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Support the international scientific community in its written production Science, Technology and Innovation in the Field of Humanities and Behavioral Sciences, in Subdisciplines of human talent, organizational commitment, work welfare, work performance, human resources management, human capital, productivity, organizational culture, leadership and sustainability.

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Encourage the interlocution of the International Scientific Community with other Study Centers in Mexico and abroad and promote a wide incorporation of academics, specialists and researchers to the publication in Science Structures of Autonomous Universities - State Public Universities - Federal IES - Polytechnic Universities - Technological Universities - Federal Technological Institutes - Normal Schools - Decentralized Technological Institutes - Intercultural Universities - S & T Councils - CONACYT Research Centers.

Scope, Coverage and Audience

Journal of Human Resources Training is a Journal edited by ECORFAN-Mexico, S.C. in its Holding with repository in Spain, is a scientific publication arbitrated and indexed with semester periods. It supports a wide range of contents that are evaluated by academic peers by the Double-Blind method, around subjects related to the theory and practice of human talent, organizational commitment, work welfare, work performance, human resources management, human capital, productivity, organizational culture, leadership and sustainability with diverse approaches and perspectives, that contribute to the diffusion of the development of Science Technology and Innovation that allow the arguments related to the decision making and influence in the formulation of international policies in the Field of Humanities and Behavioral Sciences. The editorial horizon of ECORFAN-Mexico® extends beyond the academy and integrates other segments of research and analysis outside the scope, as long as they meet the requirements of rigorous argumentative and scientific, as well as addressing issues of general and current interest of the International Scientific Society.

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Instructions for Scientific, Technological and Innovation Publication

Knowledge Area

The works must be unpublished and refer to topics of human talent, organizational commitment, work welfare, work performance, human resources management, human capital, productivity, organizational culture, leadership and sustainability and other topics related to Humanities and Behavioral Sciences.

Presentation of Content

In the fist article we present, *Study of graduates of the engineering career in productive systems of the Universidad Tecnológica del Norte de Aguascalientes*, by VAZQUEZ-GUTIERREZ, Rosa Inés, with adscription in the Universidad Tecnologica del Norte de Aguascalientes, the next article we present, *Extension and linkage in university practice within the framework of Social Responsibility*, by RIVERA-IRIBARREN, Maricel, CALDERÓN-SOTO, Lorena, CAMACHO-FÉLIX, María Ángela and CERVANTES-QUIÑONEZ, Izhalia Josefina, with adscription in the Instituto Tecnológico de Sonora, the next article we present, *Evaluation of the level of sense of belonging in a clinical analysis laboratory company in the City of Durango*, by LEÓN-MARTÍNEZ, Javier Alejandro, COVARRUBIAS-SALAS, Lizeth Sarahi, HERRERA-VARGAS, Isela Vanessa, with adscription in the Universidad Juárez del Estado de Durango, the next article we present, *Trends of higher education institutions with the productive sector in the formation of human capital and the generation of innovation and development: challenges and challenges in the face of COVID-19*, by ANTONIO-VIDAÑA, Paula Rosalinda, AGUILAR-HERRERA, Doris, HERNÁNDEZ-PERALTA, Alejandro de Jesús and MARTÍNEZ-NAVARRETE, Daniel, with adscription in the Universidad Tecnológica del Centro de Veracruz.

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Study of graduates of the engineering career in productive systems of the Universidad Tecnológica del Norte de Aguascalientes

Estudio de egresados de la carrera de ingeniería en sistemas productivos de la Universidad Tecnológica Del Norte De Aguascalientes

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Abstract

The present study of Graduates of the Engineering in Productive Systems career of the Universidad Tecnológica del Norte de Aguascalientes seeks to show an overview of the situation of the graduates of this University. A study of graduates allows us to obtain the necessary information on the impact that the education that graduates acquired while they were students has had, likewise it allows us to know specific problems in the market and find areas for improvement in the educational system of our University. The analysis of a graduate study will allow to have a strategic vision in the short, medium and long term for the competent authorities of our institution, as well as to show current and future students the validity of their career through the opinion of our graduates.

Education, graduates, UTNA, quality, industrial engineering

Resumen

El presente estudio de Egresados de la carrera de Ingeniería en Sistemas Productivos de la Universidad Tecnológica del Norte de Aguascalientes busca mostrar un panorama de la situación de los egresados de esta Universidad. Un estudio de egresados permite obtener la información necesaria del impacto que ha tenido la educación que los egresados adquirieron mientras fueron estudiantes, así mismo nos permite conocer problemas específicos en el mercado y encontrar áreas de mejora en el sistema educativo de nuestra Univesidad. El análisis de un estudio de egresado permitirá tener una visión estratégica a corto, mediano y largo plazo para las autoridades competentes de nuestra institución, así como permite mostrar a los estudiantes actuales y a los futuros la válidez de su carrera por medio de la opinión de nuestros egresados.

Educación, egresados, UTNA, calidad, ingeniería industrial

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Introduction

This report presents a study of Graduates of the Engineering Career in Productive Systems of the Universidad Tecnologica del Norte de Aguascalientes.

A survey was conducted to determine the most important parameters to measure on the information of the graduates.

The areas that were considered during this study were:

- General data.

- Employment situation.

- Aspects of the career of Engineering in Productive Systems.

The results of the survey applied to a sample of 35 students from the generations 2015 to 2019 are shown below.

This project benefits the Universidad Tecnologica del Norte de Aguascalientes since it allows it to know the most important information about its graduates.

Methodology

According to Hernández Sampieri (2010), the study that was applied was a "Quantitative Exploratory" study where a survey-type data recovery tool will be used.

Sampling

The type of sampling that was carried out was stratified.

The advantage of this type of sampling is that it tends to ensure that the sample adequately represents the population based on selected variables. It also makes it possible to obtain more precise estimates and its objective is to obtain a sample that is as similar as possible to the population in terms of the stratified variable (s). The result was a sample of 35 students from the generations 2015 to 2019. The survey was applied from April to June 2020.

Background

The Universidad Tecnológica del Norte de Aguascalientes is part of the Subsystem of Technological Universities (UUTT). It was created in 2000, and is located in the Municipality of Rincón de Romos, it has two fundamental purposes:

a) relocate the higher education services of the State of Aguascalientes, adapting them to the geographic distribution of the population.

b) contribute to the diversification of the higher education offer in the entity.

Currently, apart from its programs at TSU, the university increased its educational offer by opening the Bachelor level in four of its programs:

- Accountancy

- Productive Systems

- Mechatronic

- Industrial maintenance

- Software Development and Management

- Virtual Environments and Digital Businesses

- Sustainable and Protected Agriculture / Plans and objectives

- Human Capital Management

- Business and Marketing Innovation

- Metal Mechanics

- Business and Project Management

- Design and Management of Logistics Networks [1]

The objective of the career in Productive Systems Engineering is to provide a quality education to train Productive Systems Engineers with leadership, communication and collaborative work skills; with skills to design quality management systems, production processes through the implementation and management of projects using manufacturing and quality tools for technological and / or social development; committed to their professional and work development, with a high sense of social responsibility.

The degree has a duration of 3.8 years[2].

