in the West? one of the possible explanations is the search for quick gain, with a short time horizon.

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Unlike Asian competitors it is long-term, allowing greater integration of its operations and more democratic decision-making. In the case of Mexico, having its economy integrated with the United States and Canada; it has forced it to work with the same technological means, in order to coordinate its productive activities; so it is not surprising the widespread use of the Internet and all its applications; so that at this moment he has the conditions for his industry to take advantage of this new industrial revolution in the areas: industrial, health, entertainment, services, government, security, transparency, financial, etc.

How new technological developments help us solve our problem, such as the use of smartphones to organize production, based on the fact that almost all the population has access to them and can pay the connection cost that is approximately $ 5 per month; At this time, wireless communication networks have been installed in both urban and rural areas, which allow the tracking of mobile devices.

To achieve the above purpose, it is necessary to have different bandwidths defined, so that each mobile device can send and receive information, allowing a knowledge of its activities at all times, keeping the register of these in a database, so that then you can analyze and try to understand their behavior. Big Data emerges and with it the application of 3rd level artificial intelligence, Gilchrist (2016), (1st level artificial intelligence started in 1990 and its objective was to find elements that were common as names of goods or people.

The 2nd level refers to data mining), which can be characterized by finding the differences and thus find patterns, which can be common to a set of random activities that are given in the world, giving the possibility of stratifying the different information and in this way personalizing the relevant aspects of the same, thus reducing the level of uncertainty for decision making, thus eliminating the possibility of giving explanations that do not correspond with reality.

If the technological development has the potential to trace mobile devices, with the use of wireless signals, it is possible to use electronic chips with a dimension 0.3x0.3x0.3 mm, which can be integrated into any good, at the moment it is starts the manufacture of it, the information it will contain will be the different phases through which it has to pass the same, until arriving at the hands of the consumer, at first.

When the ERP production master plan records the code of all the stages of the value chain, where manufacturing is included, once this is done, it is sent to the production floor; when leaving the respective task the system generates the code on the chip, this way it has two registers one that corresponds to all the steps and another one that indicates the tasks done, in this way it is possible to compare the planned against the executed, giving therefore the possibility of monitoring it inside the plant and outside it.

As the chip has a read only memory and a write memory, it is possible to define the master and slave code, the latter will change over time to indicate that it has been added to the product, the system will know in real time where it is and compare the planned with the executed and send the respective alerts or make the decisions autonomously.

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The objective of any productive process is to give a flow to the production and to know of all the incidents both in plant and outside of it, in this way to register them, to consider possible points of improvement in the time, in many cases depending on the size of the company, there may be more than one problem to solve, with the information received can be analyzed, quantified and make an informed decision that is the most appropriate for the company, leaving aside all that is not true.

With the data generated in a productive process and using the appropriate computer tools, information can be grouped by type of product, consumer age, region of the country, countries where they are most consumed, possible customer interests, real needs and psychological, customer profile, lifestyle, if it is representative of a particular group, vision of the future, etc. once we have defined well the same, we can send films of possible new functions of the products and in this way receive their opinion, which will allow us to make better goods, which take into account the diverse opinions of the market.

Smart companies have constant communication with their customers, the benefits they receive are products with better characteristics that meet their expectations and keep them at the forefront of technology, many times consumers are motivated to change the good they are using, when the substitute represents novelties that they can not ignore, which solve problems in the home, office and factory, as a result of modern life, where you have less time to make unnecessary transfers to solve an administrative problem, clarification, warranty, service, etc. and through the electronic devices that purpose is achieved.

If the product is intelligent, it can give information to the consumer of which part is failing, where it can buy the same, how to install it and the cost, this way it will be possible to easily determine if it is good to keep the good or buy another, all this can do on the schedule outside of work; So that by having an informed decision, the client will take the one that suits him best; and not as it happens now, where products do not give information and are working blindly, in the end can be found with the surprise that the costs and time invested are higher compared to a new one.

If the case were to buy a new product, the previous one could inform you where to communicate so that they come for the one to be discarded and in this way to be able to recycle and help with the care of the environment, by its action would receive a bonus and have the security where the different parts of the product went; This would force manufacturers to design parts whose materials are recycled, thereby reducing manufacturing costs by having a safe source of raw materials.

In the event that the product will reach the collection centers, the government would have all the information of the client of the rejected good, depending on the degree of contamination would be credited to a warning or a fine; the same applies to companies in the case of substantially contaminating parts, which can damage aquifers and soil.

As the chip is so small (0.3 mm cubic), it can be placed in any product, the cycle ends when the same is recycled, so even traceability can be given in municipal waste, so that the people who classify the waste do it in a faster and orderly way, which meets the original objective of being informed, the electronic device is able to continue generating information that helps in the work of the people and takes care to the environment by preventing the contamination of our planet.

