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Presentation of Content

In a first article we present, *Numerical solution of the gentle slope equation and its application in the design of the protection works of a marina in Nayarit Mexico*, by HERRERA, Israel, GASCA, José, GALVAN, Arturo and MORENO, Jatziri, with adscription at Universidad de Guanajuato, in the next article we present, *Strategic and participatory planning in the context of higher education: a case study*, by MARTINEZ, Rosalba, PASTOR, María del Pilar and GONZÁLEZ, Carlos, in the next article we present, *Retrospective analysis of the behavior of the economic units of Guanajuato, Puebla and Querétaro, in order to determine their impact on the economic growth of each state*, by GONZÁLEZ, Lizette & HERNÁNDEZ, Juan, in the last article we present, *The impact of human resources in Guanajuato's industrial MSMEs*, by CUEVAS-VARGAS, Héctor, LÓPEZ-TORRES, Citlalli, RUIZ, Lilia and SERVIN, Joe, with adscription at Universidad Tecnológica del Suroeste de Guanajuato, Universidad Autónoma de Aguascalientes and Instituto Tecnológico Superior de Salvatierra.

Content

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Article   Page

</div>

Numerical solution of the gentle slope equation and its application in the design of the protection works of a marina in Nayarit Mexico

Solución numérica de la ecuación de la pendiente suave y su aplicación en el diseño de las obras de protección de una marina náutica en Nayarit México

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Abstract

Numerical solution of the mild-slope equation and its application in the design of the breakwater structure of yachting harbor in Nayarit Mexico. We present the numerical solution of the Berkhoff method (1971) known as the mild slope equation in elliptical shape for deep water and similarly for shallow areas considering the speed of wave group depending on the depth and the acceleration of gravity occurs. The equation has been subdivided into three equations simultaneously to calculate the direction, wave height and phase of the wave; solving the system of equations is determined by a numerical method a relaxation algorithm for calculating the phase of the wave. Finite difference scheme with elliptical approach and staggered- celd with the option of a fine mesh in areas where protection works or structures that modify the surf for study are used. The numerical calibration was performed with simulation examples of literature in its analytically presented examples of application with constant conditions obtaining acceptable values (Herrera, 2009). The application of the model was carried out in protection structures a yachting harbor located in Guayabitos Nayarit where we need to know the magnitude of the agitation of the free surface generated by wave transmission considering the projected yachting harbor geometry passing through the mouth. The results of modeling propose the type and dimensions of protection structures required to minimize the agitation conditions within the yachting harbor.

Numerical modeling, Ocean wave, Protection structures

Resumen

Se presenta la solución numérica de la ecuación de Berhkoff (1971) conocida como la pendiente suave en su forma elíptica para profundidades indefinidas y análogamente para zonas someras considerando la celeridad de grupo de ola en función de la profundidad y de la aceleración de la gravedad. La ecuación se ha subdividido en tres ecuaciones para calcular de forma simultánea la dirección, altura de ola y fase de la ola; la solución del sistema de ecuaciones es por un método numérico determinado con un algoritmo de relajación para el cálculo de la fase de la ola. Se emplea un esquema de diferencias finitas con aproximación elíptica y un mallado tipo staggered-celd con la opción de tener un refinado de malla en zonas donde se encuentren obras de protección o estructuras que modifique el oleaje para su estudio. La calibración se realizó con la simulación de ejemplos de literatura en su forma analítica que presentan ejemplos de aplicación con condiciones constantes obteniendo valores aceptables (Herrera, 2009). La aplicación del modelo se llevó a cabo en las obras de protección de una marina náutica ubicada en el Guayabitos Nayarit donde se necesita conocer la magnitud de la agitación de la superficie libre generada por la transmisión del oleaje considerando la geometría proyectada para la marina náutica a su paso por la bocana. Los resultados obtenidos de la modelación proponen el tipo y dimensiones de las obras de protección requeridas para minimizar las condiciones de agitación dentro de la marina.

Modelación numérica, Oleaje, Obras de protección

† Researcher contributing first author.

Introduction

The interaction of waves with the seabed is one of the reasons why waves change. As a consequence of this interaction of waves with the seabed, the wave train or swell is transformed giving rise to several coastal processes visible to an observer from the shore. These transformation processes are mainly translated into: variation in wave height and in the direction of propagation. These are called refraction, diffraction, reflection and breaking.

Each of these phenomena has been analysed separately using graphical and numerical methods. It should be noted that in nature all the phenomena are related to each other, therefore, in the present work we will describe the development of a numerical model that takes into account several phenomena and its application to a study area whose main problem is to know the agitation or oscillation of the free surface caused by the incident waves.

The numerical model developed on the solution of the Berkhoff equation (1972) which, by means of a finite difference scheme with Matlab programming, can model regular waves in regions with irregular bathymetry. The discretisation of the equations, numerical solution and examples of validation of the model can be consulted in the work of Herrera (2009).

Materials and methodology

The equation developed by Berkhoff (1972), also known as the gentle slope equation, is one of the equations that works very well to simulate the refraction-diffraction-reflection phenomena, in places where the irregularity of the bottom would cause energy concentration during the advance of the wave front. To understand this equation, it is presented in its general form by defining each of its parts as follows:

$$\underbrace{\frac{\partial E(x,y,t,f,\theta)}{\partial t}}_{1} + \underbrace{\nabla \cdot \left[C_y(x,y,f) * E(x,y,t,f,\theta) \right]}_{2} =$$

$$\underbrace{S_w}_{3} + \underbrace{S_m}_{4} + \underbrace{S_d}_{5} + \underbrace{S_f}_{6} + \underbrace{S_p}_{7} \qquad (1)$$

Where the first term represents the rate of temporal change of the spectrum, the second term represents the propagation of wave energy, the third term represents wind inputs, the fourth term represents the redistribution of wave energy among various non-linear components that occur, the fifth term represents dissipation due to the breaker, the sixth term represents losses due to friction, and the seventh term represents losses due to seepage.

Numerical modelling is used to solve eq. (1) in an elliptic approximation (eq. 2) that describes the propagation of a periodic, finite-amplitude free surface wave over complex bathymetries, where its deformation on approaching shallow depth and obstacle zones exhibits the phenomena of refraction, diffraction and reflection (Panchang *et al.*, 1991).

$$\nabla \left(C_{Cg} \nabla \eta \right) - \frac{C_g}{C} \frac{\partial^2 \eta}{\partial t^2} = 0$$

Where:

$\eta(x,y)$ is the level or elevation of the free surface (m).

$C(x,y)$ phase velocity or phase velocity (m/s)

$Cg(x,y)$ Group velocity (m/s)

The solution of the Berkhoff equation is worked out and expressed as a function of the wave flow ratio in its x and y components (Fuentes, 1996), this by means of a scheme implicit in time by means of the following finite difference equations.

$$c^2 \frac{\partial \eta}{\partial x} = -\frac{\partial Q_x}{\partial t}$$

$$c^2 \frac{\partial \eta}{\partial y} = -\frac{\partial Q_y}{\partial t}$$

Where Q (x, y) is the flow ratio in the horizontal plane (m/s).

For the solution of the equation for the variation of the free surface area due to waves as a function of the above-mentioned flow ratios we have:

$$\frac{\partial \eta}{\partial t} = -\frac{1}{n} \left[\frac{\partial}{\partial x} (n Q_x) + \frac{\partial}{\partial y} (n Q_y) \right]$$

$$n = \frac{1}{2} \left(1 + \frac{2kh}{senh(2kh)} \right)$$

Where:

n (x, y) Group factor

k (x, y) Wave number (2π/L)

h (x, y) Depth (m)

This type of equations has the advantage of having the values of the flux ratios and flow and that they allow us to find the direction of the and to consider the presence of an obstacle in a simple way.

Boundary conditions

To obtain the wave propagation in the free boundaries, Snell's law is applied, which allows the wave to leave the domain of study without modifying its direction or magnitude; the obstacles or structures within the domain are considered solid boundaries, so these are proposed as a totally vertical wall, this wall presents 3 reflection conditions which are manifested with a coefficient of (KL), whose value is limited between 0 and 1 (0 for a structure that does not present reflection, 0.5 for a partially reflecting structure and 1 for a totally reflecting structure, 0.5 for a partially reflecting structure and 1 for a totally reflecting structure). fully reflective condition). This applies around the perimeter of the structures.

In order to obtain the elevation of the following equations are used to obtain the elevation of the free surface at the ends of any obstacle:

$$\eta_0^{n+1} = (1 + K_L) * \eta_{\left(\frac{c\Delta t}{\Delta x}\right)}^{n} - K_L \eta_0^{n-1}$$

$$\eta_L^{n+1} = (1 + K_L) * \eta_{\left(L - \frac{c\Delta t}{\Delta x}\right)}^{n} - K_L \eta_0^{n-1}$$

Eq. (7) is used for the start of obstacle with infinite length, and Eq. (8) is used for the end of the obstacle is used for the end of the obstacle. For the calculation of a quasi-oscillatory wave, it results from the superposition of an incident wave with height (Hi) and a wave travelling in the opposite direction with a lower height (Hr). This reduction in wave height and the phase lag between incident and reflected are associated and the resulting surface can be expressed:

$$\eta_{i,j}^{n+1} = \frac{H_{i,j}}{2} cos\left[\left(Kx_{i,j}X_{i,j}cos(\theta_{i,j})\right) + \left(Ky_{i,j}Y_{i,j}sen(\theta_{i,j})\right) - \frac{2\pi}{T} * t\right]$$

Where the wave reflected by any obstacle is considered to leave the study region.

Finally, the wave angle or direction can be estimated from the relationship between the phases (Qx^{n+1}) and (Qy^{n+1}):

Model validation

To perform the validation of the wave modulus, domains similar to the theoretical examples in the literature were designed to reproduce the phenomena of refraction, diffraction and reflection, determining wave heights, angles of incidence and comparisons between the analytical solutions and the modelling results.

Resonance in a rectangular harbour

As a first validation case, the problem of resonance in a rectangular harbour (fig. 1), whose analytical solution was presented by Unluate et al. (1973) and the numerical solutions presented by Maa et al. (1997) and Lee (1971), was taken as a first validation case. The geometry of the harbour is 0.3212 m long by 0.0605 m wide and a depth of 0.2576 m; the wave incidence angle is zero degrees and the wave height is 0.01m; the modelling parameters can be seen in table (1).