According to Cabrero, E. "The new world economy is characterized by having an important component related to the knowledge economy. In other words, it is based on its dynamics in the creation of markets where ideas, processes and diverse knowledge are offered around the systems of production of goods and services ". Hence the importance of carrying out a study of graduates of the UTNA, as it is important to have knowledge of what the progress of the graduates of this university is. [3]

The student was the one who received the education in the teaching institution, he is the main actor of the learning process. [4]

Education varies according to the conception of the world and of man, therefore it must be considered that education is proposed, fundamentally to transmit to the new generations a certain culture and specific knowledge and prepare them, in addition to the assimilation of new techniques, generally the result of technological changes5. For this reason, during this study a comparison was made on the real application of some subjects in the working life of graduates.

According to López, M. the quality has 3 supports:

- Evaluation, in terms of prior, simultaneous and subsequent knowledge. Reliable action support and in the right direction.

- Planning, as a resource that systematizes those aimed at improvement. Essential requirement of a job well done.

- Innovation to the extent that new values are incorporated or existing ones are improved, in the direction of the improvement learned [6].

Therefore, considering the last three quality supports, it is considered that this study of graduates is important for the UTNA because it will allow it to evaluate its graduates in order to plan and subsequently carry out an innovation in their teaching processes.

Background of the career of engineering in productive systems

Mission

Provide a quality education to train Productive Systems Engineers with leadership, communication and collaborative work skills; with skills to design quality management systems, production processes through the implementation and management of projects using manufacturing and quality tools for technological and / or social development; committed to their professional and work development, with a high sense of social responsibility.

Vision

To be an educational program in the area of Productive Systems, recognized for its relevance and quality standards with a high level of acceptance of its graduates in the labor field; for being a pioneer in the implementation of new technologies; be strongly linked to the business sector and offer a comprehensive training proposal for its students under a sustainable approach and social responsibility, aligned to the needs of specialized human resources demanded by the social, productive and services sector, with the skills to generate solutions innovative solutions to the problems faced by organizations as a result of globalization and technological changes.

General Objectives of the Educational Program

Prepare engineers in production systems for successful practice in the administration, management, implementation and control of production processes through the analysis, synthesis and efficiency of production systems, achieving compliance with quality standards, regulations and customer requirements for the obtaining and / or transformation of a product and service.

Educational Objectives

EO1. They manage human, material, economic and technical resources of the company to ensure compliance with production.

EO2. They control production processes based on customer requirements through standards and regulations.

EO3. They manage continuous improvement projects for the development and increase the efficiency of processes, products and services.

EO4. They carry out the evaluation of the process to ensure the quality of the product.

Egress Attributes

EA1. Identify, formulate and solve engineering problems in industrial maintenance applying the principles of basic science and engineering.

EA2. Apply, analyze and synthesize production processes by designing maintenance strategies considering technical and economic factors and by managing quality systems.

EA3. Experiment, analyze and interpret data using engineering judgment for decision making.

EA4. Communicate effectively in a clear and detailed way, on concrete and abstract topics in their professional and sociocultural context.

EA5. Act with proactive values and attitudes of excellence in their personal, social and organizational development, in harmony with their environment.

EA6. Recognize the permanent need for updating and training to locate, evaluate, integrate and apply this knowledge in areas of maintenance engineering.

EA7. Directs and / or participates in work teams by defining their characteristics, coordinating efforts and evaluating their achievements, to contribute to the development of the organization.

Graduate Profile

1. Manage production through administration tools, to meet customer requirements.

2. Manage the supply chain, through logistics systems, to guarantee the availability of materials and products.

3. Manage auto parts production processes and the automotive industry through quality assurance and innovation, to contribute to the competitiveness of the organization.

Professional occupations

- Product Engineer

- Design Engineer

- Eng. In Forming Processes

- Engine and Automotive Parts Designer

- Manager of metalworking companies

- Service Manager

- Supply manager

- Manager of your own company

Performance Scenarios

Companies in the automotive and auto parts industry for transformation including the Tier 1, 2 and 3 supply chain.

Companies in the industrial sector of Services for the Automotive industry.

Your own company in the supply chain and services to the automotive and auto parts industry.

Syllabus

FIRST QUARTER	SECOND QUARTER	THIRD QUARTER
Linear algebra	Mathematical functions	Differential calculus
Basic Chemistry	Physical	Statistical Process Control
Industrial organization	Probability and statistics	Manufacturing Processes I
Metrology l	Electricity and magnetism	Manufacturing Topics
Industrial Drawing	Work Methods and Systems I	Integrator I
Technologies for Digitization	Distribution plant	Work Methods and Systems II
English I	Production costs	Safety and industrial hygiene
Oral and Written Expression I	English II	Production Management I
Sociocultural Training I	Sociocultural Training II	English III

FOURTH QUARTER	FIFTH QUARTER	SIXTH QUARTER
Structure and Properties of Materials	Fundamentals of Industrial Legislation	INDUSTRY INTERSHIP
Quality Management	Manufacturing Processes II	
Environmental management	Supply chain	
Integral calculus	Applied Manufacturing	
Production Management II	Chemical processes	
Advanced Industrial Drawing	Integrative II	
Fundamentals of Economic Engineering	English v	
English IV	Oral and Written Expression II	
Sociocultural Training III	Sociocultural Training IV	

SEVENTH QUARTER	EIGHTH QUARTER	NINTH QUARTER
Mathematics for Engineering I	Mathematics for Engineering II	Materials Logistics
Statistics Applied to Engineering	Physics for Engineering	Advanced Quality Topics
Thermodynamics	Industrial Metrology	Project Development and Monitoring
Lean Manufacturing	Materials Engineering	Integrator I
Market study	Elective I	Operations research
English VI	English VII	Elective II
Time management	Planning and Work Organization	English VIII

TENTH QUARTER	ELEVENTH QUARTER
Process engineering	INDUSTRY INTERSHIP
Process automation	
Investment projects analysis	
Integrative II	
English IX	
High Performance Team Management	
Business Negotiation	

Figure 1 Syllabus

Results

I) General data

In this section, age, sex, marital status, name and email were considered as questions, only that for reliability of the data the name and email will not be published.

a.   Age

The age of the surveyed graduates ranges between 22 and 25 years.
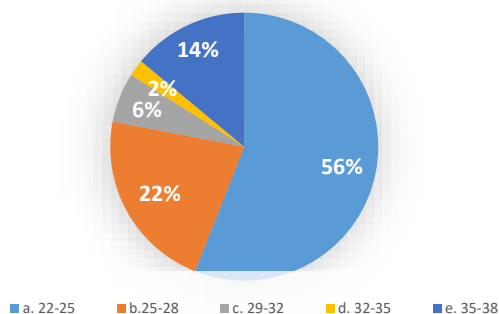
Figure 2 Age of the surveyed graduates

b.   Sex

The composition by gender of the degree in Engineering in Production Systems surveyed corresponds to 37% female and 63% male.
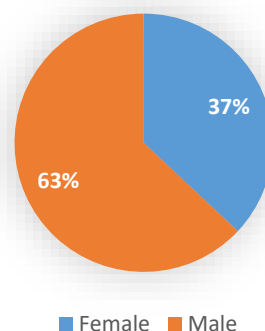
Figure 3 Sex of the surveyed graduates

c.   Marital status

Regarding the marital status of the graduates surveyed, the category of married stands out with 74%; while 20% are married and 6% are in common law union.
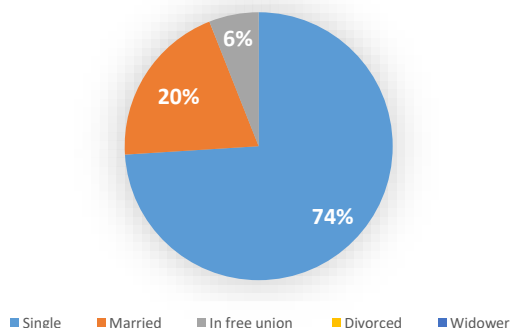
Figure 4 Civil Status of the graduates

II) Employment situation

The most important items on the current situation of our graduates are shown below. In this area, they were asked if they worked, monthly income, number of hours worked per week, duration of work, as well as their current job position.

a.   Employment situation

During the survey, the students reported that 97% were working.