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Hence the importance of having smartphones, people bring them with them all the work and social time, giving the possibility to configure them with the applications that are necessary for them. We must be aware that these devices are computers and can do endless activities, currently living in a digital world, their possibilities are limitless.

Conclusions

We continue with the technological revolution that began in the 90s with the massive use of the desktop computer, after the laptops in the 2000s and the emergence of smartphones in 2007, So that society is prepared for industry 4.0 and ready to make use of its innovations; For this purpose, the economic policies of distribution of wealth must be considered so that they generate a social benefit.

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Local and Global productivity and their effects on value added in Mexico, (1993-2015): The case of industrial manufacturing sub branches

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Abstract

This paper analyses the effects originated by global and local productivity of 81 manufacturing sub branches in México for period (1993-2015) according to INEGI data base. The article shows the evolution of manufacturing sub branches productivity and their value in international trade. This article approach the value of global value chains in an international dimension. The information provide us that a high participation in global value chains is important because it explains that national competitiveness can create innovation and competitive advantages. The current work focus on the value of exportations gained in Mexican manufacturing sub branches and current trends indicate that liberalization has tried to improve economic growth trough exportations. Although national manufacturing exportations contains an important percentage of imported inputs. The obtained results from current research in a panel regression model indicates that whole value added is explained by global manufacturing productivity. In other words, local productivity can't generate significant value added in Mexico. On the other hand, the complexity of productive chains is remarkable in a context of productive evaluation inside the global value chains and a high dependence of the national economy on Foreign Direct Investment.

Productivity, exports, value added, competitiveness

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Introduction

In a context of free market and trade openness, economic growth via exports is fundamental to achieve competitive success and economic development. Therefore, it's essential to analyze the added value that industries can generate in their productivity. In this scenario, the analysis of global value chains is fundamental to evaluate the economic dimension that can obtain the productive chains in the national industry. In this sense, it's crucial to assess the impact generated by possible decisions made in relation to NAFTA and to explain a possible answer to a situation that is not yet realized but that is latent.

On the other hand, competitiveness is a basic subject in the economic and administrative sciences to explain the degree of success that can have the national industry of a country. In this sense, Porter explains that the economic gains of a country is due to the competitiveness of the industrial sectors. Therefore, it is pertinent to evaluate the value added generated by the local industry in a comparative context with global productivity (global value chains) in order to establish a valid reflection on the subject.

The first section of this article approaches the theorical framework and the explanation of a function that talks about the correlation between exportations and productivity from Kaldor´s perspective. The second section explains the development of the manufacturing industry in Mexico. Consequently this article shows the econometric analysis to test hypotheses. Finally the conclusions are presented to make a deep refexion about competitiveness in Mexico.

The research has an objective that is to evaluate the effects generated by global and local manufacturing productivity on value added. In particular, the work will analyze if the amount of productivity represented in a monetary form is positively correlated to added value.

The article pretend to test that value added in manufacturing industrial sector is explained by global manufacturing productivity. By the other hand, local manufacturing productivity can´t generate the same effects as the first one in Mexico. That phenomena is caused by productive chains and global value chains and lack of competitiveness in local manufacturing sectors.

Theory framework

The current section approaches two theories to support the idea of evaluate the added value in exports and the latest mentioned as a key factor of competitiveness and productivity.

From the perspective of demand, the link between exports and economic growth is explained by the effect of the first in the components of global demand through two mechanisms, specifically: a) directly, since exports are a component of aggregated demand and. b) indirectly, by the multiplier effect of exports, which allows the expansion of other components of global demand.

Under the same approach, Kaldor (1966) considers that demand is an element capable of boosting economic growth, in such a way that supply-side factors increase as it also does, this generates the growth of the economy in the long term. In this context, CEPAL (1998) notes that manufacturing exports are a source of real growth through the transmission channels of export growth, namely: 1) currency generator, since these are necessary to import the intermediate goods and inputs required in the production process, 2) a greater internal productive chaining of the exporting activities causes two important effects:

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First, a greater multiplier effect on demand and therefore on production (due to direct and indirect impulse of exports to the product and to other sectors, respectively) and secondly, it generates a substitution process of imports, which in turn causes a decrease of the income elasticity of imports and a decrease in the demand of these as the product grows, 3) the positive externalities generated within an economy due to the character of competitiveness and innovation demanded by the exporting activities.