Parámetros	
H(m)	0.01
T(s)	Varía
θ (grados)	0.00
h(m)	0.2576
Δx (m)	0.10
Δy (m)	0.10
W x L (m)	4.497 x 1.845
MP x NP	45 x 20
Tiempo de cómputo (s)	41
W, L son el ancho y largo del dominio de estudio	
MP, NP, son los numéros de celdas en la dirección "x" y "y" respectivamente	

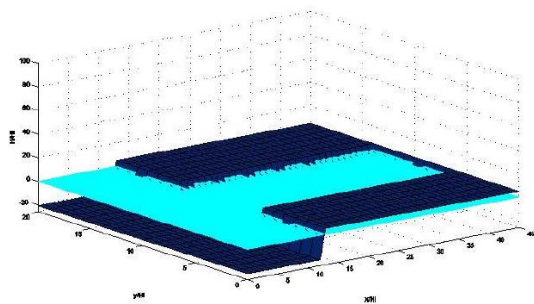**Table 1** Parameters used for wave model validation

Figure 1 Geometry of the harbour

The domain was designed with 45 x 20 cells using $\Delta x = \Delta y = 0.1$ was compared with the solution obtained by Maa et al. (1997), which is presented in figure (2) the normalised wave heights.
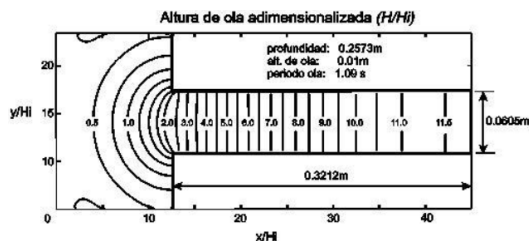

Figure 2 Solution presented by Maa *et al.*, (1997)

Figure (3) shows the result obtained by the numerical model developed, where it was considered that all the walls have a reflection coefficient equal to 1.0, which is a totally reflective condition.
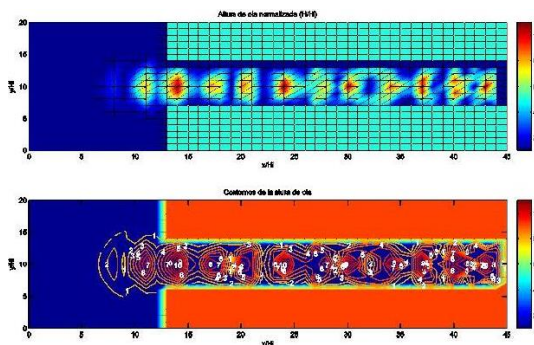

Figure 3 Results of the numerical simulation

Subsequently, a quantitative comparison was made between the solutions obtained by Lee (1971) and Maa et al. (1997), with reflection coefficients from 0 to 4 of the resonance presented by the harbour with different periods of incident waves. Figure (4) shows the results of the model with a relative percentage error between the values of the analytical solution and the calculated average values of 3.75%, due to the fact that the reflection on the faces perpendicular to the direction of the waves is considered, which presents a small agitation and is closer to reality.
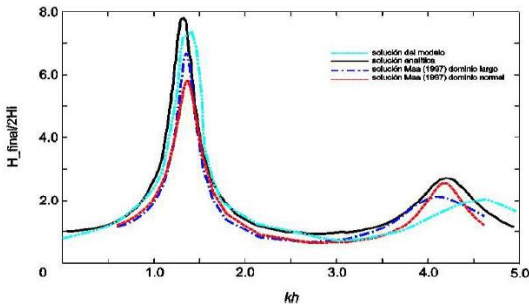
Figure 4 Comparison between different solutions of the harbour resonance analysis

Results and Application

The marina under study is located in the south of the state of Nayarit in the municipality of Compostela in the town of Los Ayala (fig. 5).
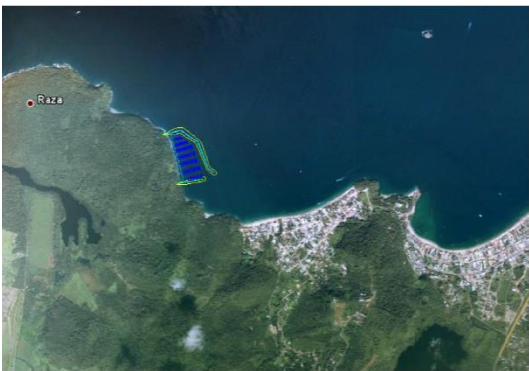
Figure 5 Location of the marina

The purpose of the study is to model the agitation that originates inside the marina due to the effects of the incident waves with NW direction, which is the predominant one in the region. In order to monitor the different levels of agitation that occur inside the marina and in some external points of interest, 10 control points or viewfinders were located, which allow a more specific diagnosis. Figure (6) shows a diagram of the marina with the location of the viewfinders.

Figure 6 Location of the control points or viewfinders during the simulations

The wave propagation data such as height, period and angle of incidence in the study domain are known and are supplied to the numerical model; so that the study grid (fig. 7) presents 145 x 148 cells with constant spacing for both directions of 5 mts.
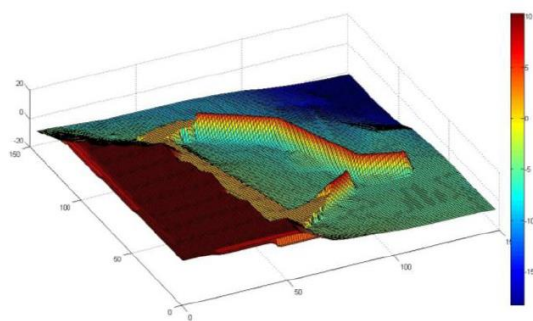
Figure 7 Numerical mesh for the simulation of the nautical marina

For the simulations of the incident waves on the protection works of the marina and their propagation within the marina, 4 wave scenarios are proposed, one under normal conditions and the others under extreme conditions.

1. Normal swell in a NW direction.

2. Hurricane waves in a NW direction with a return period of 10 years.

3. Hurricane storm surge in NW direction with a return period of 15 years.

4. Hurricane storm surge in NW direction with 20-year return period.

Simulation of agitation in the interior of the Marina with normal waves

According to the refraction-diffraction and wave height analysis, the waves to which the marina is most vulnerable under normal conditions are those coming from the north-west (NW) direction due to three main factors: the frequency of their presence, the way they arrive in the study area and the wave height, the marina is morphologically protected. Figure 8 shows the agitation inside the marina in the scenario described (NW direction, H = 3.21 m and T = 8.5 s).
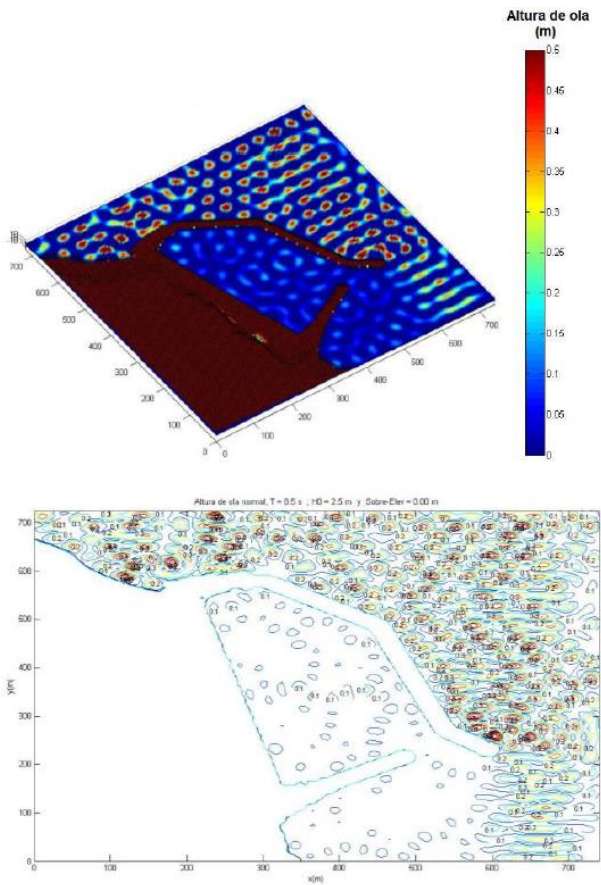
Figure 8 Disturbance inside the marina with a NW swell

Figure (8) shows the different wave heights inside the marina, using a colour scale ranging from zero in blue to 0.5 m in brown. In the interior of the marina we identify dark blue as the predominant colour with some lighter touches, which expresses a height of less than 0.10 m, and only in some areas of the marina is the colour of the waves. 0.10 m and only at some points is this height exceeded but without exceeding 0.20 m wave height, generating an area of great calm.

Figure (9) shows the wave heights of the control points where the wave height variations that exist inside the marina can be clearly observed. At points 1 and 2 we can observe relatively higher heights in relation to the rest of the points, produced by the reflection effects; however, their heights are of the order of 0.14 and 0.16 m respectively. 0.16 m respectively, wave heights that do not represent any risk to navigation or the mooring of vessels. Between points 3 to 8, none of the wave heights exceed 6 cm, which means that the morphological protection of the study area, as well as the arrangement of the proposed breakwaters, satisfies navigability conditions under normal climatic conditions.

Points 9 and 10 present an increase in wave height, this effect is defined because the location of these points is outside the protection works, however, their values do not exceed 15 cm in height, it is important to identify these values, as they correspond to the access mouth of the marina.
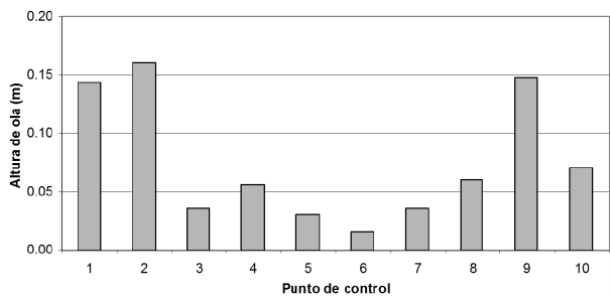

Figure 9 Wave heights determined at the control points for normal waves

Simulation of agitation inside the marina with hurricane waves

For the simulation of hurricane waves, different return periods (10, 15 and 20 years) were considered, for which the over-elevation generated in the study area was also estimated; the following figures show the results obtained.

10-year return period

For hurricane wave conditions, the heights generated in the deep-water region generally exceed the navigability conditions, however the proposed shelter to generate the calm zone inside the marina, significantly mitigates the agitation; in figure (10), the results obtained for a return period of 10 years, wave height H = 6.86 m, period T = 12 s and overelevation S = 1.42 m are shown. 1.42 m.
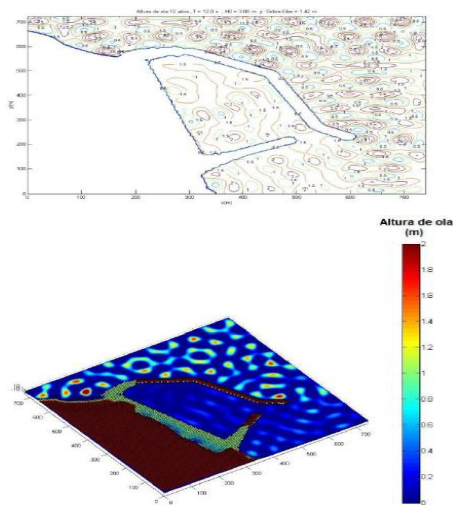
Figure 10 Perspective of the agitation inside the marina with hurricane waves, 10-year return period, NW wave direction, graphical scale from 0 to 2.0m.

Figure (10) shows the results obtained from the simulation carried out for a 10-year return period, where it can be seen that inside the marina, levels higher than 0.5m are not reached.

