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The works must be unpublished and refer to topics of education, crowdsourcing, operation of academic's corps, regional development, fiscal, architecture, networks and other topics related to Social Sciences.

Presentation of the Content

In volume eight issue fifteen, as the first article we present, *Analysis of a criterial examination of integral calculus: the case of a public university of Mexico*, by DE LAS FUENTES-LARA, Maximiliano, AGUILAR-SALINAS, Wendolyn Elizabeth and JUSTO-LÓPEZ, Araceli Celina, with secondment in the Universidad Autónoma de Baja California, as a second article we present, *Technical report for the Higher Technological Institute of the Sierra region in matters of productivity, for the generation of an improvement model*, by PÉREZ-GÓMEZ, Gerardo Ernesto, PÉREZ-PÉREZ, Iris Cristel, ELISEO-DANTÉS, Hortensia and LÓPEZ-ANZUREZ, Omar Alejandro, with an appointment at the TecNM campus Villahermosa, as a third article we present, *Effects of the earthquake of September 19, 2017, in homes, in the municipality of Chietla, Puebla*, by VÁZQUEZ-TORRES, María del Rayo, CASTILLO-REYES, Alberto Rosendo, MORALES-ORTEGA, José Alejandro and MONTERO-URRUSQUIETA, Rubén Ángel, with secondment at the Benemérita Universidad Autónoma de Puebla, as fourth article we present, *Tacit knowledge, as a source of competitiveness: case study*, by RIVERA-ACOSTA, Patricia, MARTÍNEZ-TORRES, Rosa Elia and OJEDA-GUTIÉRREZ, Maricela, with secondment at the Instituto Tecnológico de San Luis Potosí and Universidad Politécnica de San Luis Potosí.

Content

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Analysis of a criterial examination of integral calculus: the case of a public university of Mexico

Análisis de un examen criterial de cálculo integral: el caso de una universidad pública de México

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Abstract

This research analyzes the quality and results of a criterial and large-scale comprehensive calculus test in the school cycles between 2014 and 2019 to a total of 5367 second-semester students of the engineering careers of a mexican public university. With the results obtained it is observed that the criterial examination of integral calculus is a valid, reliable test with satisfactory power of discrimination and with a majority load of procedural reagents. The results of the research show that the greatest difficulty for students is focused on integration techniques, especially when trigonometric functions are involved. It was also found that the success of students in the ECCI is due to the ability to resolve integrals with hyperbolic, exponential and logarithmic functions, as well as the proper application of the fundamental theorem of calculus and the technique of variable change.

Integral calculus, Criterial test, Evaluation

Resumen

Esta investigación analiza la calidad y los resultados de un examen criterial y de gran escala de cálculo integral en los ciclos escolares comprendidos entre 2014 y 2019 a un total de 5367 estudiantes de segundo semestre de las carreras de ingeniería de una universidad pública mexicana. Con los resultados obtenidos se observa que el examen criterial de cálculo integral es una prueba válida, confiable y con poder de discriminación satisfactorio y con carga mayoritaria de reactivos procedimentales. Los resultados de la investigación evidencian que la mayor dificultad para los estudiantes esta centrada en las técnicas de integración sobre todo cuando se involucran funciones trigonométricas. También se encontró que el éxito de los estudiantes en el ECCI se debe a la habilidad para la resolución de integrales con funciones hiperbólicas, exponenciales y logarítmicas, así como la aplicación adecuada del teorema fundamental del cálculo y la técnica de cambio de variable.

Cálculo integral, Examen criterial, Evaluación

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Introduction

Subjects in the area of mathematics are an essential part of the professional training of the engineer. In the case of the Integral Calculus (CI) learning unit, it is intended that students appropriate the concept of integral and the techniques for its resolution. The study and learning of IC allow modeling, understanding and advancing in the knowledge of various phenomena of nature, such as: the area between curves, solids of revolution (volumes), arc length, centroids and problems of fall free; are common examples of it. For Tasman and Ahmad (2018), calculus is the heart of the curriculum and one of the most important learning units for science and engineering careers. Its objective is to provide students with knowledge that allows them to analyze, interpret, pose and solve science and engineering problems (Zúñiga, 2007), since the training of these professionals demands mathematical learning that contributes to solving specific problems of a technological nature, but above all practical (Ruiz, Carmona and Montiel, 2016).

Calculus is one of the most difficult but fundamental subjects in the training of engineering students (Machromah, Purnomo & Sari, 2019). For this reason, its theoretical study and understanding by future engineers is of the utmost importance.

It is known that in education, evaluation plays a very important role in determining school performance and the knowledge that students achieve, the consequence of which may be accountability, or the redirection of instructional design and teaching strategies.

At present, large-scale evaluation that is carried out through standardized instruments of national and international application is one of the most used tools to determine the knowledge and monitoring of student learning and the status of educational systems (Jiménez, 2016) With this type of evaluation, it is feasible to identify the topics or topics where students find greater complexity, to later design and implement strategies that allow to remedy or improve the quality of student learning.

Today there are large-scale assessment systems in almost all European Union countries and in other highly developed countries such as Japan, South Korea, Singapore and Israel. They are beginning to be implemented in Arab countries, and in Africa, with the support of UNESCO's International Institute for Educational Planning.

A positive consequence of the Program for International Student Assessment (PISA), and large-scale testing in general, is that it has drawn the attention of society to the importance of making efforts to improve the levels of learning that are achieved. reach in the educational system (Martínez-Rizo, 2016).

In the United States, for example, since the mid-20th century, large-scale tests have been developed to assess learning achievements in both the conceptual and procedural components, and their application is highly recommended to improve education systems (Bautista, 2015).

In Mexico, it is known that the results obtained in mathematics courses at practically any school level are not satisfactory, for Mexican students the results obtained in international assessments (PISA, 2012, 2015) are below the average Although there are many factors that intervene in such performances, deficiencies have been detected to represent and carry out treatments and conversions between the different registers of representation of mathematical concepts, which seems to be due to the preponderance of the teaching of mathematics based on a traditional approach , in which procedural content is emphasized. However, nowadays the information regarding the school effectiveness variables obtained is poor (López and Gamazo, 2020).

Objective

A research study is carried out in a Faculty of Engineering of a public university in Mexico with the following particular objectives: (1) to present the criterial examination of integral calculation; (2) demonstrate that the ECCI is a valid, reliable assessment instrument with acceptable discriminatory power; (3) run a cluster analysis to identify the items and topics that predict student success; (4) carry out an analysis of the results obtained by the students in the ECCI.

Theoretical framework

For Contreras and Backhoff (2004) large-scale exams are applied to hundreds or thousands of students and have the purpose of certifying educational achievement, they have direct consequences on the accreditation of students with respect to a course or subject.

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The exam is declared criterial from the definition of the evaluative domain, when it comes to absolutely measuring the abilities of the students, what the examinee can do or not, serves as a diagnosis and significantly contributes to the creation or improvement of the design instructional, in the same vein, criterial tests are aimed at contrasting the curriculum designed, the one implemented and educational achievements (Jornet and González, 2009). Large-scale exams are usually designed with multiple choice (one correct answer and several distractors) in which the student is asked to choose the correct answer.

In the educational system, it is intended that students who attend schools are destined to acquire mainly theoretical and practical knowledge, so it is convenient to analyze whether the knowledge and content whose domain is evaluated refer to concepts or procedures.

For Sfard (1991), the structural or conceptual vision is characterized by an entity that has its own characteristics, is static, instantaneous and integrative. For Contreras and Backhoff (2004) it refers to the characteristics, ontological attributes and definition of the concept itself, it is also distinguished by the appropriation of a regularity. Harel, Selden and Selden (2006) consider it abstract and that it implies an implicit belief about the nature of mathematical entities that are described by formal definitions.

Regarding the operational or procedural vision, Sfard (1991) mentions that it is qualified by actions and algorithms, that it is dynamic and procedural or sequential. Contreras and Backhoff (2004) refer to them as the domain of the phases that implies the sequence of operations involved, the use of algorithms, and how, when and where they are used. since the learner is able to interpret multiple realities, he is better prepared to face real life situations. If a student can solve problems, he will be better prepared to apply her knowledge to new and changing situations (Guàrdia and Sangrà, 2005).

Methodology

The data used in this research correspond to the results of the criterial integral calculus exam (ECCI) applied between the 2014 and 2019 school cycles. The ECCI was applied to a total of 5,367 second-semester students of engineering careers.

The administration of this exam, which consists of 40 multiple-choice items, was carried out in the computer labs of the same university and lasted a maximum of 2 hours. The answers are recorded and processed in the QuestionMark data platform.

The content validity is guaranteed from the selection of appropriate indicators related to mathematical processes and the contrast of the validity of the reagents through the judgment of experts (Alsina and Coronata, 2014).

A reliability analysis was performed using the Kuder-Richarson coefficient (KR-20), which allows obtaining the reliability of an instrument from the data obtained in a single application (Corral, 2009). Additionally, the Ferguson delta coefficient was calculated, which measures the discrimination power of a complete test, the range of this coefficient is [0.1] and it is satisfactory when it is greater than 0.90 (Ding et al., 2006).

The difficulty index (ID) was determined, which is related to the proportion of students who correctly solve a question, and is calculated according to Crocker and Algina, (1986). There are parameters for the acceptance of a reagent according to its level of difficulty, the one established by Contreras and Backhoff (2004), says that it must be greater than 0.05 and less than 0.95.

For Engelhardt (2009) the average of this index in the test must be 0.5 to maximize discrimination. According to Backhoff, Larrazolo and Rosas (2000), the average level of difficulty of the instrument should range between 0.5 and 0.6.

The discrimination index (IDC) of the item allows differentiating (discriminating) between those students who obtained good grades in the test and those who obtained low scores, it is related to the high possibility of correctly answering the item, that is, of those students with a overall outstanding performance in the test, the opposite situation in the case of students with poor performance, in this analysis 54% of the sample population is considered, since 27% of students with high performance and equal Percentage of students with the lowest performance, for each item that is reviewed.

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For Contreras and Backhoff (2004) the discriminative value of the reagent is considered appropriate if it is greater than 0.2. The IDC scale according to Backhoff, Larrazolo and Rosas (2000) is: bad (IDC <0.20), fair (0.20 <IDC <0.30), good (0.30 <IDC <0.40) and excellent (IDC> 0.40).

The correlation coefficient of the biserial point (rpbis) was also calculated. For some researchers (Henrysson, 1971; Molina, Wizner, Lacave and Gallardo, 2015) this coefficient is an indicator of predictive validity, where the response to an item by a student and the result obtained from the test is related. This psychometric indicator is calculated according to the Backhoff, Larrazolo and Rosas (2000) model. For Ding et al. (2006) the rpbis should be greater than 0.2 although only a few test items could not meet this condition.

