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In Number 1st presented an article *Analysis of internal competitiveness in private basic incubators: an international comparative case study* by CARRETERO-LARREA, María Alejandra RÍOS-MANRIQUEZ, Martha in the Universidad Politécnica de Querétaro in the next section an article *The influence of maintenance on process innovation and business performance* by CUEVAS-VARGAS, Héctor, QUIROZ-GARCÍA, Jessica, RAMÍREZ-BARAJAS, Alejandro, PALACIOS-ALMANZA, José Rafael Alejandro in the Universidad Tecnológica del Suroeste de Guanajuato, in the next section an article *The technological transfer of the Integral School Control System in the National Technological Institute of Mexico* by VEGA-OLVERA, Gustavo Iván, VEGA-FLORES, Patricia y GUTIÉRREZ-TORRES, Luis Germán in the Instituto Tecnológico del Suroeste de Guanajuato in the next section an article *Proposal to encourage Innovation in MSMEs, with the appropriation of serious game* by FOSADO-MARTÍNEZ, Dulce Olivia in the Universidad Politécnica Metropolitana de Hidalgo, in the next section an article Telematic management technologies for urban public transport by ARELLANO-ROCHA, Francisco Javier and DÍAZ-NIETO, Elia Socorro with adscription in the Universidad Autónoma de Querétaro.

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Analysis of internal competitiveness in private basic incubators: an international comparative case study

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Abstract

Competitiveness is a term used from the origins of humanity when, human tried to do things better than his competitors, improving, innovating or presenting a competitive advantage (Rubio, 2011). Most of the researches tend to establish economic factors as the principal quantitative indicator to measure the competitive (Solleriro & Castañon, 2005); however, according to Rubio & Aragón (2002), the internal variables have more influence in organizations competitiveness. The present investigation shows the results of a case study comparing three private institutions located in Costa Rica, Brazil and Mexico, which are generators of companies, commonly called "Business Incubators".

The competitiveness of these institutions was measured by internal factors:

- Human Resources
- Strategic Planning
- Financial
- Innovation and technology
- Certifications
- Quality
- Information systems
- Marketing

From the descriptive statistical analysis, we conclude that Brazil incubator is more competitive in the internal factors than Mexico and Costa Rica.

Competitiveness, business incubators, Entrepreneurship

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Introduction

The business competitiveness has been used in the business, political, socioeconomic, as well as in the general scope to compare one entity with another under the same established indices, with the aim of establishing parameters of comparison within the environment where it is conceptualized.

Among the various indicators that have been used for this purpose are two mainly; internal and external factors, which depend on the context in which competitiveness is being measured and as mentioned by Müller (1992), cited by Solleiro (2004), if a company remains in the industry over time it must be competitive because it has obtained a market share.

To stay in the industry and survive in a competitive world, business incubators have been used by entrepreneurs as a means to transform their business idea into a formal organization (Toledo, 2007).

The missions of these institutions aim mainly to graduate competitive companies, which is supported by statistics because the comparison in the survival time of companies graduated from an incubation system is greater than the rest of the companies.

Justification

Currently Mexico has 142 basic incubators registered in the incubation network and recognized by the Secretaría de Economía (SE) through the Instituto Mexicano de Empresarios (INADEM), which can access government support and its application must be reflected in the number of competitive companies graduated and the creation of sources of employment, therefore, it is necessary to carry out studies that in the future will help the 3 main interest groups in decision-making; to the entrepreneurs so that they can have a way of comparing business incubators and accelerators and thus choose the best option to incubate their idea and have a greater chance of having a competitive company, the Government and mainly the Secretaría de Economía(SE) for the evaluation of the supports granted and thus increase the competitiveness of the country and finally to the subjects of study of this research, the incubators of companies so that together or individually they can create strategies that support the fulfillment of their objectives and above all his vision.

Problem

In recent years the figure of the entrepreneur has noticed an increasing attention in the political, economic and social spheres derived from the fundamental role that these play in global economic growth, that is why governments around the world and different international organizations such as the Bank Global and the International Monetary Fund (IMF) have launched different initiatives where entrepreneurship is promoted to improve the economy of the country, which are mainly applied to developing countries (Minniti, 2012) Statistics show that of the SMEs in Mexico, four out of ten die during the first year of life and their life expectancy at birth is from 7 to 22 years, depending on the size of the companies, since the index of life expectancy has an increasing behavior as the size of the company increases (INEGI, 2015), however, a company developed under a model of business incubation increases its survival rate, statistics of the Pyme Universe (Torreblanca, 2013) mention that 80% of the incubated companies survive the first two years of operations.

For this reason, many local economic development agencies, governments and other public or private institutions have adopted incubators as a tool to reduce the probability of failure and to accelerate the process of business creation (Grimaldi & Grandi, 2005); they also maintain that the importance of incubators is growing, since over the years they have been seen as mechanisms to improve the economic and technological development of the countries, to promote the emergence of promising and promising ideas and in turn to promote the growth of the newly created company.

During the last decades of the twentieth century, companies are in a process of change and adaptation to the systems that surround them, where the nature of competition and its struggle for survival is increasingly important, the problem is based on that there is no evidence that shows a system for measuring the competitiveness of incubators that allow them to compare entrepreneurship options, beyond the cost implied by the incubation process.

Hypotesis

The age of the private business incubator is related to the competitiveness index measured through its internal factors.

Objectives

General objective

Compare the internal competitiveness of the private basic incubators of Mexico, Costa Rica and Brazil

Specific objectives

- Measure the competitiveness of each of the basic private incubators through internal factors.
- Identify the main differences that exist in the management of private basic incubators in each country.

Theoretical framework

Business incubators have been used since the 1950s by government agencies as a mechanism for economic reactivation in the creation of companies to cope with the unemployment rate (Huffman & Quigley, 2002) and increase the chances of survival of new companies (Lewis, 2001)

The definition of an incubator according to the National Business Innovation Association (2016), is a dynamic process of entrepreneurship development that encourages the creation of new companies, helping them to survive and grow during the birth period when they are most vulnerable. The incubators provide administrative advice, access to financing and scope to commercial or technical services considered critical. In addition, they offer entrepreneurial services shared office services, access to equipment, a flexible rental and a large space, all in the same place

The history of business incubators has emerged since the 1950s in the United States (Huffman and Quigley, 2002) when the first business incubator was installed in Batavia, NY and the basic model of an incubator is created (Lewis, 2001), Europe reached its first business incubator in 1875 (Maroto Sánchez, Andrés, García Tabuenca, 2004) and in 1984, Brazil began to work under these models and it was not until 1990 that the first formal incubator was created in Mexico with the support of the Consejo Nacional de Ciencia y Tecnología (CONACYT).

The incubators of companies in Mexico are cataloged according to the type of companies to be incubated, classifying them into two main categories (INADEM, 2016):

- Basic incubators; Traditional business incubators focus their efforts on the creation of companies whose requirements for physical infrastructure, technology and operating mechanisms are basic, such as the commerce, service or light industry sectors. The average incubation time is three to six months
- High impact incubators; they are organizations that support the constitution of companies whose physical and technological infrastructure requirements, as well as their operating mechanisms, are specialized and incorporate elements of innovation. These are projects with high growth potential, high sales rates and internationalization possibilities. The average incubation time is from 1 to 2 years.

The incubators of private companies are entities that generate profits and therefore must seek to be competitive.

Competitiveness is a very broad term used according to Rubio (2011), from the origins of mankind, when the human being tried to do things better than his competitors, improving it, innovating or presenting a competitive advantage to gain the will or use on the part of consumers.

It is very common to hear today the rankings of competitiveness of countries or companies and the position that is occupied, is one of the factors that affect the decision making for investment and in the case of entrepreneurs to decide where to incubate your business idea

The concept of competitiveness seen from the Rubio company scope (2011), defines it as "the capacity of a public or private organization, lucrative or not, to systematically maintain comparative advantages that allow it to reach, sustain and improve a certain position in the socioeconomic environment", the term successful competitiveness (Achanga, Shehab, Roy, & Nelder, 2006, Bárcenas Estrada, De Lema García Pérez, & Trejo Sánchez, 2009, O'Regan & Ghobadian, 2002, Rubio & Aragón, 2002, cited by Bárcenas et al., 2009), is defined as the ability to achieve a better position in the market in relation to other competitors in its sector, obtaining results in a sustainable way over time.

A large part of the research tends to establish economic factors as the determining quantitative indicator for the measurement of competitiveness (McFetridge, 1995, Unger et al., 2013, European Commission, 2003, Sobrino, 2005, Bueno, 1995; Waterhouse, 1995, Álvarez and García, 1996, Marbella, 1998, Donrosoro et al 2001, Camisón, 2001, Industry Canada, 1995, cited in Solleiro and Castañón (2005), however, this type of research leaves out many other items. of internal and external competitiveness that are not reflected in financial returns but are qualitative, such as knowledge management, quality, technology, innovation, human capital, market, demand, legal aspects among many others (Zahra, Neubaum and Naldi, 2007, Okamuro, 2007, Quinn and Rohrbaugh, 1983, Navas and Ortiz de Urbina, 2002, Rubio and Aragón, 2002, Zevallos, 2007, Bárcenas Estrada et al., 2009.) Derived from the restrictions for the development of The investigation will consider only the internal factors that do not involve economic factors.

As mentioned in the characteristics of competitiveness, these can be classified into internal and external factors; although according to Rubio and Aragón (2002), internal variables have a greater weight in the competitiveness of organizations.

Regarding the internal factors besides the financial one can be determined:

Human resources (Colombo and Grilli, 2005, Aragón and Rubio, 2005, De la Cruz, Morales and Carrasco, 2006, Bruderl, Preisendorfer, and Ziegler, 1992, Llopis, 2000, Monfort, 2000, Zapata, 2012, Alderete and Diez, 2014; Chaves et al., 2013; Solleiro and Castañón, 2005).

Strategic planning (Rudd et al., 2007; Kraus et al., 2006; Guzmán, Rebolloso and Vallejo, 2007; Martínez and Álvarez, 2006; Bravo et al., 2015; Arrieta et al., 2015; Mora-Riapira, Vera -Colina and Melgarejo-Molina, 2015, Haro and Basurto, 2016).

Innovation and technology (Rubio and Aragón, 2002, Donrosoro et al., 2001, Ahuja and Katila, 2004, Baldwin and Gellatly, 2006, Roberts, 1999, Saavedra, 2012, Ríos and Marroquín, 2012, Alderete and Diez, 2014, Solleiro and Castañón, 2005, Quijano, Arguelles and Aguilar, 2015, Vázquez-Ávila, Sánchez-Gutiérrez and González-Uribe, 2015, Ramírez and Parra, 2015, Heredia, Castillo and Juárez, 2016).

Certifications (Ayala et al., 2004; Sánchez, García and Estrada, 2009; Diaz, Delgado and Páez, 2016).

Quality (Martínez and Álvarez, 2006, Solleiro and Castañón, 2005, Rubio and Aragón 2002, Quiroga, 2003, Donrrosoro et al., 2001, Artail, 2007, Miñarro and García, 2006, Prajogo and Brown, 2006, Jiménez, 2016)

Marketing (Donrrosoro et al., 2001, Rubio and Aragón 2002, Quiroga, 2003, Solleiro and Castañón, 2005, De la Cruz, Morales and Carrasco, 2006, Valladares, 2008, Corla, Andrade and Ortega, 2012, Aguilasochi, Galeana and Peña, 2016).

Information Systems (Llopis, 2000, Donrrosoro et al., 2001, Katz and Hilbert, 2003, RICYT, 2009, Best, 2010 cited by Melchor, Pedraza and Ábreo, 2012).

Research Methodology

Type of Research

The research design is quantitative, the strategy to obtain the data is non-experimental, and when the data is collected in a single moment, it falls into a transectional investigation with a correlational analysis where the variables are described and their incidence is analyzed. interrelation at a given moment (Hernández, Fernández, Baptista, 2014).

Development Methodology

The instrument used was developed based on the identification of internal factors of competitiveness in the review of the literature and later it was endorsed by four experts in the area, obtaining an instrument with 5 sections where the quantitative evaluation of the internal factors of competitiveness is designed on a scale of Likert 1 to 5, consisting of 8 variables, 14 indicators and 26 questions as shown in table 1.

Variable	Code	Number of questions
Human Resources	RRHH	5
Strategic planning	PE	5
Financial	FIN	3
Innovation and technology	IT	5
Certifications	CER	4
Quality	Q	2
Information systems	SI	3
Marketing	MKT	2

Table 1 Operationalization of variables. (Own elaboration)

Este instrumento fué validado en una prueba piloto a nivel internacional donde se obtuvo un alfa de Cronbach de 0.883 y obteniendo los estadísticos descriptivos básicos mostrados en la tabla 2.

Dimension	Item	V	Mín.	Max	Average	Desv tip
CER	4	32	1	5	3.84	0.85
FIN	3	24	3	5	4.29	0.69
IT	5	40	1	5	3.48	1.01
MKT	3	24	3	5	4.25	0.74
PE	5	40	3	5	4.43	0.68
Q	2	16	3	5	4.31	0.6
RRHH	5	40	2	5	3.98	0.8
SI	2	16	3	5	3.56	0.63

Table 2 Statistical descriptive pilot test. (Own elaboration)

The instrument was applied by email through google forms to the Directors or Managers of the 3 incubators of basic companies, of private origin subject to this investigation during the month of April being the Mexican incubator the oldest, since it was created in 2004; the incubators of Costa Rica and Brazil have a date of creation in 2014.

Results

Regarding the comparison of infrastructure to serve entrepreneurs, as shown in Table 3, the Brazilian incubator is the most equipped, followed by Mexico and finally Costa Rica.