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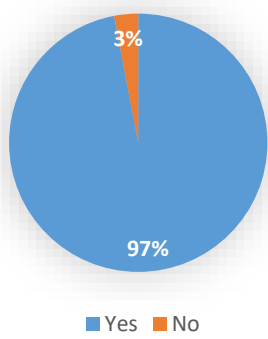
Figure 5 Employment situation

b.   Monthly income

The item that stands out in the monthly income is $ 10,001 to 15,000 with a percentage of 63%, while there is also a percentage of 14% that mentions earning only $ 5000. Likewise, there are no graduates of this survey who are earning more than $ 20,000.
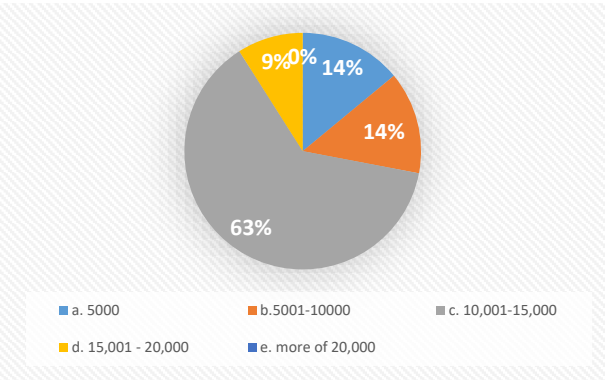
Figure 6 Monthly income

c.   Number of hours worked per week

The average number of hours worked per week is 45 hours, followed by 40%, 50 hours per week.
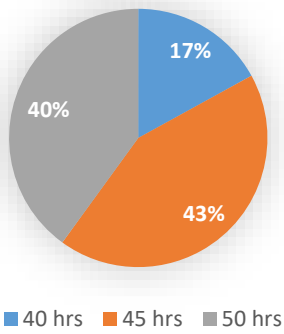
Figure 7 Number of hours worked

d.   Working time

The duration of work that graduates have oscillates in 43% with 2 years in their workplace. It is followed by 26% with some who have been working from 6 months to 1 year.
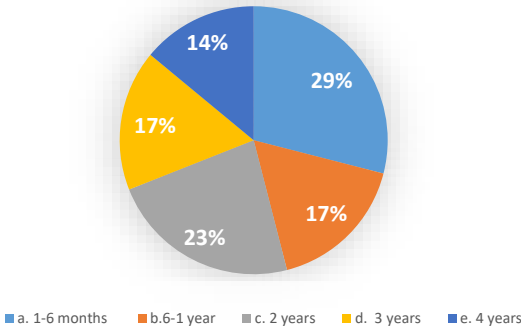
Figure 8 Working time

e.   Main activity you do at work

The area in which most of our graduates work is Quality with 29%, followed by the Production area with 23%.
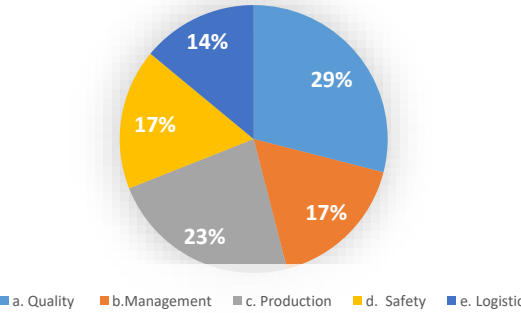
Figure 9 Main activity carried out

f.   Primary means through which you found current employment

46% of the graduates got a job by sending CVs, while in 31% the students found a job after having completed their professional internships.
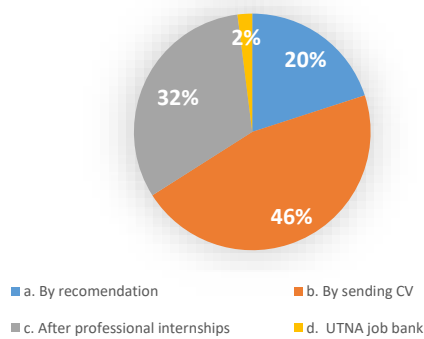
Figure 10 Primary means through which you found current employment

g.   In addition to your job, do you have any other paid activity?

97% of the students stated that they do not have any other paid activity, while 3% stated that they do carry out another activity in addition to their work.
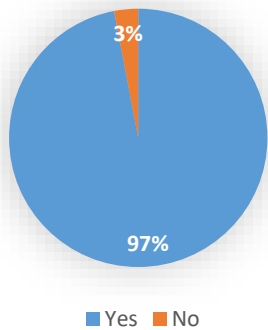
Figure 11 Extra paid activity

h.   Match your job with the career you study

91% of the graduates surveyed mentioned that their career coincides with their work, however, 9% stated that their work does not coincide with what they studied.
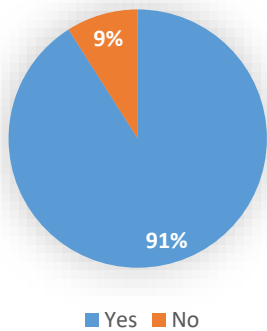
Figure 12 Coincidence of work with what I study

i.   Below is a comparative table of the level of satisfaction with their work of the respondents

Item	Totally satisfied	Regular	Little
a) Putting into practice the knowledge acquired in the degree.	28.6 %	62.9%	8.6%
b) The possibility of making your own ideas	65.7%	34.3%	0%
c) Professional recognition achieved	68.7%	28.6%	2.9%
d) Teamwork	68.7%	28.6%	2.9%
e) Possibility of coordinating a work team.	68.7%	28.6%	2.9%g
f) Possibility of responding to work problems.	74.3%	25.7%	0%
g) The content of work.	60.0%	37.1%	2.9%
f) The work environment	60.0%	40.0%	0%
g) Salary (income and benefits)	25.7%	65.7%	8.6%
h) Actual position	57.1%	42.9%	0%

Figure 13 Work satisfaction

III) Aspects of the career of Engineering in Productive Systems

 In this area, the most important aspects of the graduate's perception of their career are considered and likewise it seeks to detect areas of opportunity in order to be improved.

a.   Career Option

In the degree in Engineering in Productive Systems, 54% of the graduates surveyed from the UTNA were their first choice while 46% were not their first choice at our university.