The QuestionMark platform database contains the response to each item for each student, the item results are assessed as a correct (1) or incorrect (0) response, these results were analyzed through the IBM SPSS Statistics program and Microsoft ® Office Excel. The information treatment allows obtaining the indices of difficulty, discrimination and the correlation coefficient of the biserial point, in addition to the reliability of the test by the Kuder Richardson (KR-20) and Ferguson delta methods.

An analysis of variance (ANOVA) was carried out with a post-hoc Tukey HSD test, in which the number of item was considered as a factor and the ID as a dependent variable in order to determine significant differences between the five units that make up the integral calculus course.

An analysis was also carried out on the development of reagent profiles, in order to identify the reagents and topics that predict student success and the existing relationship with discrimination and difficulty, for this purpose, the technique called cluster analysis (Bausela, 2005; Castejón et al., 2016, Dixson et al., 2017; Gonçalves et al., 2017). This analysis is a type of data classification that is carried out by grouping the analyzed elements. The fundamental objective of this type of analysis is to classify n objects into k (k> 1) groups, called clusters, by using p (p> 0) variables. The type of classification is k-means, as it is a tool designed to assign cases to a fixed number of groups.

Results and discussion

This section has been divided into four parts, the first refers to the presentation of the ECCI, followed by the quality analysis of the ECCI, the cluster analysis and finally the analysis of the results obtained by the students in the ECCI.

ECCI presentation

The ECCI is formally applied in the Faculty of Engineering of a public university in Mexico to all students who take the Comprehensive Calculus learning unit. The results of this exam are part of your ordinary evaluation and provide 30% of the final grade for this course, while the other 70% is awarded by the teacher who teaches the subject. The ECCI has been applied since 2005, it is currently made up of 40 items and has the following characteristics: it is criterial, it is aligned with the curriculum, it is multiple choice (one correct answer and three distractors) and it is large-scale.

In the construction of the ECCI, the model of Nitko (1994) was adopted to develop exams oriented by the curriculum, this model was complemented by the methodology for the construction of criterial tests of Popham (1990) and with methodological and operational contributions of Contreras (1998, 2000). The ECCI explores five basic units of knowledge of the Integral Calculus course, the items that make up each unit and their specific competence are shown in table 1.

Unit	Name	Competence	Reactives
1	Anti-derivation and definite integral	Calculate the antiderivative of a function and its definite integral by definition, using the corresponding theorems, to discern about the use and application of the concept of integral, with a critical, proactive and responsible attitude	1-7
2	Applications of the integral	Solve geometric engineering problems, based on the use of mathematical theorems and models, to design, optimize engineering processes and systems, with a critical and responsible attitude.	8-11

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3	Transcendent functions	Calculate integrals of transcendent functions, for the resolution of problems that involve the analytical, graphical and numerical aspects, through their properties and theorems, with a disposition for teamwork, a critical and responsible attitude	12-20
4	Integration techniques	Solve definite and indefinite integrals, by identifying and using the corresponding integration techniques, for application in various engineering problems, with a disposition for collaborative work, a critical and responsible attitude.	21-32
5	Improper integrals	Solve geometric problems with improper integrals, applying the concept of limit, to design, optimize engineering processes and systems, with a critical, proactive attitude and a willingness to collaborate work	33-40

Table 1 Competence and reagents of the differential calculus exam
Source: Self made

For the design of each of the reagents, a technical specification was previously developed based on the content of integral calculation and the psychometric point of view. The specification consists of a section of data identifying the content to be evaluated, an interpretation of its meaning, the characteristics of the stimuli that the item will present to the examinee (instructions to respond, item base, distractors, correct response, tables or figures of support, etc.), as well as a sample reagent that exemplifies the application of such reagent design considerations.

ECCI quality analysis

The existing documentation (content and grid of the subject, justification of the contents, table of specifications and specifications of the reagents) on the design and construction of the ECCI evidences the selection of adequate indicators related to the mathematical processes and the contrast of the validity of the reagents through the judgment of experts (Alsina and Coronata, 2014). The content validity was guaranteed with the participation of expert judges (Integral Calculus teachers with a minimum teaching experience of 5 years) and the group consensus method (Corral, 2009). In the subjects object of the validation, they were those who reviewed the coherence of the items with what is to be evaluated, the complexity of the items and the cognitive ability to be evaluated (Barraza, 2007), as well as the sufficiency and relevance of the items, in where the relevant aspects of the construct were considered, included in the competencies and indicators (Cisneros, Jorquera and Aguilar, 2012).

The average reliability during the 6 years of application was calculated using the Kuder Richarson method (KR-20), a coefficient r = 0.86 was obtained, which is considered appropriate when it is greater than or equal to 0.85 in the case of standardized criterion tests. and large-scale (Contreras and Backhoff, 2004; Ding et al., 2006; Muñoz and Mato, 2008). The average distribution of the total scores was also calculated using the Ferguson delta test, obtaining a value of 0.98, which broadly satisfies the established criteria (Ding, et al., 2006; Engelhardt, 2009).

The average value of the difficulty index is 0.51 ± 0.11 (mean ± standard deviation), it is a medium and adequate level of difficulty (Backhoff, Larrazolo and Rosas, 2000; Ding et al., 2006; Engelhardt, 2009). No reagent with ID less than 0.2 or greater than 0.85 was identified. In contrast, the minimum average value of the ID is 0.35 while the maximum average value of the ID is 0.77, the difficulty is appropriate according to the criteria of the specialists.

The average of the IDC is 0.44 ± 0.09 (mean ± standard deviation), which falls within a rating considered excellent (Backhoff, Larrazolo and Rosas, 2000), it also meets the criteria declared by Ding et al. (2006) in the which the average IDC is greater than 0.3.

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The average of the biserial correlation coefficients of the test is 0.35 ± 0.09 (mean ± standard deviation), the coefficient complies with the recommendation of the specialists (Ding et al., 2006; Engelhardt, 2009) in that the mean of the rpbis is greater than 0.2.

Cluster analysis

To establish the significant characteristics between the psychometric indicators and the results of the students, a cluster analysis of k-means was carried out. The results are three profiles that are described in table 2.

Psychometric indicators	Group		
	1	2	3
Difficulty index	0.58	0.60	0.41
Discrimination index	0.51	0.38	0.34
rpbis	0.44	0.33	0.29
Amount of reagents	13	9	18

Table 2 Final cluster centers
Source: Self made

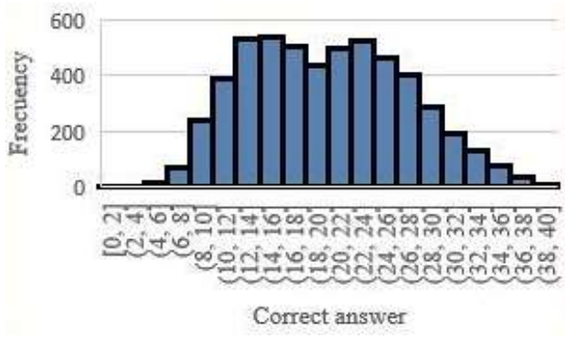
There are 13 items in group 1 and are characterized by their medium difficulty (0.58), by the excellent discrimination value (0.51) and items with the highest prediction (0.44) compared to the rest of the groups. They are reagents that mostly belong to units 1 and 3, the method of change of variable, the application of the fundamental theorem of calculus, the resolution of integrals with hyperbolic, exponential, logarithmic and trigonometric functions stand out as topics in this group.

The items in group 2 are 9 and are characterized by their medium difficulty (0.60), the discrimination value (0.38) and items with acceptable rpbis (0.33). It is observed that the reactants that belong to this group correspond to the calculation of area under the curve, area in two regions, solids of revolution and integration techniques.

Finally, group 3 consists of 18 items, with the most difficult items (0.41), acceptable discrimination (0.34) and the lowest biserial correlation coefficient (0.29). In this group there are reagents from all units, but unit 4 (integration techniques) stands out, since 44% of the reagents belong to that unit.

Analysis of the results obtained by the students in the ECCI

The average of the correct answers in the ECCI is 20.48 out of 40 possible points (graph 1), the average expressed as a percentage of the total points is 51%, which corresponds to the average ID of 0.51.



Graphic 1 Distribution of the number of correct answers in the ECCI
Source: Self made

The distribution of the number of correct items was significantly non-normal (Kolmogorov-Smirnov, D (5367) = 0.076, p <0.000. The asymmetry of the distribution of the number of correct items is 0.218 (Deviation = 0.033), these values indicate an asymmetry positive, the kurtosis of the distribution is -0.678 (Deviation = 0.067). For the type of distribution, the measures of central tendency and dispersion are added, the median is 20, the mode is 15, the quartile 1 is 15, the quartile 2 is 20 and quartile 3 is 26 (25% obtained a score equal to or greater than 65). Students had difficulty with 21 items (rated as highly and moderately difficult) and the positive asymmetry shows the difficulty of the ECCI, only the 34.6% obtained a score equal to or greater than 60 (on a scale of 0 to 100) with which they accredit the ECCI, that is, of the 5,367 students who applied the ECCI only 1,859 approved it.

Table 3 describes the characteristics of the 5 most difficult items for students, according to ID. These reagents belong to the techniques of integration by parts, trigonometric functions and case 4 partial fractions called repeated quadratics, all the reagents have content of the procedural type.

Reactive	Contents	Achievement indicator	ID
22	Procedural	Solve indefinite integrals by using the so-called piecemeal technique	0.35
24	Procedural	Solving definite and indefinite integrals of powers of secant and tangent	0.36
25	Procedural	Solve definite and indefinite integrals by using the cosecant and cotangent powers technique	0.37
23	Procedural	Solve definite and indefinite integrals of powers of sine and cosine	0.38
32	Procedural	Solve definite and indefinite integrals by using the technique called	0.38

Table 3 The five most difficult questions
Source: Self made

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Table 4 describes the characteristics of the 5 items with the highest prediction, according to the biserial correlation coefficient. It was found that the most predictive items of the success of the students in the ECCI are of the procedural type, involving the resolution of integrals with hyperbolic, exponential and logarithmic functions, the application of the fundamental theorem of calculus and the variable change technique that is practically use throughout the course.

Reactive	Contents	Achievement indicator	rpbis
19	Procedural	Solving Indefinite Integrals of Hyperbolic Functions	0.50
12	Procedural	Solve indefinite integrals of exponential and / or logarithmic functions.	0.48
7	Procedural	Apply the Fundamental Theorem of Calculus to Solve Definite Integrals	0.46
4	Procedural	Solving integrals using the change of variable method	0.46
16	Procedural	Solve indefinite integrals that result in sine, tangent, or inverse secant.	0.45

Table 4 The five most predictive items
Source: Self made

The analysis of variance between the items of each of the units and the ID did not show significant differences (p = 0.131). The averages of the ID for the five units calculated are: 0.56 for unit 1 (antiderivation and definite integral), for unit 2 (applications of the integral) it is 0.55, unit 3 (transcendent functions) has an average ID of 0.56, in unit 4 (integration techniques) the average difficulty is 0.45 and 0.49 for unit 5 (improper integrals). With these values, congruence is observed with the reactants with greater difficulty that belong to integration techniques and involve trigonometric functions and rational functions.