Origin of the incubator	Offices	Workshops	Laboratories	Meeting room	Computation areas	Training room
COSTA RICA	Yes	No	No	Si	No	Si
MÉXICO	Si	No	No	Si	Si	Si
BRAZIL	Si	Si	Si	Si	Si	Si

Tabla 3 Equipamiento de las incubadoras privadas

(Own elaboration)

In terms of the number of collaborators who have the largest number is Brazil with 9, while Mexico and Costa Rica have 4 each under the scheme of hiring by fees and only the incubator of Mexico has an average of 25 external advisors who support in particular projects.

The incubators of Mexico and Brazil make strategic alliances with the public sector, mainly to strengthen some business areas and political relationships, while Costa Rica is not interested in strategic alliances. Regarding the criteria to enter the incubator again, Mexico and Brazil indicate that a high potential for growth must be demonstrated, while the Costa Rican incubator with only having the business idea is sufficient and this is reflected in the time Maximum of exit for Mexico is 6 months, Costa Rica 1 to 2 years and Brazil up to 3 years to incubate a basic company.

Regarding the competitiveness of internal factors of the 3 private incubators, the results for variables are shown in the following tables.

Table 4 shows the results of the human resources category, which shows that Brazil is the incubator that obtains the highest average, followed by Mexico and Costa Rica; being the indicators conditions of the job and participation of the collaborators in the decision-making that make the difference between Brazil and the other two incubators.

HUMAN RESOURCES (RRHH)			
	COSTA RICA	MÉXICO	BRAZIL
5	4	5	
5	4	5	
3	3	5	
3	4	3	
3	4	5	
Average	3.8	3.8	4.6

Table 4 Comparative results of category human resources

(Own elaboration)

Regarding strategic planning, it can be seen in table 5 that Brazil and Mexico have the same average and the main difference between these two and Costa Rica is the indicator on the use of control tools.

STRATEGIC PLANNING (PE)			
	COSTA RICA	MÉXICO	BRAZIL
5	5	5	
3	4	4	
3	4	4	
3	4	4	
4	4	4	
Average	3.6	4.2	4.2

Table 5 Comparative results of category strategic planning

(Own elaboration)

In the financial aspect, it stands out a lot because, as indicated for Brazil, it is not important to obtain financial profitability or to manage funds to finance projects, since the private incubator has subsidies that cover most of the costs, therefore, as shown in the table 6 Mexico and Costa Rica are on par.

FINANCIAL (FIN)			
	COSTA RICA	MÉXICO	BRAZIL
5	5	5	4
4	4	1	
4	4	1	
Average	4.33	4.33	2.00

Table 6 Comparative financial category results.

(Own elaboration)

The category of technological innovation, as shown in Table 7 and 11, is the lowest of all the internal aspects of competitiveness, especially in Mexico, since it obtains the lowest average when it does not consider that it has the machinery and equipment of laboratories. at the level of other incubators at a national or international level, between Brazil and Costa Rica, the indicator that differentiates them is the development of new products, services or processes.

TECHNOLOGICAL INNOVATION (IT)			
	COSTA RICA	MÉXICO	BRAZIL
3	1	4	
3	1	3	
3	4	3	
3	3	5	
4	4	4	
Average	3.2	2.6	3.8

Table 7 Comparative results of technological innovation category.

(Own elaboration)

In terms of certifications for Mexico and Brazil, both have international certifications of administrative and academic innovation methodologies, while Costa Rica despite having the same age of Brazil does not have certifications of any kind. The only difference that existed between Mexico and Brazil was the degree of importance of having procedural manuals defined as shown in Table 8.

CERTIFICATIONS (CER)			
	COSTA RICA	MÉXICO	BRAZIL
3	4	4	
3	4	4	
4	3	4	
3	4	4	
Average	3.25	3.75	4

Table 8 Comparative results of category certifications

(Own elaboration)

The quality evaluated under the quality and efficiency management indicators of the three incubators subject to this study obtain the same score as shown in table 9, which is why quality is considered to be one of the main aspects, regardless of the country of origin of the incubator.

QUALITY (Q)			
	COSTA RICA	MÉXICO	BRAZIL
4	4	4	
4	4	4	
Average	4	4	4

Table 9 Comparative results of quality category

(Own elaboration)

The information systems under the indicator of production, control, storage, recovery and dissemination of information and its sources, as shown in Table 10 Brazil is by far the incubator that obtains the highest score, considering all the items with a high degree of importance and application, followed by Costa Rica and in the end Mexico.

INFORMATION SYSTEMS (IS)			
	COSTA RICA	MÉXICO	BRAZIL
4	3	5	
3	3	5	
Average	3.5	3	5

Table 10 Comparative results of category information systems

(Own elaboration)

The last variable is marketing, within which, as shown in table 11, Mexico and Brazil obtain the same score, differentiating themselves from Costa Rica only in the item focused on conducting business fairs where the products of the incubator are shown.

MARKETING (MKT)			
	COSTA RICA	MÉXICO	BRAZIL
4	4	4	
4	4	4	
3	4	4	
Average	3.67	4.00	4.00

Table 11 Comparative results of marketing category

(Own elaboration)

Conclusions

The most competitive incubator in its internal factors as shown in table 11 is the Brazil incubator, since the sum of its internal factors is 31.60, followed by Mexico and finally Costa Rica. Which rejects the hypothesis raised because it does not influence the lifetime of the incubator in the competitiveness of it.

Igualmente se observa que el factor interno de la competitividad más importante es el recurso humano.

	COSTA RICA	MEXICO	BRAZIL	Average
RRHH	3.80	3.80	4.60	4.07
PE	3.60	4.20	4.20	4.00
FIN	4.33	4.33	2.00	3.56
IT	3.20	2.60	3.80	3.20
CER	3.25	3.75	4.00	3.67
Q	4.00	4.00	4.00	4.00
IS	3.50	3.00	5.00	3.83
MKT	3.67	4.00	4.00	3.89
SUM	29.35	29.68	31.60	

Table 10 Comparative results of internal factors competitiveness

(Own elaboration)

Subsequent studies will focus on determining competitiveness in internal factors to perform the calculation of incubators with greater competitiveness by evaluating the best practices of them and share them, in order to strengthen the entrepreneurship and the economy of the countries.

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The influence of maintenance on process innovation and business performance

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Abstract

Scientific literature reveals that maintenance is a key strategy for a firm's success, as it is a factor that improves business performance. For this reason, the present study aimed to analyze the influence of maintenance on process innovation and business performance, based on a sample of 288 micro, small and medium enterprises (MSMEs) from the industrial sector of Guanajuato. The results obtained through the statistical technique of Linear Regression under the stepwise method reveal that there is sufficient empirical evidence of the influence of maintenance on process innovation and business performance. For this reason, decision makers must include within their business strategies the maintenance strategy, which will be reflected in a greater efficiency of their equipment and reduction of costs, in order to comply with the requirements of their clients and with it achieve higher levels of business performance.

Maintenance, Process innovation, Business performance, MSMEs

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Introduction

From the industrial revolution that occurred initially in England in the eighteenth century, caused companies to focus and pay more attention to standardization. In the case of Mexico, due to various circumstances, this process of industrialization did not begin until the end of the 19th century (Chavez Palacios, 2004). And it was because of the need to mass-produce that the standardization of processes was adopted, so that maintenance became a fundamental part of the corporations, aimed at equipment repair activities (Vilarón Vázquez, Pineda Domínguez, & Pérez Rodríguez, 2007).

Currently, companies consider the maintenance area as a strategic activity that is related to innovation and productivity needed in the globalized world of today (Vilarón Vázquez et al., 2007).

The costs of manufacturing within the companies have caused that it is to improve the maintenance, reason why it demands greater degree of talent, skill and training of the personnel that repairs the equipment. It is here where innovation in the processes is created, giving way to the reduction of costs in the productive processes and stimuli of creativity in the manufacturing processes (Vilarón Vázquez et al., 2007).

It has been found in scientific literature that maintenance is crucial compared to the ability of a corporation to compete against its rivals with quality, delivery and cost, since this must be seen as an investment to improve business performance (Fredendall, Patterson, Kennedy, & Griffin, 1997).

In this sense, maintenance from the strategic point of view, promises to improve the performance of a company, with the commitment, training, resources and integration that this requires (Swanson, 2001).

So the purpose of this research is to determine the influence of maintenance on process innovation and business performance of MSMEs in the state of Guanajuato.

Justification

There is theoretical and empirical evidence that states that there are several variables involved in process innovation and business performance, but there are few studies that deepen to know if maintenance is a facilitator for process innovation and performance within the corporations, mainly in smaller companies in an emerging country such as Mexico.

Most of the work has focused on the many external and internal factors that are associated with generic innovation, but more recently attention has been given to innovation in maintenance management (Pitt, Goya, & Sapri, 2006).

Therefore, the present study intends to contribute empirical evidence on the relationship that exists between maintenance with process innovation and business performance in the industrial MSMEs of an emerging country such as Mexico.

An additional contribution is that not only the impact of maintenance on process innovation and business performance is evidenced, but also maintenance activities that significantly influence both process innovation and business performance are identified.

Problem

Because of globalization and the demand of the current market, a pattern has been set in the competition, which has led organizations, specifically MSMEs (micro, small and medium enterprises) to rethink their strategies and improve their business performance, in order to comply with market requirements, offering innovative products and / or services that reinforce its competitiveness (Cuevas-Vargas, Aguilera Enríquez, & González Adame, 2015).

In this sense, after the theoretical support that exists of the relationship between maintenance with process innovation and business performance, there is a need to know if the maintenance performed in the industrial MSMEs of Guanajuato affects the level of innovation of processes and performance improvement within organizations.

For this reason it is important to know how important maintenance is within the MSMEs of an emerging country and how maintenance activities help them to innovate in their processes and improve their business performance.

Hypotheses

H1: Maintenance significantly influences process innovation.

H2: Maintenance significantly influences business performance.

Objectives

General objective

To determine the influence of maintenance on process innovation and business performance of industrial MSMEs.

Specific objectives

- To identify maintenance practices that have a significant influence on process innovation.
- To identify maintenance practices that have a significant influence on business performance.

Theoretical framework

This research presents the theoretical arguments that sustain the relationship of the analysis variables: maintenance, process innovation and business performance.

Relationship of maintenance with process innovation

Maintenance is defined as the combination of all technical and administrative actions, including control actions, aimed at retaining an element, or restoring it to a state where it can perform a required function. A process such as maintenance can be defined as an activity or a set of linked and ordered activities for the transformation from entry to exit (Rentzhong, 1996).

For his part Teresko (1992) states that maintenance is an investment, that is, one of the functions of a company, which returns quality, safety and reliability.

Likewise, Etienne-Hamilton (1994) defines maintenance as a partner that together with other functions works to achieve the goals or strategic objectives of a company.

Faced with these definitions, we can say that maintenance is a resource that corporations can use to achieve their goals, obtaining advantages from it.

Over the years entrepreneurs have understood the importance of the proper functioning of the teams that participate in the production systems with respect to the profits of their organizations.

Regarding empirical evidence, in a study conducted with 22 Mexican companies from different sectors, Vilarón Vázquez et al. (2007) found that the role that industrial maintenance plays has been based on both operational and administrative activities; highlighting that maintenance stimulates creativity, generation of technology in the area, increases the effectiveness of companies, reduces costs in the maintenance area, allows companies to be more competitive in their field, provides knowledge to human capital and it gives a pattern to innovation in manufacturing processes.

In their empirical study carried out in Spain with medium and large companies in the industrial sector of machinery and instruments for measurement, analysis and control, Perdomo-Ortiz, González-Benito, & Galende (2006) reveal that there is a link between maintenance practices and the innovation capabilities of a company, that is, the knowledge of a company to make changes in its processes, products and systems. In addition, they found that process documentation and proper and preventive maintenance help to carry out innovation in companies.

On the other hand, Zehir & Sadikoglu (2010) in their study conducted with 373 Turkish companies found that the practices performed by maintenance employees to achieve quality, improves innovation in processes products or services, since they generate innovative ideas.

On the other hand, Pitt et al. (2006) in their research carried out in Malaysia, highlight the importance of a strategic maintenance management system in relation to innovation, that is, it is emphasized that innovation in this process adds value to corporations by the continuous efficiency produced by a Creative environment

The costs of manufacturing within the companies have caused that it tries to improve the maintenance, reason why it demands greater degree of talent, skill and qualification of the personnel that repairs the equipment; it is here where innovation in processes is created, giving way to the reduction of costs in productive processes and stimuli of creativity in manufacturing processes (Vilarón Vázquez et al., 2007).

Process innovation is reflected in the changes in the processes that cover the techniques, equipment and information programs of auxiliary activities, such as purchasing, accounting, IT and maintenance (OECD, 2005). Based on these arguments, the first hypothesis is presented:

H1: Maintenance significantly influences process innovation.

Relationship of maintenance with business performance

Fredendall, Patterson, Kennedy, & Griffin (1997) indicate that maintenance is crucial against the ability of a corporation to compete against its competition with quality, delivery and cost, since maintenance is not an expense, but an investment for better business performance. In their study carried out in Singapore with 67 industrial companies, Brah & Chong (2007) found that companies that implement total productive maintenance, that is, maintenance in their processes, machinery and equipment, perform better in contrast to those that do not perform.

For his part Swanson (2001) in his research with 287 North American companies of the metallurgical industry, whose purpose was to explore the different maintenance strategies in relation to the maintenance and performance of the plant, conclude that the maintenance from the strategic point of view, It promises to improve the performance of a company, with the commitment, training, resources and integration that it requires. Assuming that managers or managers of corporations can already feel comfortable when investing in maintenance, due to its positive impact on business performance.

Another empirical study conducted by Ahuja & Kumar (2009) in India, reveals that properly applied maintenance influences the improvement of the companies' performance and leads them to build the capacity to be competitive, since a well-executed maintenance contributes to the compliance with organizational goals and objectives. For his part, Solís Coria (2012) in his study conducted in Mexico concludes that the maintenance and participation in the planning of the product process are positively related to performance, because it is a tool that provides the confidence that the productivity will not be affected while it is being implemented. So we can say that there is a link between the maintenance that takes place in a company and the performance that is obtained. Based on these arguments, the second hypothesis is presented:

H2: Maintenance significantly influences business performance.