Figure 14 Career Option

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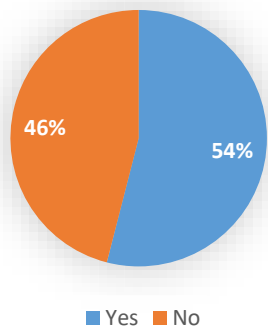
b.   Reason why you chose the UTNA

The highest percentage by which our students choose to study at the Universidad Tecnológica del Norte de Aguascalientes is because of the location with 37%. It is followed by the cost of fees with 23% and the academic model with 20%.
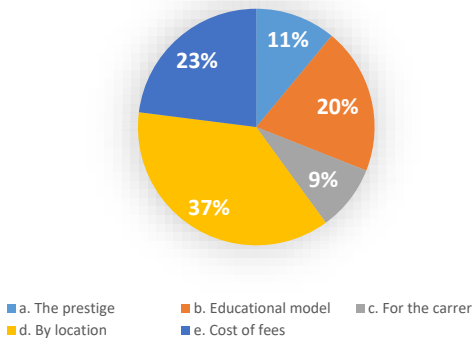
Figure 15 Reason why you chose the UTNA.

c.   His financial life improved after graduating from college

89% of our students affirm that their life improved after graduating from the degree, however 11% affirmed that it did not change their life.
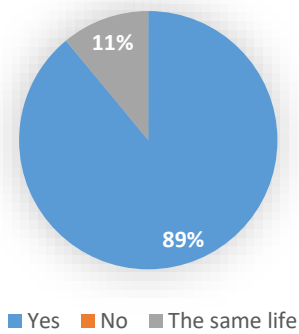
Figure 16 Improves after having studied at UTNA

d.   When did you get a job after graduation?

49% of our graduated students affirm that they already had a job before graduating. However, 9% affirm that they found work after more than 1 year of having graduated.
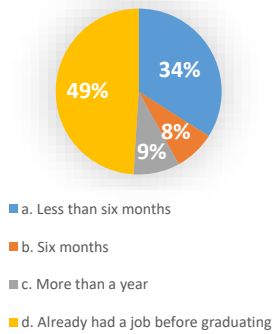
Figure 17 Time to get a job after graduation

e.   Does the PSE career allow you to identify, formulate and solve problems?

97% of the students consider that the career allows them to identify, formulate and solve problems, while there is 3% who consider that it does not.
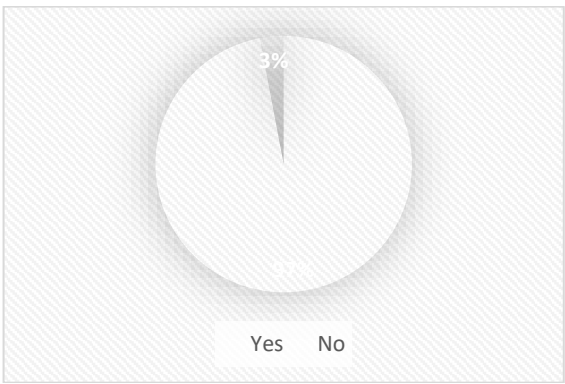
Figure 18 PSE career allows you to identify, formulate and solve problems

f.   Do you consider that you have applied, analyzed and synthesized Productive Systems Engineering strategies through human, technological, economic and financial factors?

71% of the graduates consider that they have applied, analyzed and synthesized Engineering strategies in Productive Systems through human, technological, economic and financial factors.

Figure 19 Estrategias de PSE

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g.   Do you consider that the UTNA gave you the necessary elements to communicate effectively in the development of your work?

69% of those surveyed consider that the UTNA gave them the necessary elements tocommunicate effectively in the development of their work, however 23% consider that perhaps it gave them the elements, however 8% consider that No.

Figure 20 Communication Competence

h.   Do you consider that the training that the UTNA gave you today helps you to act with values, proactive, personal, social and environmental attitudes?

83% of those surveyed consider that the training given by the UTNA currently helps them to act with values, proactive, personal, social and environmentally friendly attitudes, while 14% consider that perhaps.
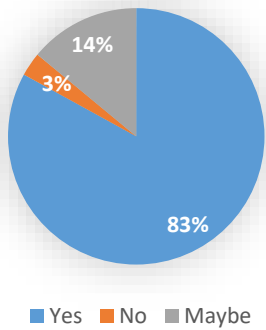
Figure 21 Values and attitudes

i.   The students answered to what degree the following subjects contributed to the development of their work.

Subject	Litle	Regular	More
a. Chemistry	51.4%	42.9%	5.7%
b. IT tools	60.0%	34.3%	5.7%
c. Working methods	65.7%	25.7%	8.6%
d. Distribution plant	51.4%	28.6%	20.0%
e. Statistical Quality Control	5.7%	40.0%	54.3%
f. Safety and hygiene	8.6%	54.3%	37.1%
g. Industrial drawing	14.3%	34.3%	51.4%
h. Supply chain	14.3%	31.4%	54.3%
i. Lean Manufacturing	14.3%	22.9%	62.9%
j. Materials Engineering	25.7%	31.4%	42.9%
k. Operations research	22.9%	22.9%	54.3%
l. Manufacture	17.1%	22.9%	60.0%
m. Process engineering	8.6%	17.1%	74.3%
n. Investment projects analysis	20.0%	51.4%	28.6%
o. Thermodynamics	51.4%	37.1%	11.4%
p. English.	8.6%	37.1%	54.3%

Figure 22 List of subjects and their contribution to the development of your work

j.   The students answered in what percentage they carry out the following competences for their professional development acquired in the UTNA

Entry	Percentage
Manage the quality management system	25.4%
Manage the necessary resources of the organization to ensure planned production according to customer requirements	41.8%
Develop and innovate manufacturing systems	18.2%
Manage the industrial security of the company	9.1%
Manage and create ergonomic systems	5.4%

Figure 23 Competences for your professional development acquired at the UTNA

k.   When asking students which courses they recommend should be taught in the educational program, they mentioned:

- Industrial design

- Development of new projects

Article

- Planning and development of new projects

- Core tools, CNC machining (practical), advanced CAD CAM, practical PLC, programming, advanced Excel

- Conversational English

- Gemba kanri

- Sap

- Advanced Excel

- Cnc programming

- Advanced English,

- Metrology

- Focus on leadership and coordination of groups, CNC practices (machines and Tools)

- Personnel management

- ANPQP / APQP

- Welding and use of tools such as lathe, milling machine, grinding machine etc.

- Values and treatment of staff

- IATF, BQS, CORE TOOLS ,, VDA

- Cutting tools, PLC, types of motors, CNC programming, solidworks, oils and coolants.

- Current methodologies

Conclusions

According to the research carried out, the following points can be highlighted:

During the survey, the students reported that 97% were working.

The item that stands out in the monthly income is $ 10,001 to 15,000 with a percentage of 63%, while there is also a percentage of 14% that mentions earning only $ 5000. Likewise, there are no graduates of this survey who are earning more than $ 20,000.

The duration of work that graduates have oscillates in 43% with 2 years in their workplace. It is followed by 26% with some who have been working from 6 months to 1 year.