In the ECCI, it was found that only 5 items of the 40 (12.5%) are conceptual, while 35 (87.5%) are procedural, the above is a reliable example of the emphasis of a teaching scheme that does not show a balance between the conceptual and procedural contents. A T-test of independent samples between the conceptual cut reagents (ID = 0.50) and the procedural reagents (ID = 0.51) did not show significant differences regarding the difficulty of the ECCI reagents.

Conclusions

The quality of the ECCI that is applied on a large scale in a public university in Mexico was reviewed and whose main characteristics are: criterial, aligned to the curriculum, multiple choice and high impact, its application began in 2005 and consists of 40 items of the of which 87.5% are procedural.

It was determined that the ECCI has valid content, is reliable and has satisfactory discrimination power.

Reliability was calculated using the KR-20 method and a coefficient r = 0.86 was obtained, the Ferguson delta coefficient was also determined, whose resulting value is 0.98, which are considered by specialists as satisfactory.

The asymmetry of the distribution of the number of correct items evidenced the difficulty of the ECCI with an average ID = 0.51, which is practically at the lower limit of the range established by Backhoff, Larrazolo and Rosas (2000).

The ECCI revealed that the greatest difficulty for students is centered on integration techniques, especially when trigonometric functions are involved.

The conglomerate analysis carried out allowed to establish that the predictive items of a student's success in the ECCI are associated with the understanding and integration of hyperbolic, exponential and logarithmic functions, the correct use of the fundamental theorem of calculus and the adequate use of the change of variable, also called substitution technique.

The percentage of procedural reagents is latent evidence of the teaching scheme that prevails in the Faculty of Engineering of this public university, the incorporation of technological resources, the use and balance of different semiotic representations, as well as the search for a balance between procedural content. The revision and updating of the ECCI is an imperative need from the perspective of the results found. Today students need to explore, visualize, conjecture, analyze and interpret rather than carry out a series of step-by-step algorithms to obtain a result.

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Technical report for the Higher Technological Institute of the Sierra region in matters of productivity, for the generation of an improvement model

Informe técnico para el instituto tecnológico superior de la región sierra en materia de productividad, para la generación de un modelo de mejoramiento

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Abstract

Productivity is essential for all organizations, especially in current times where companies are still suffering the drastic changes given by the Covid -19 pandemic, this transformation has provided new areas of opportunity around the world, generating new techniques, jobs and This is the case of the present investigation that focuses on the realization of a technical report in the Institutions of Higher Education of the public sector, taking as a reference the Higher Technological Institute of the Sierra Region. This report is carried out through a systemic and comprehensive approach, considering the use of the Comprehensive Technical Productivity Assessment tool (TIEP) that integrates within its application the evaluation of 10 priority elements to achieve productivity and therefore the quality of organizations. It should be noted that the information that integrates the tool and the elements is taken directly from the experts linked in the context of the study. It is of great importance to mention the participation of the personnel who collaborated in the compilation of the information, as well as the experts who advised to be able to integrate a comprehensive scheme of the organizational scenario.

Productivity, Institute of higher education, Comprehensive approach

Resumen

La productividad resulta fundamental para todas las organizaciones, sobre todo en tiempos actuales donde las empresas sufren todavía los cambios drásticos dados por la pandemia por Covid -19, esta transformación ha brindado nuevas áreas de oportunidad en todo el mundo, generando nuevas técnicas, empleos y conocimientos.Este es el caso de la presente investigación que se centra en la realización de un informe técnico en las Instituciones de Educación Superior del sector público, tomando como referencia el Instituto Tecnológico Superior de la Región Sierra. Este informe se lleva a cabo a través de un enfoque sistémico e integral, considerando el uso de la herramienta Técnica Integral de Evaluación de la Productividad (TIEP) que integra dentro de su aplicación la evaluación de 10 elementos prioritarios para lograr la productividad y por ende la calidad de las organizaciones. Cabe señalar que la información que integra la herramienta y los elementos, es tomada directamente de los expertos vinculados en el contexto del estudio. Es de gran importancia mencionar la participación del personal que colaboró para la recopilación de la información, así como los expertos que asesoraron para poder integrar un esquema integral del escenario organizacional.

Productividad, Instituto de educación superior, Enfoque integral

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Introduction

Higher education is a key element to improve the development and productive capacities of the State, as well as to propitiate a better cultural and political level. The Technological Institutes promote the development of man in harmony with the environment, with others and with himself, where the recovery and future projection of the cultural heritage in its different fields and dimensions acquires fundamental importance.

Without quality higher education, it will not be easy to break the vicious circle of exclusion or to offer young people more and better opportunities and higher levels of well-being. A quality educational offer is also an indispensable means to achieve a more advantageous insertion of Mexico in the knowledge economy and in the value chains of global competitiveness.

Efforts to improve the quality of services provided by educational institutions have been underway for at least two decades. Among the various measures implemented, programs for institutional strengthening, the professionalization of academic personnel, the formation and strengthening of academic bodies and the integration of research networks stand out.

The measurement of processes allows identifying the main problems in a specific way, in such a way that provides better understanding at the time of locating areas of opportunity and improvement, which is why productivity is a key pillar in any organization with which an integral approach that benefits all stakeholders is determined, analyzing each of the variables of the context.

The development of this project is determined by the need to evaluate productivity in the Instituto Tecnológico Superior de la Región Sierra, in order to maintain a good productive level and to know the current situation of the organization, through the application of the tool "Integral Technique of Productivity Evaluation" in order to analyze the ten elements that every organization must take into account for the improvement of the system.

Description of the method

In order to give continuity to this productivity improvement, the application of a tool called: Integral Evaluation Technique for Productivity (TIEP), which identifies in what way the variables of the context influence the ten elements that every organization should have to integrate the knowledge and development of the organization, these elements are essential for the integral knowledge of the company and integrate a series of general and specific aspects that denote the productive scope of the company.

Elements:

1. Conceptual approach of the company.
2. Knowledge of the processes.
3. Social scope of the organization.
4. Planning administration.
5. Management participation.
6. Organizational creativity and innovation.
7. Knowledge of customers.
8. Technological development.
9. Macroeconomic knowledge.
10. Integral development of human resources.

The Integral Evaluation Technique for Productivity (TIEP) is a tool that gives us the security of being able to evaluate ten fundamental elements that every organization must have, with this generate a concrete measurement through a qualitative and quantitative analysis that relates the elements with the variables of the context; Environmental, Cultural, Economic, Social, Political, Technological, that could influence the productivity of the institute.

It is considered that the evaluation is performed in each of the departments that make up an organization and can be segmented by a group of departments, this is done personally so that the interviewer can engage in a conversation that integrates questions with which to qualify at its discretion how the variables influence on each of the elements and their relationship.

Analysis based on the method

The study of productivity using the Integral Productivity Evaluation Technique tool (Dantés, 2021), allowed obtaining results of the institution with a view to the application of an integral approach, analyzing the different elements that every organization must integrate in its work areas and identifying the incidence of the variables of the context on these, in order to determine the productive level of the institution.

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The present study will focus on the study of the academic sub-direction of the Instituto Tecnologico Superior de la Región Sierra, where the following departments were taken as reference for its study:

Academic Direction.

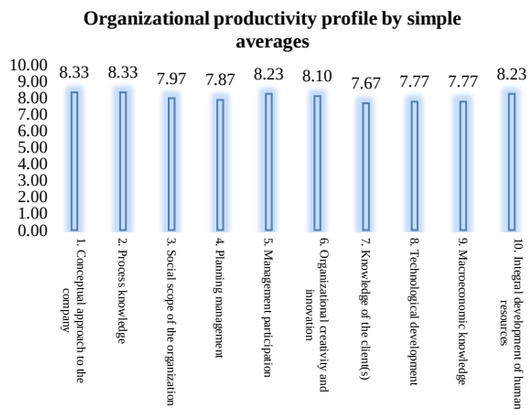
Academic Subdirection.

Subdirection of Graduate Studies.

Subdirección de Servicios Admisnistrativos (Administrative Services).

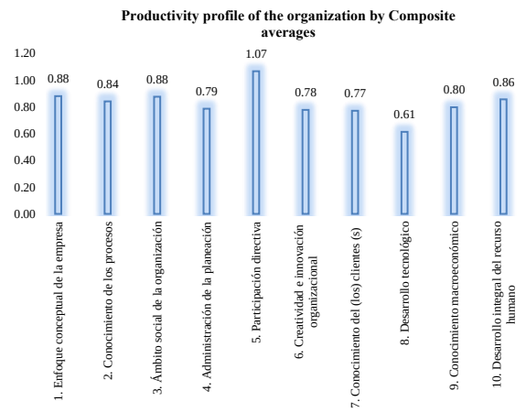
Head of the Management Engineering Division. The application of 5 instruments will be considered, one in each of the above mentioned departments to analyze the 10 elements that every organization should integrate in its organization for the control and improvement of productivity.

Results



Graphic 1 Productivity profile of the organization
Source: Author's elaboration, 2021

The integral graph of the organization's productivity profile shows the relationship of each of the departments and is summarized in the following, the departments are at a stable level given the interpretation of the graph, however there is the impact of the variables on each of the elements, this greatly influences the results and as can be seen in the graph the weight of the variables in the elements is remarkable, especially there are more notable points for the variables; economic, environmental, technological and social. The elements with lower scores; knowledge of customers, technological development and macroeconomic knowledge, represent the incidence of the variables as well as a performance with areas of opportunity, that through the design of an improvement model, it is possible to identify those points that would concretize and help to raise the score of the organization.



Graphic 2 Productivity profile of the organization
Source: Author's elaboration, 2021

In the following graph we can see more clearly where this score is leaning, which is one of the red lights for the institution. Technological development is of great importance for all organizations and even more so for higher education institutions, since this is where the knowledge comes from and the generation of trained personnel to perform their activities in the industry, which is why the measurement showed the lack of implementation of technological systems that improve the academic performance of students and teachers in their work.

Similarly, there is a better score on the element "knowledge of customers", this despite having a low score, is due to the integration of one of the departments that scored low on this element, however in most of these there is a total and integrated understanding of customers, thus concluding that the impact of the variables influences the time to obtain the results.

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Proposal

The Instituto Tecnológico Superior de la Región Sierra is an organization committed to the development of professionals in the industry, that is why by measuring its academic areas we were able to determine that it is at a stable level, given the scores obtained in the different areas, however we found incidence of the variables in the elements evaluated in each department, determining that the impact of these greatly influences the performance and achievement of the objectives.