Next, in figure 1, the theoretical research model is shown.

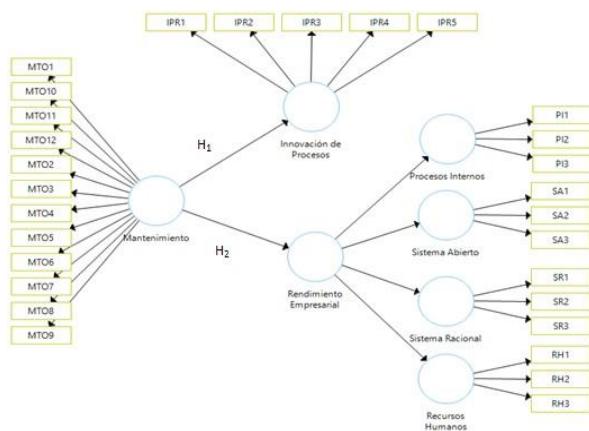


Figure 1 Theoretical model of research.

Research Methodology

Sample design and information gathering

The present empirical study of explanatory type, had a quantitative approach, with a non experimental design and transversal cut, through the Multiple Linear Regression under the method of successive steps. Considering as a reference the database of the Mexican Business Information System (2017), in which 3,123 economic units of the industrial sector in the State of Guanajuato, from one to 250 employees, were registered.

In this sense, a survey was designed to be answered by the managers or owners of this type of company, which was applied randomly to 342 entrepreneurs, using a confidence level of 95% and a margin of error of 5%, obtaining a response rate of 84%, counting on a final sample of 288 surveys. In Table 1, detailed information is shown.

characteristics	Description
Kind of investigation	Empirical, explanatory, descriptive and transversal
Focus	Quantitative
Analysis unit	Mipymes of the state of Guanajuato from 1 to 250 workers
Geographic area	State of Guanajuato, Mexico
MiPymes Universe	3,123 micro, small and medium industrial companies
Method of information gathering	Personal survey to managers or owners of the company
Sampling method	Simple random sampling
Sample size	342 mypymes
Final Sample	288 mipymes
Sampling error margin	$\pm 5\%$ error, 95% confidence level ($p = q = 0.5$)
Data analysis	Multiple Linear Regression

Table 1 Research data sheet.

Measurement of the variables

Maintenance variable

The measurement scale of the maintenance variable was adapted from Quickview 3.0 Manufacturing Assessment (TDO Solutions for Manufacturing and Technology, 2001), measured with 12 items, with a Likert scale of 1 to 5 points, where 1 refers the total disagreement and 5 total agreement.

Being a latent variable that can not be observed directly, it was necessary to create a new variable that would take on the role of an exogenous variable, based on the arithmetic mean of its 12 manifest variables, as pointed out by Cuevas-Vargas & Estrada (2017).

Variable process innovation

Process innovation variable was taken from Cuevas-Vargas et al. (2015), adapted from Pinzón (2009), which was measured with five items, using a Likert scale of 1 to 5 points, where 1 refers the total disagreement and 5 the total agreement.

Given that this variable took on the role of an endogenous variable, as shown in the theoretical model, it was necessary to generate a new variable, as Cuevas-Vargas & Estrada (2017) point out, based on the average arithmetic of its five manifest variables.

Business performance variable

The scale of measurement of the business performance variable was adapted from Quinn & Rohrbaugh (1983), which was measured based on its four approaches: the internal processes approach, measured with a 3-item scale, the open-system approach , measured with a scale of 3 items, the rational system approach, measured with a scale of 3 items, and the human resources approach, measured with a scale of 3 items, all of them measured with a Likert scale of 1 to 5 points, where 1 is total disagreement and 5 is total agreement.

Similarly, to measure this endogenous variable according to the theoretical research model, it was necessary to create the four variables of the different approaches, starting from the arithmetic mean of its manifest variables, as Cuevas-Vargas & Estrada points out. (2017), and subsequently created the variable business performance, from the arithmetic mean of its four variables representing the four approaches proposed by Quinn & Rohrbaugh (1983).

Reliability

In order to demonstrate the reliability of the scales, the Cronbach's Alpha (Cronbach, 1951) was used, obtaining values much higher than the 0.7 suggested by Nunally & Bernstein (1994), which are shown in Table 2.

Construct	Cronbach's Alpha >0.7
Maintenance	0.932
Process Innovation	0.903
Performance with focus on internal processes	0.855
Performance with open system approach	0.872
Performance with rational system approach	0.912
Performance with a human resources approach	0.854

Table 2 Reliability of the scales.

Therefore, it can be concluded that the different scales with which each of the variables was measured have reliability, which indicates that there is internal consistency between the variables with which each of the constructs was measured.

Results

First, the descriptive statistics are presented in Table 3, where it can be seen that the industrial Mipymes of Guanajuato, according to the perception of the managers or owners, give greater attention to their operators being responsible for cleaning and organizing their tools, equipment and work area, with an average of 3.95, followed by the variable equipment is cleaned, maintained and lubricated on a regular basis, with an average of 3.90, however, although they claim to have a program of maintenance for the workshop team, with an average of 3.46, it has been found that what they have paid less attention to is documenting this maintenance program, with an average of 2.82, followed by documentation of the time invested in the maintenance of the teams, with an average of 2.88.

ID	Variable	Mean
M T1	There is a maintenance program for the workshop team	3.46
M T2	That maintenance program is documented	2.82
M T3	The measuring devices are calibrated periodically	3.17
M T4	There is a traceable calibration record for each device	2.93
M T5	The cutting tools are stored and clearly identified	3.45
M T6	The time invested in the maintenance of the equipment is documented	2.88
M T7	Operators perform equipment maintenance repairs	3.43
M T8	The equipment is cleaned, maintained and lubricated on a regular basis	3.90
M T9	The condition of the pieces of mobile equipment is evaluated on a regular basis to verify that it works within the tolerances	3.65
M T10	The measuring devices mounted on machines are checked and / or balanced on a regular basis to ensure operation within the tolerances	3.55
M T11	Operators are responsible for cleaning and organizing their tools, equipment and work area	3.95
M T12	Operators are responsible for cleaning their own machines, lubricating them and maintaining them on a regular basis	3.74

Table 3 Maintenance descriptive statistics.

With regard to process innovation, it was found that the managers or owners of the industrial MSMEs have bet more to introduce new equipment with the purpose of automating their processes, with an average of 3.36, followed by the incorporation of new or improved methods of creation and provision of services, with an average of 3.09, however, managers give less importance to the use of computer programs and techniques for the supply of inputs, with an average of 2.82, as shown in the Table 4, which is presented below.

ID	Variable	Mean
IP 1	New equipment has been introduced to automate the company's processes	3.36
IP 2	Computer programs and techniques are used for the supply of supplies, allocation of supplies in the company or the distribution of final products	2.82
IP 3	New or improved methods of creation and provision of services have been incorporated	3.09
IP 4	Significant changes are introduced in the equipment and software used in the procedures or techniques for the provision of services	2.95
IP 5	New or improved techniques, equipment and computer programs are introduced that are used in auxiliary support activities (purchasing, accounting, calculation, maintenance)	3.04

Table 4 Descriptive statistics of process innovation.

Regarding business performance, according to the perception of the managers of this type of company, it was found that their organizations have had an increase in the satisfaction of their clients, with an average of 3.90, followed by the improvement of the quality of their products., with an average of 3.73, and in third place the improvement of the image of the company and its products / services, with an average of 3.63, however, the lowest ratings on average are shown in the human resources approach with the reduction of staff turnover, an aspect that should be considered to improve the work environment, as shown in Table 5 presented below.

ID	Variable	Mean
PI 1	Improvement of product / service quality	3.73
PI 2	Increase in the efficiency of internal operational processes	3.55
PI 3	Improvement in the organization of staff tasks	3.53
SA 1	Increase in customer satisfaction	3.90
SA 2	Rapidity of adaptation to the needs of the markets	3.54
SA 3	Improvement of the image of the company and its products / services	3.63
SR 1	Increase in market share	3.43
SR 2	Increase in profitability	3.45
SR 3	Increase in productivity	3.52
R H1	Improvement in worker motivation / satisfaction	3.47
R H2	Reduction of staff turnover (voluntary abandonment of workers)	3.33
R H3	Reduction of work absenteeism	3.42

Table 5 Descriptive statistics of business performance

Subsequently, it was necessary to show the linearity between the independent variables, finding that there is linearity between the observable variables with which the exogenous maintenance variable was measured. In this sense and according to what was pointed out by Hair, Black, Babin, & Anderson (2010), it is feasible to apply multiple linear regression analysis, which was applied under the method of successive steps and whose results are shown in the Table 6.

Hypotheses	β	t-value	R ² Adjusted	F- value
Maintenance → Process Innovation	0.526***	10.446	0.274	109.11 ***
Maintenance → Business Performance	0.647***	14.366	0.417	206.39 ***
Significance: ***=p<0.001; **= p<0.01				

Table 6 Results of the linear regression.

Based on the findings found, previously shown in Table 6, with regard to H1, the results obtained ($\beta = 0.526$, $p < 0.001$), they indicate that the maintenance influences positively and significantly in the innovation of processes, when impacting the maintenance in a 52.6% in this type of innovation of the industrial SMEs of the state of Guanajuato, and that the innovation of processes is explained in a 27.4% for maintenance, therefore, H1 is accepted, confirming the findings found by Perdomo-Ortíz et al. (2006) in Spain, since maintenance practices are related to the innovation capabilities of a company in its processes, products and systems. It also coincides with the results of Zehir & Sadikoglu (2010) in Turkey, where the practices of maintenance employees to achieve quality improves process innovation.

Regarding H2, the results indicate that maintenance significantly influences business performance ($\beta = 0.647$ $p < 0.001$), when impacting the maintenance of business performance by 64.7% and that the business performance of MSMEs under study is explained by 41.7% for maintenance, therefore, H2 is accepted, and confirms the results obtained by Ahuja & Kumar (2009) in India; Brah & Chong (2007) in Singapore, and Swanson (2001) with American companies, who found that the maintenance carried out properly within the company, improves their performance and allows them to build the capacity to be competitive.

Finally, in order to identify the maintenance activities that have a significant influence on process innovation and business performance, a new multiple linear regression was applied under the same method of successive steps, and the results are shown below in the following section. Table 7.

Variable	Innovation Processes	Business Performance
The measuring devices are calibrated periodically.	0.177** (2.192)	0.218*** (3.578)
The maintenance program is documented.	0.218*** (3.314)	N.S.
The measuring devices mounted on machines are checked and / or balanced on a regular basis to ensure operation within the tolerances	0.138** (2.188)	N.S.
The cutting tools are stored and clearly identified	0.138** (2.029)	N.S.
There is a maintenance program for the workshop team	N.S.	0.268*** (4.161)
The equipment is cleaned, maintained and lubricated on a regular basis	N.S.	0.152** (2.225)
Operators are responsible for cleaning and organizing their tools, equipment and work area	N.S.	0.146** (2.248)
R ² Adjusted	0.296	0.418
F-value	30.449***	52.521***
Highest VIF	2.671	2.302

Table 7 Multiple linear regression results.

Where it can be seen that the companies that calibrate their measuring devices periodically, see the impact of this maintenance activity in a significant way both in their process innovation and in their business performance, influencing 17.7% and 21.8% respectively.

Likewise, the results indicate that documenting the activities of its maintenance program significantly impacts on 21.8% in process innovation; that when they periodically balance machine-mounted measuring devices to ensure operation within tolerances they see a positive effect at 13.8% on process innovation; that the fact of saving the cutting tools and having them clearly identified has a significant influence of 13.8% on the innovation of their processes. On the other hand, it was found that having a maintenance program for the workshop team has a significant impact on business performance of 26.8%; that when the equipment is cleaned, maintained and lubricated on a regular basis it significantly impacts a 15.2% on the business performance; and that having operators responsible for cleaning and organizing their tools, equipment and work area has a significant effect on business performance.

Conclusions

Based on the objective of the research, it is concluded that maintenance has a positive and highly significant impact on both process innovation and business performance, so it is essential that the decision makers of this type of companies consider its business strategies maintenance management, since it will allow them to reduce their costs, streamline their processes and improve their level of innovation. That is why having the equipment that is given maintenance continuously, will guarantee the company greater durability and likewise will allow it to meet the requirements of its customers and thereby obtain better business performance.

On the other hand it has been found that document your maintenance program, periodically calibrate your devices, save and clearly identify the cutting tools, as well as regularly check or calibrate the measuring devices mounted to the machines and scales to ensure its operation within tolerances, significantly influences the innovation processes of this type of companies.

In the same sense, it was found that having a maintenance program for workshop equipment, calibrating the measuring devices periodically, cleaning, maintaining and lubricating the equipment on a regular basis, as well as the fact that the workers are responsible for cleaning and organizing their tools, equipment and work area has a positive and significant impact on business performance.

Therefore, decision makers should pay special attention to having a maintenance program and document the types of maintenance that are being done to the teams to have a history for decision making. In the same way, they should inculcate in their workers and workers the culture of equipment maintenance, in which cleaning, lubrication and calibration of tools and devices, the care and organization of their tools and equipment, as well as their own work area. Within the limitations of this study, it can be highlighted that the surveys were answered from the point of view of the MiPymes managers, which can be lent to subjectivities.

In future investigations, it is recommended to identify whether the size and age of the company influence maintenance management. Similarly, it is suggested to carry out a comparative study with another geographical area of the country to see how maintenance is found in industrial SMEs.

Analyze the relationship of maintenance with other variables such as knowledge management, technology, prevention of pollution and waste reduction, financing, competitiveness, etc., in order to expand the results and compare them with the conclusions set out in the present study. Finally, it is suggested to apply an exploratory factorial analysis to the scale in order to identify if it is feasible for the maintenance variable to pass from that large number of manifest variables to a smaller one of explanatory elements (factors), which allow explaining in a more simple maintenance.