15-year return period

The results of the simulations for a return period of 15 years (wave height H=7.28 m, period T=12 s and over-elevation S=1.64 m), the agitation is presented in figure (11) using a colour scale that represents the wave heights on the same scale (0 - 2m) as in the simulation described above.
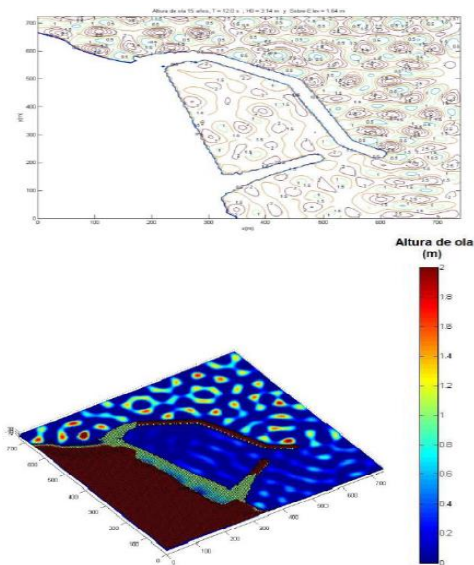

Figure 11 Perspective of the agitation inside the marina with hurricane waves, 15-year return period, NW wave direction, graphic scale from 0 to 2.0 m

Figure (11), shows a three-dimensional perspective view, showing that the protection provided by the proposed breakwaters, allows an agitation inside the marina that does not exceed 0.50 m, which reflects a favourable condition for the berthing of vessels, without endangering the integrity of the docks, nor that of the vessels. the integrity of the docks, nor that of the vessels.

20-year return period

This simulation represents the most unfavourable case, with a wave height of 7.57 m, a period of 12 s and an over-elevation of 1.79 m. The results are presented in figure (12), where it is observed that the wave agitation heights inside the marina are notably higher than the higher cases, however, they do not present a risky condition, the heights exceed 0.50 m (which in none of the cases is higher than 0.50 m). 50 m (which in none of the previous cases was exceeded), at some points, however, none exceed 0.70 m.

The area with the greatest agitation is the centre, as it is in this region where the waves and reflections from the different borders of the marina are concentrated. the marina.
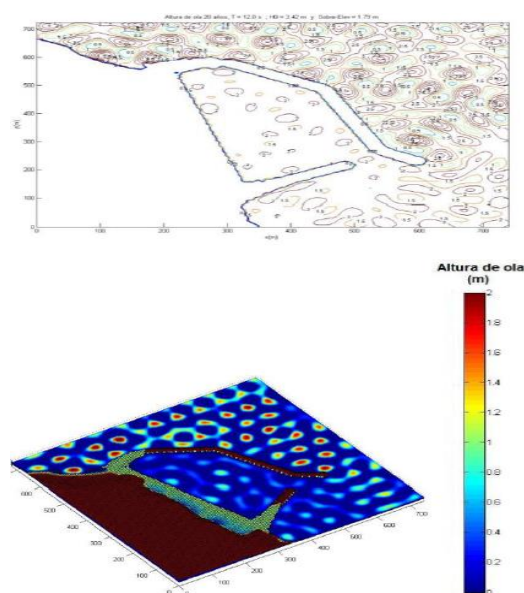
Figure 12 Perspective of the agitation in the interior of the marina with hurricane waves, return period of 20 years, NW wave direction, graphic scale from 0 to 2.0 m.

Figure (12), shows a three-dimensional perspective view, showing that the protection provided by the proposed breakwaters, allows for a turbulence inside the marina that does not exceed 0.70 m, even though this condition may present a moderate risk to the berthing of vessels, the frequency of presence of this turbulence is 20 years.

Conclusions

From the results described above, the following conclusions are drawn.

The arrangement of the protection works satisfactorily fulfils its function of providing minimum agitation inside the Marina basin for normal conditions.

For the extraordinary wave conditions, the agitation inside the marina does not present any risk for the 10- and 15-year return periods, however, for the 20 year return period the conditions can be dangerous for some vessels or for the marina facilities, so it is suggested to identify the areas of less agitation and direct the vessels present towards these areas, and also to prevent the mooring or navigation of vessels in the areas of greater agitation.

In terms of the operational limits within the marina, it is indicated that the agitation of the free surface may not exceed a wave height of 0.60 m in a period greater than 1.0 % per year.

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Strategic and participatory planning in the context of higher education: a case study

Procesos de innovación de las empresas de la ciudad de Sucre: la influencia del capital relacional

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Abstract

Offering a space for reflection oriented to highlight the elements to facilitate the way to face its challenges and support the efficient management.

Strategic planning, IES, Participatory planning

Resumen

Ofrecer un espacio de reflexión orientado a resaltar los elementos que faciliten el camino para enfrentar sus retos y apoyar la gestión eficiente.

Planificación estratégica, IES, planificación participativa

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Introductionn

The context of continuous change is today the usual environment for all types of institutions. In the field of higher education, the demands that the knowledge society demands of the different education systems are evident. Among other consequences, this has increased the number of higher education institutions (HEIs), at all levels (worldwide, national, regional and local) and in all areas of knowledge (UNESCO, 2009).

This scenario entails a marked competition for students, teachers, research funds, and resources in general. In this sense, and given the context of budgetary restrictions, governments and institutions accentuate the rivalry between HEIs, through the financing they grant. The question is what and how HEIs are aware of this scenario, to face its challenges, achieve efficient management, and make the right decisions.

This work offers a space for reflection on the management process of strategic planning through participatory processes in HEIs.

The text is structured in four sections: firstly, some elements of strategic management in HEIs are pointed out (section I). Subsequently, the implications of the participatory planning methodology in the context of higher education are highlighted (section II). Next, the results of the case of the Faculty of Accounting and Administration of the Autonomous University of San Luis Potosí are analyzed, emphasizing the experience of the participatory planning process initiated in 2014 (sections III); and, finally, by way of conclusion (section IV), a reflection is made on the future challenges of strategic university management.

And participatory planning systems, in the current context to which HEIs are subjected.

Strategic Planning in Higher Education Institutions

Given the current forms or structures of organizations in which strategic planning is developed, it is common to observe a progressive decentralization of decisions, and the need arises to guide individual action and each organizational unit towards the objectives of the organization. (Wider, 2007).

This should promote the coordinated action of the different people and organizational units aligned with the objectives of the management (Porter, 2001).

Hence, for the development of the strategic management of an organization, the communication and participation of those involved is necessary in order to have useful information available for managers and directors (Thompson et al., 2008). Particularly, that information is required that constitutes the basis of planning and control through which the performance of the organization is evaluated, based on the scope of the objectives, both at a strategic and operational level.

Planning is a tool within the framework of organizational theories, which involves anticipating the future through strategies aimed at maximizing resources to achieve the mission and vision. HEIs have been encouraged to carry out planning processes by different institutions at the international level, such as the World Bank, the United Nations Organization for Education, Science and Culture, the Organization for Economic Development Cooperation, the Inter-American Bank Development and the Economic Commission for Latin America, among others.

In Mexico, by the Federal Government through the National Development Plan 2013-2018. In addition, the evaluations of external organizations also promote the planning of HEIs; this is the case of the Interinstitutional Committees for the Evaluation of Higher Education, the accreditation of programs that are carried out under the Council for the Accreditation of Higher Education and the National Center for the Evaluation of Higher Education.

Undoubtedly, this trend implies that planning and evaluation suppose a greater probability of accessing extraordinary funds through calls and programs derived from institutions such as the Ministry of Public Education, through different instances, for example, the Undersecretary of Higher Education, with the Program for Strengthening Quality in Educational Institutions (PROFOCIE) (DGESU, 2014).

It is logical, then, that HEIs develop planning exercises in response to the demands of the environment to meet these expectations and increase their efficiency. For this purpose, it is useful to resort to participatory processes that include® key actors, such as authorities, researchers, teachers, students, among others. This facilitates the establishment of goals linked to transparency and accountability and the involvement of the community in the execution of what is planned.

Participatory Planning as a Method of Strategic Management in HEIs

Linas-Audet *et al*., (2011) obtain evidence from HEI planning exercises that reflect leadership in formulating the strategy by a small and hermetic management team.

This implies an incomplete vision of the strategy in the key areas of HEIs and poor communication between centralized information systems; In addition, the support units perform their functions incompletely by simultaneously executing their daily activities, thus contributing to the limited commitment and effectiveness of strategic planning.

In response to the above, Jiménez (2009), based on the ideas of Robbins (1999), states that the participation of the members of the organization in the planning and implementation of the plans has a positive impact on educational management. In addition, it improves the perception that the community has of the leaders and managers, which generates confidence in the decisions that are made, influencing the success of the actions that are undertaken. Active participation also promotes the perception of individual and collective achievement, which favors the work environment and in turn promotes greater collaborative work for the benefit of meeting institutional objectives.

Hence the importance of carrying out participatory planning exercises that make its implementation feasible and risk expanding the number of participants in the process in a controlled manner. The participatory planning process implies (Sevilla, Galaz & Arcos, 2008):

Enrichment of the planning content, thanks to the participation of the actors involved; Implementation of a plan through the people who collaborated in its formulation; Improvement in communication within the institution; Strengthening of collegiate life; Implementation of a culture of quality; and Attitude of continuous improvement.

In this regard, the aforementioned authors highlight the challenge of creating a governance mechanism that allows institutions to design effective mechanisms to determine priorities for the future and that these are credible, legitimate and accepted by their community.

Despite the clear benefits for organizations that make use of this method, based on the existing literature, it is concluded that the results of participatory planning exercises could suffer from the following weaknesses: Wear in the process and enormous institutional effort invested ; Excessive attention to performance indicators on generated processes; Differences in the level and quality of participation of the academic communities in the planning process; Increase in quality gaps between institutions; Reduced consideration of differences between disciplines; Diversity of missions in HEIs that are not considered.

Results

Next, we present the case of the Faculty of Accounting and Administration (FCA), of the Autonomous University of San Luis Potosí (Mexico), a pioneer in the training of professionals in the administrative accounting area.

The participatory planning processes are delimited by the specific context of each HEI, its tradition and its culture. Currently, the FCA offers five careers at the undergraduate level: Administration, Public Accounting, Public Administration, Agribusiness and Strategic Marketing. The largest proportion of students are in the bachelor's degrees in Public Accounting (52%) and Administration (37%).

Based on the Institutional Development Plan of the Autonomous University of San Luis Potosí (PIDE) 2013-2023, in February 2014, the direction of the faculty led the work for the construction of the Development Plan 2014-2023 with a strategic approach, participatory and systematic, covering the functions of teaching, research, dissemination of science, culture, extension and management. For this, different levels of interaction were established based on proposals prepared by the FCA Planning Commission (officials of the first management level) and enriched by all those responsible or leaders of key areas, as well as by the community. in general, through open consultations via the Internet. The planning process was structured in three phases.

First, it was oriented to analyze the context and diagnosis of the ACF. In addition to the planning team, teachers and administrators responsible for various areas participated by preparing diagnoses related to: The political and administrative organization of the State; demographics; The indices of social and educational backwardness; The educational and economic panoramas; The competitiveness; The OECD overview; and the analysis of postgraduate training, science, technology and innovation. Based on this analysis, the strengths, opportunities and challenges were identified, which were specified in relation to: Leadership, identity and social presence; Current and future educational offer; Quality of the educational offer; Academic plant and academic bodies; Educational practice and innovation; Research; bonding; Culture and art; Sport and health; Environmental perspective and sustainability; and Management and administrative structure. On this basis, the mission, values and principles were developed, as well as the vision for the year 2023 and its distinctive features.

In a second phase, work was carried out with more than thirty professors to develop policies, programs, objectives and strategies in order to specify the way to approach the aspects related to the diagnosis. Likewise, and as a fundamental part of any planning exercise, the indicators that serve to evaluate the results of the implementation of the plan were proposed.