It is found that the organization does not have a department in charge of environmental issues, a procedure or a guideline to achieve certification to improve processes and provide greater presence in higher education institutes in the state of Tabasco. It should be noted that in order to integrate this into the system, it is necessary to implement training to raise awareness of environmental issues in the different areas.

Similarly, technological development is a highlight, due to the lack of equipment to improve the development of knowledge in students, this does not mean that the institute does not have equipment, but it has very well equipped laboratories, but analyzing the constant changes in the present given by technological advances and the presence of a confinement by the health contingency generates new needs in the labor market, which is why the implementation of new equipment and technological services would improve the productivity of the organization.

Finally, the integration of a quality culture that benefits the system in an integral way, where the elements that determine the tool, are used with its totality in all the areas, which will look for a common goal, to be a productive company.

Productivity improvement model

Figure 1 Productivity improvement model
Source: Author's elaboration, 2021

In the model presented, it is possible to visualize the representation of the organization as a system with an integral approach where all areas of the institution work inside and outside. In the same way, the elements of the TIEP tool are integrated, since through these it is possible to analyze the departments and the incidence of the variables, from this it is considered that the variables of the context significantly influence the results of the organization and it is determined the integration of improvement cycles throughout the company. The impact of specific variables shows areas of opportunity that will benefit the organization as a whole.

Training and technological equipment.

At this point it is assumed that the organization needs new technological equipment to improve the academic performance of students in the industry, this given the emerging changes in the present and technological progress, likewise it is proposed to train the staff so that any subject or activity that requires it, there is a human resource that knows how to perform the use of machinery.

Generation of an organizational culture.

Thinking about the generation and implementation of an organizational culture is due to the lack of certain aspects in the institution, since the organizational culture can facilitate the implementation of strategies if there is a strong coherence between the two or, on the contrary, prevent or delay their implementation. If we accept the premise that business strategy, in addition to leading the company towards the achievement of certain economic objectives, serves as a guide in its constant quest to improve its performance, it can be deduced, therefore, that culture can and does influence the results of the company's activity.

Environmental awareness program.

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This program will serve to improve the entire company, not only internally, but also externally, since it will raise awareness of those aspects that were not so relevant in the location of the institution, as well as in the region. Strategies that benefit the environment will be implemented, school programs that provide support to localities through the development of projects that integrate this sensitivity to environmental care, thus generating an environmental culture in the organization.

Sustainable development.

Sustainable development is that development that is capable of satisfying current needs without compromising the resources and possibilities of future generations. Thus, keeping in mind objectives with a view to the future will benefit the institution, as well as providing an example to the students.

ISO 14001.

The international standard ISO 14001: 2015 Environmental Management Systems, provides specific guidelines through a set of standards covering aspects of the environment, products and organizations, when implemented provides better information management and a high degree of quality. This Environmental Management Systems (EMS) standard enables companies to demonstrate that they are responsible and committed to protecting the environment. And when implemented in the organization denotes a high degree of commitment.

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This work is the result of the effort and dedication of a work team, who throughout the development gave their support to the author and collaborators.

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Conclusions

As a conclusion to this work it is determined that the Instituto Tecnológico Superior de la Región Sierra is in a stable level, however it is demonstrated that the variables of the context and its incidence in the elements can influence at any given moment in the results obtained.

It is suggested that the institution initiate changes or improvements to the system as soon as possible, since this will greatly benefit the personnel as well as the organizational performance, providing a better service based on quality and productivity.

It is recommended to create an environmental committee, which will be responsible for seeking the necessary measures to raise the awareness of all personnel, as well as the implementation of international standards, since these will provide specific guidelines that will help in the search for continuous improvement. In the same way, training and technological equipment is sought, that is why a survey on new technologies in the world will provide support when selecting the desired equipment for the corresponding divisions, it should be noted that the use of software today and for contingency reasons have been crucial for the management and business continuity, which is why programs should also be implemented to help materialize the knowledge that teachers provide to the student community.

The materialization of the model can be materialized in the application of the same, taking as a starting point the research given the present, being internal aspects of the organization and to a large extent none affect the processes of this, you can continue with the activities in its normality, however it is necessary to appoint staff to integrate a committee to carry out the recommendations mentioned, as well as periodic evaluations using the TIEP tool, as it ensures concrete and stable results that seek the full benefit of organizations.

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Effects of the earthquake of September 19, 2017, in homes, in the municipality of Chietla, Puebla

Efectos del terremoto del 19 de septiembre de 2017, en viviendas, en el municipio de Chietla, Puebla

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Abstract

This work aims to publicize the effects of the 2017 earthquake on homes in the municipality of Chietla, Puebla, epicenter of the earthquake. The fieldwork was carried out by teachers and students of the Faculty of Architecture of the Benemérita Universidad Autónoma de Puebla, to support the community with a damage survey. To carry out the work, a report sheet was used where the data from the survey sheet were processed, determining the seismic analysis, the state of the construction was verified. The working groups were composed of a teacher and four students who visited each house, where images were taken, the location by latitude and longitude coordinates and the data collection. Subsequently, the information was gathered and a report was made to Civil Protection ranking the degrees of affectation. This work is the result of this field research divided into three sections. In the first part, the concepts involved in the topic are defined; the second part describes the geographical location and characteristics of Chietla; finally, the third part identifies the most common faults found in the fieldwork.

Earthquake, Vulnerability, Failures

Resumen

Este trabajo tiene como objetivo dar a conocer los efectos del terremoto de 2017 en las viviendas del municipio de Chietla, Puebla, epicentro del terremoto. El trabajo de campo fue realizado por docentes y estudiantes de la Facultad de Arquitectura de la Benemérita Universidad Autónoma de Puebla, para apoyar a la comunidad con una encuesta de daños. Para realizar el trabajo se utilizó una hoja de informe donde se procesaron los datos de la hoja de levantamiento, determinando el análisis sísmico, se verificó el estado de la construcción. Los grupos de trabajo estuvieron compuestos por un docente y cuatro alumnos que visitaron cada casa, donde se tomaron imágenes, la ubicación por coordenadas de latitud y longitud y la recolección de datos. Posteriormente, se recabó la información y se elaboró un informe a Protección Civil ordenando los grados de afectación. Este trabajo es el resultado de esta investigación de campo dividida en tres secciones. En la primera parte se definen los conceptos involucrados en el tema; la segunda describe la ubicación geográfica y las características de Chietla; finalmente, la tercera parte identifica las fallas más comunes encontradas en el trabajo de campo.

Terremoto, Vulnerabilidad, Fallos

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Introduction

Buildings constantly show structural damage so small that they go unnoticed, others are more evident, but those that do not put their inhabitants at risk are considered minor damage; but there are other serious damages that can be caused by poor structuring or be caused by intense seismic movements.

The task of the architect in Mexico is to design, build, budget, rethink architectural proposals to adapt them to the needs of the current era and assess the conditions of the buildings, among other tasks. Every architectural process raises different questions and different answers for the same problem or project. In the academic field, the teacher has to constantly prepare to give guidance to his students and at the same time carry out research activities and support to the community.

It is for these reasons that such important phenomena as the sismos occur, an immediate technical response must be given because if we do not do so, people's lives are being exposed and it would be irresponsible not to do so. Therefore, public universities such as the Benemérita University of Puebla are obliged to support communities that experienced serious situations.

The Benemérita University of Puebla, BUAP, supporting the government of the State of Puebla with the collaboration of the faculty of engineering and architecture organized brigades for the analysis of housing in areas that required technical support. Therefore, a group of professors of the faculty of architecture were assigned Chietla for the review and analysis of the houses, whose evaluations allowed to determine the security that there would be no need to fear before possible aftershocks of the earthquake or the risk that the inhabitants of some houses ran.

In the work of brigades there was the work of authorities, teachers and students of the faculty of architecture who not only focused on giving a technical response, but also a human approach where users exposed their problems because they needed to be heard and guided. In this practice, the students found themselves in the possibility of supporting and learning from the effects that housing had and understanding how to improve their professional practice. Also, it was found that the inhabitants were in solidarity with each other, because, if they did not need food or economic aid; they rejected them because others had difficult living conditions and were not going to deprive them of the help that was given to them at that time.

It stands out in the case of the groups of students the enthusiasm to allow them to help and at the same time learn things that they only see in theory and that made them aware of the importance of knowledge and ethics because they become responsible for the safety of users. In the case of the teachers, they were allowed to help and learn from the students because they used digital applications that facilitated the work of localization, becoming an amalgam that allowed them to deliver a professional work. As for the Institution, the organization was efficient, fulfilling its humanist approach. Regarding the knowledge obtained, it could be noted that the vernacular houses did not have serious problems because in the area there is a constructive tradition that allowed to elaborate houses with good quality. The problems arose in buildings with old and humid materials due to the constant rains of the previous two weeks and in new homes where the structural elements were not correctly located or modifications were made without considering the nature of the house.

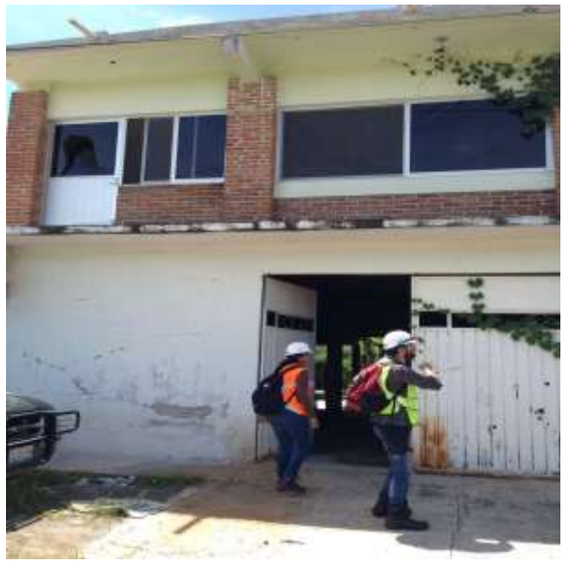

Figure 1 Buap students
Source: Faculty of Architecture BUAP, 2017

During the work of field research and community support was considered the methodology of civil protection that also mention Espada, Mego, Quevedo, Barreto, & Ñaupari (2021). This consisted of a preliminary evaluation where a visual inspection of the house was made to observe and describe the conditions of the house, considering the local faults and the physical conditions of the environment. At this stage, the areas or structural elements that presented damage were delimited and identified according to their levels of affectation. The record of the conditions found was applied the format of civil protection for lifting of damages.

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The civil protection format considers the type of natural phenomena that generate the damage; types of structure in building in vertical elements (columns and walls) and horizontal elements (Locks and slabs); types of damage to building structures; building sketch and damage record; elaboration of sketches of the building structure and registration of the damage.