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The technological transfer of the Integral School Control System in the National Technological Institute of Mexico

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Abstract

The Sistema Integral Control Escolar (SICE) is a software product developed to systematize the academic and administrative processes of the Instituto Tecnológico Superior del Sur de Guanajuato (ITSUR). This paper discusses the stage of technological transfer of SICE software within the system of technological institutes in Mexico. Strategies are plotted to find possible candidates.

An implementation plan was created that should be implemented when the technology transfer is approved with another institution. A mechanism of continuous improvement is proposed that has contributed to the maturation of the SICE platform. Monitoring and technical support is provided in the operation of each of the system modules.

The results show the approved implantations and the economic income generated for the ITSUR. It created a protocol for the attention and execution of technology transfer, so it is concluded that this stage is and will remain an opportunity to understand and apply strategies in the creation of software products.

software, technological transfer, academic process

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Introduction

The Comprehensive School Control System (SICE) is a software product developed to systematize the academic and administrative processes of the Higher Technological Institute of the South of Guanajuato (ITSUR).

(Vega Olvera, Alcantar Ortiz, & Martínez López, 2015) mention in their article that 3 different platforms have been generated for the SICE system, for which they represent 3 solutions for users of desktop, web and mobile platforms.

SICE is a software project that has been developed under the methodology of the ITSUR Software Development Center (CDS). The CDS has currently accredited level 3 of CMMI, as they claim (Martínez López, Vega Olvera, & Morales Orozco, 2015) in their article, highlighting the collaboration of teachers and students in software development.

The SICE platform is a software solution that systematizes the academic and administrative processes based on a quality management system ISO-9001-2000 (SGC), and on academic-administrative guidelines for traditional and competency-based curricula. of some internal processes proper to the institution.

The ITSUR is within a SGC multi-site scheme, which is implemented in various technological institutes throughout the country. Within the multisite framework cross-audits are carried out, which have allowed other institutions to know the SICE platform, giving guidelines to be a software solution that can be implemented in other institutes in the country, generating technology transfer.

The CDS of ITSUR has set itself the objective of transferring the SICE software platform to other technological institutes in Mexico, seeking the consolidation of a robust, secure and scalable software solution.

To carry out the technology transfer, the following strategies were proposed:

- Study of the solutions available in the market.
- Dimensioning of candidates for technology transfer.
- Creation of the SICE software product concept.
- Planning the implementation of the solution.
- Compilation of lessons learned in implementation execution.
- Monitoring and technical support in the operation of the SICE system

Theoretical Framework

(Mendivil, 2015), through a collection of data on higher education institutions, counts 262 technological institutes, of which 132 are federal and 130 decentralized from the state government. A survey conducted by CDS of the ITSUR to a population of technologists of growing creation (no more than ten years) was obtained that of 20 technological, 15 implement software for the administration of academic-administrative processes and 5 do not have any.

In the same survey it was obtained that of the 15 that had a solution 10 they wanted to change the software for a better one.

The software solutions implemented in most of the technologies are two: The Integral Information System (SII) and the CONNECT system.

The SICE platform has the statistics module, module for study plans by competences, being functionalities that other software does not implement. Additionally, the SICE platform offers a mobile application for Android devices for the notification and consultation of academic information. (Vega Flores, Morales, & Vega Olvera, 2017) show in their article that the application has an acceptance level of 4.8 on a scale of 1 to 5.

Methodology

The methodology to make possible the technological transfer was carried out in stages

Stage of analysis of available solutions: 2 software were found as competition, the SII system and CONNECT system. An analysis of advantages and disadvantages was made in comparison with the SICE platform.

Candidate dimension stage for technology transfer

The following criteria were established for the transfer: The technology must be of recent creation, must have a maximum of ten if it has been created, and be located in the center, west, east and east from the south of the country.

In the **stage of creation of the product**, strategies were sought to present and disseminate the product. I'm heading to perform the following actions:

- Generate digital advertising of the SICE product to expose its advantages in digital media.
- Promote the product in the digital media of the CDS, Facebook, Twitter.

- Generate a trial version that allows prospects to know the platform

Created the concept of the product, the information generated should be sent to the selected technologists. The detailed information must be sent via email.

The execution of these first stages places the SICE platform as a software alternative for the administration of academic processes of the country's technological institutes.

For the next phase of the project, the implementation planning stage is executed. In this stage, an implementation plan is created with the different activities to be carried out during the on-site implementation.

The next stage, compilation of lessons learned, aims to create a log that lessons learned will be recorded during the on-site implementation period.

The first 3 stages were carried out in the period July-December 2014, creating a marketing concept that allows the SICE platform to be offered as an information technology solution.

The last 2 stages are activities that must be executed at the moment in which the technology transfer is authorized, as well as giving a follow-up and technical support in the operation of each one of the modules of the system.

The technical support and maintenance is finished after all the modules contained in the system have been put into operation. To execute the operation of all modules, a one-year school year is required.

Results

Article

Figure 1 shows the database of candidates for the technological transfer of the SJCE platform.

Figure 1 Prospect database for technology transfer

Digital advertising of the product was generated for its promotion in social networks, emails and on-site presentations, Figure 2 shows digital advertising. A trial version was also created so that prospects can test the functionalities of the SICE platform.



Figure 2 SICE digital advertising

(Own Elaboration)

To date, of the 35 prospects for technology transfer. Table 1 shows the 6 institutions that have implemented the SICE.

Technological Higher Technological Institute of Ciudad Hidalgo	State Michoacán
Superior Technological Institute of Tacámbaro	Michoacán
Higher Technological Institute of Cocula	Jalisco
Superior Technological Institute of the Grullo	Jalisco
Higher Technological Institute of Jerez	Zacatecas
Higher Technological Institute of Salvatierra	Guanajuato
Higher Technological Institute of Tlatlahuquitepec	Puebla

Table 1 Institutions with the SICE platform

(Own Elaboration)

The technological transfer of the SICE platform has generated revenues of approximately half a million pesos to the ITSUR.

A protocol for the attention and execution of technology transfer was created.

There is planning for the implementation of the platform on site. During this stage, lessons learned are recorded. This mechanism of continuous improvement contributes to the consolidation of a robust, safe and scalable solution.

To date, in this stage of technology transfer, 7 teachers, 15 students and 5 administrative staff have been involved..

Conclusions

The technological transfer stage of the SICE platform is and will continue to be an opportunity to understand and apply the marketing part of a software product.

The project can be cataloged as a successful pilot test in the transfer of the innovation and technological development that is being generated in the ITSUR.

The lessons learned as part of the continuous improvement have contributed to the maturity of the SICE platform, however, it is necessary to apply all of these since the procedure for supporting the platform can be optimized.

It is also necessary to implement tools to improve customer service and relationship.

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Proposal to encourage Innovation in MSMEs, with the appropriation of serious game

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Abstract

After researching entrepreneurial profiles close to the Polytechnic Metropolitan University of Hidalgo (UPMH) in Mexico, this writing provides a framework for best practices to strengthen the longevity of micro, small, and medium enterprises, employing WakeUp Brain and a 360 degree model.

In part, this writing relies on information about the entrepreneurial environment in closest three municipios to UPMH.

Innovation, Serious play, 360 degree Model, MSMEs

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Introduction

What is presented below is the experience that has been obtained with the desire to find actions that impact on the improvement of micro, small and medium enterprises.

When a review of the topic of innovation is made, it is impossible to separate it from creative processes and science. Although there is a considerable production of terms and definitions on the subject, what the University of Quilmes published in Argentina (1992) is repeated: it is possible to understand the innovation process as the use, application and transformation of scientific knowledge and technicians to solve certain specific problems. These ideas have been promoted and have been visible for more than three decades, especially in the companies belonging to the bloc of the countries of the Organization for Economic Cooperation and Development (OECD).

It seems unquestionable that innovation is linked to R & D (Research plus Development), however, every time there is a wide range of scientific writings and reflection on the paradigm that has been generated around the concept of innovation and that relates it with the MSMEs and not only with the large corporations and industries that are able to afford the cost of maintaining a team for R & D as was demonstrated in 1987 by Mordschelles-Regnier et al and contrary to what the collective imagination has traditionally thought when associating major multinationals with major multinationals (Vossen, 1998).

The idea is not to make an extensive treatise about it, but to pay towards what is closest to companies that use soft technology (it is known as that which refers to its internal or administrative development) or to what is not necessarily generated in industrial processes and transformation.

That is, MSMEs that are mostly service providers and in a lower percentage of manufacturing and intensive application of technology.

Justification

How could the UPMH be effective through the Innovation paradigm? In the context of being an educational entity, with limited human and economic resources applied to research it has been indisputable to understand and have knowledge about the population that lives in the region or territory in which the educational infrastructure is located.

For the institution, located in Mexico and in a metropolitan area adjacent to Mexico City, this knowledge is coherent, not only from the perspective of considering the population as the possible users of educational services but also to that population at the same time that can be served in various areas and thus achieve the link with society, which sometimes seems a utopia and for the much-needed transfer of knowledge and technology in which an institution of this nature should have as an aspiration, in its ratio of be and in their schedules. However, it is not intended to do from a welfare paradigm, where the actors involved or the community that is impacted or linked has a passive role, right there is the right field for what is recently known as Innovation with a basis in the social.

The institution in question is one of those that, in its category, represents a possibility to make a qualitative leap for those who graduate by belonging to the BIS Universities model since 2014, which means being Bilingual, International and Sustainable.

This connotation implies maintaining an innovative perspective both of its internal administrative issues and its outward projection.

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Involves activities particularly directed to both students and teachers who give support so that graduate students can do so in an environment that distinguishes them from the new generations that are coming out in this school year of 2017.

The BIS graduates are students who have a level of competitive English, who had opportunities to have exchanges in other countries and who maintain an attitude and understanding of the world towards sustainability which, as we know, is a strong aspiration of our civilization because the dimensions of the environment and harmonize with those that allude to social and economic factors. In this context, the institution can aspire to make social innovation a perspective that contributes to the appropriation, modification and operation of the paradigm through the co-creation of initiatives that can be efficient, accepted, incorporated and inclusive.

With the information that we have of the companies that are located in the municipalities that are geographically close to the UPMH, our strategy is to promote what has recently become known among innovation strategies: gamification.

Although the term is a composition of an Anglo-Saxon word, of "game" (game) and that effectively alludes to the ludic, to the enjoyment of an activity, it has turned out to be a tool that can be applied to transform the entrepreneur's vision and that which is related to your company internally. It is a bet that you have to work on and bet decisively.

It requires a huge amount of time and effort to use the innovation for the takeoff of the MSMEs, but it is considered that there is no other option that is affordable, we must bet on the creation of value, a recombination of what already exists.

Open innovation practices in companies will never see the fruits if the so-called internal business ecosystem based on knowledge and acceptance of the "culture of innovation" is not built beforehand and organized from a structure that encourages the participation of all members of the organization.

Gamification is a practice that facilitates a participatory culture based on the innovation of internal and external agents.

There is a whole theoretical framework that supports the use of this resource, however, what we want to emphasize is that, within this strategy, a series of ways to carry out gamification have emerged. On the one hand is what refers to marketing and customer acquisition through the use of social networks and applications or apps, which has interaction through video games or the use of information technology such as clear examples Foursquare that appeared in 2009 and has become a benchmark application in both geolocation and gamification.

Another case is that of Nescafé Dolce Gusto that includes on its website a section of games for registered users; BBVA, which in the banking and insurance sector is committed to this new strategy initiated in 2012 for Spain; Nike under the Nike + modality, both in the functionality it provides for the user, and in the way of communicating its strategy and the devices through which the connection can be made, marks a benchmark of good practice in gamification (De Pablos and Gallego 2013, 811) all with the intention of maintaining an interaction with users or customers.

As an example in the services and with their own employees, according to what the authors De Pablos and Gallego (2013) report, Accenture¹ is a consultancy that is advanced in the use of gamification to change behavior and motivate in the achievement of actions, promoting new values not only work but habit that they want to introduce into the life of their employees of a company, whose results are reflected through its initiative that has supposed: "an improvement of the motivation of the employees ciphered in a 6%, likewise that the improvement of the labor climate has increased in a 7%; the loyalty of employees by 5% and the decrease in turnover by 2%, concluding that the impact has reached 56% of the workforce".

Another clue about the implications of gamification, is a branch known as serious games as those designs that are used to reinforce knowledge, as reported by Mezquita and Vergara (2016) in reference to use in a school, where Its use is increasing in the application of the methodology that has favored the dynamics of teachers with their students and that has been achieved that they are increasingly involved in the teaching and learning process. These authors affirm that it has been demonstrated that the dynamics of active learning can clearly motivate the students and the people involved in the process (Baillie and Fitzgerald, 2000; Freeman, Eddy, McDonough, Smith, Okoroafor, Jordt and Wenderoth, 2014; Huber, 2008). In this sense, the strength of innovation in the processes of generating knowledge through the game is a circumstance that the UPMH wants to capitalize through the Educational Program of Administration and Management of SMEs, through its application first in the classroom, with the use of an exprofeso built facility, the laboratory of Lego Serious play.

¹ Accenture integrates "gamification" into everyday work, disponible online en: <http://careers.accenture.com/us-en/about/news/pages/integrates-gamification-everyday-work.aspx>

This infrastructure enabled in the facilities of the University, is for the use of students in a first stage of this initiative and in a subsequent, open the possibilities of training and use by the business ecosystem, ie, entrepreneurs and institutions of the municipal government of the region, involved with the promotion, strengthening and development of the productive sector.

Problem Identification

One of the questions with greater weight for what is intended to be developed is what or what type of appropriation of innovation is relevant to strengthen microenterprises in the region? What can be done to support and impact these economic units that make a considerable effort to survive?