The area in which most of our graduates work is Quality with 29%, followed by the Production area with 23%.

The highest percentage by which our students choose to study at the Universidad Tecnológica del Norte de Aguascalientes is because of the location with 37%. It is followed by the cost of fees with 23% and the academic model with 20%.

89% of our students affirm that their life improved after graduating from the degree, however 11% affirmed that their life did not change.

71% of the graduates consider that they have applied, analyzed and synthesized Engineering strategies in Productive Systems through human, technological, economic and financial factors.
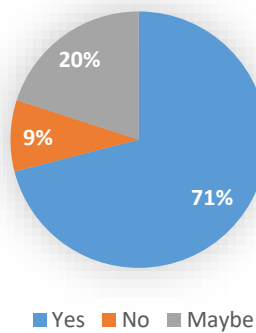
69% of those surveyed consider that the UTNA gave them the necessary elements to communicate effectively in the development of their work, however 23% consider that perhaps it gave them the elements, however 9% consider that No.
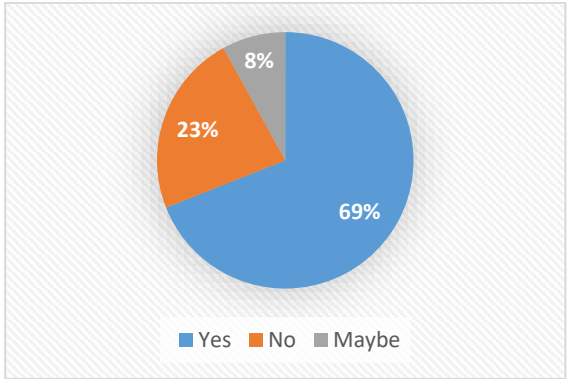
83% of those surveyed consider that the training given by the UTNA currently helps them to act with values, proactive, personal, social and environmentally friendly attitudes, while 14% consider that perhaps.

Acknowledgment

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Article

Extension and linkage in university practice within the framework of Social Responsibility

Extensión y vinculación en la práctica universitaria desde el marco de la Responsabilidad Social

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Abstract

The university is called to attend to the needs of the community, for this, it is necessary to generate socially responsible attitudes and significant learning, through promoting work in the field where the needs and problems of the context are addressed so that extension-linkage is decisive for the achievement of social impacts. The objective of this study is to describe the actions that the university carries out to integrate the social responsibility guidelines in its extension-linking function, considering the indicators established by international organizations; It is qualitative, descriptive, and transversal, it was carried out in the Sonora Institute of Technology, considering a population of 15 teachers. For data collection, the focus group technique and a self-diagnosis questionnaire were used as a complement, in the data treatment the qualitative analysis process proposed by Hernández (2018) was followed. The main results show that the extension-linkage actions under social responsibility should consider: 1) meeting real, relevant, and pertinent needs of the community; 2) clearly defined objectives; 3) defined scopes; 4) identification of beneficiaries; 5) impact measurement; and 6) develop under ethical values.

Resumen

La universidad está llamada a atender las necesidades de la comunidad, para esto es necesario el generar actitudes socialmente responsables y aprendizajes significativos, a través de promover el trabajo en campo en donde se atiendan necesidades y problemáticas propias del contexto, por lo que la extensión-vinculación es determinante para el logro de los impactos sociales. El objetivo de este estudio es describir las acciones que la universidad realiza para integrar las orientaciones de responsabilidad social en su función de extensión-vinculación, considerando los indicadores establecidos por organismos internacionales; es de tipo cualitativo, descriptiva y transversal, se llevó a cabo en el Instituto Tecnológico de Sonora, considerándose una población de 15 docentes. Para la recolección de los datos se utilizó la técnica de grupo focal y un cuestionario de autodiagnóstico como complemento, en el tratamiento de los datos se siguió el proceso de análisis cualitativos propuesto por Hernández (2018). Los principales resultados arrojan que las acciones de extensión-vinculación bajo la responsabilidad social deberán considerar: 1) atender necesidades reales de la comunidad, relevantes y pertinentes; 2) objetivos claramente definidos; 3) alcances definidos; 4) identificación de los beneficiarios; 5) medición de impactos; y 6) desarrollarse bajo valores éticos.

Social responsibility, Extension and bonding, Teaching practice

Responsabilidad social, Extensión y vinculación, Práctica docenten

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Introduction

The results of various discussion forums and analyses carried out by UNESCO on the role of higher education as a driving force for the progress of society have highlighted its importance and transcendence, classifying it as a common good (Martí, Licandro and Gaete, 2018). However, despite being a right and the role it has as part of the country's growth, there are still challenges to face, among them is the determination of its priorities: the formation of committed citizens and the generation of knowledge that contributes to the community in which it is immersed, or the fulfillment of the demands of evaluating bodies and companies (Benavides, 2015).

Rajhi (2014), cited by Sánchez and Pérez (2018, p.62), states that one of the roles entrusted to universities is the "responsibility to contribute to the construction and consolidation in scientific, humanistic and technological advances", through the development of its substantive functions: teaching, research, management and extension. The latter is associated with the so-called third mission of the university, which endorses its commitment and social responsibility to society and its community, thus influencing its growth, reducing gaps and generating equal opportunities (Acosta, 2013).

In view of this reality, since 2012, ANUIES has established social responsibility as one of its 10 strategic axes, setting a guideline for higher education institutions, which should consider these guidelines in the implementation of their teaching, research, management and extension functions in their institutional development plans, which should not only address the dimension of life in society, but also the activities generated in this dimension for the training of human talent (ANUIES, 2012).

Within this framework, the Instituto Tecnológico de Sonora, raises in its Institutional Development Plan as one of its social responsibility strategic programs, which highlights the concern of the university to meet the expectations of the community in its various fields, prioritizing educational inclusion, gender equity and the welfare of the community (ITSON, 2016).

Therefore, from the academic area, a curricular innovation proposal arises, which implies designing the curriculum based on the problems of the context, using the development of projects as a didactic strategy. This is how the socio-formative approach is applied from 2016 in the Bachelor of Science in Education, where social responsibility is declared from its specific competences as one of the guiding axes (Crespo, Mortis, Manig & Tobón, 2018). However, the lack of a clear definition of the term and its connotations leads to the development of actions, sometimes isolated, that could be catalogued as social responsibility without really being so, falling into welfarism, where through the provision of a social service, it is assumed that not only are actions of this type being developed, but also that the student is being trained in this ideology. As stated by Benavides (2015, p.178) "the differences in the way in which each university conceptualizes and deposits social responsibility, are a reflection of the diversity of types of tasks, actions or activities that are developed under this framework without really being so".

In this sense, promoting the participation of each and every stakeholder, both inside and outside the university, will be socially responsible to the extent that the university's participation in the community is promoted in a timely manner, so the projects that are developed with other actors, should aim to generate links for mutual learning and social development (URSULA, 2019, p.5).

Vallaeys (2020, p. 43-44), states that "extension alone does not generate the necessary impacts", so each and every one of the substantive functions must be articulated and identify the space or spaces of incidence of the universities, since it is these specific contexts, in which the institutions are introduced, where not only the alliances are developed, but also the research-action processes and the implementation of the competencies acquired during the training process, so that the extension must be inserted in the dynamics of the different functions.