A key concept for Kaldor is the process of interaction established between demand increases caused by increases in aggregate supply as a result of an increase in demand (Jesús Felipe, 1998). This process is known as the *cumulative circular causation model*, which is the result of the Kaldor's three laws, which are explained below. According to Mc Combie and Thirlwall (1994:164-166), the basic assumptions of the model are as follows: i) the faster the rate of growth of the manufacturing sector, the faster will be the rate of growth of GDP; ii) the faster the rate of growth of manufacturing outpu, the faster will be the rate of growth of labour productivity in manufacturing owing to static and dynamic economies of scale, or increasing returns in the widest sense; iii).

The faster the rate of growth of the manufaturing output, the faster the rate of transference of labour from other sectors of the economy where there are either diminishing returns, or where no relationship exists between employment growth and output growth; iv) As the scope for transfering labour from diminishing returns activities dries up, or as output comes to depend on employment in all sectors of the economy, the degree of overall productivity growth induced by manufacturing growth is likely to diminish, with the overall growth rate correspondingly reduced; v).

The growth of manufacturing output is not constrained by labour supply […] but is fundamentally determine by demand from agriculture in the early stages of development and the exports in the larger stages; vi) A fast rate of growth of exports and output will be tend to set up a cumulative process, or virtuous circle of growth, through the link between output grow and productivity growth".

In relation to the presence of growing returns within the manufacturing sector, Kaldor emphasizes the Verdoorn's law, which establishes a statistical relationship between labour productivity and production in terms of manufactures and industry (also includes manufacturing activities, in addition to construction and public services). This law is important because it constitutes the basis of the cumulative circular-cause model of economic growth and then, because it is an important component within the demand-oriented approach to economic growth (Mc Combie and Thirlwall, 1994), and is defined as:

$$p = a + bq; \quad (1)$$

Where "p" and "q" are the exponential growth rates of productivity and product, while the slope coefficient "b" is defined as the Verdoorn's coefficient. However, to develop these ideas, it's necessary to study the Kaldor's three laws of that establish a link with the cumulative circular causation model, as shown below: a) *first law*. It establishes that there's a positive correlation between total GDP growth and manufacturing. The foregoing is explained by the following reasons, namely: in the face of an expansion in industrial production and the product, there is a transfer in labour resources from sectors characterized by underemployment and unemployment, which ensures that there is no decrease in the product in these and that, at the same time, the industrial sector experiences an increase in productivity.

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So, as the manufacturing sector grows, the rate of transfer of work from the sectors described above will be faster; b) *second law* (also known as the Verdoorn's law). It refers to the direct relationship between the growth of labour and product productivity in both the manufacturing sector and the industry level; c) *third law*. There's a positive relationship between the growth of total productivity and the growth of employment in the manufacturing sector. While at the microeconomic level, the increase in productivity could be reflected in a displacement of physical capital by human, it's considered that at an aggregate level (macroeconomic perspective), the jobs that are generated are greater with respect to those that are lost (De la Rosa, 2006).

Once the causality is established, at least partially, from the growth of the product to the productivity of the work through the Verdoorn's Law (Thirlwall, 1975), it's necessary to establish that the link between exports and growth is given by the growth of productivity and price competitiveness within an international context (see figure 1).

Starting analysis from exports (x), then it has to be located within a context of competition, manufacturing exports compete for the price side (d_p), so they are based on the relationship of internal/external prices and the income of the rest of the world. In such a way that the lower the domestic price, the greater the volume of exports, thus the growth of these will drive the aggregate demand, which will allow to achieve a certain level of growth, denoted as "$\dot{y}$". Then, because of the growth of the product, there will be an increase in productivity (δ) through the Verdoorn's law. However, through increased productivity it's possible to improve the domestic price (d_p), which allows a better positioning in the international market, achieving with it a sustained growth of exports.

Finally, it should be noted that this system will tend to balance because the expansive effects on exports and products are becoming smaller.

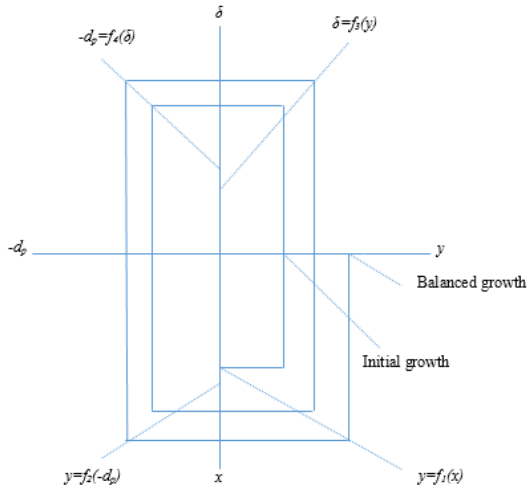

Figure 1 Cumulative circular causation
Source: De la Rosa, Juan Ramiro (2006). Dos enfoques teóricos sobre el proceso de crecimiento con énfasis en las exportaciones manufactureras. Análisis Económico, vol. XXI, núm. 48

The classic theory of international trade explains the success of nations as a natural consequence of the endowment of factors that count: natural resources, labor and capital; Countries specialize in those sectors where they have a more intensive use of some factor. However, for Porter (1999:170) classical theory has been eclipsed in advanced countries and industrial sectors and by the globalization of the competition and technological development. As we analized previously, the classical international trade theory explains the success of the nations as natural consequences of the natural factors dotations with each is counted: natural resources, labor and capital; the countries specializes in those sectors where them have an intense use of a factor.