Innovation, despite being a word widely used today as a virtue that should be cultivated and encouraged, finds real difficulties in its application. Coupled with this, the MSMEs have the stigma that, as most have difficulty remaining in the market, they change quickly or disappear.

In this sense, it is real that in areas whose economic dynamics are conservative, such as the one that presents the area close to the UPMH, it is essential that the existing economic units be revitalized or at least maintained. That is where participation is not ignored as a factor of change in the institution in question.

The elaboration of this document has among others, the objective of putting into consideration the strategy that has been cooked, as a metaphor about the preparation to undertake in a Mexican university, with certain territorial and regional characteristics to positively impact the MSMEs for that achieve their strengthening and permanence in the business ecosystem through innovation within, as the paradigm and the antecedent for future projects.

It should be noted that prior to this determination, an exploratory study was carried out with diagnostic characteristics carried out in 2016 that served a representative sample of micro-enterprises with a gender perspective, which allowed for first-hand information and which is valuable input for the continuation of the research proposals to be addressed in the future through the intervention of the academic body with which UPMH has the area that deals with the business sector.

Hypothesis

That said, it is established that, as a finding that confirms what a good part of the literature reports, the determination of the profile of the entrepreneur for the topic of innovation is a guide for the actions to be carried out.

In this sense we have the following hypothetical framework:

- With the detection of good practices it is possible to improve the modernization and competitiveness of MSMEs, with the support of the innovation component that is acquired with gamification and with the perspective of the 360 model^o.

Faced with an unflattering picture of the growth of microenterprises in the region that make up the three municipalities geographically close to the University (Tolcayuca, Villa de Tezontepec and Zapotlán de Juárez), one must act on the premise of detecting good practices to improve modernization and competitiveness, with the support of the innovation component.

Objectives

General objective

Strengthen MSMEs in the region to remain in the market through actions that encourage the use of innovative strategies.

Specific objectives

- Determine the premise of innovation under which action is taken
- Apply the 360° model and the gamification of the serious game with the WUB.

As a theoretical framework

The specialized literature is coincident with what Benito et al. (2012) in the sense that the factors that contribute most to explain innovation in companies with fewer than 10 employees (which for the Mexican case, the number of employees is what determines the size of the company and the sector to which is dedicated) are the internal type, that is, those linked to the profile of the entrepreneur such as training, age and experience and internal strategies led by the entrepreneur, while the variables of the environment, which are so significant for the large company, they do not significantly impact the MSMEs, that is, these "environmental" factors contribute to a lesser extent, unlike those considered as "internal".

In the search of antecedents that confirm that the decisions that are taken have an epistemic body that supports them, it was found the existence of a generic analysis model that has proven to be useful to incorporate the innovation on the part of the companies and that to apply it must recognize that innovation is influenced by a set of variables, same as Hadjimanolis (2000), cited by Benito et al (2012), has integrated into three major categories (Figure 1):

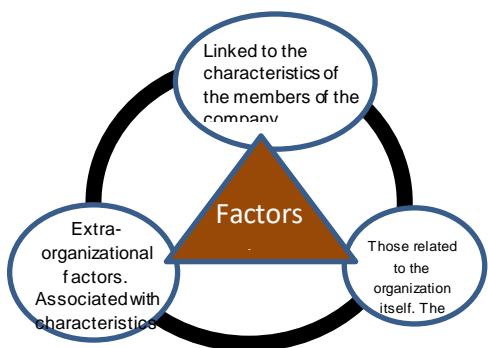


Figure 1 Factors that Influence Companies at the Time of Innovation

Source: Prepared by the author with the ideas of Hadjimanolis (2000)

It is important to take into account these stated factors as they intervene in the model in a decisive manner, in the case of implementing actions that allow innovation and enable replication of the practices in a Mipyme from an educational platform.

Now, of the authors who in the last century were occupied by unraveling the relationships that exist in the participation of universities in the concert of relations with society -as an educational institution- in the face of generating knowledge and participating in research basic scientific and development, it is that in the subject of innovation through these channels, is Rosenberg (1982).

Who determined that before the adjustments in the roles of the economy and politics, not necessarily the R & D is a determining factor sine qua non to encourage technological development and industrial innovation. This idea brought with it a rethinking of the role of universities and even drew attention to the way in which the processes in which knowledge is generated and disseminated by a society that demands it must be addressed.

Years later there is a new approach to the role of universities that, in some way hold a more democratic possibility of establishing links with the productive sectors and being the channel of what is proposed, is produced and applied in the context of the generation of scientific knowledge, through research and development that establish the conditions of greater productivity with an adequate application of technology.

The above briefly describes the dynamics that attend the production of knowledge and the linkage that allows the application and resolution of problems of a particular context, in this case Gibbons et al., In 1994 they contribute their perspective and this phenomenon they denominate as the performance of an "external agent" that may be the participation of the industry, the government or the companies with which the contact has been made, and the support and cooperation that, implicitly entails changes in the institutional operations and performance toward a flexibility that for our case, strengthens the creation of academic bodies with an important load towards research privileging interdiscipline and with a wide recognition towards the university, as an active agent in the diffusion of knowledge and with real links with its environment, such as This is the case of the Polytechnic University of Hidalgo (UPMH), particularly nte in the

Educational Program of Administration and Management of Small and Medium Enterprises.

The perspective of the Model 360°

This model is proposed by Allamand and Monge (2016), is based on a process of co-construction of an innovative solution to one or more social or environmental problems and that is relevant to its adoption because it is part of a diagnosis and is intended to be carried out until its concrete application. The authors offer it as a methodology to companies or interested entities such as the UPMH with the purpose of intervening in the nearby communities, requesting their involvement and active participation in each step. It is called 360 ° because those who participate learn the techniques to develop projects with social impact and can then repeat the sequence with other members of the community; that is, they start a new cycle.

The model consists of three phases that are summarized below, with the following image:

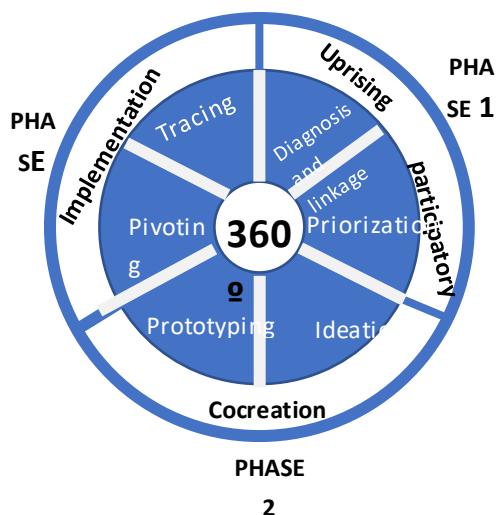


Figure 2 Outline of the 360° Model

Source: Allamand and Monge (2016)

Methodology

The 360° model is used to convert it into the scheme on which the activities to be based are based, adapting to the possibilities and particularities that are found in the institution.

The scheme explains the factors and the actors that will participate. The first phase called Participatory Lifting alludes to an activity where the members of the community and the university, georeferenced the main problems and opportunities of the territory in a real map.

The most important problems are determined and the tools provided by the WakeUpBrain are used, as explained below, as an alternative proposal to the methodology of the original problem tree, however, it is used for the same purpose to determine the causes and effects of the selected problem.

The use of gamification supports the complexity that exists in the determination of the priority of the problems because, according to the authors, "it is difficult to define it and the exercise allows them to identify what is the background of the problem originally proposed and thus establish the necessary modifications for its correct definition "(2016, 83). The results or findings are informed to the interested parties, as well as the suggestions for the work.

The second phase of Co-creation refers to the series of possible solutions to the detected problems and in the same way the tool of the aforementioned gamification is used.

The authors suggest that in this phase the participating teams build a solution through a series of workshops that include tools such as brainstorming, storytelling and the business model canvas that can be built with the versatility of the WakeUpBrain game.

The first solution ideas are identified, which will then be worked on until achieving a concrete project that should incorporate objectives, methodology, stages and a business plan if it were chosen to obtain resources from competitive funds and that the solutions would be expected to be elaborated from horizontal way, that is, by the people involved and not imposed as usual. With this last, we would be invoking one of the guiding principles of the UPMH, self-sustainability. In a sub-section, the "prototype workshop will be held, where each team builds a model of their solution in order to glimpse its execution in reality and receive feedback from the rest of the community" (Allamand and Monge, 2016, 84).

It turns out that the Implementation is the third and final phase, that is, what has been proposed must be put into operation, which will result in co-constructed projects being executed according to the availability of resources.

The authors of the model explain on this point that "this instance is the most complex, a mentor is assigned per team that is guiding the implementation in both technical aspects and soft skills (leadership, team work, motivation, etc.), a period of between two to four months depending on the progress of each initiative".

WakeUpBrain, the serious game used

It is a serious game that tries among many other possibilities, the solution of real problems, that for a Mipyme turns out to be the innovative ludic device that triggers a series of actions that, in sum, strengthen and improve the operations of the companies. The game WakeUpBrain (WUB) is a tool designed to support creative skills development processes and innovation processes in organizations as specified in its portal. The following is specifically found on its website, in relation to its fundamental uses:

- As an ideation tool and methodology for generating high potential ideas for innovation in products, services or processes. In this case, it is used in brainstorming sessions, or applying the CROMAS methodology, among others. It is also a guide for the use of the innovation MACROS methodology that leads from the definition of the framework to the design of prototypes and pilot of innovative concepts.
- As an entertainment tool or training in innovation concepts. In this sense WakeUpBrain a highly entertaining strategy game. It can be played between teams or individuals, who compete to produce the best innovations using different strategies to get the necessary resources and patent the most convenient ideas. If you want to delve into the key elements of the innovation, you can do a subsequent re-feeding session.

During the last 10 years, WakeUpBrain has been the most interesting platform for innovation games and it has worked as a tool for companies that have joined the series of games specifically for innovation, no matter the size of it. There are others such as Design Thinking, Magic Model etc.

The coverage of its application has been mainly in Latin America. Its creator Guillermo Solano of Colombian nationality has designed WakeUpBrain with a team led by him. The first public version of the game was launched in 2005, with the final version that was launched at the ISLAE fair in Glasgow, Scotland in 2009. This instrument is a synthetic game that is operated with a set of 70 large cards designed to be used as: A collection of more than 50 ideation techniques (CROMAS), a guide for innovation processes (MACROS) as well as a thematic table game.

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To say of this brand of game, it is reported that more than 5,000 people from 25 different countries have been trained in WakeUpBrain in the last 9 years. The WUB's framework of thought uses three basic components under which its interactivity is based on the people with whom it works: 1) Exciting questions, 2) Ideas first and 3) Expanding. This game is particularly used in a workshop session of 30 to 45 minutes to show how to take advantage of the game methodologies to understand the challenges in other ways, generate really innovative ideas and take them to the next level, is played in groups. It takes a series of psychological aspects where it is encouraged that the participants in the game compete and win various badges (objects, status, etc) and recognition, making the experience exciting.

He has exercised with students in class to resolve conflicts with good results, which encourages him to continue exploring the possibilities that the game has.

The UPMH has been certified in this game obtaining the elements for the experience of the WakeUpBrain, for which a program that serves the entrepreneurs and is the laboratory where with the premise that the game can allow the adoption of practices that strengthen the administrative processes, which can generate internal synergy in companies, as theory and experience suggests.

Results

Having said that, UPMH is in a position to apply the 360° model, which ensures that it is committed to Social Innovation given that said model invokes the mechanisms that can be applied in the concrete.

Innovation, as is known, comes from an idea, preceded by an identification of a problem to be solved where such innovation finds its place and pretends to be the feasible proposal in its application, because it is possible that you can have the best idea, the more finished innovation, but if the mechanisms for its operation and implementation (or socialization) are not found, such innovation is not such.

This participation of the university can be compared to what according to Molas-Gallart et al. (2002), cited by Castro and Vega (2009), can be termed with the "third mission" that encompasses all those activities related to the generation, use, application and exploitation, outside the academic scope, knowledge and other capabilities of those that the universities have.

In particular, the strategy that has been piloted to be a continuous practice in the short term, is training in the use of the WakeUpBrain (WUB) tool, mentioned above.

At the moment the partial results are reported in the application of this strategy as a pilot in a Hidalgo company, which is not in the radius of influence, since it was first tried to see if it worked well for the fulfillment of the objectives that have.

WUB in Mi Cabañita Restaurant²

This company is one that is considered by the number of employees as a small company. Its main characteristic is the regional and Mexican food with gourmet food tints and it is located in the countryside completely, between the cities of Tulancingo and Pachuca of the State of Hidalgo and led by a young businesswoman, who has bet her investment to offer her culinary skills in addition to being considered a family business, opening its doors 5 years ago.

² <https://www.facebook.com/Mi-Caba%C3%81ita-178484202305831/>

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This company presents a series of problems for its full development. The response of the diners is acceptance, is very much in demand especially on weekends. This has led to the expansion of its facilities. When identifying that it was necessary to do something to solve the problem, a training for waiters was obtained online. In that quest to improve they contacted each other and asked for the corresponding support.

Hence, it was favorable to use the strategy and model of the WUB, which was carried out on May 18, 2017, on site, that is, at the company's facilities.

It was operated under the following Objective: Integrate the company's collaborators from the different areas to achieve the collective identification of the main ideas through the use of the WUB strategy to solve the problems that prevent a sustained growth of the company.



Figura 3 Eligiendo la tarjeta que represente a la empresa en "Carrera de obstáculos"

Fuente: Dulce Olivia Fosado Mtz.

Development

The effective assistance was of 7 members of the company. It began with the explanation of what it means to work innovation and especially with regard to serious games.

There was talk of "exciting ideas and the WUB method".

The level of studies and experience of the participants was varied, so care was taken that the messages were understood by using a language that used complex concepts.

It began with the presentation using "This card represents me", later the "Mentalist" was used, as part of the games proposed by the WUB. Once the tension was broken, the "Obstacle Course" was played and ideas were identified and the most pressing problems identified were identified..