In the concept of types of structure in building in vertical and horizontal elements are recorded the physical conditions of the house and its environment as cracks in multiple supports, high deflections in roofs, notable differential settlements, lack of coating in reinforcing steels, colorations in the structural elements that can be a sign of corrosion, areas with high humidity, exposure to salts, chlorides, etc. Also, there are problems of corrosion or aggression to the concrete and the degree of exposure to these substances and / or conditions. It is important to describe the quantitative elements such as the bearing capacity of the house, angles of turning of the supports, measurement of fissures, width of cracks. In the case of the structural characteristics of the house, exposure to sulfates and the removal or addition of some structural element must be recorded. at the time of any remodeling in the house. Espada, Mego, Quevedo, Barreto, & Ñaupari (2021).

This work was done to rank and classify the type of damage and identify the most serious cases that could pose a danger to the lives of users, which, if it happened and people had to vacate the houses to allow their intervention.

It should be noted that the homes that had problems during and after the 2017 earthquake were due to the fact that the materials were very old, had no maintenance or had interventions that damaged the house. That is, few cases were due to bad practice because the community has a constructive tradition that has allowed their homes to withstand the actions of the sismos.

According to Espada, Mego, Quevedo, Barreto, & Ñaupari (2021) the useful life of a building is the period from the moment the building is used until a major intervention is necessary to allow its use, without danger to its inhabitants. The period included for an important intervention in the building can reach 40 years or 70 years, where the design earthquake that causes the structure to enter the inelastic range that is the maximum tension that a material supports without suffering permanent deformations will occur.

For Silva (2021), the vernacular house of Mexico has been designed and built to meet the bioclimatic comfort and by the use of the materials of the area the integration with the environment occurs. However, this close relationship has been broken because industrialized materials are used that modify that environment, although in the last three decades of the twentieth century the concept of sustainability is integrated into architecture with countless works carried out by the country's universities. There are two currents on ecotechnologies for housing that are: technology such as photovoltaic cells, solar heaters, water saving devices, boiler of passage, films and thermal insulators, among others and the non-technified ones that are built with materials from the area or easy to acquire.

The population cannot access the technological systems due to their high costs, but it was observed that some houses that were visited have rainwater harvesting systems, dry baths, compost and solar stoves. On the other hand, the population does not have access to new housing financing, whose institution annually finances around 350,000 homes with a Green Mortgage in the country, so that the inhabitants acquire used homes or use self-construction. This means that some homes lack quality and cannot be resistant to the action of the sismos as observed in the visits to the community.

Earthquake

Sismos are movements of the earth, caused by the release of energy in the form of waves, due to the collision of tectonic plates, causing the Earth's crust to slide along a fault. (Carhuanira, 2021)

An earthquake can be defined as the propagation of waves through the Earth's environment that produce vibration; the propagation of seismic waves that cause damage is of three basic types of which two are internal because they propagate in all directions in the interior of the Earth and the primary wave or P wave that is the fastest between 1,100 and 8,000 m/s. (CENAPRED 2011).

Tremors are the effect of a disturbance that occurs either on the surface or in the interior of the Earth and originates from movement, friction and deformation of tectonic plates; where frictional motion provides energy and is an important precursor to the quake, plate deformation stores that energy.

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To understand what an earthquake is, it is necessary to understand the operation of tectonic plates. The core of planet Earth is made up of iron and nickel; the mantle is the middle part of the Earth, which is made up of ferromagnesian silicates. Finally, the outer part of the Earth called the lithosphere, is formed by the crust and part of the mantle with a thickness up to 100 km. The lithosphere has a behavior similar to a rigid body that floats and moves according to the slow internal movement of the mantle; this movement is produced by convection currents because of the temperature difference between the region near the core. This internal movement of the mantle causes the Earth's lithosphere to be formed by different segments or lithospheric plates, or tectonic plates. The Mexican Republic consists of five tectonic plates: Pacific, North America, Caribbean, Rivera and Cocos. The Tectonic Plate of Cocos is the most important because there originates the greatest seismicity located on the coasts of the Mexican Pacific. In northern Mexico, the Pacific and North American plates have great friction; because the Pacific plate moves in a northwesterly direction and the North America plate moves to the southeast: while the Baja California peninsula is slowly moving away from the continent, it is a region of great seismic activity, product of almost vertical faults and move horizontally in opposite directions (Espíndola and Pérez, 2018).

It should be clarified that the terms earthquake, earthquake and tremor are synonymous and there are 3 types of natural earthquakes which are: tectonics are produced by interaction of 5 tectonic plates: The North American plate, the Cocos plate, the Pacific plate, the Rivera plate and the Caribbean plate, volcanic are produced by volcanic eruptions; and collapse of the roof of caverns or mines. The National Seismological Service reports on average the occurrence of 40 earthquakes per day by the 5 tectonic plates.

On September 19, 2017, the National Seismological Service (SSN) reported an earthquake with magnitude 7.1 located on the state border between the states of Puebla and Morelos, 12 km southeast of Axochiapan, Morelos and 120 km from Mexico City with six aftershocks until 18:00 hours on September 19. Aftershocks occur after a large earthquake and rocks near the rupture zone are rearranged causing tremors that vary the number of events that occur in several days or weeks.

The site

Puebla is located southeast of Mexico City, has 217 municipalities the second state with the largest number of municipalities; being the first Oaxaca and has seven geoeconomic regions. Within these municipalities is Chietla is located in the southwest of the State of Puebla bordering to the north with the municipality of Tepexco, to the south with the municipality of Chiautla de Tapia, to the west with the municipalities of Tilapa, Atzala and Izúcar de Matamoros, and to the west with the state of Morelos. The name of Chietla is defined by the Nahuatl words Chichic, cosa amarga and Tlán, together or near; that together they mean "Near the bitter thing"; its name originates from the date palms that existed in the region, which secrete a bitter saline. Chietla is located almost entirely in the sub-basin of the Nexapa River, a tributary of the Atoyac, which is the border with the State of Morelos that runs through the center of the municipality with irrigation branches that reach the valleys. It is a municipality with warm humid climate in almost the entire municipality and sub-humid warm climate in the southeastern mountains.

Chietla in 2017 became the epicenter of the quake; Carhuanira, (2021) defines the epicenter as the point located on the earth's surface in the vertical line of the focus or hypocenter, where the earthquake acquires its maximum intensity or degree of the effects caused by an earthquake. Magnitude is the energy with which an earthquake manifests itself, the Richter scale that goes from 0-10 and is obtained with instruments called seismographs. Vulnerability is the degree of exposure or fragility to the occurrence of a hazard.

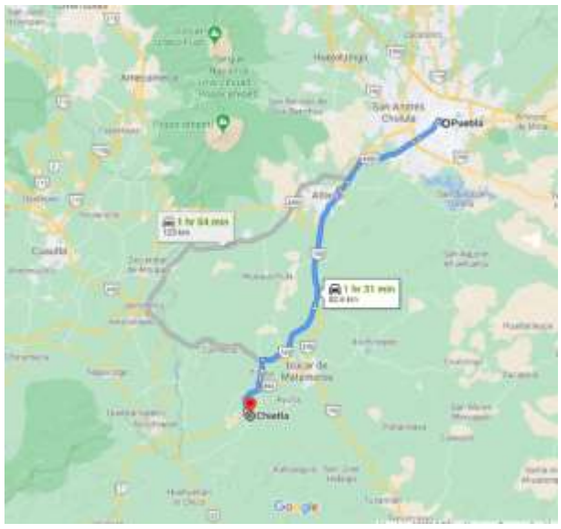

Figure 2 Location of Chietla
Source: Google maps, 2020

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As for the population, after the earthquake was in a state of stress, for López, Muñoz, & Visoso (2021), the post-traumatic stress that caused the earthquake of September 19, 2017, the main feelings evidenced by the population are fear, uncertainty and stress. These feelings are more intense in adults than in children and adolescents. People are unexpectedly subjected to natural disasters and their consequences.

However, it was observed that the inhabitants know this type of experience and even know the technical language; because according to them they have had to deal with that reality constantly and have been supported by the Universities to understand the dangers to which they are subject. They also met people who commented that the quake had not been as intense and that nothing had actually happened.

López, Muñoz, & Visoso (2021), distinguish two types of strategies in a demanding situation: problem-solving strategies or direct action where information is sought, strategies for anticipating a disaster, control of oneself and circumstances and social support and strategies for regulating emotions where the person can range from denial to behaviors of rejection and passive acceptance.

Also, these authors mention that the psychological consequences after disasters are diverse with symptoms such as reexperimentation of the event either expressed in nightmares or constant and involuntary images, denial or difficulties in concentrating, generalized distress, agitation, tremor, sleep disorders with variable durations that produce physiological effects. Sismos are seen as a threat to life and can have an effect on protective behaviors, forms of individual and collective adaptation. This situation contributes to families, fearing a new seismic event, resorting to reinforcing their homes or abandoning the traditional construction system because they consider it inefficient to withstand natural threats.

The State Commission for Reconstruction, earthquake report September 19, 2017 of the 217 municipalities of the state of Puebla, 112 were declared in emergency situation and 9 command centers were generated. The command center of Izúcar de Matamoros contemplated the municipalities of Acteopan, Ahuatlán, Atzala, Chietla, Coatzingo, Cohuecán, Epatlán, Izúcar de Matamoros, San Martín Totoltepec, Teopantlán, Tepemaxalco, Tepeojuma, Tepexco, Tilapa, Tlapanalá, Xochiltepec.

The 2017 Puebla earthquake occurred at 1:14:40 p.m. local time on Tuesday, September 19 with a magnitude of 7.1 Mw. Whose epicenter was located 12 km southeast of Axochiapan, Morelos. Earthquakes ..." They are sudden movements of the Earth's crust, originated by the release of accumulated energy, mainly in the faults or fractures of the plates, resulting in landslides that define the magnitude of the earthquake" (Government of the State of Puebla 2019).

The Mexican geological survey classifies the sismos as follows: tectonic sismos (interaction of tectonic plates); volcanic sismos (fracture of rocks by movements of magma and released by a volcanic eruption); collapse quaes (collapses of caverns and mines); artificial (man-made) sisms; deep sismos (generated at a depth of more than 75 km); cortical sismos (occurring superficially less than 75 km deep); interplate sismos (produced in the limits between two tectonic plates) and intraplate sismos (produced within a tectonic plate) (Government of the State of Puebla 2019).

According to the Government of the state of Puebla, in the Special Program for Seismic Emergencies (2018), it classifies the Mexican Republic, it was divided into 4 types of seismic zones to facilitate the anti-seismic design of the facilities of the Federal Electricity Commission (CFE). The following describes:

Zone A (there are no historical records of sismos in the last 80 years); zones B and C are intermediate zones (not so frequently occurring sismos or are areas affected by high accelerations without exceeding 70% of the ground acceleration) and zone D (large frequent historical axes and with soil accelerations that can exceed 70% of the acceleration of gravity). The state of Puebla belongs to zone B, which in turn divides the state into three seismic risk zones: High Risk where epicenters are frequent and includes municipalities such as Tehuacán, Acatlán, Izúcar de Matamoros and other nearby towns. Medium risk whose epicenters are less frequent and cover municipalities such as San Martín Texmelucan, Cholula, Puebla, Oriental, Lara Grajales, Ciudad Serdán, Tecamachalco, Acatzingo, Atlixco, and others of lower incidence. Low risk where epicenters are rare and are located the northern and northeastern sierra, cuetzalan region, Teziutlán and Zacatlán.