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However, for Porter (1999:170) the classical theory has been eclipsed in the sectors and advanced countries for the competition globalization and the technological development. Based on a study realized in ten countries that distinguish in the foreign trade in the 1980's, Michael Porter made a national competitivity theory based in the productivity causes, because this is the only variable that explains the competitivity of a nation, instead of what it explains the classical theory (traditional competitive advantages); there is an important quote from this theory "the national prosperity is not hereditary, it's created by the opportunities that a country gives to their enterprises, because they are the only in charge of creating a competitive advantage through innovation. For this author, once the enterprise achieves the competitive advantage, it can only be maintained by a constant improve, wich it has to renew or die, otherwise, competitors will overtake any enterprise that quits innovation.

What generates competitive advantage? Competitive advantage is created and maintained by a highly located process, even the most developed countries are not competitive in every sector, that´s why nations succed in specific sectors because the national environment is the most progressive, dynamic and stimulating (Porter, 1999:163).

This competitive environment, as stated by Porter, is reached through four competitive factors that individually and as a system define the competitive environment in wich, enterprises learn and develop their competitiveness, this model known as "Diamond´s Model" (1990), conformed by four awns, defines the next competitive factors:

Factor's Conditions

Talks about the specialized factors creation (specialize workforce, infrastructure creation, etc.) needed for making a competitive nation, because the key of the competitiveness is not constituted by the natural factors dotation, it's the ability of how there are processed for making an efficient production. Aversely as it's known, providing a wide specialized workforce don't represent any advantage, because it´s needed a specialized workforce in specific enterprises necessities, as well as counting with investigation centers specialized in innovation, development, assimilation and application of the science and technology knowledge, because this factors are limited and hardly to imitate for the national and foreign competitors, and it's needed a sustained investment for creating them.

Demand conditions

we can belive that globalization has been reducing the intern demand importance, that the international competition and the external demand are more important to develop nation's competitive capabilities but it is not true at all because from Porter's point of view the composition and character of the internal market often has a disproportionate effect on the way companies perceive, interpret and respond to the needs of buyers.

Companies start production close to the observed market, ie the conditions of domestic demand help create competitive advantage when a particular segment of the sector is larger or more visible in the domestic market than in foreign markets (Porter, 1999:182). If consumers in an economy are demanding and well informed, the pressure they put on business will be greater and will force them to constantly improve their competitiveness; Companies will benefit from these demanding consumers because they will open their eyes to the new needs of markets; 3) related sectors.

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The third element of national advantage deals with the availability of nationally competitive national suppliers. Through these related and auxiliary sectors, timely and efficient access to the main inputs is allowed, spatial proximity between suppliers and end users facilitates the exchange of information and promote a continuous exchange of ideas and innovations. Companies have the opportunity to influence the technical efforts of their suppliers and can serve as testing sites for R&D work, accelerating the pace of innovation.

Firms benefit to the fullest extent when suppliers are, in turn, competitors worldwide (Porter, 1999:184); 4) strategy, structure and rivalry of companies. The fourth determinant tells us that national conditions strongly influence the way companies are created, organized and managed, as well as internal competition. No management system is universally appropriate (whether Japanese, German, Italian, etc.), these systems are appropriate in different national contexts, the Japanese management system may be very successful, but this is only appropriate in certain industries of one size and hierarchical structure; but isn't appropriate in Italian family enterprises that are not very organized because of their family structure (Porter, 1999:185).

On the other hand for the same author, competition between national rivals encourages the creation and improvement of competitive advantage, as it encourages companies to innovate and improve; this competition between companies forces to reduce costs, improve the quality of products, as well as a new variety and diversification of products. In addition, internal competition helps to nullify the advantages of a certain company simply by being in a given nation (labor cost, market access, etc.) and this forces it to innovate and move beyond these advantage.

It's important to understand that if a firm wants to gain important competitive advantages from the presence in it´s home nation of world class buyers, suppliers and related industries. They provide insight in to future market needs and technological developments. They contribute to a climate for change and improvement, and become partners and allies in the innovation process (Porter, 1990a). The same author mention that having a strong cluster at home unblocks the flows of information and allows deeper and more open contact than is possible when dealing with foreign firms.