Figure 4 Discussing in the "Obstacle course"

Source: Dulce Olivia Fosado Mtz.

The second part of the "obstacle course" was used and the problems were prioritized, resulting in COMMUNICATION, the problem identified as the most frequent, that is, there is a lot of interference in the messages arriving correctly and with opportunity to the areas of the ones that make up the process "from the taking of the command to the kitchen and from there to the table.

Once the above, we proceeded to play "Bad Ideas". There some of them were obtained to genius them, mostly "desires" were found, as can be seen in the images.

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Figure 5 Locating the problem
Source: Dulce Olivia Fosado Mtz.

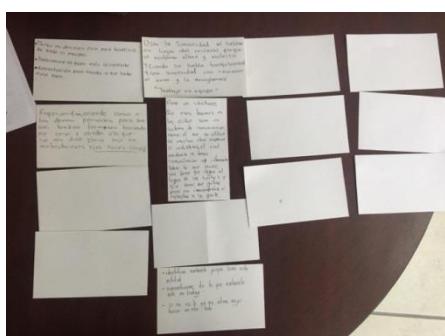


Figure 6 Various solutions to the problem of Communication as the identified problem
Source: Dulce Olivia Fosado Mtz

Time was the limiting factor, however, there was the motivation to continue exploring with the problems that were identified collectively in successive sessions, given the work dynamics of this company.



Figure 7 Reverse of the location cards of the Communication problem.
Source: Dulce Olivia Fosado Mtz.

The "bad idea" for communication, for this example was to put on taps in the ears, that is, they are asked to imagine the worst of the solutions, which can even be considered as improbable or crazy. When performing the "genius" exercise, the idea was obtained of using a device that makes communication more effective, especially between the areas of greatest conflict such as cooking and service.

It is understood in this case that the "genius" is to find the best solution, that "bad idea". This way of dealing with a problem in a collective way triggers ideas that of first intention would not have been posed for the resolution of a problem, something like what is known as "thinking in reverse".

The important thing is to have the cognitive tools that allow the management of a group that is in permanent contact with the problem to be solved, in the understanding that the characters that participate manage to find unthinkable solutions and of an intrinsic value and without realizing it being a game.

The experience in the company Mi Cabañita, proved to be stimulating. For the people who participated it was evident that they felt comfortable and when asked their opinion, the majority agreed that it was interesting and when reporting the results to the owner, she seriously considered taking into account the proposals that were systematized.

Observations

Perhaps as a self-criticism, it should be noted that the difference between IDEAS and DESIRES among the participants was not clear. This made that, with the enormous potential of the "Bad Ideas", only an idea that could be "genius" was found as part of the process suggested by the WUB. It is considered that a second visit is necessary.

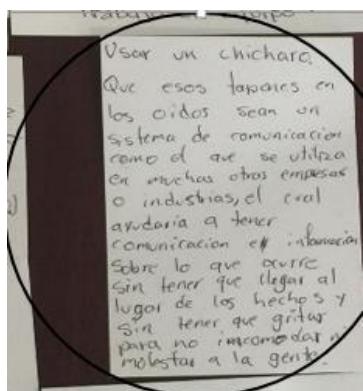


Figure 8 Detail of the proposal to improve the problem identified on Communication

Source: Dulce Olivia Fosado Mtz.

Conclusions

It is a great challenge that the University (UPMH) has to be able to make the conversion of an educational institution only, to one where there is effectively the link with the productive and social sector and that is recognized as a generating institution of change, of better realities and that innovation is not a snack that can be eaten by the one who has more, but that it is seen as something achievable, such as the possibility of remaining in the market with an acceptable profitability and tracing an economic model that does not deal effectively to the concretion of a harmonious and sustainable society.

The use of innovative strategies to capture reality is motivating and as a teaching scheme for new generations to teach innovation, first it must be possible with simple practices.

With the application of the exercise and piloting of the WUB both in the classroom and its use in the business environment has unsuspected possibilities, and that is expected to enable innovation in the processes of capturing the good practices that exist in the business ecosystem.

The use of gamification via the operation of some of the WakeUpBrain games together with the perspective and application guide of the 360° model, turn out to be the innovation that is proposed to be used as a way to create links and bridges with companies that are nearby to the University, and capture the best practices that are operated, however, the pretension, although ambitious, we believe that it is possible to complete it, perfect it and operate it so that later it can be replicated and favor the permanence of the MSMEs throughout the country.

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Telematic management technologies for urban public transport

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Abstract

This article is shown that relates a public urban transportation problem in a city in Queretaro, Mexico, that made review literature with topics about the subsidy as help to invest to develop this service in Mexican medium-sized cities. As well, it is reviewed the topic of pollution, from the view of another country, and it is taken to a conclusion, the creation of routes, the general systems, the road system, the stronger internet system and the proposal, where the great benefits of the usage of telematic technologies to develop this project. It is concluded with a proposal to apply with the central topics in an applet to query, but under a scheme of data base and monitoring control of all needs required to start this process. All said previously could be taken as a model to be applied in other Mexican cities. The management of the informatic technologies in the transportation to benefit users is the central topic. The article gives a revision and analysis of the telematics technologies management literature.

Transportation, digital devices, informatic, users

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Introduction

Justification

The Urban public Transport Systems in the country present several problems which can be addressed in research work like this, similarly, the same types of problems are presented in other countries, which have been treated in published articles. For example, the issue of subsidies, an urban collective transport service must be subsidized by local governments or federal governments. Not only it is up to governments to regulate and control the urban collective transport service, where their tasks range from the approval of routes, establishment of official stops for descent and boarding, establishment and publication of regulations, among others, where the subsidy must exist for the series of expenses that requires forming a urban collective transport route and groups or individuals do not have enough capital to spend on that establishment of routes and stations. Even more difficult where the collective transport must be through trains on a rail route, the investment is greater and individuals can not withstand the enormous investment load for its creation. Then it is up to the local, state or municipal governments, sometimes even in tripartite form, to allocate part of the capital they have to invest in support and support of urban collective transport networks. (Kiggundu, 2009)

The cases of Kuala Lumpur, Manila, Tokyo, or Mexico City, show that they are examples worldwide for urban public transport services and their investment at the state, federal or local level, and where they work for citizen users in those cities.

However, the cases of this type of investment are for larger cities in population size, not for small cities such as those in the city of San Juan del Río, surely the management to achieve investment in a large project of rail lines, dual or monorail, trains, stations and the whole range of services that are involved with the presence of this type of services, will not be possible because the same industrial, commercial, city, do not allow so much investment, even tax collection of contributions to the treasury, do not support large investments, therefore, it should be left aside and wait until a larger population is reached to address the solutions to this issue of subsidizing the implementation of an urban collective transport service. This is not a problem to address in San Juan del Río because it will not be possible to invest on the part of the federation, the state or the same municipality.

Problem

The issue of emissions from the urban public transport or by all motor vehicles in a city, is everyone's problem, whether federal, state and local government, citizens using private vehicles and also users urban public transport, all affected, and all cause impact to emissions, but also forget those users who do not use any of these vehicles, but being pedestrians, passers-by and do not use them but inhabit the same place where if used and they share emissions in a general way, so the problem is everyone's. In Singapore, it has been possible to create a strategic control with the creation of government policies that are applied in the reduction of emissions, with the creation also of alternative transport that uses non-polluting renewable energy among other advantages to reduce the environmental pollution caused by motor vehicles. . (Hoi, 2003)

The experience in Mexico City, first led to build an incredible network of a collective system called metropolitan, but over time simply derived by metro, an urban transport service, very low cost for the user, clear with high federal subsidy, and that led to transport a large number of passenger users throughout Mexico City, seeking to reduce emissions and creating a type of transport for the masses. There is also the trolleybus system, which works with electricity, not causing emissions from fuel used in transport and other interesting phenomena such as the management of joining transport companies in a single line among other great achievements, which, although applied to Throughout history, it has not worked. We see the example in the non-circulating program, which appeared to be the best for the control of millions of vehicles, but it did not work, since the middle class managed to save money for the purchase of two or more vehicles to be able to circulate in the days a car did not do it. So the staff of vehicles in Mexico City doubled in the first decade of operation of the program and now it has quadrupled, causing chaos with traffic and emissions.

This problem is not unique to Latin American countries, the OECD has investigated these phenomena and there are other studies worldwide that have addressed it, even the problem has been evaluated to develop appropriate proposals.

For example, in a group of Asian countries, specifically in Bhutan, Cambodia, Lebanon and Sir Lanka, (Dhar and Marpaung, 2015) in Table 1 of their article, on page 453, refer to the prioritization actions that they had to present in their respective countries and include the data in the replica of the table below.

Use of non-motorized transport

Establish policies to modify and eliminate non-motorized transport, with alternative technologies.

Transit in urban mass

Control the movement of people en masse, through the cities.

Planning and administration

Maintain control in the planning and administration of companies and the government that regulates them.

Interurban rails

Investment, development of inter urban technologies that can allow the transportation of the masses in an organized manner.

Efficient vehicle technologies

Efficiency is sought for vehicles with modern technologies that avoid the problems they have suffered in the history of transport for cities with large populations. (Dhar and Marpaung, 2015)

Mitigation strategies	Prioritized technologies			
	Bután	Camboya	Líbano	Sir Lanka
Use of non-motorized transport	1	0	0	1
Transit in urban mass	1	1	0	1
Planning and administration	1	0	0	1
Interurban rails	0	1	3	0
Efficient vehicle technologies	3	2	3	3
Total	6	4	6	6

Table 1

Source: (Dhar y Marpaung, 2015)

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However, none of these prioritization technologies and strategies can be applied in the city of San Juan del Río, because they do not correspond to the situations of these countries, since these are not applications for small cities, but are applications of strategies that are implemented in the whole country, in the cities of large populations, therefore, it is not corresponding to the case that is proposed to analyze and evaluate, for a proposal in the city of Querétaro.

The most important thing would be the proposal to reduce pollutants in transport using alternative renewable energy technologies that do not pollute and do not cause damage to the environment. (Dhar and Marpaung, 2015)

Hypothesis

The urban collective transport service in the city of San Juan del Rio, presents problems that can be solved with the management of the use of telematic technologies for its improvement.

Objectives

General Objective

Identify the problems that exist in the urban collective public transport service in the City of San Juan del Rio, Querétaro, derived from the fact that the routes offered are not known, the schedules, fares and a large number are not known of additional problems.

Specific Objective

Find the possibilities of proposing technologies to create an application that can solve the information needs, the control of a database and the fleet, as well as to solve the problems of telecommunications in a city in the process of being intelligent.

Theoretical Framework

In an approach to the routes that are established in San Juan del Rio, do not amount to more than 27, which are authorized to operate in the city, in the urban part, since the municipality has urban routes, suburban routes, routes foreign and mixed routes. The only routes that are part of the topic of this research is that of urban routes, the others will be excluded because they are not part of the study.

At first, several years ago, the citizens of San Juan del Rio, began to need collective transport and gradually, taxis were authorized. This allowed any person, citizen who obtained his license plate to operate, could provide the taxi service. Of course, he had to have his mobile transport unit, knowledge of the city and experience as a driver of vehicles. However, the service was lousy, uncontrolled, expensive and many abuses were committed, causing no quality recognition. The ladies did not receive good treatment and everyone complained about the terrible service.

With the passage of time, the Diligencias emerged, which were organized minibuses in a concessionary transport line that began to provide good service and linked the two parts of the city, the center with the east. After that and with the surprising growth of the city, two more concessionary lines were authorized, which are those of the FTEQ and the CTM, which operate not only in San Juan del Río, but in Tequisquiapan and Ezequiel Montes. (Treviño, 2016)

There is no catalog of routes that can be consulted by users, so it is necessary to create one. Check the routes and if possible the schedules. The only way to know about the routes operating in the city is by asking the same users.

And if someone does not know or has bad will, they simply report erroneously, which causes more problems. It is also not known what time the first route is in the morning and what is the schedule for the night routes. This misinformation causes great confusion and problems.

Similarly, we must modernize the fleets, their services, the staff and give some advantages of modernity and updating as the information of all the above, but in digital form. This information will be broadly addressed in the proposal of this investigation. However, one of the urban collective transport lines of San Juan del Río, is already being revised to integrate GPS locators and video cameras so that the signal can be seen from a control and monitoring center, this was announced in a press conference in the month of November 2016. (Treviño, 2016)

Of great importance the contribution of Camacho (2016), where the philosophy of thinking about transport is that it is focused on the passenger, on the user who travels and consumes this type of service: the philosophy is the innovation of focusing on the passenger. (Camacho, 2016).

In its three derivations, commercial aviation, the connected vehicle and the reconceptualization of public transport. The latter is where the idea of shared public transport is focused for its consultation, knowledge and use, with an application equally focused on the passenger so that it allows a better use of the routes, schedules and all the additional information that allows . (Camacho, 2016)

Research Methodology

The human body is full of systems, digestive, circulatory, auditory, visual, many more, and that human condition is identified from the entrails of the human to its outside, for example, a lot of factors in previous centuries in the cities helped creating systems, for example, in houses, walls, supports, columns, providing shelter and protection to people, in addition to others, such as water supply, waste in channels, served as systems external to human beings , with great help to their own development, life and growth. As the cities grew, these systems also needed development and expansion, causing a great manifestation and creation of more developed and sophisticated systems. Everything that surrounds the human being is composed of systems, from the most basic principles such as sleeping, eating, drinking, is supplied through systems, and everything outside is also provided by systems. (Mitchell, 2007)

The fact that a large number of people live in a city, this allows them to be connected to different networks and systems, which, without their participation, life would not be the same; even, every year, every period, networks and systems face improvement processes, which makes them more practical and convenient for use with the inhabitants.