As part of a third stage, the document in which the planning exercise was reflected was submitted to open consultation, via the web, mainly in relation to the objectives, programs and strategies. From this exercise, 444 written comments were collected, some with very specific proposals with which the final document was enriched. In addition, the activities carried out by the different student representations, including announcements on social networks, were used as support in the dissemination. For teachers and administrators, email and the use of printed media such as posters and banners were used.

Thus, with the participation of teachers, students, heads of areas, managerial and administrative staff, the Development Plan was obtained, which will need to be adapted to changes in the external context and internal conditions without changing its strategic purposes, in order to ensure validity for decision-making, through participatory planning processes, evaluation of its implementation and achievements.

Finally, derived from the Development Plan, the first work agenda was built (Agenda 2015) which includes the short-term activities that will allow the achievement of the PIDE by 2023.

Conclusions

Thes HEIs use strategic planning exercises with the intention of leading the institution to a good conclusion. Strategic management and planning are tools that the directors of any organization must master, in order to be able to navigate in an environment of uncertainty and risk. So there is an urgent need to break paradigms, resorting to the use of planning methods that involve, from the first stages, the entire community. This will facilitate greater community acceptance and action when strategies are implemented in line with the strategic course that management has set out.

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Article

Retrospective analysis of the behavior of the economic units of Guanajuato, Puebla and Querétaro, in order to determine their impact on the economic growth of each state

Análisis retrospectivo del comportamiento de las unidades económicas de Guanajuato, Puebla y Querétaro, a fin de determinar su incidencia en el crecimiento económico de cada estado

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Abstract

The research project shows how the behavior of the economic units has impacted the growth dynamics of the Gross Domestic Product (GDP), of the states of Guanajuato, Puebla and Querétaro, in the last ten years from 2003 to 2013. The above, in order to strengthen companies, entrepreneurs and institutions in their decision making before administrative, financial and/or economic scenarios aimed at the generation of micro, small, medium and large companies, or in the detection of areas of opportunity that allow the obtaining of goods and services to satisfy needs. For which it is necessary to have bibliographic references in economic matters that are easy to use but with reliable and concise figures referring to the behavior of the economic units and the GDP.

Economic units, Gross domestic product, Economic growth, Federal entities

Resumen

El proyecto de investigación muestra cómo el comportamiento de las unidades económicas ha impactado en la dinámica de crecimiento del Producto Interno Bruto (PIB), de los estados de Guanajuato, Puebla y Querétaro, en los últimos diez años de 2003 a 2013. Lo anterior, con el fin de fortalecer a las empresas, emprendedores e instituciones en su toma de decisiones ante escenarios administrativos, financieros y/o económicos orientados a la generación de micro, pequeñas, medianas y grandes empresas, o en la detección de áreas de oportunidad que permitan la obtención de bienes y servicios para satisfacer necesidades. Para lo cual es necesario contar con referencias bibliográficas en materia económica de fácil manejo, pero con cifras confiables y concisas referentes al comportamiento de las unidades económicas y el PIB.

Unidades económicas, Producto Interno Bruto, Crecimiento económico, Entidades federativas

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Introduction

This research work aims to describe and specify how the behavior of the economic units of the states of Guanajuato, Puebla and Querétaro has been. This through a series of indicators in the last ten years, in order to determine their interference in the dynamics of economic growth of each State.

For which we will use one of the most relevant macroeconomic indicators of any economy, the Gross Domestic Product (GDP), through which economic growth can be measured, which serves as one of the pillars to determine competitiveness and support the nations.

Thus, requiring naming the GDP as a global indicator of the economy, which measures the level of production of final goods and services at monetary value, in a given period, in such a way that these production levels have a direct impact on growth and/or or economic slowdown of the Countries, Federal Entities, Regions or Municipalities.

For earlier, it gives guidelines to design poles of economic attraction for new economic units, that is, when certain Nations, States or Regions present an increase in production levels, derived from a growth and strengthening of their economic units previously, economic scenarios are generated optimal that make them attractive for investment and the creation of new productive agents, adding as sources of employment and generators of cash flow.

The latter, vital for the growth dynamics of their economies, which affects the economic behavior of each productive sector (primary, secondary and tertiary sectors). Thus, marking the relevance of the research topic, which seeks in the first place to know the dynamics that the economic units of each Federal Entity indicated in advance have presented and thus diagnose the way in which its GDP from 2003 to 2013 has been favored. or affected and, above all, to identify if these States are poles of economic attraction for companies, together with reviewing the competitiveness in each productive sector through the information generated by the National Institute of Statistics and Geography (INEGI), the Ministry of Economy (SE), the Ministry of Finance and Public Credit (SHCP) and the Mexican Institute for Competitiveness AC (IMCO).

For earlier, in order to assess how this situation impacts the generation of more economic units.

Where the proposed research topic seeks the relationship between the following two variables:

The generation of Economic Units has an impact on:

The Gross Domestic Product (GDP)

For this, annual and average annual growth rates were implemented that allowed evaluating their growth dynamics and justifying that these States have become poles of economic attraction for Micro, Small, Medium and Large Companies, which has allowed them to prop up their economy through Nacional level.

Placing itself in the rankign of the ten states with the highest economic performance.

To give way to knowledge, it was necessary to reproduce the information presented by the various sources mentioned above.

Research approach

The research process frames a qualitative and quantitative approach, which explores the behavior of two fundamental variables: the Economic Units and the Gross Domestic Product of the states of Guanajuato, Puebla and Querétaro.

B. seeking to recognize through descriptive data, if the creation of economic units has an impact on the generation of the Gross Domestic Product (GDP), and in this way affirm that the phenomenon of economic growth in these entities has led them to become poles of attraction. economic.

General objective

Diagnose the behavior of the economic economic units of the states of Guanajuato, Puebla and Querétaro, in order to determine their impact on the Gross Domestic Product.

Specific objectives

- Formulate an economic diagnosis of the States indicated in advance.

- Select the variables and/or economic factors of the research project.

- Design an economic impact matrix of the Federal Entities

- Apply and analyze the dynamics and growth rates of economic factors.

- Carry out a correlation analysis between the economic units and the GDP, as well as the correlation between the GDP and the employed personnel of each Federal Entity.

Hypothesis

There is a relationship between the Economic Units and the generation of the Gross Domestic Product of the states of Guanajuato, Puebla and Querétaro.

H_0: The higher the correlation between the GDP and the growth of the economic units, the less attractive the federal entity is as a pole of economic attraction.

H_1: The higher the correlation between the GDP and the growth of the economic units, the more attractive the federal entity is as a pole of economic attraction

Justification

It is imperative to highlight that the success of any economy lies largely in the composition of its added value, which is generated through the different economic sectors; same that must respond to the needs dictated by society.

Giving guidelines to self-sufficient economies, where in good part the creation of economic units makes up the detonating force of these federative entities.

Where economic information is essential for all economic entities (family, company, government and external sector), who for decision making must recognize the behavior of the macro environment, in this case the corresponding to the behavior of production levels.

And even when various articles and/or publications have been written about the states indicated in advance, the theme of this line of research is focused on describing and categorizing the dynamics of growth of each of the States.

The main objective is to diagnose the economic context in which they find themselves and thus determine whether there is a feasible environment for the generation of economic units, which will allow them to trigger economic growth.

For what we know in advance that there can be no economic growth without the previous generation of the so-called productive units or also called economic units, which underpin and strengthen the entire Nation.

But for this there must be a viable environment that allows good economic performance with social responsibility to trigger growth in each state, which is why this study aims to recognize how the main variables such as GDP and economic units have been behaving, coupled with the four great pillars of economic growth: human resources, natural resources, capital and technology.

Emphasizing that information gives power in decision-making and what is sought is to provide municipalities, businessmen, entrepreneurs and the interested public, a reliable source of information on growth dynamics and above all in the identification of business opportunities.

In other words, from the perspective of financial management, planning is a fundamental element for achieving objectives and goals.

To which is subject to the information generated in a situational diagnosis, for which it is necessary to carry out a research exercise focused on diagnosing the economic environment of the States indicated in advance, in order to identify their competitive advantages and give guidelines for the generation of strategies. Therefore, the prevailing need arises to provide a wealth of qualitative and quantitative information, which can be consulted by the different economic entities in order to give confidence and strengthen the creation of new economic units.

Methodology

The research process that was handled for this topic revolved around a descriptive approach with a quantitative and correlational design, evidently comparative of various economic factors.

This based on the central objective, for which secondary information was collected referring to the period from 2003 to 2013 in terms of: Economic Units (EU), Gross Domestic Product (GDP), Economic Activities, Employed Personnel and Productivity Indicators and Competitiveness.

Where the processing of the information was directed to determine the behavior of the economic units and recognize their incidence in the GDP, for which the data of the three states of Guanajuato, Puebla and Querétaro were collected.

The collection mechanism was carried out based on the information presented on the official pages of the Institutions such as: National Institute of Statistics and Geography (INEGI), the Ministry of Economy (SE), Ministry of Finance and Public Credit (SHCP).

And National Institute for Federalism and Municipal Development (INAFED), and the web portal of each Federal State; as well as unofficial sources at the federal level, but with recognition and prestige given its content framed in a socially responsible scheme.

Thus, stating the information platforms on which this research project was built.

At the end of the first phase, the data collection through secondary sources, a hard data arrangement was designed by federal entity, variables or characteristics and time period.

Giving guidelines to the capture and processing of information, horizontal analysis methods (annual growth rates and annual average), vertical analysis method (percentage and/or participation structures), and that corresponding to the method of correlation, which consisted of performing a statistical analysis to accept or reject the hypothesis.

For previous allowed obtaining absolute and relative statistics (percentages), of each variable in order to generate a critical, comparative and correlational analysis, to reflect on each economic scenario and have an impact matrix that would allow us to visualize the products, achievements and benefits of each State, in order to recognize not only the incidence of economic units in the GDP, but also to identify that these states have become in recent years economic poles of attraction for MSMEs and large companies.

For which it was necessary to apply the following statistical tools:

Subsequently, once the horizontal, vertical and correlational analysis methods were instrumented to the data arrangement, an impact matrix was created and also the construction of statistical graphs, which allowed visualizing the economic panorama of each federal entity and guide the critical, comparative and correlational analysis of the different economic variables that make up this study.

Thematically, it is disclosed how, through the implementation of annual average growth rates, percentage structures or participations and the correlation method, it was possible to diagnose the economic behavior of each of the states.

Where the results have multiple uses in various projects and in different sectors, public, private and social. Serving as a reliable and practical source of information, which denotes the retrospective behavior of the main economic variables of the states of Guanajuato, Puebla and Querétaro.

Thus, allowing elements of weight for decision making, which contribute to the creation of economic units, economic growth and also the strengthening of the National economy.

Without leaving aside the promotion of economic attraction, which is also a triggering factor to guide competitiveness and productivity in each state.

Based on the foregoing, it was sought to identify how the economic units in the last ten years, in each state, have been having an impact on economic behavior, in such a way that their product has generated income growth (GDP), thus achieving a position national level in the ranking of the states with the greatest contribution to GDP, or with the greatest growth dynamics.

In such a way that attention was focused on the economic behavior of each state, identifying the progressive rhythm of these in the exercise of their economies.