To generate social impacts, according to the conceptualizations of experts, it is required to promote the implementation of projects in coordination with different actors that generate links for mutual learning and social development, thus promoting social capital, in which students, teachers and community converge, ensuring a permanent and meaningful learning that contributes to the solution of social problems (Schwalb, et al, 2019).

As García and Vélasquez (2015) state, in order to generate socially responsible attitudes and significant learning, it is necessary to promote field work in which the needs and problems of the context are addressed, so that outreach is crucial to achieve the social impacts that the university is called to address. Therefore, the objective of this research is to describe the actions that the university carries out to integrate the orientations of social responsibility in its extension-linkage function under the international indicators, established from the perspective of experts and from the framework provided by the URSULA Model (Vallaeys, 2020), which promote the intervention of the student body in the community, as well as the analysis of the needs and problems of the same (PRME, 2018; ORSALC, 2018; Tarradellas, 2019; Zamudio& Figueroa, 2020; Valleys, 2020). [See Table 1]

Substantive function	Indicators
Extension – linkage *Linkage with society through technical assistance or dissemination of culture (Cordon, 2019).*	Field work activities promoted by the teaching staff to meet the needs of the context.
	Research projects involving community outreach.
	Formalization of projects through the signing of collaboration agreements.
	Ethical considerations.

Table 1 Extension-linkage indicators
Source: Own elaboration

Method

This is a qualitative, descriptive and transversal type of research; it was carried out in the field where the object of study is developed, Sonora Institute of Technology, from a process of direct information collection of the reality around the phenomenon of study. Likewise, information was collected in a documentary manner, that is, part of the data collected was provided by other research related to the development of socially responsible projects generated in universities.

The population of this study consisted of 16 professors working at the university, who are assigned to the areas of Social Sciences and Humanities, Economic-Administrative and Engineering, teaching during the January- May 2021 semester. Of these, nine were female and seven were male, ranging in age from 26 to 60 years old; 62.6% of the participants have between 15 and more than 20 years of teaching experience, as well as experience in the development of community projects; while 25% have between 11 and 15 years and 12.5% between six and 10 years. For data collection, the focus group technique was used, supported by a semi-structured interview guide. As a complement, the "Self-diagnosis questionnaire of socially responsible actions from the substantive functions of university professors" was used in digital format, which takes as a reference the self-diagnosis instrument of RSU proposed by the URSULA Model (Vallaeys, 2020). The purpose of this instrument was to identify the actions that university professors carry out from their teaching and research functions in relation to outreach and liaison within the framework of university social responsibility.

The instrument consisted of six statements, with a Likert-type scale in which the values assigned were: 1) Totally disagree; 2) Disagree; 3) Partially disagree; 4) Partially agree; 5) Agree; and 6) Totally agree. Finally, there were two open questions that inquired about the characteristics of the actions carried out by the faculty in their teaching and research functions in relation to outreach - liaison.

Procedures used

The process for data analysis proposed by Hernandez (2018, p.495) was followed, who determines that it is necessary to systematize the data to build theoretical principles through the logical interpretation of the information, for this he proposes the following procedure:

1. Transcription of the narratives of the experiences.

2. Review of the description and information collected to get a complete picture.

3. Identification of units of analysis, including the development of controls and codes. (See table 2)

Code	Meaning
P	Participant
IEV1	Outreach-Linkage Indicator 1. Field work
IEV2	Outreach-linkage indicator 2. Community linkage
IEV3	Extension-linkage indicator 3. Formalization of projects
ET	Ethical considerations

Table 2 Control and codes
Source: Own elaboration

4. Generation of categories, themes and patterns present in the descriptions and narratives of the participants' experiences with respect to the phenomenon under study.

5. Identification of connections between participants' experiences in relation to the phenomenon. Coding of the data. Units of analysis coded by indicators. (See table 3)

6. Constructivist and comparative determination of the phenomenon from the analysis of experiences.

7. Development of a general narrative that includes the common and different categories and themes, as well as their links within the context.

8. Validation of the narrative and description of the phenomenon.

Control	Participant	Department of assignment
P1	Participant 1	Education
P2	Participant 2	Education
P3	Participant 3	Education
P4	Participant 4	Education
P5	Participant 5	Education
P6	Participant 6	Education
P7	Participant 7	Civil Engineering
P8	Participant 8	Education
P9	Participant 9	Education
P10	Participant 10	Education
P11	Participant 11	Sociocultural
P12	Participant 12	Education
P13	Participant 13	Education
P14	Participant 14	Education
P15	Participant 15	Administration

Table 3 Identification of participants
Source: Own elaboration

Results and discussions

The implementation of the selected data collection techniques (focus group with experts and self-diagnostic questionnaire), allowed the identification of the actions that the faculty of the Sonora Institute of Technology perform in terms of the extension-linkage function from teaching and research.

The indicators defined for this substantive function were: 1) field work activities promoted by the teaching staff to meet the needs of the context; 2) research projects involving community outreach; 3) formalization of projects through the signing of collaboration agreements; and 4) ethical considerations.

When the faculty was asked about the different extension-linkage actions they carry out from teaching and research, the results show that 93.8% agree that the actions derived from the projects they undertake give rise to specific interventions for the benefit of the university and non-university community, while 6.3% partially agree in this sense.

According to the data obtained in the focus group, two orientations were identified, the first one referred to the actions carried out by the teaching staff from the practical courses, who repeatedly pointed out that it is through professional practices and academic practices in "real scenarios" that the needs of the context are addressed through the activities that emerge from them. Another element that stands out in this first orientation is the attendance and permanence of the students in the scenario, which, according to what is indicated, favors the students to know not only the reality, but also to be sensitive to it, leading them to innovation and adaptation.

> "how we get students to innovate and adapt their learning is by throwing them into the water or throwing them into the arena, learning by doing, learning by confronting... very flexible mentality, very open and with a lot of capacity to adapt..." P11IEV1

The second orientation are the actions that emanate from the theoretical courses, in which, although volunteer actions or academic practice are promoted, the importance of reflecting on one's own practice is emphasized, by conducting an analysis of the situation that allows them to identify the impacts generated.

"Basically what I do is continually have them reflect on what they are doing and always considering options, never being guided by one issue, never making a blanket statement about something, but considering the various options that may have generated it, like what alternative is there besides what you are contemplating..." P8IEV1

The data provided by the self-diagnosis questionnaire regarding the promotion of innovation and the acquisition of significant learning show that 87.5% agree with this statement, that is, they promote innovation and significant learning from their teaching work, 6.3% partially agree and 6.3% partially disagree in this regard.

In relation to this element, the actions carried out by teachers to promote innovation in their students are related to the activities and products derived from professional practice, emphasizing the relevance of these interventions, which seek to "improve social reality", as well as raising students' awareness. This is consistent with the data previously presented, as well as with the approach of Cañedo and Figueroa (2015), who visualize teaching practice as a "social praxis" that promotes the insertion of students in real contexts, which will allow them to face and respond to the different situations that will be presented, thus promoting innovation and meaningful learning.