The use of a currency in a country is a whole system. The language spoken and written by a certain population is a communication system with many variants, but it is a system. The transmission of television programs is a system, which implies from its production of the recordings, its editing, its transmission, then its reception, decoding and projection in another device, until it is seen in our homes, it is a predetermined system that day by day, it has been perfected to what we have today, but also has the possibility of improving every day equally.

The urban collective transport is a system that also uses other systems, which must all have correspondence and follow-up to work, the determination of the routes, the control of the personnel operating the units, the determination of the rate, the form of payment and collection, the system of stops to board and descend, the schedules, the control of the cleaning of the units, in short, it is a whole system that works on the basis of other subsystems. This is a problem that we want to study, analyze and look for solution opportunities, supporting with development and technology activities (Seguí, 2004), to achieve greater satisfaction for the inhabitants and visitors of the city of San Juan del Río, second municipality in importance and population in the State of Querétaro, let's see this segment of a magazine article.

"Urban traffic is now complicated in most metropolitan areas of developed countries where congestion has become a daily problem of difficult solution. A problem that produces undesirable effects on the mobility of drivers and pedestrians. Failure to comply with schedules in public transport, increased travel time in public and private transport, air pollution and intolerable sound levels that seriously affect health are some of these effects.

All this results in an evident decline in the well-being of the population, but, in addition, has its correlate in significant economic losses. "(Seguí, 2004: 1)

The issue of the systems will be addressed for its solution in the aspect of an urban collective transport system for the city of San Juan del Río, where technology can be applied, apply the management and propose an innovation project in these two senses previous And the subsystems that this need requires will be addressed.

Type of investigation

It is a quantitative and qualitative research. Quantitative because the aspects and factors of flotillas, user population, distribution centers and Internet signal emission, repeaters, routes will be considered, therefore, their objects of study are quantitative.

The research is qualitative, because the problems that arise to improve will be analyzed and in the proposal the factors that will change the quality of the services will be considered, making the users more satisfied with it.

Theoretical methods

It is very important to consider this aspect in city life, the road system, which includes transportation routes, the direction of roads, the width and thickness of the streets to transit, the areas allowed and restricted, the hours of circulation or restrictions such as the No program circulates in several important cities of the world such as Mexico City, as well as the traffic signaling, signaling, personnel control system on foot, control with patrol personnel or control with motorcycle personnel.

The subsystem of stops and / or boarding and descending stations, all are aspects that must be planned according to the growth of each city and each local need. In the city of Tokyo, it is estimated that due to traffic problems, 50 million euros are lost each day, since congestion causes many problems of various kinds, for that reason it is necessary to plan the road system, the place where the means of transport and specifically the means of urban collective transportation in the city of San Juan del Río, which will lead to several problems to be solved beginning with the origin of the city that has had different stages due to different needs. (Seguí, 2004)

In its origins, the city is developed in the pre-Columbian period by the proximity to the river and to be between some rocks where there would be place for rituals and to observe enemy attacks. Then comes the colonial era and there is San Juan del Río at the beginning of the route to the north, as it was called the Camino de Tierra Adentro now declared a World Heritage Site by UNESCO mentioned in the Informador (2010), since it was the passage for the north from the city of Mexico to strategic points for trade and for the exploitation of mining, say gold and silver.

San Juan del Río was developed because in the rainy season, the river had a growing and needed a place to spend the night, including the service for people and animals of draft or load, that's why the former hacienda of La Venta is to take care of a side of the river that need and on the other side of the river, several places were developed to stay. (Informer, 2010)

With the passing of time in the 70's of the last century the Mexico-Querétaro highway was built and brought with it the eviction from the center of many commerce and food places, industrial development reaching the city due to the use of groundwater. Trade and other services also arrive.

However, they did not realize that the city had been designed originally for the passage of carts and cars with draft horses, so it has a medieval type cut, although it has no hills and mountains such as Zacatecas, Guanajuato, San Miguel de Allende or some other mining type, such as El Oro, Tlalpujahua, Taxco, simply in a semi flat place, at 1890 meters above sea level, the city develops.

Even in times of the previous century and of this the expansion of the same city towards the east is built without adequate planning, which makes it very difficult to develop excellent roads such as in the city of Obregon in the State of Sonora, which has a planning urban excellence Without observing, for example, the electricity supply network, the potable water supply and sewerage network, the drainage network, which causes problems in the roads so that transports transit. Therefore, they must be addressed at some point for their solution. Neither have they considered that in the future they can have transport as a collective train type Metro, or a monorail, they have left the roads without development opportunities.

Today the city of San Juan del Río, requires a proposal to improve the roads for the passage of transport, both private and private, as well as specifically the urban collective transport. It could address issues such as the proposed "Civitas Initiative that takes place in 19 European pilot cities: Aalborg (DK), Barcelona (E), Berlin (D), Bremen (D), Bristol (UK), Bucharest (RO) , Cork (IRL), Gdynia (PL), Göteborg (S), Kaunas (LT), Lila (F), Nantes (F), Pécs (HU), Prague (CZ), Rome (I), Rotterdam (NL) , Stockholm (S), Winchester (UK). Civitas is part of the EU's 5th R & D framework program and aims to support the development and implementation of innovative and effective measures to improve the problem of urban transport.

"Electronic controls have been introduced to limit traffic in cities. urban centers, has also opted for a logistics improvement, information is given to the traveler and public transport itself. Intelligent transport systems have been proposed to manage urban transport with new strategies. (Seguí, 2004)

On the other hand, Pozueta (2000), considered in his time after a long analysis with graphs and theory, that it is necessary to promote in the cities the use of urban collective transport against the reduction of the individual vehicular transport. With a large number of options such as cycling or walking, including the promotion of special lanes for collective transport beyond the lanes for individual transport.

Also with policies such as higher fuel prices among other policies, but the main trend is that both local, state or federal government, and organized citizens, should promote the use of urban collective transport in preference and almost absolute priority, and reduce individual transports. (Pozueta, 2000)

Proposal

In order to achieve a project for the development of urban collective transport that can be applied through the management of technology with digital devices, quality and innovation strategies, it is essential to strengthen the internet system. The current networks are not providing a strengthened system, on the contrary, it is weak, with too many failures, falls and this does not allow projects of better quality to be developed.

Let's see what Castells and Quintana (1995) think, "In order not to get too far back, we started in the decade of the 80s, an especially significant decade because a set of relevant innovations converge in it: microcomputers, data transmission networks Low cost or data storage systems.

These innovations prepared the revolution that would take place in the middle of the 90s and that involved the convergence of technological innovation and digitized information through the network of networks, the Internet.

Information and Communication Technologies have since inaugurated and defined the new information society "cited by (Seguí, 2004), the Internet service stands out among other factors in order to revolutionize telecommunication and digitized information.

On the other hand, the same Seguí et al, (2004), mention that "Already in the 2000s, the technologies communication and data transmission made it possible to query data on mobile devices, such as cell phones or Personal Agendas. Digital Assistance (PAD). Thus, through the mobile phone or the PADs that have access to the Internet, the user can access the data transmission networks from anywhere.

For example, through an Internet interface, drivers have the possibility of accessing the digital plans of most European or North American cities through personal agendas or on-board computers, "so the use of digital devices such as the cell phone, now called smart and the personal assistance digital diaries, the pad, to connect to the Internet and interact with applications and digital information. The necessary thing is to maintain that connection to the networks of data transmission from any place. (Seguí, 2004)

The city of San Juan del Río, requires that leap towards technologies by implementing, for example, the GMS technology, which means Global System Movile, that is, Global Mobile System, even now surpassed by another technology such as UTMS, Universal Mobile Telecommunication Service, that is, for its acronym in English, Universal Mobile Telecommunication Service, which consists of a third generation technology that works with a protocol called WAP, that is, Wireless Application Protocol, or in other words, the Protocol of Wireless Application, which allows the devices to connect with each other, through the Internet.

This technology is 200 times faster than the GMS. Currently in Europe, the leadership in the information systems depends on the UMTS. All movements can be made based on the transmission of voice and data in digital format, all images, transactions can be made, also make payments in virtual currency, videos and the use of high quality multimedia. (Seguí, 2004)

To support in control, monitoring and security, another communication technology is used to support the SIT (Intelligent Transportation Systems) and it is the GPS, Global Position Systems, Global Position Systems, for its acronym in English, which allow the location of vehicles and the movement of them in real time. (Seguí, 2004)

A well-established extraordinary network must be created so that, in the city of San Juan del Río, users can implement this type of systems and subsystems for better communication, and the best provision of the urban collective transport service. The city would become a totally intelligent and virtual city. The OECD (2016) lists the laws that currently allow the regulation of the topics of Internet use in Mexico, with the following publications:

Federal Law on Protection of Personal Data in Possession of Individuals, published in DOF on July 5, 2010; Regulation of the Federal Law for the Protection of Personal Data Held by Private Parties, published in the DOF on December 19, 2011 and finally the Self-Regulation Parameters in the field of personal data protection published on May 29, 2014. (OECD, 2016). There will have to be more collaboration and contribution from the Congress of the Mexican Union to implement more laws as it is discovered and other aspects of Information Technology are needed in the Economy, in the Systems and in the daily life of the citizen users.

The OECD (2016) also considers that the Internet system should be strengthened not only in Mexico, but also in other Latin American countries so that through its services the economic development, security and sustainability of the regions can be improved. All the above with a better broadband in the national system so that all citizens can benefit. (OECD, 2016)

Result

The proposal is as follows, and the information in the table that includes the integral strategies of an Intelligent Transportation System (SIT) is taken as a model, with the following applications and with the responsibilities according to a proposal presented by Miles John and Perret, Ken (1997) cited by Pérez, Gabriel (2001):

ITS application	Main decision maker or responsible for its implementation
Management and control of interurban traffic	Government, highway authorities and tenured highway concessionaires
Electronic tolls	Government, authorities and concessionaires of tendered highways, bridges or tunnels
Management and control of urban traffic	Local authorities with support from the central government
Electronic identification of vehicles	Authorities, concessionaires and private that require it
Speed and traffic monitoring	Authorities and police
Passenger information systems	Bus operators and collective transport authorities
Payment cards	Bus operators and collective transport authorities
Driver information systems, including VMS, GPS	Operators of buses and fleets, private vehicles, authorities of collective transport and government
Efficient fleet and cargo handling applications	Operators of fleets of trucks or cargo transport, multimodal operators
Applications for road safety	Government, highway authorities and tenured highway concessionaires

Table 2 Main applications and its responsible for implementation

Source: Miles, John y Perrett, Ken (1997) Citados por Pérez (2001)

As for the management and control of interurban traffic, it does not apply in this proposal because the scope is only for urban collective transport. This possibility is ruled out in this proposal.

The electronic tolls do not apply either because it implies the payment of a fee for the use of the motorways, so, since it is a project for a city, for a purely urban center, then it will not be used in this proposal.

The management and control of urban traffic if included in this proposal and will have to be established in the research project to consider all the possibilities that are required as a control center with telecommunications, with equipment for the emission and reception of signal, of voice and data, and that there is a monitoring of the buses, the stops for users, the points of repetition and connection to Internet, even to the personnel that operates the units. Throughout the research process other alternative needs will arise to resolve with this proposal, such as control of bus flow, entrances, exits, route, and traffic conditions in the city. The boarding and descending of the users of the routes. (Pérez, 2001).

For this strategy, those responsible for the control and management of urban traffic are the local authorities with support from the central government, that is, the local government and perhaps an inter-disciplinary committee with representation in these sectors of government, chambers of professional associations, industrial, commercial, education sector, health sector and society in general, so that the decisions that are made, are totally permeated by majority and without particular or specific interests. The search is for traffic control and management that is efficient and of high quality. The management work will be left by the stakeholders of the local government and the representatives of the companies that provide the transport service. (Pérez, 2001).

To improve the control of the vehicles, of the urban collective transport units, the following strategy is required, the electronic identification of vehicles, which allows us to first know the total of the units with which it is counted, of course with a dynamic database that allows the immediate identification by the search of any of the items of the base, also by way of inventory, a coding number not only by the engine number, but by the unit numbers assigned by grouping, Measures, FTEQ and CTM. In such a way that they are under control, with highs, lows and movements by update. (Pérez, 2001)

Also that you can know where they are, in which of the roads they are, where they cross and more information about the route taken, together with information on the applied maintenance, daily cleaning, complaints received by the unit and its operators, in case of accident, the registration of all information. All the above, controlled from an intelligence center that leads to perform these tasks of the strategy. (Pérez, 2001)

Those responsible for achieving this strategy, to maintain it and to take it to its permanent continuous improvement, are the local authorities, the concessionaires and individuals that require it and that have been assigned. It is important to add that this strategy will increase security by the control of the vehicles, it will be possible to help with GPS technologies, UMTS and other standard telecommunications services that are already known in the market, supporting of course with a closed circuit system with cameras in the units, in strategic points to be able to review the information that happens every day in them. (Pérez, 2001)

A very specific strategy for the control of the units in question of traffic in the roads is the monitoring of speed and traffic, which corresponds to the local authorities and the road police, however, it is also required and useful for the representatives of the 3 urban collective transport lines. Sensors are placed to record the speed of the units, both externally and internally, which help to fully report the speed of the units with high technology, if there was a stoppage by any unit, an alert would be recorded for know that something is happening, in the same way if the maximum speed is exceeded both for the normal route and in roads of greater caution, you must report a different alert so that the situation of the speed increase can be verified later. It is a very logical and very important strategy that will help to increase the quality of the service and guarantee the safety of users, operators and the same urban collective transport units. (Pérez, 2001)

One of the strategies of great importance for the continuous improvement, for the development of the society, is to have an urban collective transport with information systems to the passenger, to the users, where the routes can be consulted, the costs of the routes, if there are discounts, if there are cancellations, including recommendations for visits to cultural places, events and other additional services, all through web pages or blogs that can be consulted through an application to traditional systems such as Microsoft™, Android™, IOS™, among others, then from a digital device, mobile or fixed, a computer, a laptop, or any other similar nature, the person who wants to consult all kinds of information can do so as long as they have access to the Internet. (Pérez, 2001)

For example, when boarding a bus, with specific codes of Augmented Reality, you can know the operator's data, your name, age, employee number, among other data, or consult the bus data, your traffic registration, your numerology, you can even know the location of a unit, recognizing that it has been launched on a route, or if you are in a unit, then to be able to inform someone you trust that you are in such a unit to be located and follow up through maps.