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The earthquakes that occurred in September 2017 caused serious damage to buildings and human losses because in the case of the state of Puebla 570 people died. In the case of hydrometeorological phenomena they represent more than 90% of the impact of disasters, however, in 2017 those of geological origin exceeded this proportion with 92.3% of the total damage and losses, mainly due to the September sismos. (Secretariat of Security and Citizen Protection and CENAPRED, 2017).

These hydrometeorological phenomena that the damage caused by the earthquake intensified causing in the affected municipalities by the constant concern that more earthquakes would happen that destroyed their homes due to structural vulnerability.

The vulnerability of housing

Structural vulnerability refers to exposure to possible damage to structural elements and non-structural vulnerability is the fragility or exposure to possible damage of non-structural elements of the structure. In the case of traditional housing the concept of confined masonry is identified is a set formed by masonry and reinforced at the ends by mooring supports and at the top joined with concrete enclosures. As for the non-reinforced or un-reinforced masonry also called Simple or factory masonry. (Carhuanira, 2021)

The structural vulnerability is defined according to the WHO, 2000 to the susceptibility that the structure presents to possible damage to the elements that allow the construction to continue standing before an intense earthquake such as the one that occurred on September 19, 2017.

It is important to point out the concepts that will be used, according to Carhuanira (2021), which are the following:

The confined masonry is a structural system, formed by walls contained in units or blocks with reinforced concrete porticoes, which allow to resist the horizontal forces caused by a seismic movement, where symmetry, regularity in plant and height are sought. The most common damages in homes according to CENAPRED (2018) are: collapse of walls either in supporting elements or parapets, beams displaced by not being well attached to the wall or because these caused damage to the walls during the seismic movement, vertical and diagonal cracks in walls, long collapsed walls, vertical crack in corners, and inclined cracks in corner displacement enclosures (image 3).

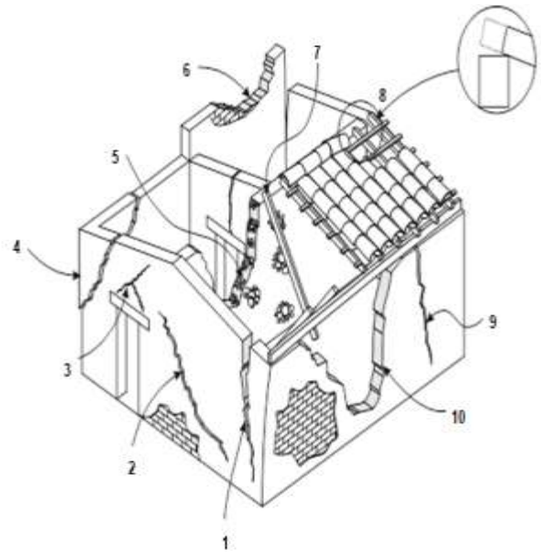

Figure 3 Common damage to adobe homes. 1. Vertical crack in corners by flipping walls. 2. Sloping cracks in walls. 3. Sloping cracks in enclosures. 4. Dislocation of corners. 5. Collapse of stone and mud walls. 6. Fallen parapet. 7. Fallen roof. 8. Beams run about to fall. 9. Vertical cracks in walls. 10 central turning on long walls
Source: (CENAPRED, 2018)

This type of faults are manifested in the cracks, they are caused to the forces by torsion, tension and compression, movements that the sismos, with their types of movement that are oscillatory and trepidatory, and not being the buildings with a quality of construction both in labor and in the materials, are subject to present this type of cracks.

The most common types of faults in adobe buildings are as follows: bending perpendicular to the plane of the wall; bending perpendicular to the plane of the wall with vertical cracking in the central area; bending perpendicular to the plane at the unconfined corners of walls; Fall of the roof towards the interior of the house, for being badly supported on the walls; poor connection of the walls of the first floor with those of the second.

Bending perpendicular to the plane of the wall. Horizontal cracking at the base or at an intermediate height and additional vertical cracks. When the wall is subjected to an acceleration, the inertial forces of the distributed mass of the wall cause the wall to deform in double curvature outside the plane; most inertial forces are transmitted to the sides of it. (Jaramillo, 2002).

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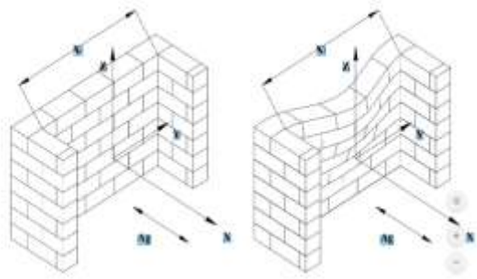

Figure 4 Orientation of the wall with respect to the acceleration at the base and deformation of it. It shows the orientation of the wall under study with respect to the requesting acceleration and the reference axes, X, Y and Z that indicate: the direction perpendicular to the plane of the wall, the horizontal direction along the wall and the vertical direction, respectively. X Y Z L Ag X L Z Y
Source: Jaramillo, 2002

Figure 5 Bathroom of a house where the bending perpendicular to the plane of the adobe wall is shown
Source: Faculty of Architecture BUAP, 2017

Figure 6 housing where the bending perpendicular to the plane of the adobe wall intensified by the structural failure of the enclosure is shown because the confined wall is not found and there is no effective distribution of the loads
Source: Faculty of Architecture BUAP, 2017

Figure 7 The longitudinal fault is seen in the image at the top
Source: Faculty of Architecture BUAP, 2017

It fails by bending perpendicular to the plane of the wall with vertical cracking in the central area. Diagonal cracking that constitutes the mechanism of failure and cracking at the top. The off-plane behavior of confined walls is different from that of unreinored, reinforced, and diaphragm walls. This is because the confined walls consist of an unreinsisted masonry panel and confining elements that form a flexible reinforced concrete frame. Diaphragm walls consist of a reinforced or non-reinforced masonry panel and a reinforced concrete or structural steel frame; in the case of diaphragm walls, first the frame is built and then the masonry panel, there being clearances between the frame and the masonry panel. (Varela, Chan, Fernández and Moreno, 2015).

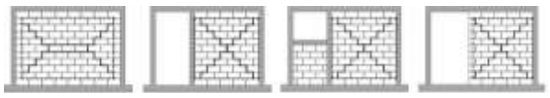

Figure 8 Main cracking pattern of the walls
Source: (Varela, Chan, Fernández and Moreno, 2015)

Figure 9 It fails by bending perpendicular to the plane of the wall by crushing the segments of the wall generating compression forces that increased until they reached the axial compression resistance of the masonry
Source: Faculty of Architecture BUAP, 2017

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Figure 10 It fails by bending perpendicular to the plane of the wall by static instability of the segments caused by the rigidity of the upper dala
Source: Faculty of Architecture BUAP, 2017

Bending fault perpendicular to the plane at the unconfined corners of loose walls or at corners not effectively connected to the transverse walls. This problem is common when masonry acts independently and not being joined easily detaches causing the loss of verticality or collapse.

Figure 11 Unconfined walls, observed at the top of the wall, the separation of the wall with the roof
Source: Faculty of Architecture BUAP, 2017

Figure 12 Unconfined walls, observed at the top of the wall, the separation of the wall with the roof
Source: Cano, 2020

Fall of the roof towards the interior of the house, for being badly supported on the walls. A fault is generated in the upper area of the walls. This type of failure occurred in homes in the historic center of Chietla. Fault that arises due to poor connection of the walls of the first floor with those of the second. In this failure mechanism the mezzanine breaks the main walls almost horizontally, generating the instability of the second floor. This type of failure occurred in homes in the historic center of Chietla, but the buildings could not be observed because they collapsed. Other constructive problems that favored the destructive action of the earthquake are the following:

Figure 13 One of the problems encountered is that adobe dwellings are integrated with reinforced concrete frames and covered with reinforced concrete or ribbed asbestos
Source: Faculty of Architecture BUAP, 2017

Figure 14 Interior view of the house of the image where reinforced concrete frames are integrated and rooms are added with other materials without taking care of the joints between one system and another
Source: Faculty of Architecture BUAP, 2017

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Figure 15 In several houses it was observed that the constructions of unconfined masonry were placed reinforced concrete roofs that caused separation between the slabs and compression in the walls
Source: Faculty of Architecture BUAP, 2017

Figure 16 A common problem was that the eaves were too long and flexed causing cracks that moisture caused the degradation of the materials
Source: Faculty of Architecture BUAP, 2017

Figure 17 It was observed that there were already cracks produced by other earthquakes, in which the humidity caused more fissures than in the earthquake of 2017 were evidenced
Source: Faculty of Architecture BUAP, 2017

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It is worth mentioning that of approximately 500 damaged homes in these analyses carried out, we have data that indicate the causes of the damage in this area, but what does not cease to be interesting, that the results indicate failures of the most common by the materials such as adobe, in the houses and buildings, not only by the construction system characteristic of these places , on the contrary it is more punctual than the cracks that appeared, were seen before the event so there was never a timely intervention, to avoid that in case of the eventualities to which this area is subjected, and the structural damage and failure in the adobe walls, which were of great magnitude, were minimized.

The quality of the houses and buildings, which were left to show that the minimum maintenance in the adobe walls, has not existed for a good time, this as mentioned above, leaves the house with the minimum security for its resistance, to the natural events that can be subjected, and that once the results are thrown forces us to generate , protocols that help us in a before and not after the damage caused by natural phenomena, because there are buildings that by the rains and seasons of ravaging, the adobe walls are degraded and never restored for their permanence, this makes them vulnerable to diverse situations, making them a danger to those who inhabit them.

On the other hand, the protocols to be proposed is of a constant technical supervision, which indicates the situation of the houses in a current way, to give indications to the inhabitants of the houses of how they should be observing their homes, since they are subjected to the constant volcanic activity and that this is often creating damage that in its beginnings is not visible until they are subjected to another type of detonating activity such as an earthquake and these collapse, creating irreparable damage, such as the loss of life, and that could well be avoided with the appropriate protocols for its mitigation of the damage caused.

Conclusions

The earthquake of September 19 called into question the concept of seismological danger, because the considerations that had been established for the disaster caused by the earthquakes, reminded us of the tragedy of September 19, 1985, which devastated part of Mexico City, and which was perceived in the state of Puebla.

In Puebla the earthquake of 7.1 degrees on September 19, 2017, left severe damage in the southern region of the state of Puebla, mainly in homes, hospitals, schools and the most serious in 620 buildings comprising temples and historic buildings.