Finally, it is important to highlight that through the correlation method it was possible to carry out an analysis in which the GDP was taken as the dependent variable and the economic units as the independent variable, for which it is affirmed that the greater the number of economic units, the greater the GDP, therefore the correlation between both variables was high, thus confirming that the greater the number of economic units, the greater the GDP, and the greater the GDP, the state becomes stronger as a pole of economic attraction.

Results

In this line of research, it was focused on a qualitative - quantitative approach, in which the economic behavior of the states of Guanajuato, Puebla and Querétaro was identified and diagnosed, in order to expose their growth dynamics in the last ten years of 2003 to 2013, based on the analysis of the economic units and the assessment of the Gross Domestic Product (GDP).

Gives do that both are main elements to trigger the economy, where the latter is part of the System of National Accounts of Mexico, so it is an indicator that allows measuring the productivity of the different factors of production that intervene in the economy, that is, Let us remember that the GDP is the sum of the market values of all the services and final goods produced by the resources (labor and capital) of the economy that reside in the country.

On the other hand, it is essential to highlight that the unobserved economy, which includes the informal and the illegal, was not included in this category.

Now, based on the information worked on, it was possible to identify that Guanajuato, Puebla and Querétaro were located in positions seven, nine and seventeen respectively, this in relation to the year 2013 in a comparison at the national level, thus placing themselves among the economies with the highest income (GDP).

This allowed them to provide a significant contribution to the GDP, where Guanajuato contributed 4%, Puebla 3.24% and Querétaro 2.08%, as shown in the following graphic.
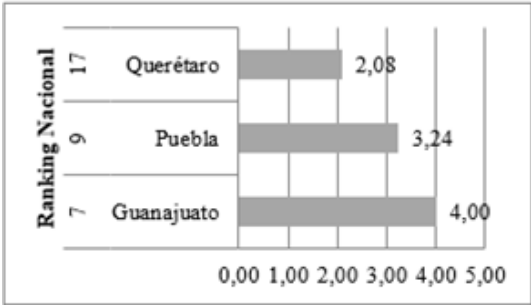
Graphic 1 Gross domestic product by federal entity. Percentage participation in current securities, 2013

In terms of GDP growth dynamics, Querétaro presented an average annual growth rate from 2003 to 2013 of 9.9 percent, placing it on the third rung at the national level; Guanajuato in fifteenth with an economic growth rate of 7.75% annual average and Puebla with 7.52%, ranking twenty.
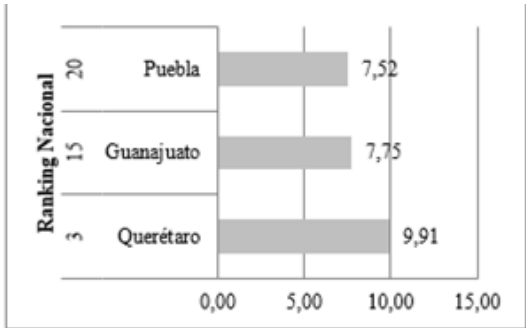
Graphic 2 PGross Domestic Product by Federal Entity. Annual Average Growth Rate, 2003-2013

Recognizing that Querétaro presented a significant economic expansion, given that its economic growth rate is above the national average 8% estimated based on the average annual growth rates of all states in the period from 2003 to 2013.

Regarding the GDP by great division of economic activities in 2013, Guanajuato contributed 4.57% to primary productive activities, ranking seventh in the national ranking and in ninth place we find Puebla with a participation of 4.46%. As for Querétaro, it contributed 1.57%, taking it to point twenty-two.

Other relevant results of this primary sector focused on the average annual growth from 2003 to 2013 in these states, highlighting that Puebla ranked twelfth with a growth rate of 7.16%.

Guanajuato in seventeenth with average growth rates per year of 6.56%; followed by Querétaro with a percentage of 6.51%, where the average annual growth rate at the national level averaged 6.46%.

Regarding secondary activities, the figures are also encouraging, given that Guanajuato in 2013 contributed 4.53% to the Nation, thus achieving ninth place, Puebla in eleventh with a participation of 3.14% and Querétaro in fifteenth with 2.56%.

On the other hand, when comparing the annual average growth rates of this secondary sector in the period covered, Querétado was observed in eighth step with a growth dynamic of 9.61%, in the case of Guanajuato the evolution of its economic growth was conformed by 7.30%, thus placing it in fifteenth. Puebla in twenty-second place with a rate of 6.85%.

With regard to tertiary activities, which bring together activities related to commerce, services and large-scale transportation, it was identified that the states of Guanajuato and Puebla in 2013 ranked sixth and seventh in this national ranking with the highest contribution to the sector. Therefore, Guanajuato participated with 2.28% and Puebla with 2.01%, while Querétaro, in sixteenth place, contributed 1.5% to these tertiary activities.

However, this last federal entity in its behavior dynamics, was supported in the first place with an average annual growth rate from 2003 to 2013, of 10.33%, thus recognizing that the outsourcing of the economy prevails.

In the case of Guanajuato, its growth rate amounted to 8.15% annual average, taking it to space ten, and Puebla to fifteenth with a dynamic growth of 7.92% annual average.

Bearing in mind that all this derives from the generation of economic units year after year, which are the triggering factor and pillars in the increase in production levels.

This can be demonstrated through the correlation method implemented in this research, where the following results can be noted:

Guanajuato: Correlation analysis between the state GDP of Guanajuato and the growth of the economic units.

Año	PIB	Unidades económicas
2003	326,882	150,800
2008	436,671	179,867
2013	617,325	272,635

Table 1 Analysis of correlation between the GDP of Guanajuato and the economic units

Observing that the correlation was 0.9882 in general, this indicates that the correlation between the variables is high. Regarding the analysis by economic sector, we have:

Correlation analysis between the state GDP of Guanajuato and the growth of the economic units of the primary sector

Año	PIB	Unidades Económicas Sector Primario
2003	326,882	46
2008	436,671	60
2013	617,325	164

Table 2 Correlation analysis between GDP and the economic units of the primary sector. R= 0.9624

Correlation analysis between the state GDP of Guanajuato and the growth of the economic units of the secondary sector

Año	PIB	Unidades Económicas Sector Secundario
2003	326,882	18,666
2008	436,671	24,142
2013	617,325	28,494

Table 3 Analysis of the correlation between the GDP and the economic units of the secondary sector R= 0.9788

Año	PIB	Unidades económicas Sector Terciario
2003	326,882	132,088
2008	436,671	155,665
2013	617,325	191,341

Table 4 Correlation analysis between the GDP and the economic units of the tertiary sector R= 0.9997

Queretaro. Correlation analysis between the state GDP of Querétaro and the growth of the economic units.

Año	PIB	Unidades Económicas
2003	143,405	42,524
2008	225,553	56,345
2013	321,858	68,783

Table 5 Correlation analysis between GDP and economic units. R= 0.9971

Like Guanajuato, Querétaro also has a high correlation index between the dependent and independent variables. The correlation between GDP and economic units by economic sector is reviewed below.

Correlation analysis between the state GDP of Querétaro and the growth of the economic units of the primary sector

Año	PIB	Unidades Económicas Sector Primario
2003	143,405	14
2008	225,553	23
2013	321,858	26

Table 6 Correlation analysis between GDP and economic units of the primary sector R= 0.9470

Correlation analysis between the state GDP of Querétaro and the growth of the economic units of the secondary sector

Año	PIB	Unidades Económicas Sector Secundario
2003	143,405	4,639
2008	225,553	6,542
2013	321,858	7,340

Table 7 Correlation analysis between the GDP and the economic units of the secondary sector R= 0.9616

Correlation analysis between the state GDP of Querétaro and the growth of the economic units of the tertiary sector.

Año	PIB	Unidades Económicas Sector Terciario
2004	143,405	37,871
2009	225,553	49,780
2014	321,858	61,417

Table 8 Correlation analysis between the GDP and the economic units of the tertiary sector R= 0.9986

Puebla. Analysis of the correlation between the state GDP of Puebla and the growth of the economic units.

Año	PIB	Unidades Económicas
2004	263,525	165,237
2009	366,427	215,288
2014	499,753	250,622

Table 9 Correlation analysis between GDP and economic units R= 0.9850

Puebla also has a high correlation index, as well as Guanajuato and Querétaro. The correlation between the dependent and independent variable by economic sector is analyzed.

Correlation analysis between the state GDP of Puebla and the growth of the economic units of the primary sector

Año	PIB	Unidades Económicas Sector Primario
2004	263,525	43
2009	366,427	196
2014	499,753	196

Table 10 Correlation analysis between GDP and economic units of the primary sector R= 0.8265

Correlation analysis between the state GDP of Puebla and the growth of the economic units of the secondary sector

Año	PIB	Unidades Económicas Sector Secundario
2004	263,525	27,997
2009	366,427	38,606
2014	499,753	42,737

Table 11 Correlation analysis between GDP and the economic units of the secondary sector R= 0.9483

Correlation analysis between the state GDP of Puebla and the growth of the economic units of the tertiary sector.

Año	PIB	Unidades Económicas Sector Terciario
2004	263,525	137,197
2009	366,427	176,486
2014	499,753	207,689

Table 12 Correlation analysis between GDP and the economic units of the tertiary sector. R= 0.9901

Conclusions

As we can see in the following Table, the correlations of the three states are high, therefore we can conclude that the increase in the productive units increases the GDP, making them poles of economic attraction.

Entidad FEderativa	Correlación global	Correlación sector primario	Correlación sector secundario	Correlación sector terciario
Guanajuato	0.9882	0.9624	0.9788	0.9997
Querétaro	0.9971	0.947	0.9616	0.9986
Puebla	0.985	0.8265	0.9483	0.9901

Table 13 With correlation centering

In such a way that the creation of productive or economic units, give guidelines for the generation of sources of income in each economic entity, be it family (individuals), private and governmental companies, promoting optimal scenarios for aggregate consumption, investment and creation. of new productive agents, joining as sources of employment and generators of cash flow, thus, once again to become a cycle that detonates and favors the economy.

In addition to this, there are other factors that print a greater value than what has been mentioned in economic matters, so if these elements are combined in such a way that they encourage MiPymes, large companies, the government or the external sector to invest or generate traditional or innovative projects, there will be a sum of efforts that give guidelines to economic growth.

Finally, recognizing that productivity and competitiveness are important elements that serve as underpinning forces for the favorable economic attraction or the formation of poles of economic attraction, as is the case of the case study fedrative states.

Finally, it is important to recognize that for this, the identification of favorable socioeconomic environments is essential in order to take advantage of the competitive advantages that they provide for the performance of the business opportunities demanded by society.