This strategy will require management sessions to negotiate with companies that already provide these location services or maybe create some new ones, using the same aforementioned network of sensors, combined with GPS, UMTS, and telecommunications to be able to provide the information in a complete way. to users or prospective users, it is not necessary to be a user, but the general public that wishes to consult information on urban collective transport. (Pérez, 2001)

The previous conceptualization is supported by Foth (2013), where it is indicated that the user of urban collective transport must be supported with entertainment when sitting in any unit and that from there, it can be connected not only for fun and distraction, but for interact with information applications, links with other routes, specific routes, rates, schedules and a whole range of additional information services in one or several applications that provide this sense for the simple fact of being connected to the Internet. (Foth, 2013)

Those responsible for the implementation of these passenger information systems will include the bus operators, the authorities that control and represent the collective transport, and perhaps the monitoring centers of the same service.

It is very likely that, in order to implement these systems, tripartite investment will be required, part of the entrepreneurs that represent the urban collective transport lines, another part the local government supported by the state and federal governments, and finally some of the associations that can participate with a little investment. (Pérez, 2001)

This is a very attractive proposal for the users and very convenient for the administrators of the urban collective transport lines, since it consists in that the user will no longer charge any kind of cash to address the transport services, all will consist of cards of payment in several modalities, for example, a card with microchip, which is recharged in specific kiosks distributed in the city for its operation of sale and collection, but also rechargeable through electronic transfer and payment with credit and debit cards. Another option is the cards with electronic band, which bring a charge of specific prepaid rate, which are bought in the kiosks, are not rechargeable, but they are bought even in other self-service stores.

A third option is to pay with a type of tag that is loaded and recharged in the different modalities already mentioned, but that allow the approach to the units without problems, and more quickly, with the option to register a user or more one's. Finally, the units for the collection of the transport can accept the payment with credit and debit cards, which will allow a wide range of forms of payment, which will no longer allow the user to suffer from the load of cash or collection With change and cash handling problems for operators, everything now would be digitally, prepaid and securely. For this, the investment in equipment that makes all this service more complete, because it will have its value at the beginning, but will bring the great benefits as in the great cosmopolitan cities. (Pérez, 2001)

Those responsible for this strategy, which are implemented, are met and achieve their objectives, will be the bus operators, and the collective transport authorities, who must do all the management work for the implementation of the technology, the kiosks, of the system of collection and collection, of the negotiation with the banks and the subsidiaries so that the cards are accepted, but once implemented, the services will be safer and more efficient, proof of theft and looting, or of losses in the use of capital for the trips made. (Pérez, 2001)

As it is proposed that there are information systems for users, it is also proposed that there are driver information systems, including VMS, GPS among others, this will allow operators, when a problem arises, setbacks or doubts, including , the frequency of traffic and stoppages for special reasons, make decisions and adjust according to what is indicated, traffic and road issues that can help you give a better service. The technologies are variable, but repeated, also include UMTS and of course the Internet connection that is very important in the telecommunication networks with the controllers or the monitoring centers. (Pérez, 2001)

Those responsible for this strategy, goes directly to bus operators and collective transport authorities, for security reasons, also falls to local governments. All together, will make the decisions that arise for the needs identified, but the driver is a matter of great importance to have him in constant communication to inform him of the routes, roads and traffic issues in general. (Pérez, 2001). The strategy of creating efficient management applications for fleets and cargoes will not be necessary for this project, although it will be considered in the previous strategy, an application to consult operators on the issues already raised.

Similarly, the creation of applications for road safety, will not be necessary because it has been implemented little by little, generally the telemonitoring system with security cameras in strategic points of the city and will gradually increase to have a total follow-up of what happens in San Juan del Río, therefore, this strategy does not apply directly.

Conclusions

The set of strategies of this project is specifically for users of urban collective transport, but within this user population, there is a group of users who are classified as tourists, which, little by little, will cause a greater flow of visitors to the city of San Juan del Río, derived from the word-of-mouth dissemination that occurs, since it is not only intended for the general population, but also for a population of visiting tourists who come to the city to enjoy what it offers in culture, commerce and sports or other activities.

Technological innovation in tourism is also important and can be studied by developing several factors of benefit, which although much has been done using computer technologies, more can be done, combining one of the tourist services used by the local visitor, which is the Urban Collective Transport, where it is confirmed that this service benefits and affects the development of society, with the application of computer technologies. (Álvarez, 2008)

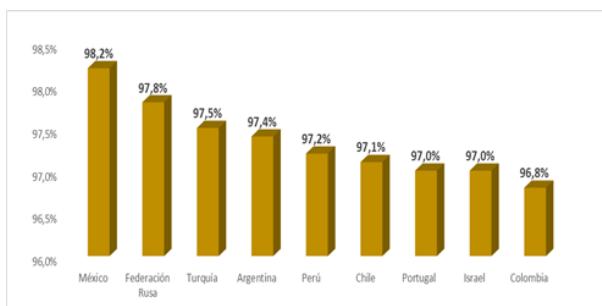
Miret-Pastor (2011) in collaboration with other authors of the Polytechnic University of Valencia, indicate that tourism products must be renewed, updated, reformed, applying new technologies, not only perform this process of integration to digital devices and computer technologies, but are fully eco-innovative processes that benefit.

For example, the emissions of buses in the urban area so that there is no pollution, which Tourism and the areas where it develops, can be better exploited with this technological application that is proposed.

Not only is the consultation and knowledge of the routes, but the application of new technologies in the control of emissions, among other applications. (Miret-Pastor et al., 2011). Telecommunications then become the central point of the theme because they are the promoter of development, causing the increase in the flow of information (voice and data) that the benefit in the countries is considered as development. With this increase in the flow of information, companies and users, face great benefits resulting in higher revenues, transformed the economic and political life of their environments. (De León, 2009)

Users will benefit from the use of networks and the Internet, regardless of the difference between common users of the same city or if they are a tourist type user, a visitor in the city concerned, their use and application of the social networks and the international network, will allow users to be connected to the most important media currently, with unparalleled growth, with additional services and everything in a digital type device, which is really a great benefit. (Miranda, 2016).

The use of the Internet is one of the tools with the most used electronic devices by the world population, and more in Mexico, let's see the following graph published by Miranda (2016).



Graph 1 Use of social networks in the world (in percentages of scope)

Source: *Miranda (2014)*

Social networks are applied in all areas, in all sectors, so it would be of great help, apply it in matters of urban public transport in any city, and Mexicans would have no problem as it has been shown that they are Internet users more than other populations in the world. (Miranda, 2016)

The connection to networks allows them to obtain the information that is offered and the users are determinant for the consultation depending on the information needs that they have, for the specific case of the urban collective transport services in any part of the world, it is of great importance. utility to be able to have the opportunity to know the routes of the collective transport, the tariffs of the same ones, the schedules and all a series of information that helps to take the decisions that the users have.

The virtual reality is very important in supporting the use of computer technologies where it allows that reality that is needed can be reproduced in digital devices, in such a way that they benefit society, the community in general. Strengthen access, consultation, interconnectivity, which, as a whole, allows for development. (Coca, 2009)

There are proposals from research centers such as the UPQ, where it is proposed to create 3D models of Augmented Reality so that it is supported by videos, books and applications where tourists to the city of Querétaro can through a consultation on digital devices, Find information about the attractions that are offered and found in the area. Similarly, these models can be applied for urban collective transport in other cities, considering the need for information and consultation on attractions in Augmented Reality. (Pereido, 2014)

Once the literature supporting this project is reviewed, issues such as public transport, its subsidy, the creation of policies for its development and improvement, as well as some case analyzes are addressed. In this article the problem of urban collective transport in the city of San Juan del Río has been presented, and to solve or reduce these problems a proposal is made integrated by the strategies that were also explained.

It will be necessary to work in the management between work groups composed of the representatives of the bus lines of Diligencias, of the FTEQ and of the CTM, together with local, state and federal government authorities, as well as with associations and society in general, so that the treated points can be fulfilled. The proposal includes the strengthening of an internet service in the city that will help improve telecommunication in all aspects. The implementation of databases and applications for users and operators with technologies such as GPS, UMTS, software such as Microsoft™, Android™ and IOS™, as well as the connection and consultation with any type of device, fixed and mobile, in order to track routes, rates, units, traffic, problems and many other issues.

There should be capital investment and management should be worked on so that all participate and can jointly implement these strategies. The proposal should be more robust as the project progresses and as more specific needs arise for the area, the city and the real circumstances.

What is sought then is the management of telematics and quality technologies for continuous improvement in the urban collective transportation system of San Juan del Río through digital devices and will be achieved through a project that addresses the details for its implementation.

Once the literature supporting this project has been reviewed, issues such as public transport, its subsidy, the creation of policies for its development and improvement, as well as some case and situation analyzes in other countries are addressed, citing Camacho (2016), also to Dhar (2015), going through Kiggundu (2009) and Hoy (2006), who make approaches and proposals to find a transport service in cities with better expectations and in a better sense of provision.

All the literature reviewed by these authors was very supportive, although in cases where situations from Asia or from other cities in Europe were addressed, it is not applied in a specific way, but it would be applied in case of carrying out the project, in an adaptation to the case of San Juan del Río.

Of great support was what De León (2009) contributes, where the importance of tourism, economy, and innovation is mentioned, which with a project to improve urban collective transport through management, through technologies, coincides in a big way for the purpose of this project.

The strength of the assembly of literatures that have to do with proposals for Information Technology is abundant, and we have Castells (1995), Coca (2009), Mitchell (2007), OECD (2016), Peredo (2014).) to Pérez (2001) who write about the application of technologies in transport processes, although the emphasis is in general for the use of technologies, telematics, telecommunications among other very similar items, all the literature consulted and cited from very specific support for this topic.

And consistent with the use of computer technologies and urban public transport, they were presented to Foth (2013), Pozueta (2000), Seguí (2004) and Treviño (2016), who reinforced in a way the approach to the use of these technologies in applications with urban collective transport, emphasizing the creation of virtual and intelligent cities both for consulting services and for the use of applications in very specific cases.

Finally, the literature consulted by Álvarez (2008), Miranda (2016) and Miret-Pastor (2011), reinforce the importance of Tourism and the use of technologies, applied to the administrative processes of the two disciplines, emphasizing in Tourism.

All the literature consulted makes a minimal contribution, although some provide additional and exhaustive way, saying directly the possibility of dealing with the topic of this project. It has been a very productive consultation.

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Instructions for authors

A. Submission of papers to the areas of analysis and modeling problems of the:

- Market structure, business strategy and market functioning
- Objectives, organization and behavior of the company
- Non-profit organizations and public enterprises
- Politics of defense of the competition
- Regulation and industrial politics
- Sectorial studies: manufactures
- Sectorial studies: primary products and construction
- Sectoral studies: services
- Sectorial studies: transport and basic supplies

Introduction

Text in Times New Roman No.12, single space.

General explanation of the subject and explain why it is important.

What is your added value with respect to other techniques?

Clearly focus each of its features

Clearly explain the problem to be solved and the central hypothesis.

Explanation of sections Article.

Development of headings and subheadings of the article with subsequent numbers

[Title No.12 in Times New Roman, single spaced and Bold]

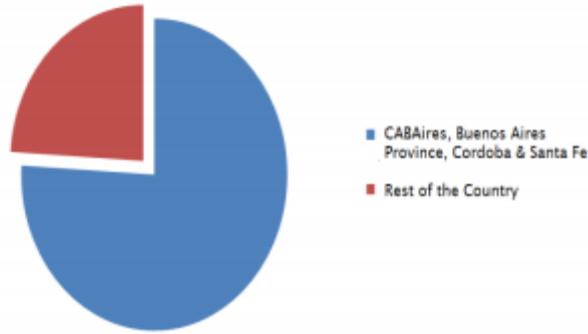
Products in development No.12 Times New Roman, single spaced.

Including graphs, figures and tables-Editable

In the article content any graphic, table and figure should be editable formats that can change size, type and number of letter, for the purposes of edition, these must be high quality, not pixelated and should be noticeable even reducing image scale.

[Indicating the title at the bottom with No.10 and Times New Roman Bold]

National Geographic Gross Product by Percentage



Graphic 1 Title and Source (in italics).

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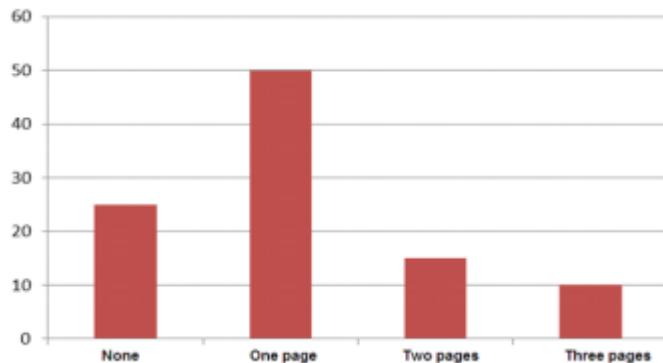


Figure 1 Title and Source (in italics).

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Knowledge of the terms Mesh o DeCS	0	0.0
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Operator knowledge OR (o)	2	10.0
Operator knowledge NOT (no)	2	10.0

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For the use of equations, noted as follows:

$$Y_{ij} = \alpha + \sum_{h=1}^r \beta_h X_{hij} + u_j + e_{ij} \quad (1)$$

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The results shall be by section of the article.

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Tables and adequate sources thanks to indicate if they were funded by any institution, University or company.

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Explain clearly the results and possibilities of improvement.

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