In the case of Chietla, it is a town with a colonial historical center that was seriously affected by the old age of the materials and the weather conditions prior to the earthquake; in the case of the houses around the limits of the historic center they were affected by the inadequate way of using the construction systems, because these buildings are the product of unmanaged self-construction. However, it could be observed that adobe buildings had few problems, as they are the product of a great experience and constructive tradition that allow to build lasting and safe buildings.

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Tacit knowledge, as a source of competitiveness: case study

El conocimiento tácito, como fuente de competitividad: caso de estudio

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Abstract

In the society of the XXI century it is generally accepted that a new intangible resource of organizations is knowledge, in addition to the other existing resources: human, capital, raw materials and equipment. This is particularly true in a knowledge-based society and economy, where knowledge has become an invaluable medium for all organizations, particularly businesses. The objective of this paper is to make a diagnosis to describe how to apply knowledge management in the family business Campechanas la Escondida de la Trinidad. This project is based on a case study methodology, with a descriptive type of research; the collection of information uses as instruments with a qualitative approach, observation and interviewing. The results obtained show a dependence on the tacit knowledge possessed by bakers who apply in the artisanal process, in addition to family members, lack human talent management, formal training and innovation, which has limited their competitiveness.

Competitiveness, Technology management, Knowledge management, Tacit knowledge

Resumen

En la sociedad del siglo XXI es generalmente aceptado que un nuevo recurso intangible de las organizaciones, es el conocimiento, en adición a los otros recursos existentes: humano, capital, materias primas y equipo. Esto es particularmente cierto en una sociedad y economía basada en el conocimiento, en donde éste se ha convertido en medio invaluable para todas las organizaciones, en particular para las empresas. El objetivo de este trabajo es realizar un diagnóstico para describir la forma de aplicar la gestión del conocimiento en la empresa familiar Campechanas la Escondida de la Trinidad. Este proyecto tiene fundamento en una metodología de estudio de caso, con un tipo de investigación descriptivo; la recolección de información utiliza como instrumentos con enfoque cualitativo, la observación y la entrevista. Los resultados obtenidos muestran una dependencia en el conocimiento tácito que poseen los panaderos que aplican en el proceso artesanal, además los miembros de la familia carecen de gestión de talento humano, capacitación formal e innovación, lo que ha limitado su competitividad.

Competitividad, Gestión tecnológica, Gestión del conocimiento, Conocimiento tácito

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Introduction

The results of a case study carried out in 2020 in a family located in Santa Maria del Río, municipality of the estate of San Luis Potosí, Mexico, are shown. The objective of this paper was to make a diagnosis to describe how to apply knowledge management in the bakery *Campechanas la Escondida de la Trinidad.*

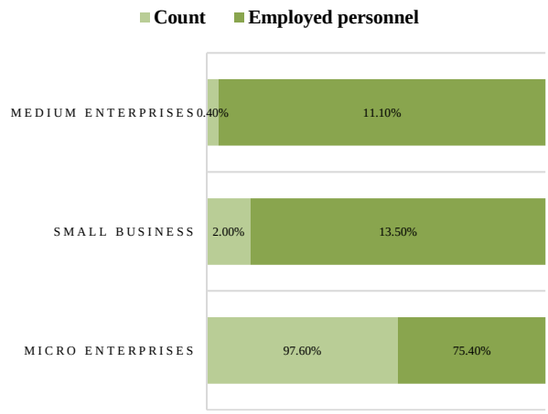
Micro, small and medium enterprises (MSMES) play a crucial role in the economic dynamics, and they are the benchmark for development consolidation. The trade liberalization has caused several nations to try to become more competitive throughout their productive and business sectors; to make this, it is necessary to take three key elements into account: innovation, science and technology. Competition encourages to consolidate local companies so that their products or services become a reference at the national level, in the first instance and on second place, at the international level.

Currently, there is an intense transformation that requires companies to make strategic decisions to be competitive and to be able to remain in the market in the short, medium and long term. For this reason, it is necessary to comprehend that the knowledge which underlines companies will allow them to face the challenges of their dynamic and competitive environment, to adapt, first to the local economy and finally to globalization (OECD, 2007).

Background

Micro, small and medium enterprises (MSMES)

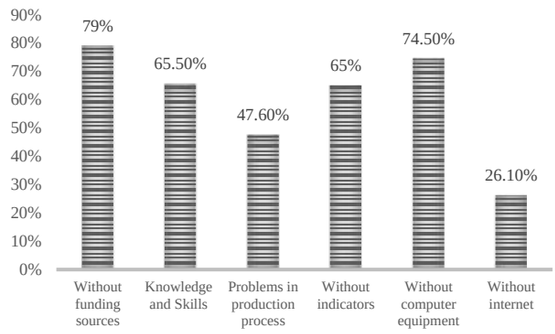
MSMES play a very important role in the economy of the countries, based on: job creation, contribution to GDP, sources of entrepreneurship, job providers, etc. The National Survey on Productivity and Competitiveness of Micro, Small and Medium Enterprises (ENAPROCE -by its acronym in Spanish-, 2015) refers that, of the total of these, 97.6% are considered micro enterprises and account for 75.4% of the total employed personnel. Followed by small enterprises with 2% holding 13.5% of the employed personnel; medium enterprises represent 0.4% of the economic units and hold just over 11% of the vacancies filled (Graphic 1).



Graphic 1 Distribution of the number of companies and total employed personnel by company size.
Source: own elaboration based on (ENAPROCE, 2015.)

Financing is a key element for business growth, particularly for MSMEs. In Mexico there are four million 057 thousand 719 micro-enterprises, of which 74% would not accept financing; it can be noted that this lack of financing has been an obstacle to its growth and permanence in the market (ENAPROCE, 2015 and 2018).

There are multiple challenges faced by micro enterprises in Mexico, among them, the lack of training, in which 65.6% of these, consider that the knowledge and skills they have, are adequate; problems in the production process represent 47.6% without solution actions; 65% do not have indicators to evaluate their performance, see graphic 2.



Graphic 2 Challenges for Micro Enterprises in Mexico
Source: own elaboration based on (ENAPROCE, 2015)

Other figures to consider are: 60.1% of micro companies consider that bank loans are expensive and 79% do not have financing; 74.5% do not use computer equipment and only 26.1% have internet access. Given these figures, there is a strength, since 85.3% of micro-companies express growth intentions.

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Theoretical framework

Competitiveness

Hernández (2000) mentions that there has not been reached a satisfactory definition of competitiveness due to the number of factors it includes. Competitiveness at the macroeconomic level, regardless, expresses it as "the ability of the companies to sell more products […] and to maintain -or increase/ its participation in the market (open and competitive), without sacrificing profits". Likewise, it divides the factors that affect competitiveness at the level of individual companies into: (1) factors that influence the cost of inputs, (2) factors that determine the efficiency in the use of the same inputs and (3) factors related to the prices, quality and differentiation of products generated by the companies, such production technology, normalization and standardization of processes and the certification of the levels reached.

Other authors (Benzaquen, Del Carpio, Zagarra y Valdivia, 2010, p.7) define regional competitiveness as a measure of their way to manage resources and abilities to increase business productivity and the well-being of its population.

Competition in many industries around the world is changing, likewise the pace is accelerating, so that the leaders of organizations require to give value to innovation, response capacity, organizational flexibility, diversity, technology, knowledge management, use of ICT and challenges of the global economy (Rubio and Aragón 2002; Esser, Hillebrand, Messne & Meyer-Stamer 1996).

There are several success factors in which they coincide: Human Resources management and personnel training, marketing abilities, quality, innovation, technological resources, information systems, financial management, cultural values, organizational structure, *know how* (tacit knowledge), management capacity, better practices in the complete production cycle, among others (Ibidem).

Technology management

Technology is the combination between skills and knowledge, capabilities, techniques, materials, machines, computers, tools and more equipment that people use to transform raw materials, problems and new ideas into valuable goods and services (Jones, 2013, p. 240).

According to (Valdés, 2009), technology is defined a a method or procedure to create something, considering the means (instruments, tools, equipment) linked to the kind of materials that are transformed and to the formal and general scientific knowdlege: company, work group or employee in particular.

Also (Daft, 2011, p.254) expresses that technology refers to the work process, techniques, machines and actions used to transform inputs (materials, information, ideas) into products, goods and services.

In accordance with the definitions proposed, technology is not considered as a single and isolated element, but as a series of interrelated elements with the common objective of satisfying the needs of the clients throughout the product or service. In the words of (Valdés, 2009) it is defined as a technological system (TS).

The administration of a TS is one of the keys to success of companies in the world, a task that is not easy without formal scientific knowledge, however it is a valid alternative to keep or increase the competitive position in the market (Ibidem, p. 5).

Knowledge management

In the Economy of Knowledge, technology (And the knowledge in which is based on) it is finally recognized as a factor of production in contrast to the traditional economy which only accepts capital and labor as factors (Rodríguez 2010, p. 64).

The consolidation of the economy of knowledge demands its generation and not only its exploitation through a good assimilation of knowledge generated by third parties. Cope (2001) adds that knowledge is essential to the point where the individual ability to process it efficiently is able to provide the company with a commercial difference.

The knowledge based economy was adopted to describe the tendency of advanced economies to contribute more and more to the generation of knowledge, information and high-level training, as well as a growing need for easy access to all these elements.

Knowledge and technology have become increasingly complex, highlighting the importance of links between companies and other organizations as a means of acquiring specialized knowledge. (OCDE, 2006, p. 36).

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In addition, a knowledge-based perspective highlights the interactive processes by which knowledge is created and exchanged both within and outside companies and with other organizations. Research and development (R&D) plays a crucial role in the process of innovation, a large part of the activities of innovation are not based on it, but they require of high-qualified workers, and interactions with other companies and with the public research institutions, As well as an organizational structure which facilitates learning and the exploitation of knowledge.

After having pointed out the relevance of knowledge in the organizational context, it is important to have an overview of how it is acquired, shirt and generated, as well as who determines its kind; for this reflection we have taken up the proposal of Nonaka and Takeuchi (1999), who considered knowledge (explicit and tacit) as the most valuable assets of any organization. Explicit knowledge, usually external to the company, can be acquired throughout books, magazines, technical information, design or machines. The tacit (subjective), internal to the company, is in the mind of the workers.

To acquire, imitate or transfer both types of knowledge it is required of learning processes that involve technical knowledge and also experience, developed by the company (Gómez 2008, p. 27). This tacit knowledge is found in people, it depends on the psychological characteristics of each individual, as well as their experiences. Its transmission can be throughout direct contact with the individual or the observation. Tacit knowledge is based on everything we know and apply automatically, not consciously, also built by a great deal of associations that create new meanings, new ideas and applications of the old (Martínez, 2009).