For Porter, the governmental policy can influence the acquirement of the competitive advantage being considered as the most important determinant. This is related to the fact that a government can influence the local market by subventions, investments in education, regulating the domestic market, creating a competitive infrastructure for reducing the accessing costs of the factors. The state is also an important buyer for certain industries, such as defence industry, aeronautics, telecommunications (Porter 1990b).

Porter (1990a) emphasises that the diamond is a system and that all four conditions identified in the Diamond Framework must hold (be strong) for an industry to be truly internationally competitive. Countries with the strongest diamonds are therefore supposed to end up with the most competitive firms in that industry. In line with previous source of information, it's important approach the system of the competitiveness conditions with a coherent governmental action in order to create or improve the national competitive advantages.

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From managerial perspective the concept of GVCs (Global Value Chains) can be understood as an evolution in the context of global supply chains management. Supply chain management emerged n the 1980s as a model to manage the total flow of goods from suppliers to the ultimate users and its primary focus is on the costs and operational excellence of supply (UNCTAD, 2015).

In 1985, Michael Porter developed the concept of value chain. He conceived the value chain as the combination of nine generic activities operating within a firm to provide value to customers. The author linked up the value chains between firms to form what he called a value system. He advocates that an analysis of the value chain rather than value added (selling price less the cost of purchased raw materials) is the appropriate way to examine competitive advantage. In the present era of greater outsourcing and collaboration, the linkage between multiple firms` value-creating processes has more commonly become the so-called GVCs, since value created by one firm will contribute to the value of other firms` products or services.

As stated by Feller *et al*. (2006), both the supply and value chains are made up of companies that interact to provide goods and services. However, these authors emphasize that the main difference between both is a shift in focus. While supply chains focus on upstream and on integrating supplier and producer processes to improve efficiency and reduce waste, value chains focus on downstream and on creating value in the eyes of the customer. As the primary focus of supply chains is on costs and operational excellence, value chains focus more on innovation in product development and marketing.

In sum, while supply chains emphasize cost reduction, value chains mostly emphasize aspects that increase values. However, this distinction is often not made in the language used in the business and research literature and the two terms are used interchangeably, though increasingly the term of value chains is being used (UNCTAD, 2015).

For Economic Sciences is important to measure productivity and added value as an indicator that tries to give information between processes involved in whole manufacturing of a product. Productivity is a measure of the rate at which inputs are transformed in to output. Hence productivity provides the technical relationship that exists between inputs and outputs (Diewert, 1992). It measures the relationship between output such as goods and services produced and inputs that include labour, capital, material and other resources (Hill, 1993).

The level of productivity with in an organization depends on labour, capital, and the state of technology. Productivity growth over time will reflect the growth in these factors over time (Velnampy, 2011).

In keeping with Velnampy, there are predefined methods for measuring the performance of a firm. Measuring all of sales growth, market share, profitability, overall performance and stock holder satisfaction will provide a more accurate view of such firms' performance.

Grunberg (2004) conceptualize the *triple P method*, which describes productivity as phenomenon. Profitability is also seen as a relationship between output and input, but it is a monetary relationship in which the influences of price factors are included. Performance is the umbrella term of excellence and includes profitability and productivity as well as other noncost factors such as quality, speed delivery and flexibility.

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Some corporate reports include measures of productivity such as sales per employee, value added per employee, profit before tax per employee, labour cost to sales and labour cost to value added, where as engineering federation of employers identified some performance ratios, namely (i) standard hour to actual hour, (ii) value added per rupee of fixed asset, (iii) value added per rupee of material cost of production, (iv) value added per direct labour hour (Velnampy, 2011) but it's difficult to find research related to value added and it's consequences in productivity.

Some of research desingned to evaluate productivity with value added find a positive correlation between value added and profits before taxes and they found other correlation between the labour cost to value added and gross profit (Velnampy, 2011). Others use value added to analyze the performance from a financial perspective and it's viewed as a useful tool to judge the efficiency and effectiveness of the enterprise as regards sales promotion, utilization of fund, capital productivity, labor productivity (Mandal and Goswami, 2008). Value Added for Liebermand and Kang (2008) is the difference between the firm's total sales and its purchases of raw materials and contracted services through the efforts of employees and the application of capital, the firm "adds value" to its purchases of raw materials.

Value Added and Global Value Chain

More recently, the concept of Global Value Chains GVCs, which was already very popular among firms, has also become an important tool to analyse the extent of international trade integration of countries. Since different stages in the production process are increasingly located across different economies, more and more intermediate inputs are produced in one country and often exported to others for further inclusion in final products.