In the same vein, it is pointed out that innovation processes are preceded and preceded by processes of analysis and reflection, noting that these imply not only "doing things well or as well as possible"; in the field of meaningful learning, the professors propose as main actions the feedback, transfer and application of knowledge in real scenarios; likewise, the meaning and relevance of their profession and of their actions in the society in which they are immersed is highlighted. On the other hand, when asked if the practices derived from the different projects they carry out give rise to new learning and projects through the communication of their good practices and mistakes, 87.6% agree with this statement, while 12.5% partially agree.

In relation to the above, 56.3% state that they periodically disseminate the findings of their projects, 37.5% partially agree with this statement and 6.3% disagree. These data are congruent with what was stated by the professors in the focus group, where they highlight the organization of forums, reports, presentation of posters, as the main dissemination activities. Although these actions are developed, it is identified that they are not enough, since according to two of the participants, these are made known within the University, so it is necessary to give them continuity and communicate them to the non-university community.

The last element contemplated for this indicator refers to the use of active methodologies such as project-based learning, service learning, problem-based learning, among others; being one of the main characteristics of the actions carried out by the faculty under the approach of social responsibility. Thus, when the teachers were asked if their teaching and research projects allow them to practice different active methodologies, 75.1% agreed, 18.8% partially agreed with this statement and 6.3% partially disagreed.

The results of the focus group regarding the second criterion, research projects that involve the link with the community, again, professional practice emerges as a strategy of direct link with the community, through which actions are generated from teaching and research to meet the needs of the community in a timely manner.

"*taking as a reference also the professional practices, already in the question of community development in community intervention it is possible to generate a linkage...*" P6IEV2

In relation to the formalization of the projects that are implemented, when asked if they are born from explicit collaboration agreements, 56.3% agree with this statement, which shows that it is a process that they follow; while 25% partially agree and 18.8% partially disagree.

These statements are in line with the findings previously described, where it is identified that the development of actions by teachers from the teaching point of view goes in two directions, on the one hand, practical courses, which generate a direct link with the community, and theoretical courses, which contribute to the processes of reflection and analysis. This indicates that the theoretical courses, given their characteristics, do not necessarily have to establish a direct link with the community. In the case of professors who do carry out formal linkage processes, they state that they have "institutional tools" that favor the formalization of the processes through the corresponding areas, such as the Department of Linkage, in the case of the University studied.

"very recurrent practice that this is formalized through the Department of Liaison, which is also important because it also gives it some visibility, formality, it also has a follow-up and therefore also ensures that the practices are linked precisely to the community..." P3IEV3

In the fourth criterion corresponding to ethical considerations, when asked if the actions undertaken, from the different teaching and research projects they develop, contribute to improve daily life and the development of their capacities, 81.3% agree with this statement and only 18.8% partially agree; asserting to do it under an ethical and responsible action (100%).

In this sense, the interviewees state the different considerations that guide their actions, identifying ethics as a value, where "empathy, communication, respect, responsibility and solidarity" are the basis for the development of their actions; likewise, it is established how ethics should permeate each and every one of the substantive functions of university professors.

In This sense, from teaching, the following are identified as the main guidelines: a) the ethical behavior of students in their "relationship with the contexts and community" with which they interact; b) the handling of personal data of the participants in the interventions they implement; c) the attention to the regulations under which these are to be developed; and d) the prevention of plagiarism. Likewise, they point out the continuous training of teachers and the need to deepen the analysis of the object of study.

Likewise, for this function, the orientations towards the ethics of the profession are identified, highlighting the formation of the student body under the ethical framework marked by the discipline itself. From the research, four dimensions to be considered in the ethical performance of the research professor are: 1) ontological; 2) epistemological; 3) methodological; and 4) ethical.

The ethical considerations raised for the development of work in the community, associated with the extension-linkage function, indicate as the main element the "emphasis on the community", as well as the adaptation to the needs and respect for the uses and customs of the community. Another element to consider, which sets the guidelines for the work of university professors, is the one referred to the institutional regulations that mark the development of the different processes and functions that will be generated within the institution, as well as the adherence to the methodologies that guide the projects that emanate from the substantive functions.

"Ethics must permeate in all the substantive activities we do... teaching: to take care of the congruence between what we think and what we say... ethics is to work every day and in each class session promoting respect... in the works they deliver... research: respect for the objects studied, the field of action where we are, the context where we are conducting the research, the protocols to be followed, objectivity in the way we capture the results and how we disclose those results, also respecting privacy, ethical handling of information... disclosure, knowledge really derived from rigorous research and care..." P12ET

Finally, a series of general considerations are identified that set the tone for the development of the actions of the group of teachers participating in the study, such as confidentiality, information management, data protection, informed consent, respect for delivery times, attention to legal issues, also highlighting values such as personal dignity, honesty and integrity.

Conclusions

Two lines are identified at the curricular design level in relation to the linkage of the courses and the actions that emerge from them with the community: 1) curricular design of the educational programs (second level of concretion), which from their conception were designed with a focus on the needs of the context; 2) classroom level (third level of concreteness), from which two orientations are identified in the development of teachers' actions, the first referring to the analysis and reflection of the processes, as well as the understanding of the social function of their profession; and the second, related to the development of practical actions. Which according to Vera, Gómez, Acosta and Perozo (2012), from the framework of social responsibility, should promote the construction and reflection of learning processes, from theoretical and practical approaches, thus promoting the transfer and comprehensive training of the student.

The emphasis made by teachers on the importance of the linkage with the community stands out, not only in terms of the formalization of the practice, but also in the involvement of teachers in the scenarios, in order to know first-hand the reality in which the learner will perform, carrying out contextualization and diagnostic processes prior to their immersion. In view of this, Pino & Sáenz (2014), establish as necessary in the establishment of linkage processes, to generate the conditions for this, through structured and reflective actions that allow determining relevant and timely intervention strategies.

In the same thread, the results related to the dissemination of knowledge associated with the extension-linkage function, show as an area of opportunity, according to the participants, the generation of spaces to make known the results of the research and interventions carried out to the non-university community. Although the results are made known within the University, they state that they are not sufficient, and that it is necessary to give them continuity and communicate them outside the University.

Although the research conducted seeks to meet the needs of the community, the evidence shows as an area of opportunity the incorporation of community actors, as well as the coordination with external groups in the development of the same, which is relevant with the proposals of Urdaneta, Cova, Chirinos and González (2016), who among the main conclusions of their research, propose as an area of opportunity for this function, to reflect on the characteristics of the research that is produced.

From the approach of Unesco (2016), every project represents an alternative solution to meet human needs, being a tool used systematically to carry out interventions towards this end. Based on this approach, any action to be generated under the framework of social responsibility in each of the substantive functions should consider: 1) addressing real needs of the community, being relevant and pertinent to the context; 2) clearly defined objectives; 3) definition of scope; 4) identification of beneficiaries (stakeholders); 5) measurement of impacts; and 6) developed under ethical values (González, et al., 2017; Uribe, et al., 2017 & Restrepo, 2017).

These should be relevant and pertinent to the context, interdisciplinary, inclusive, equitable, participatory and contextualized, which imply the field work of teachers and students, being these the constant, as stated in the bibliographic review of the study, as confirmed by the results obtained from the data collection techniques.