Explicit knowledge, the objective and rational one, can be expressed in words, sentences, numbers or formulas (it is free of context) and Includes theory, problem-solving manuals and databases (Nonaka y Takeuchi, 1999).

The "organizational knowdlege" (Ibidem), should be understood as "the capacity of a company to generate new knowledge, spread it among the members of the organization and materializing products, services and systems". This vision establishes that the people who make up the organization are the ones who hold the knowledge, which contributes to the actions of the organization.

Individual knowledge is created an expanded through the social interaction between the tacit knowledge and the explicit, throughout the four basic forms: socialization, externalization, combination and internalization, as shown in table 1.

	To tacit	To explicit
From tacit	Socialization	Externalization
From explicit	Internalization	Combination

Table 1 Spiral of knowdlege creation
Source: Own elaboration based on Nonaka y Takeuchi (1999)

Following this perspective (Ibidem), distinguish between managing knowledge and creating knowledge, the first one works with pre-existing knowledge, whereas to create knowledge it is needed that both kinds of knowledge, the tacit an explicit, interact throughout the spiral of knowledge creation.

Methodological description

He was developed based on the case study methodology, (Yin, 1994, Tellis, 1997a), with a qualitative approach and following the characteristic of this type of research, according to Creswell (2003, p. 164): "it is presented in its natural setting". Carrying out this study at the company's facilities allowed us to get to know the scenario and participants and get involved in their experiences.

The data collection techniques used for this study where observation and interview. An annexed category of qualitative data used was photography an audio recording of the interview. About the participants and the locations (Ibidem), fours aspects are identified: the setting, the actors, the event and the processes; for the unit of analysis these aspects where categorized.

Interview and observation

The interview was carried out in the bakery and in the owner's home, where besides listening and corroborating their experience in the business, there were the researchers involved in the anecdotes and history of its ups and downs, the succession and the new administrative forms. In these interviews, recordings of the same are considered for the subsequent analysis and interpretation of the information to complete diagnosis.

The observations mentioned were made at the bakery, paying attention first to the process of production of *campechanas* in one shift until the end of it with the packaging for sale.

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The responses from the interview were corroborated by specifying data on the knowledge creation process, from which the production process is developed, the methods of conversion from tacit to explicit knowledge and vice-versa, the work environment, the service provided, the facilities and the way the administration carries out daily activities.

Contextualization of the case study

The bakery *Campechanas Escondida de la Trinidad*, is located in Santa Maria del Río, considered a magical town of the municipality of the state of San Luis Potosí, 46km from the capital, where the main economic activities are commerce, crafts and agriculture. In Santa Maria del Río, there are other 24 bakeries that make "campechanas", according to the information available in the State Commission for the Gurantee of Access to Public Information of the State of San Luis Potosí (CEGAIP -by its acronym in Spanish-, 2017). Given the characteristics of this bakery, it is a family business, with 4 workers and the married couple who owns it; established in 1974, it has 45 years of history.

Process, the main product of the unit of analysis

Different types of bread are made, of which the one considered traditional is known as: "*campechanas*", having become a typical bread from the state of San Luis Potosí. Its elaboration is considered artisan, without electrical appliances, with rustic ingredients and its cooking is in a wood-fired brick oven. In figure 1, a phase of the production process is shown.

Figure 1 Production process
Source: own elaboration based on the field study

Analysis and results

From the answers provided by the owners in the interviews, the information obtained from a platform used for the diagnosis is specified:

It is considered a successful company with 45 years of service, it has a system defines as artisanal, where knowdlege, aligned with the "know how" concept, is the original recipe for the elaboration of the products, as it has been inherited from their ancestors.

The business in general, has been carried out "by imitation", since in 1974 Mr. Lauro, whom at the age of 17 learned the proper activities by working with Mr. Juan Hernandez, and starts his small business in his own home.

A momentum is recognized in the workers and the intentions from the owners to keep growing. In addition to be willing to adopt administrative system, they have been involved in activities for the regional growth since there are several bakeries, they have created a Cooperative Society. This effort requires that part of their profits are used for that, which they do without an accounting structure, so it is a point to regulate.

In addition, the Cooperative Society is prepared to train staff to increase production and serve the customer with quality service, as well as achieve effectiveness and it's processes to meet the demand since they have not been able to introduce the product in wholesale distribution centers, in which strict requirements must be met, such as having a registered trademark, barcode, product quality certifications, etc., considering that since their foundation, these family businesses do not have financial items for this.

Weaknesses:

The authors identified, that they do not have qualified bakers and that they have faced frequent absences from work with those hired, hurting the production process. While it is true that they satisfy the demand of the clients, this is possible because the owners get involved in the production so that delivery times are met.

In addition, they do not have a training program for personal who do not have the skills and knowledge ("*Know How");* this is, the experience to make *"campechanas"*. Nonaka and Takeuchi argue that knowledge is created throughout the knowledge spiral in the process of continuous creation of new knowledge and its assimilation by the company, at the same time has carried out the transformation of the value creation process, based on knowing how to manage the different types of knowledge and the flows or relationships that are established within and outside of it.

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The individual knowledge, *"know how"*, is created and expanded throughout the social interaction between the tacit knowledge and the explicit one, throughout the spiral of knowledge.

Another weakness is that the owners pay rent for a place that has two brick kilns to satisfy customer demand, this rent is obtained without following a financial pattern.

Opportunity areas:

The areas of opportunity observed for the unit of analysis are, among others, the way of conducting the business in its administrative practice, the use of information technology, such as having a website.

Also the rules are not well defined formally, logistics is the responsibility of the owner, who sometimes performs multiple tasks: delivery driver, baker, salesperson, delivery service and administrator.

Conclusions

Santa Maria de Río, Mexico, is a municipality considered as a touristic destination, magical town and cradle of the *rebozo*, which also offers very attractive landscapes. For this reason, the tradition of "*campechanas*" finds direct distribution and publicity. It has earned reputation with this product for more than 60 years, being in competition with regions, and national markets such as Tamaulipas, Hidalgo, Querétaro, Aguascalientes.

To improve the productive and competitive performance of the unit of analysis, it is necessary to focus the actions and activities of knowledge conversion, in the development of new abilities and knowledge to optimize and qualify the processes that allow the manufacturing of "*campechanas"* to respond to the changing demands of customers and markets.

The artisanal production system and knowledge management could be seen in the production process and interview with the owners. In the technology by unit and small batches of the unit of analysis, workshop operations are carried out to manufacture small orders to satisfy the specific needs of the clients. However, production depends on a great deal on the tacit knowledge of the baker, so it is not highly mechanized.

The cooking oven does not obey environmental regulations, it is made rustically with bricks and fired with woods; so there is a risk, if they switch to the use of renewable energy, that the flavor of the "*campechanas"* changes as well.

In short, the application of strategies, actions, tools that help achieve competitive advantage through competitive success factors are promoted. The complexity generated by globalization, sets new challenges to the unit of analysis; however, the application of the principles and postulates of knowledge management will allow them to better face this challenges.

In the same way, Soto y Barrios (2006, p.2), suggest incorporating activities that generate knowledge in any organization that suits each country and encourages the use of ICTs as a tool for their management; also, that it helps MSMES to raise their levels of competitiveness, Maldonado *et al*. (Apud Arriaga y Gómez, 2014).

Mexico and its regions, face the challenge of making MSMES competitive and that they incorporate strategies and practices related to knowdlege management that lead them to be more productive and efficient in the context of the factors mentioned in this paper of competitive success, throughout knowledge.

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Abstract (In English, 150-200 words)

Objectives
Methodology
Contribution

Abstract (In Spanish, 150-200 words)

Objectives
Methodology
Contribution

Keywords (In English)

Indicate 3 keywords in Times New Roman and Bold No. 10

Keywords (In Spanish)

Indicate 3 keywords in Times New Roman and Bold No. 10

Citation: Surname (IN UPPERCASE), Name 1st Author, Surname (IN UPPERCASE), Name 1st Coauthor, Surname (IN UPPERCASE), Name 2nd Coauthor and Surname (IN UPPERCASE), Name 3rd Coauthor. Paper Title. ECORFAN Journal-Spain. Year 1-1: 1-11 [Times New Roman No.10]

* Correspondence to Author (example@example.org)
† Researcher contributing as first author.

Introduction

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

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

What is your added value with respect to other techniques?

Clearly focus each of its features

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

Explanation of sections Article.

Development of headings and subheadings of the article with subsequent numbers

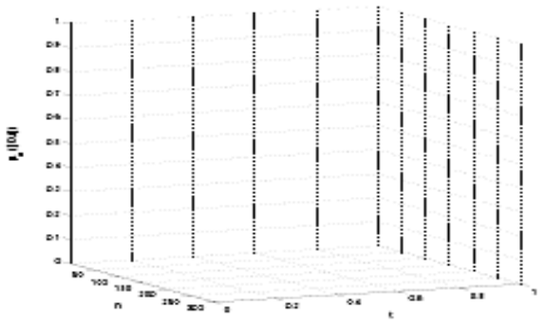
[Title No.12 in Times New Roman, single spaced and bold]

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

Including graphs, figures and tables-Editable

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

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



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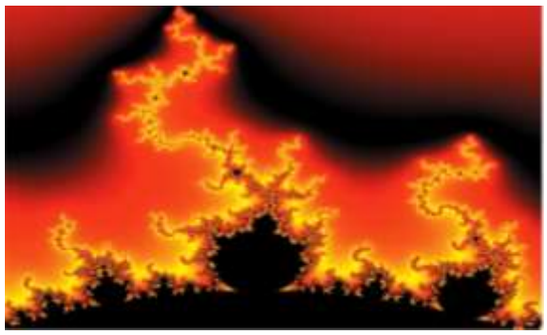

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Each article shall present separately in **3 folders**: a) Figures, b) Charts and c) Tables in .JPG format, indicating the number and sequential Bold Title.

For the use of equations, noted as follows:

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

Must be editable and number aligned on the right side.

Methodology

Develop give the meaning of the variables in linear writing and important is the comparison of the used criteria.

Results

The results shall be by section of the article.

Annexes

Tables and adequate sources

Thanks

Indicate if they were financed by any institution, University or company.

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Conclusions

Explain clearly the results and possibilities of improvement.

References

Use APA system. Should not be numbered, nor with bullets, however if necessary numbering will be because reference or mention is made somewhere in the Article.

Use Roman Alphabet, all references you have used must be in the Roman Alphabet, even if you have quoted an Article, book in any of the official languages of the United Nations (English, French, German, Chinese, Russian, Portuguese, Italian, Spanish, Arabic), you must write the reference in Roman script and not in any of the official languages.

Technical Specifications

Each article must submit your dates into a Word document (.docx):

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Article title
Abstract
Keywords
Article sections, for example:

1. Introduction
2. Description of the method
3. Analysis from the regression demand curve
4. Results
5. Thanks
6. Conclusions
7. References

Author Name (s)
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