Consequently, a country's exports increasingly comprise value added by imports (UNCTAD, 2015). A country's exports can be divided into domestically produced value added and foreign value added (imported input that is incorporated in exported goods and services). Thus, GVC participation rate, which is the foreign value added used in a country's exports (upstream perspective) plus the value added supplied to other countries' exports (downstream perspective), divided by total exports indicates the share of a country's exports that is part of multiple processes and is a useful indicator of the level of integration in international production networks.

UNCTAD (2015) make an analysis about the influence of GVCs inside manufacturing processes, where the eight most developed economies whith highest participation rate in Global Value Chains has more equilibrated participation inside manufacturing processes better known as domestic value added (downstream component) than upstream component that is the rate of foreign value in manufacturing processes. For Mexican case is viewed that foreign rate of value added is bigger than domestic. This is the reason to analyze the problem that's going to be explained in the next section of the article.

Manufacturing development, value added, and exports

With Mexico's entry into GATT in 1986, trade began a phase of liberalization in which it was intended to integrate the country in a different way in the world market. Then, the economy was oriented towards the foreign with the intention of achieving greater competitiveness through trade, boosted by the dynamics of exports. As can be seen in chart 1, within the total exports, the most dynamic component is the manufacturing exports, which have experienced a huge boom since 1980 and which prevails until today.

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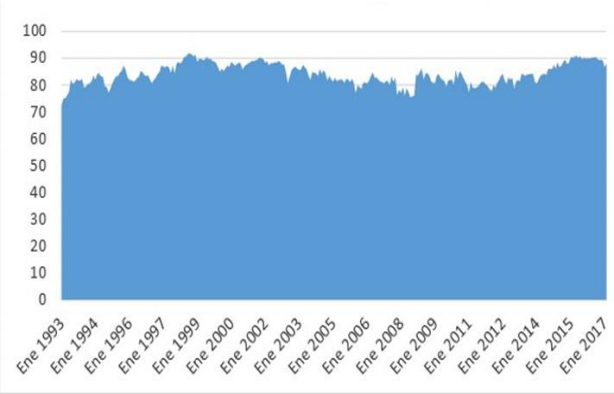
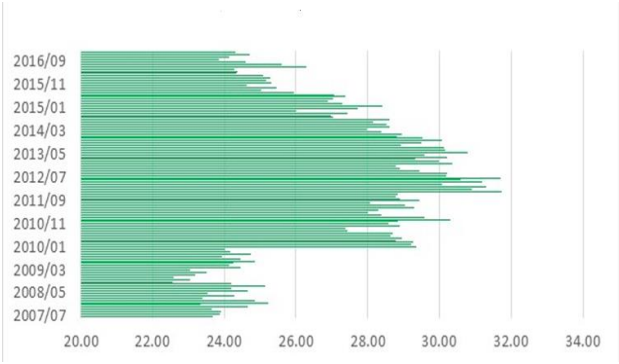
In particular, these exports experimented some decline in their participation during the period corresponding to the financial crisis of 2008, which originated in the sub-prime mortgage problem.



Graphic 1 Share of manufacturing exports with respect to total exports, 1993:01-2016:12. *Source: Own elaboration with information from CEFP*

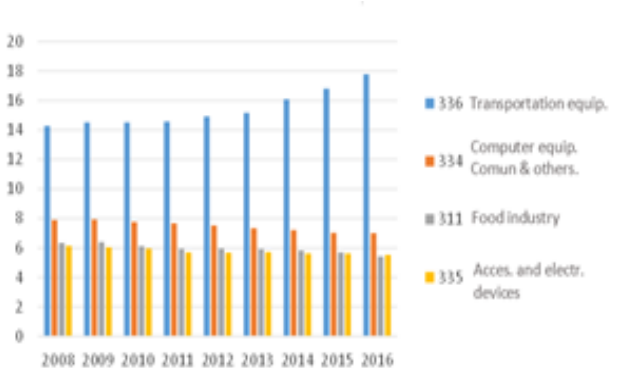
All mechanisms aimed at the liberalization of trade and capital were part of a policy whose purpose was to boost economic growth through the increase in manufacturing exports. Thus, by increasing exports, aggregate demand would also increase, which would lead to increases in domestic production and employment (Ruíz and Moreno-Brid, 1996).

During the period of trade liberalization, manufacturing exports have been characterized by a high content of imported inputs, which is explained, among other things, by the exiguous national production, thus causing local companies to have to resort to external consumption. This trend is corroborated by observing the consumption of national inputs by local manufacturing establishments, which, at best, doesn't exceed 32 per cent of the total (see Graphic 2).



Graphic 2 Consumption of national inputs in respect of total inputs by manufacturing establishments in Mexico, 2007:01-2017:01. *Source: Own elaboration with information from INEGI*

Consistent with chart 3, within the manufacturing establishments in Mexico, subsector 336 (corresponding to manufacturing of transport equipment) has grown progressively from 14 to 18 establishments, followed by subsector 334 (manufacture of electronic components) and food industry (subsector 311) during the period 2008-2016.