Guanajuato / Indicador	Productos 2003	Productos 2013	Logros TCPA 2003-2013 (%)	Logros Ranking	Efectos Participación %	Efectos Ranking
Unidades económicas. Sector privado y paraestatal	208,975	293,194	3.44			
Unidades económicas	150,800	219,999	3.85	13	5.2	6
PIB Millones de Pesos	292,701	617,325	7.75	15	4.0	7
Actividades Primarias (S1)	12268	23161	6.56	17	4.57	7
Actividades Secundarias (S2)	119288	241413	7.30	15	4.53	9
Actividades Terciarias (S3)	161,144	352,751	8.15	10	2.28	6
Unidades Económicas S1	46.00	164	13.56			
Unidades Económicas S2	18,666	28,494	4.32			
Unidades Económicas S3	132,088	191,341	3.78			
Personal ocupado. Universo total	1,003,639	1,383,466	3.26			
Personal ocupado total.	731,350	1,059,008	3.77	9	4.90	5
Personal Ocupado S1	1,311	3,310	9.70			
Personal Ocupado S2	268,567	376,695	3.44			
Personal Ocupado S3	461,472	679,003	3.94			

Table 14 Guanajuato Impact Matrix, 2003-2013

Puebla / Indicador	Productos 2003	Productos 2013	Logros TCPA 2003-2013 (%)	Logros Ranking	Efectos Participación %	Efectos Ranking
Unidades económicas. Sector privado y paraestatal	250,077	341,902	3.18			
Unidades económicas	165,237	250,622	4.25	7	6	4
PIB Millones de Pesos	263,525	499,753	6.61	20	3.2	9

Puebla	Productos		Logros		Efectos	
Indicador	2003	2013	TCPA 2003-2013 (%)	Ranking	Participación %	Ranking
Actividades Primarias (S1)	11,321	22,612	7.16	12	4.46	9
Actividades Secundarias (S2)	91,473	167,040	6.21	22	3.14	11
Actividades Terciarias (S3)	144,654	310,101	7.92	15	2.0	7
Unidades Económicas S1	43	196	16.38			
Unidades Económicas S2	27,997	42,737	4.32			
Unidades Económicas S3	137,197	207,689	4.23			
Personal ocupado. Universo total	959,872	1,229,804	2.51			
Personal ocupado total.	649,927	860,794	2.85	19	4	7
Personal Ocupado S1	368	1,602	15.85			
Personal Ocupado S2	237,244	266,950	1.19			
Personal Ocupado S3	412,315	592,242	3.69			

Table 15 Puebla Impact Matrix, 2003-2013

Querétaro	Productos		Logros		Efectos	
Indicador	2003	2013	TCPA 2003-2013 (%)	Ranking	Participación %	Ranking
Unidades económicas. Sector privado y paraestatal.	61,627	97,389	4.68			
Unidades económicas	42,524	68,783	4.93	10	6	4

Querétaro	Productos		Logros		Efectos	
Indicador	2003	2013	TCPA 2003-2013 (%)	Ranking	Participación %	Ranking
PIB (Millones de Pesos)	125,148	321,858	9.91	3	2.1	17
Actividades Primarias (S1)	4,241	7,970	6.51	18	1.57	22
Actividades Secundarias (S2)	54,474	136,352	9.61	8	2.56	15
Actividades Terciarias (S3)	66,433	177,537	10.33	1	1.5	16
Unidades Económicas S1	14	26	6.39			
Unidades Económicas S2	4,639	7,340	4.70			
Unidades Económicas S3	37,871	61,417	4.95			
Personal ocupado. Universo total	374,470	601,554	4.85			
Personal ocupado total.	277,336	459,265	5.17	2	2.10	
Personal Ocupado S1	394	168	-8.17			
Personal Ocupado S2	110,896	314,535	10.99			
Personal Ocupado S3	166,046	144,562	-1.38			

Table 16 Querétaro Impact Matrix, 2003-2013

Based on the information worked, it was possible to identify that the states of Guanajuato, Puebla and Querétaro presented in the last ten years from 2003 to 2013, an outstanding economic behavior, for which they have become poles of economic attraction.

Guanajuato: In 2013 at the national level, 5.2% of the economic units were concentrated in said federal entity, which increased its economic units by 145.89% from 2003 to 2013, going from 150 million 800 thousand to 219 million 999 thousand economic units, thus achieving an annual average increase of 3.85% of the economic units, in such a way that these were triggers for the generation of a significant Gross Domestic Product (GDP), thus achieving a participation for 2013 of 4% to the National GDP, thus placing it in the ranking with the greatest contribution in position seven. Its average annual growth dynamics was 7.75%, placing it in the fifteenth place in the ranking, indicating that in recent years its growth rate has not been so strong, however, it has presented a good economic performance.

Where the secondary activities have been favored with an average annual growth of 7.30%, in such a way that its participation in the GDP by great division of activities allowed it to contribute 4.53%, this being a key factor to be placed in the ninth step, However, the sector with the highest growth is the tertiary sector, in which, in terms of percentage participation, it allowed it to be in sixth place, highlighting that the growth dynamics of the economic units was 3.85%, with a recruitment of employed personnel at national level of 4.9% in 2013.

For that meant that it is one of the economies with the highest recruitment of human resources, given its place in fifth position in this ranking.

Specifying that Guanajuato can be framed as an entity with greater employment generation and also diversification since most of it is working in non-governmental private productive sectors.

However, in terms of labor productivity, it is below the national average, which is 662 pesos, a figure in which Guanajuato reported in 2012-2013 an amount per 588 pesos, an element that directs him to the concept of salary poverty.

But not everything is gray, since this entity underpins the promotion of exports and what corresponds to labor diversification as already mentioned, indicating that it has a percentage of 2.7% of the population employed in Government, so the rest of This population was located in various private productive activities.

Based on the foregoing, it can be corroborated that derived from its favorable growth in the economic units, it has been possible to underpin the participation of economic income to the Nation, where its three economic sectors are highly dynamic.

Puebla: One of the most relevant aspects is that in terms of contribution to the National GDP, it ranks ninth with an average annual growth dynamic of 6.61% from 2003 to 2013. However, its average annual growth rate regarding generation of economic units in the primary sector, is significant, given that it rose to 16.38% annual average for the same period, for which the personnel employed in this sector also became more dynamic.

Achieving an average growth rate per year of 15.85%.

On the other hand, its tertiary activities marked a favorable growth rate with an average annual growth rate of 7.92%, which allowed it to be placed at number seven at the national level, thus highlighting its participation in the Mexican economy.

Regarding the behavior of its economic units in the last decade, it generated an average growth rate per year of 4.25%, belonging to the ranking of entities with a growth rate of in the production units, however, in terms of employed personnel, placed in the nineteenth place, which is worrying, because it denotes little capture of human capital.

Querétaro: This state entity, despite the fact that it ranked seventeenth in terms of contribution and/or participation in the GDP, can be seen as a promising economy, given its accelerated growth rate, since in the period from 2003 to In 2013, its economic units increased by an average of 4.93% per year, thus achieving tenth place in the national ranking in terms of generation of economic units.

For earlier had repercussions on its GDP growth dynamics, thus achieving an average annual growth rate of 9.91%, and as such, it ranked third nationally with the highest rate of growth in income.

This, in turn, had a favorable effect on the recruitment of employed personnel at the national level, since its growth in labor demand managed considerable and dynamic figures.

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The impact of human resources in Guanajuato's industrial MSMEs

El impacto de los recursos humanos en las MIPYMES industriales de Guanajuato

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Abstract

Nowadays, companies face a different way of doing business, since globalization has made markets more competitive and changing, taking them to rethink their strategies. In this sense, human resource management has become a strategy that allows firms to achieve business success, for that reason, this empirical study aimed to analyze the impact of the human resources in the industrial Micro, Small and Medium-size Enterprises (MSMEs) of Guanajuato. A personalized survey was administered to 288 managers of these businesses, and the results obtained through the statistical technique of analysis of variance (ANOVA) of one factor, allow us to infer that there is empirical evidence that the firm's size and the level of education of their managers influence the way in which human resources are managed, allowing these businesses to keep their employees satisfied and face minor problems of staff turnover and lower rates of absenteeism, which has been reflected in the business success of these kind of businesses.

Resumen

Hoy día las empresas enfrentan una manera distinta de hacer negocios, toda vez que la globalización ha hecho que los mercados se vuelvan más competitivos y cambiantes, llevandolas a replantear sus estrategias. En este sentido, la gestión de recursos humanos se ha convertido en una estrategia que permite a las empresas alcanzar el éxito empresarial, por tal razón, el presente estudio empírico tuvo como objetivo el analizar el impacto de los recursos humanos en las Micro, Pequeñas y Medianas Empresas (MiPymes) industriales de Guanajuato. Se aplicó una encuesta personalizada a los gerentes de 288 empresas industriales y los resultados obtenidos a través de la técnica estadística de Análisis de la varianza (ANOVA) de un factor, nos permiten inferir que existe evidencia empírica de que el tamaño y el nivel de formación del gerente influyen en la manera en que se gestionan los recursos humanos, lo que ha permitido a este tipo de empresas mantener a sus trabajadores satisfechos, así como enfrentar menores problemas de rotación de personal y menores índices de ausentismo, lo que se ha visto reflejado en el éxito empresarial de este tipo de organizaciones.

Human resources, Business success, Industrial MSMEs, ANOVA, Company size

Recursos humanos, Éxito empresarial, MiPymes industriales, ANOVA, Tamaño de la empresa

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Introduction

Currently, the highly competitive and dynamic global environment faced by companies, mainly smaller ones, has led them to rethink their strategies in order to face these challenges that put their permanence in the market at risk and with This meets the expectations and requirements of customers. For this, the human resources strategy is essential for the success of companies, since human capital is considered one of the most valuable critical factors in the organization (Habbershon, Williams & MacMillan, 2003). For this reason, according to Gómez-Mejía, Balkin & Cardy (2001), dedicating time and resources to acquire, maintain and develop the skills of human resources in any organization becomes a fundamental strategic objective.

That is why, according to Rubio & Aragón (2006), companies must establish the necessary mechanisms that allow them to attract qualified candidates, as well as retain and motivate current employees, so that in this way they can establish ways that help them. to grow and develop within the company, which will enable them to achieve competitive success.

Likewise, organizations must pay special attention to those practices that favor the development of human capital and in this way manage organizational knowledge correctly, since according to McEvoy (1984) the main cause of failure of SMEs lies in the mismanagement of human resources, by not recognizing the value required for the management of this invaluable resource, results that coincide with those obtained by Rubio & Aragón (2008) and Hornsby & Kuratko (2003).

One of the consequences of poor human resource management is reflected in the staff turnover problems that companies face. In this sense, staff turnover and loss of productivity have made companies increasingly concerned about the value of their human assets (Colom, Sarramopa & Vázquez, 1994).

For his part, Wilkinson (1999) points out that despite the importance of human resources and their management for the competitive success of SMEs, there is little research that focuses on their analysis.

In addition, as Rubio & Aragón (2006) point out, they show that these investigations present two antagonistic orientations. The first, in which are found those who affirm that small size is considered a competitive advantage, thanks to the good work environment that exists between them, the excellent communication channels, the higher levels of flexibility, the high motivation labor, to the offer of varied jobs, and to the greater proximity of the manager with the jobs. The second orientation

Thus, as Guerrero & Sire (2001) maintain, planning investment in human talent training has become one of the main concerns of human resource managers in recent years.

Since the training of workers has come to be seen as a fundamental tool when dealing with approaches focused on quality and flexibility, as well as for coping with increasingly frequent situations of technological and organizational change.

That is why the importance of this research in order to have empirical evidence of the impact of human resource management in industrial MSMEs in Guanajuato.

Therefore, an additional contribution of this study, in addition to its application in MSMEs in a developing country, such as Mexico, is the application of the one-factor Analysis of Variance (ANOVA) statistical technique and the correlation Pearson's bivariate.