Graphic 3 Number of manufacturing establishments in Mexico, 2008:01-2016:12. *Source: Own elaboration with information from INEGI*

In particular, the subsectors 334 and 311 are characterize by being highly intensive in technology and therefore, have become important consumers of it, which exacerbates, even more, external dependence. As a result of the strong tendency to import, the added value that local companies incorporate at the final price of the market is very low.

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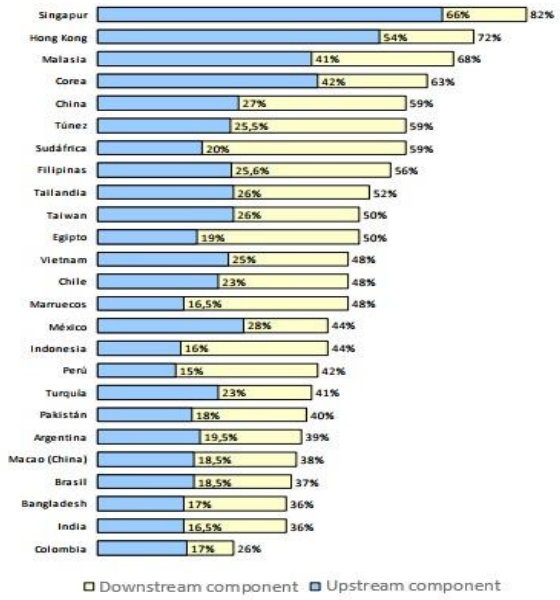
This fact is important as the value added of exports is the percentage of the final value of a product that is explained by processes developed in Mexico, and not by the rest of the countries that were part of the production chain of that product. As can be seen in Graphic 4, the main exporting countries of East Asia and South-East Asian are located at the top of the ranking of participation in the GVCs, what is explained because they import a significant portion of their exports, while a significant portion of their exports are intermediate goods used in exports from other countries.

By the other hand, other developing exporting countries, such as India, Brazil, Mexico, Argentina, and Turkey, have a relatively low rate of participation in global value chains, because they have a lower level of 'upstream component' participation due to the nature of their exports. However they also have a low level of participation 'downstream component' because most of their exports are final goods or services that are not used as intermediate goods of exports from other countries.



Graphic 4 GVC Participation per country, 2010
Source: UNCTAD (2013a).

As a reflection: while the growth of the manufacturing sector has been highlighted, the truth is that it doesn't have the capacity to transfer its positive effects to the economy as a whole because it's accompanied by a strong increase in the volume of imports (as already mentioned), which implies the existence of a high income elasticity of imports.

As a result of a predominant specialization in the assembly by local manufacturing establishments and the growing tendency to import intermediate inputs, machinery and equipment to carry out this process, the value added generated with respect to global manufacturing production is scarce.

	Values of merchand.	Values of merchand.	Balance
Country	Imports	Exports	Exp-Imp.
Singapore	379723	408393	28670
HongKong	553486	492907	-60579
Malasya	196615	227388	30773
Republic of Korea	519584	547770	28186
South Africa	124245	87256	-36989
China	1818405	2048714	230309
Tunisia	24447	17008	-7439
Philipines	65350	51995	-13355
Thailand	247590	229519	-18071
Taiwan	270473	301181	30708
Egypt	69254	29385	-39869
Morocco	44776	21417	-23359
Chile	79468	78227	-1241
Vietnam	113780	114529	749
Indonesia	190383	188486	-1897
Mexico	380477	370827	-9650
Peru	42545	45369	2824
Turkey	236545	152469	-84076
Pakistan	44157	24567	-19590
Argentina	68508	80927	12419
China	8982	1021	-7961
Brazil	233372	242580	9208
India	439668	294158	-145510
Bangladesh	34131	25113	-9018
Colombia	59111	60274	1163
Average1-10	419991.8	441213.10	21221.3
Average 11-25	136343.8	115289.93	-21053.87
Difference in %	308.04	382.70	
*Data expressed in US Million			

Table 1 Value of Imports and Exports merchandise of 25 top 25 developing economies ordered according to GVC participation rate
Source: UNCTAD statistic (2013b)

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In relation to table 1, top 10 developed economies in Global Value Chain participation has more value in their value of exportation than the others which occupy lower positions (11-25). In the same way with importations and the balance or the difference between the amount of value in exportation and importations of top ten countries is positive comparing with the other in lower positions. The information provided confirm that countries with high participation in global value chain is reflected in high value of exports and importations due to linkage between global value chains as possible answer to the phenomena.

Econometric model and results

Data were collected from INEGI, particularly of National Accounts System (see Global Manufacturing Productivity per sub branches). Also, the study embraces 82 manufacturing subranches for period (1993-2015). We selected that period of analysis because 1993 was the first year where Mexico opened to international trade and free markets. Therefore direct foreing investment arrived formally because of NAFTA.

The econometric equation used is defined as:

$$Ln\ Value\ Added = \alpha + LnPmg_{it} + LnPm_{it} + V_i + U_{it} \quad (2)$$

R-squared	.9139	Obs	1066	Marg.
Obs per group	13	Groups	82	Effects%
Variable	Coef	Z	p>z	
Lpmg	.8584076	28.08	0.000	85.84
Lpm	.0607997	1.00	0.242	

Table 2 Econometric results
Source: Own elaboration using Stata 12

In this research we applied a panel regression model with random effects and robust errors because the performance of each manufacture sub branche is variable. In other words each observation unit are not equal.

Montero (2011) mention that these criteria is right when the researcher is not sure of the exact value at the origin that each individual can have but the researchers think that this will probably gravitate around a central value.

According table 2, the R-squared indicates that 91.39 per cent of variability of added value is originated or explained by global manufacturing productivity. The results of marginal effects mention that a 1 per cent of increase in global manufacture productivity, it will cause a growth of 85.84 per cent in value added for mexican manufacturing sub branches. By the other side, local manufacturing productivity can't have effects on added value. In other words productivity is not necesarely related to high valued activities such as patents, new product developments, or complex procceses that have value to be tranformed in other industrial processes with more value or final value for consumers.

The econometric model was tested to have statistical validity. The tests of Hausman indicated that is better to use random effects tan fixed one. The test of Breusch-Pagan Lagrange multiplier (LM) specifies that is better to use random effects than OLS regression because there was no preseence of panel effect and finally we tested serial correlation and the results indicate abscense of serial correlation among variables applied in econometric model (see Appendix).

Conclusions

Domestic competitiveness is still an open discussion, with a wide variety of views. Recent studies had presented different discussions on this subject, with conclusions ranging from bright scenarios to the most pessimistic.

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The main contribution of this paper is the presentation of statistical evidence (throug the model introduced in past section) of the positive correlation between Mexican productivity and exportations. Furthermore, our results show that in the period under analysis, exportations have boosted the performance of local productivity. In particular, we show that they can be manufactured in a local way or could be part of global value chain.

Mexican productivity is seen to be positively affected by the relevance of global value chains. Nevertheless, we also noted that the importance of value added could be explained by global manufacturing productivity, a non-expected result. This is one of the key element to be considered, since local production represents an important fraction of total productivity, but they are known to be of relative small added value. This phenomenon is explained if we consider the participation of national industry in global manufacturing processes. In these cases, national participation is not as big as the given by other developed economies, such as the apportation from several Asiatic countries.

This observation is crucial, since the value added in global processes is not as big as the observed in other cases and the importance of local manufacturing is diminished. A detailed analysis of the factors that could improve the participation of local manufacturing in global processes emerges a natural extension of this paper. The general reflection is about the dependence of an important item, which explain the competitiveness of nations. For Mexico, the renegotiation in NAFTA could affect mexican productivity and competitiveness in many ways but principally in value added. In relation to data recovered from UNCTAD, cases such as China, Singapur and other countries with a high contribution of value in global value chains are economies with bigger dynamism and economic growth than mexican case.

Therefore it's important to reconsider policies related to internal industrialization where government plays an important role. According to our poit of view, governments can help to foster competitiveness and industries are capable to make tangible that kind of support.

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Appendix

Hausman Test

	Coefficients			
	(b)	**(B)**	**(b-B)**	**S.E**
	Fixed	**Random**	**Difference**	
Lmp	-0.1560425	-0.055203	-0.1008395	0.0366756
Lpmg	0.7920532	0.8584075	-0.0663543	0.0170136
Chi2 (2)	(b-B)	[v_b_v_b)^(-1)]-(b-B)		
28.65				
Prob>chi2=0.0000				

Source: Own Elaboration with Stata 12

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Breusch and Pagan Lagrangian multiplier test for random effects

lvab[id,t] = Xb + u[id] + e[id,t]		
	Estimated	Results
	Var	Sd=sqrt(var)
Lvab	4.577183	2.139435
e	.1492025	.3862674
U	.2418798	.4918128
Test:	Var(u)=0	Prob > chibar2 = 0.0000

Source: Own elaboration with Stata 12

Wooldridge test for autocorrelation in panel data

H0: no first-order autocorrelation	
F(1, 81)	=0.017
Prob > F	0.8960

Source: Own Elaboration with Stata 12

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Figure 1 Public Policy Process

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