Due to the above, the present study has set itself the objective of analyzing the impact of human resource management on industrial MSMEs in Guanajuato, Mexico, through significant differences according to the size, age of the company and level of training. of the manager of this type of company.

In this sense, the research work was carried out in the state of Guanajuato with a sample of 288 MiPymes, during the months of October to December 2014. Likewise, this research is divided into five parts: the first part is made up of the introduction; the second covers the review of the literature; the third part comprises the methodology; in the fourth part are the analysis and results of the investigation; in the fifth part are the conclusions, limitations of the study and future lines of research.

Literature review

The concept of human resources has been evolving through time, since the beginning of classical industrialization (1900-1950) when people were considered factors of production, that is, inherent and static resources, where their emotions and feelings passed unnoticed by managers or entrepreneurs who had all the authority and power for decision-making centered on themselves. The concept continued to evolve until people were already treated as organizational resources that had to be managed (Chiavenato, 2007).

It has been found in the literature that for companies to develop new products and improve their management processes, they require the motivation and ability of human capital to produce creative ideas and develop innovative approaches (Scarbrough, 2003). That is why the human resource management function can influence and modify the attitudes, skills and behaviors of employees to achieve organizational goals (Collins & Clark, 2003; Martinsons, 1995), since it plays a crucial role in the consolidation of the necessary conditions to catalyze and channel individuals towards the development of innovation activities for the company (Scarbrough, 2003).

In this sense, companies can use some strategic human resources practices, such as staffing, training, participation, performance evaluation and compensation as means to motivate the commitment of workers and thereby make them engage in creative thinking and innovation (Damanpour, 1991; Laursen & Foss, 2003).

According to Peña (1993), the job analysis provides the description of the tasks, the human specifications and the performance levels required by each job; short- and long-term human resource plans make it possible to know future vacancies with some precision and conduct the selection process in a logical and orderly manner; and candidates who are essential to having a pool of people to choose from.

For this reason, before deciding to hire staff, it is important that companies carry out a careful analysis: identify if the function is needed on a continuous basis, if it is directly related to the well-being of the business, what experience do I need from a professional and what skills should to have this person.

Employee education and training

Regarding the education and training of personnel, it is essential that companies invest in these items, which will be reflected in the performance and satisfaction of their employees.

Batanás (1996) establishes that training should aim to provide qualification levels in line with the real needs of the company, if it is to be an effective instrument in improving its competitiveness. It is precisely this relationship with strategy that makes training a strategic variable and an element of competitiveness.

According to Siliceo (1997), the human factor is the foundation and engine of any company and its influence is decisive in its development, evolution and future, which is why management science has been giving greater emphasis to the Staff training.

From inside the companies, which has given rise to special provisions in the current labor legislation, so that any effort in terms of training is carried out to facilitate the integration and rapport of the personnel with their own functions and with the objectives of the company, will contribute to consolidate a better climate not only for human relations but also for productivity.

For its part, Koontz & Weihrich (2001), argues that companies in Mexico must seek and implement mechanisms that guarantee successful results in organizations, and promoting knowledge, through training, is undoubtedly one of the most effective means. to transform, update and make the culture of work and productivity last, in any organization, becoming at the same time one of the essential responsibilities of any company.

Employee satisfaction in SMEs

Talking about job satisfaction is a very broad topic, since several factors intervene, however, it can be affirmed that the general satisfaction of an employee with his job is the result of a combination of these factors and monetary compensation is only one of them. they. In this sense, the role of management in improving employee satisfaction at work is to ensure that the work environment is positive, that morale is high, and that employees have the necessary resources to carry out the tasks they require. have been assigned to them.

The relationship between job satisfaction and productivity is a widely studied topic (Hellriegel, Slocum & Wodman, 1999) precisely because of its importance for organizations.

However, as can be seen in the literature, there are still doubts about the determining factors in this relationship, as well as the assertion that many companies under rather autocratic and strongly managerial organizational schemes achieve productivity.

The subject has continued to be studied, as mentioned by more recent works (Appelbaum et al., 2005; Koh & Boo, 2004; Savery & Luks, 2001), which clearly confirm a close relationship between these factors and productivity. Studies often indicate that when people feel comfortable and satisfied with their work, productivity tends to improve, bringing the much-desired economic benefits.

Staff turn over

It is extremely important for SMEs to recognize the factors that influence their staff, so that they make the decision to leave the company, as this increases their costs and decreases the profitability of companies, as mentioned by Taylor (1999) labor ruptures Unavoidable voluntary decisions are due to vital decisions of the employee that are beyond the control of the employer. However, recent studies show that approximately 80 percent of voluntary job terminations are preventable, and many are due to hiring errors or a poor fit between the employee and the job. The association between training in the company and job rotation constitutes an aspect in which there is a great theoretical coincidence.

Both the perspective of human capital, as well as the theories of segmentation or the theoretical current of internal labor markets and ñalan chow the brokenacion randIt is important when there are training costs that workers or companies have to bear. If a company pays for the training of a worker and the worker leaves, the investment made by the company is lost. If, on the other hand, a worker is made redundant after having invested in training, he will suffer a capital loss. That is why companies will try to avoid job rotation through various mechanisms (García Espejo, 1999). One of the procedures to avoid labor rotation is the establishment of internal labor markets. In this regard, specific training has been considered a Facthory and latet with the generation of domestic markets (Knoke & Kalleberg, 1994).

Absenteeism

Absenteeism from work is considered a factor that seriously reduces productivity. To reduce it, companies have resorted to various types of sanctions, to encourage workers who regularly meet their obligations or to make schedules more flexible, thus reducing the reasons employees have for absenteeism (Reyes, 2000).

Keith (2007) mentions that the phenomenon of absenteeism represents a problem not only for the worker but for the company, the first, which is affected by their salary, job security, poor performance, the quality of their workforce, reincorporation to work, the supporting documents to be absent and deficiencies in the services that impede the proper development and achievement of objectives, on the other hand the company that suffers from the consequences and is economically affected, in its presentation of goods and services and in the market among others.

According to Robins (2005), many of the companies have tried to reduce the absenteeism of their workers by trying to satisfy certain types of needs that, in their own opinion, they have considered as the most satisfactory so that the worker is happy and consequently can see with I like the work, although the organization stops by the effort of the individual through monetary compensation, the problem is not so simple, then the man-work relationship arises, the man-organization relationship with all its consequences.

B. Ohlander (2001) mentions that the origin of unjustified physical absenteeism is located in the lack of well-being that exists in modern work systems, by separating too much the work carried out from the results that are achieved through them; because work, being separated from the social door it occupied, ceases to be an integral part of the worker's life, losing all meaning, to the point of becoming a tedious thing, which tends to be avoided whenever possible, not only for be a cause of dissatisfaction, but also because it is considered a supposed threat to health.

Methodology

An empirical investigation was carried out with a descriptive, correlational and cross-sectional quantitative approach, through the one-factor Analysis of Variance (ANOVA) statistical technique, in order to find out if there are statistically significant differences between the groups, taking as reference for these groups the factors size and age of the companies, as well as the level of training of the managers of this type of company; and through the Pearson Correlation to identify the degree of correlation that exists between the variables.

Sample design and data collection

In said study, the impact of human resources on industrial MSMEs in Guanajuato was analyzed. For the development of this research work, the database offered by the Mexican Business Information System (2015) was taken as a reference, in which they appear registered in the state of Guanajuato until March 8, 2015, a total of 3,056 industrial companies, from 1 to 250 workers.

In this sense, the survey was designed from the human resources aspects block, adapted from Quick View 3.0 Manufacturing Assessment Questionnaire (2001) measured with a ten-item scale, which includes the variables hiring, training, evaluation, incentives, recognition , job satisfaction, absenteeism and staff turnover, which were measured with a Likert-type scale of 1 to 5 points, where they refer from total disagreement to total agreement, and which has a reliability of 0.845 according to Cronbach's Alpha Coefficient, so it can be interpreted that there is consistency between the variables (Nunnally & Bernstein, 1994).

In the same way, general information about the company was requested, such as number of workers, seniority, type of organization and level of training of the manager.

The survey was applied randomly to managers or owners of MSMEs in the industrial sector of Guanajuato, with a confidence level of 95% and a margin of error of 5%, for which a total of 342 surveys were sent. however, only a response rate of 84.21% was obtained, with a total of 288 valid surveys at the end.

Results

First, Table 1 shows the distributions of the sample by size, which was categorized according to the number of employees, where it can be seen that the sample has a predominant bias towards the microbusiness sector given the insufficient knowledge that is has of this segment since it is the most predominant in the economy.

Tamaño	Frecuencia	Porcentaje
Micro (De 1 a 10 trabajadores)	211	73.30%
Pequeña (De 11 a 50 trabajadores)	63	21.90%
Mediana (De 51 a 250 trabajadores)	14	4.90%
Total	288	100%

Table 1 Distribution of the sample by size

Likewise, Table 2 presents the classification of companies by economic sector. As can be seen, the best represented sector is food, which reaches almost 50% of the sample. It should be noted that companies from the agribusiness sector were included given the level of integration shown by agribusiness in the State of Guanajuato, in addition to including some companies from the commercial and construction sectors as industrial, since the former are dedicated to industrial inputs and the latter to the provision of structures and industrial maintenance.

Sector	Número de empresas	Porcentaje
Agroindustrial	26	9%
Alimentos	142	49%
Textil	19	7%
Plásticos	20	7%
Química	16	6%
Metal-mecánica	13	5%
Electrónica	5	2%
Muebles	13	5%
Construcción	9	3%
Comercial	25	9%
Total	288	100%

Table 2 Distribution of the sample by sector

Next, in Table 3 it can be seen that 59% of the MSMEs under study have been in operation for more than 10 years, which have been called mature companies, 20.1% have been in operation for 6 to 10 years, which have been called young companies, and 20.8% of the companies have less than 5 years of operation, and these have been called incipient companies.

Años funcionando la empresa	Frecuencia	Porcentaje
De 1 a 5 años (Incipientes)	60	20.8%
De 6 a 10 años (Consolidadas)	58	20.1%
Más de 10 años (Maduras)	170	59%
Total	**288**	**100%**

Table 3 Age of the companies

Once the companies that treated us were characterized, the relevance index of the variables that most impact the human resources management of the industrial MSMEs of Guanajuato was applied. Table 4 shows that the three main variables of human resource management according to the interpretation of the managers of this type of company are the variable there is evidence that their employees, as a whole, take pride in their work with a mean of 3.08, followed by the variable when employees do their job exceptionally well, they receive recognition with a mean of 2.98; and the variable that they give less importance to is that relative to there are current incentive programs that promote training, with a mean of 2. 58 according to the relevance index of the variables that most influence the level of innovation of this type of company. Likewise, it is noteworthy that there are greater problems of staff turnover (2.31) than absenteeism (2.25).

ID	Variable	Medias	Desviación Típica
SELEC	Selección del personal	2.88	1.336
CAPAC	Capacitación al personal	2.96	1.286
INCEN	Programas de incentivos	2.58	1.32
SATIS	Satisfacción laboral	3.08	1.301
EVALU	Evaluación del desempeño	2.72	1.335
REVIS	Revisores capacitados	2.70	1.331
RECON	Reconocimiento al desempeño	2.98	1.354
RAC	Rotación para aprendizaje cruzado	2.77	1.352
AUSEN	Problema de ausentismo	2.25	1.209
ROTA	Problema de rotación de personal	2.31	1.268

Table 4 Average situation of the company with respect to human resources

Subsequently, the statistical technique of the Analysis of Variance (ANOVA) was applied, in order to determine if there are significant differences between the groups that are compared, first using the size of the company as a factor, where it was classified as companies according to the number of workers, and that having applied this statistical technique with a confidence level of 95%, it was found that the most important variable for managers or owners of MSMEs is their company offers training to workers in all levels of the organization, and as the size of the companies increases, so does the importance of this variable, since this variable is more important for medium-sized companies than for smaller companies. The second variable in order of importance is related to hiring, formal methods are used to guide the selection process, this variable being more important for larger companies and less important for micro-enterprises.

The third variable in order of importance refers to the fact that there is a periodic and formal performance evaluation that is given to all employees, being more important for larger companies than for smaller ones, as shown in Table 5.

Variable	Micro	Pequeña	Mediana	Sig
Selección del personal	2.70	3.25	4.00	***
Capacitación al personal	2.77	3.38	4.00	***
Programas de incentivos	2.50	2.68	3.29	*
Satisfacción laboral	3.02	3.17	3.64	NS
Evaluación del desempeño	2.58	2.92	4.00	***
Revisores capacitados	2.59	2.95	3.21	*
Reconocimiento al desempeño	2.85	3.24	3.79	***
Rotación para aprendizaje cruzado	2.69	2.94	3.36	NS
Problema de ausentismo	2.19	2.35	2.57	NS
Problema de rotación de personal	2.26	2.37	2.79	NS

Table 5 Average situation of the company with respect to human resources according to size

Regarding the age of the industrial Mipymes of Guanajuato, it was first necessary to create the age factor, in which the companies were classified according to the years they had been operating in three groups, these being the group of incipient companies with a seniority from 1 to 5 years; the group of young companies that includes companies from 6 to 10 years old, and the group of mature companies that includes companies with an age of more than 10 years, and that when applying the ANOVA of one factor.

The results obtained are presented in Table 6, which shows that since the differences between the three groups are not significant, this indicates that all of them are equally important between the three different types of companies regardless of the time they have been working. running.

Variable	Incip.	Jov.	Madu.	Sig
Selección del personal	2.82	2.98	2.87	NS
Capacitación al personal	2.97	3.00	2.95	NS
Programas de incentivos	2.45	2.69	2.58	NS
Satisfacción laboral	2.92	3.22	3.09	NS
Evaluación del desempeño	2.67	2.72	2.74	NS
Revisores capacitados	2.78	2.71	2.67	NS
Reconocimiento al desempeño	2.88	3.10	2.97	NS
Rotación para aprendizaje cruzado	2.73	2.95	2.73	NS
Problema de ausentismo	2.27	2.10	2.29	NS
Problema de rotación de personal	2.27	2.19	2.36	NS

Table 6 Average situation of the company with respect to human resources according to seniority in terms of hiring, methods

Finally, regarding the level of training of the managers of the industrial MSMEs of Guanajuato, the results obtained are presented in Table 7, which shows that the variable to which this type of company gives the greatest importance is the variable its company offers training to workers at all levels of the organization, finding that the higher the level of training of the manager, the greater the importance given to this variable. The second most important variable is that referring to hiring, formal methods are used to guide the selection process, this variable being more important for managers with a higher level of training than for managers who do not have a level of training. bachelor's degree or engineering.

Variable	Sin Lic.	Con Lic.	Con Pos.	Sig
Selección del personal	2.71	3.23	3.32	***
Capacitación al personal	2.73	3.37	3.74	***
Programas de incentivos	2.43	2.86	2.95	*
Satisfacción laboral	2.94	3.36	3.47	NS
Evaluación del desempeño	2.46	3.29	3.21	***
Revisores capacitados	2.52	3.11	2.95	*
Reconocimiento al desempeño	2.80	3.40	3.21	***
Rotación para aprendizaje cruzado	2.65	2.96	3.37	NS
Problema de ausentismo	2.21	2.36	2.21	NS
Problema de rotación de personal	2.32	2.32	2.16	NS

Table 7 Average situation of the company with respect to human resources according to the level of training of the manager

In the same way, a bivariate Pearson correlation was applied, finding that of a total of 45 correlations between the variables, 35 correlations were positive and significant ($p < 0.001$), between the variables under study, as presented in Table 8.

Variable	SEL	CAP	INC	AUS	ROT	SAT	EVAL	REV	REC	RAC
SELEC	1									
CAPAC	.486***	1								
INCEN	.440***	.549***	1							
AUSEN	.022 NS	.053 NS	.039 NS	1						
ROTA	.011 NS	.020 NS	.004 NS	.673***	1					
SATIS	.346***	.533***	.455***	.029 NS	.003 NS	1				
EVALU	.370***	.584***	.569***	.204***	.139***	.611***	1			
REVIS	.364***	.582***	.509***	.159***	.166***	.483***	.712***	1		
RECON	.401***	.620***	.562***	.046 NS	.014 NS	.592***	.619***	.513***	1	
RAC	.269***	.494***	.268***	.158***	.234***	.369***	.372***	.509***	.481***	1

Table 8 Pearson's bivariate relationships

From the bivariate Pearson correlations shown in Table 8, it can be concluded that:

1. The selection process when hiring is related to training in 48.6%, with incentives in 44%, with satisfaction in 34.6%, with performance evaluation in 37%, with the fact that there are trained reviewers in 36.4%, with the recognition that is made to employees in 40.1%, with job rotation for cross-training reasons in 26.9%; and no significant correlation was found for this variable with absenteeism or staff turnover problems.

2. Staff training is correlated with incentives at 54.9%, with staff satisfaction at 53.3%, with performance evaluation at 58.4%, with the fact that there are trained reviewers at 58.2%, with recognition that it is done to employees in 62%, with job rotation for cross-training reasons in 49.4%; and no significant correlation was found for this variable with absenteeism or staff turnover problems.

3. Incentive programs are correlated with staff satisfaction at 45.5%, with performance evaluation at 56.9%, with the fact that there are trained reviewers at 50.9%, with the recognition given to employees at a 56.2%, with job rotation for cross-training reasons at 26.8%; and no significant correlation was found for this variable with absenteeism or staff turnover problems.

4. The absenteeism problem is correlated with the staff turnover problem in 67.5%, with performance evaluation in 20.4%, with the fact that there are trained reviewers in 15.9%, with job rotation for training reasons crossed in 15.8%; and no significant correlation was found for this variable with staff satisfaction or with the recognition given to workers by the company.

5. The staff turnover problem is correlated with performance evaluation in 13.9%, with the fact that there are trained reviewers who evaluate performance in 16.6%, with job rotation for cross-training reasons in 23.4%; and no significant correlation was found for this variable with staff satisfaction or with the recognition given to workers by the company.

6. Staff satisfaction is correlated with performance evaluation in 61.1%, with the fact that there are trained reviewers who evaluate performance in 46.3%, with the recognition given to workers for their performance in 59.2%, with job rotation for cross-training reasons at 36.9%.

7. Performance evaluation is related to the fact that there are trained reviewers who evaluate performance in 71.2%, with the recognition given to workers for their performance in 61.9%, and with job rotation for training reasons. crossed in 37.2%.

8. Having trained reviewers who evaluate performance is correlated with recognition of workers for their performance at 51.3%, and with job rotation due to cross-training at 50.9%.

9. The recognition given to workers for their performance is correlated with job rotation due to cross-training reasons by 48.1%.

Conclusions

Regarding the objective of the present investigation, it can be concluded that the aspects that most impact human resource management in industrial MSMEs in Guanajuato are the satisfaction of the workers, the recognition that is made to them for their good performance, and for Of course, incentive programs that encourage staff training, confirming what was established by Appelbaum et al. (2005), Koh & Boo (2004) and Savery & Luks (2001), however, it was also found that not all companies are giving due attention and importance to these variables, which has been reflected in the problems that some companies have of staff turnover (Taylor, 1999) and absenteeism (Bohlander, 2001), which has prevented them from achieving competitive success.

Based on the results obtained from the analysis of variance, it is concluded that Mipymes are giving greater importance to training workers at all hierarchical levels and to the formal hiring methods they use when selecting their personnel, which is has been reflected in the level of satisfaction of its workers.

However, smaller companies with managers who do not have a degree are the ones that give less importance to these two fundamental aspects of human resource management, and this has been reflected in the level of turnover of their staff and in the the absenteeism problem they face. Therefore, managers must pay special attention to the personnel selection process they carry out at the time of hiring and once they are in the company, they must be trained to carry out their activities in a more efficient manner.

Similarly, it was found that the recognition of the good performance of the workers has been another core aspect to which the MSMEs that have managers with a higher level of academic training have given importance, which has been reflected in the satisfaction of the workers. and in the lower level of absenteeism and staff turnover. On the other hand, the results allow us to infer that larger companies give greater importance to the periodic evaluation of the workers' performance, an aspect that has been beneficial in human resource management.

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In this same sense, it has been found that the absenteeism problems of workers faced by companies are highly correlated with the turnover problem faced by industrial MSMEs in Guanajuato, in the same way it has been found that absenteeism may be due to Perhaps some workers are resistant to performance evaluation or to being evaluated by trained people, or to the fact that they can be rotated from their job for ergonomic reasons or cross-learning due to the roots they have in the functions they are carrying out on a daily basis.

Also emphasizing that according to the empirical evidence provided in this study, one way to reduce absenteeism is to keep workers satisfied with their work and continue to recognize their performance, either publicly or by congratulating them in a private way or by giving them something. Monetary award for outstanding job performance.

Finally, regarding the problem of personnel turnover, it has been found that it has a close relationship with the rotation of personnel that is done for cross-training purposes, for this reason, companies must be especially careful when applying this learning strategy. with their workers, since according to the results of the correlation it can be inferred that the rotation problems are related to the rotation of functions for cross-training purposes, or because the results of their performance do not allow the objectives of the company. And the way you can reduce the problem of employee turnover is by keeping employees satisfied with their work and recognizing their performance when it is outstanding.

Within the limitations, it can be highlighted that the surveys were answered from the point of view of the managers of the Mipymes, which can lend itself to subjectivities. In addition, it is recommended to analyze the relationship of the variables studied through some other statistical technique that allows testing scientific hypotheses, since it is essential to identify how they impact the turnover problem faced by MSMEs. Finally, it is suggested to establish new constructs with the variables used to expand the results and compare them with the conclusions stated in this article.

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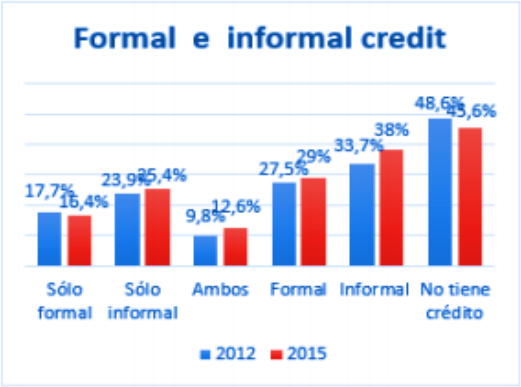
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