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Evaluation of the level of sense of belonging in a clinical analysis laboratory company in the City of Durango

Evaluación del nivel de sentido de pertenencia en una empresa de laboratorio de análisis clínicos en la Ciudad de Durango

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Abstract

Goodenow & Grady (1993), established the belonging sense as an indispensable aspect for the workers where they share organizational goals, principles and values, feeling accepted and valued. The objective of this work is to evaluate the level of sense of belonging at a laboratory of clinical analysis company of Durango city. The research was quantitative, cross-sectional, and descriptive. Forty employees were evaluated by the SOBI (Sense of Belonging Instrument), developed by Hagerty & Patusky (1995), which measures the sense of belonging in three dimensions: participation, capacities and interaction. The study shows that 34.16% of total responses indicate a medium level and 9.43% a low level of sense of belonging. The "Participation" dimension shows lower levels compared to the others. Also, a lower level was shown in the antiquity of 3 to 6 years and in the "nurse" position. The results give rise to investigate with greater depth variables such as position and antiquity, and their relationship with the sense of belonging.

Evaluation, Sense of Belonging, Organizational Psychology

Resumen

Goodenow & Grady (1993), establecieron al sentido de pertenencia parte indispensable del trabajador, donde comparte metas, principios y valores organizacionales, sintiéndose aceptado y valorado. El objetivo del presente trabajo es evaluar el nivel de sentido de pertenencia en una empresa de laboratorio de análisis clínicos en la Ciudad de Durango. La investigación fue cuantitativa, transversal y descriptiva. Participaron 40 empleados evaluados por la Escala SOBI (Sense of Beloging Instrument), elaborado por Hagerty & Patusky (1995), que mide el sentido de pertenencia en tres dimensiones: participación, capacidades e interacción. Se encontró el 34.16% de las respuestas con un nivel medio y 9.43% con un nivel bajo de sentido de pertenencia. La dimensión "Participación" muestra niveles más bajos en comparación al resto. Se identificó menor nivel de sentido de pertenencia en antigüedad de 3-6 años y en el puesto "Enfermera". Los resultados dan pie a investigar a mayor profundidad variables como "función laboral" y "antigüedad", y su relación con el sentido de pertenencia.

Evaluación, Sentido de Pertenencia, Psicología Organizacional

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Introduction

Belonging is an affective feeling, in psychology it is described as the sense where a person appreciates being valued and important to an external referent; in sociology belonging implies incorporation into groups or procedures. In this definition, belonging can be observed and described through behavioral referents such as affiliation to groups and social networks. (Hagerty et al., 1992).

According to the school of humanistic psychology, Maslow contemplates belonging in the second step of the pyramid of human needs, marks it as a basic psychological need that preserves health, likewise, establishes that when psychological and security needs are met, the need for love, affection and belonging emerges. (Elizalde et. al., 2006).

According to Hagerty & Patusky (1995) the sense of belonging has three dimensions: participation, capabilities and interaction.

Participation is the way subjects engage in responsibility, commitment, collaboration, and decision-making for the achievement of common goals. (Chavez 2003, cited in Hernández, 2013).

Capability is the ability to do things that are valuable to a particular individual or group, events that a person is capable of being or doing. (Sen, 1993, cited in Indavera, 2017).

Interaction is defined as the mutual task of behaviors between individuals when interacting, taking into account the context in which they do so. (Galindo et al. 2009, cited by González, 2017).

Goodenow & Grady (1993), established that an indispensable component in the profile of the worker is the sense of belonging, where the employee shares the goals, principles and organizational values, feeling accepted, included, important, valued by the company and the labor collective. As mentioned, according to Chiavenato (2009), the sense of belonging is the security that the person obtains when he feels that he occupies a place within a group, in this case a company, so it will lead him to look for behaviors to identify with it and feel it as his own, also allows him to observe that with his daily activities he works for the company and themselves.

The moment a person perceives a real need as satisfied, they feel motivated, identified and committed, convinced that a link has been created with the organization, modifying their behavior in favor of the same. (Huerta, 2018).

Research on the sense of belonging has focused mainly on pedagogical and community areas, so, as mentioned by Dávila & Jiménez (2014), the approach to this issue in the workplace is relatively novel, however, some studies carried out around the sense of belonging in organizations in both the international and national contexts can be mentioned.

Continuing with Dávila & Jiménez, who conducted a research study in 2014, they found that the sense of belonging was a predictor of well-being and corroborated that a strong link with the organization could help workers adhere to organizational norms and that would lead them to manage the problems associated with their positions more efficiently.

In a self-service business in Coahuila, Mexico, it was identified that 80% of the employees surveyed do not feel motivation and do not have a sense of belonging, because they report not being taken into account by their superiors and in some cases they were asked to do activities outside their functions, creating that their activities were carried out for a purely economic need (Macías, et.al. 2016).

In 2016, he conducted the study "Engagement and the Global Workplace", it was found that in Mexico, only 59% of employees think that their employers are interested in their well-being, 73% consider that there is a good relationship with their colleagues, 58% support the strategies and management of their company, 64% feel optimistic about their future within the company, and finally, only 44% of workers have achieved a sense of belonging to the company in which they work. (Steelcase Global Report, 2016).

The lack of personal identification towards the different organizations is a problem in the field of organizational psychology, because the lack of sense of belonging can cause difficulties of human nature origin, which leads to demotivation, rotation, resignation, low performance and dismissal of personnel, causing lower productivity and lower income for the organization (Flores et. al., 2015).

Fonseca (2017) comments that it is essential that organizations work daily on the commitment and sense of belonging of their employees with the business and for this it is necessary to listen to them, train them and provide them with opportunities for growth, generating in them feelings of gratitude and achieving that each one of the members of the corporation contribute and show their best willingness to do their job.

The current Official Mexican Standard NOM-035 aims to establish the elements to identify, analyze and prevent psychosocial risk factors, as well as promote a favorable organizational environment in the workplace, and promote the sense of belonging of the company's workers (Diario Oficial de la Federación, 2018).

The above shows the relevance of the evaluation of the sense of belonging for the organizational field, the elements that intervene on it and the search for strategies that guarantee this "sense" within the current work centers.

In addition to this, highlighting that according to the literature, the sense of belonging is an important factor in the well-being of employees and the productivity of the company, the objective of this work is to evaluate the level of sense of belonging in a clinical analysis laboratory company in the City of Durango, aiming to obtain data that contributes to the area of organizational psychology and overtime can help design strategies to achieve a high level of sense of belonging, favoring a favorable aspect of the work environment.

Materials and methods

A quantitative, cross-sectional and descriptive research was carried out. The participants of the study were the entire staff of a clinical analysis laboratory company with 14 years of experience in the City of Durango, that is, 40 workers, of which 20 are Pharmacobiologist Chemists, 11 Administrative, 3 of the Maintenance Area and 6 Nurses. Those mentioned agreed to collaborate in the study, with prior signature of informed consent. Data collection took place from June 01, 2021 to June 30, 2021.

In this research, the adaptation to Spanish of the SOBI scale (Sense of Beloging Instrument), elaborated by Hagerty & Patusky (1995) was applied, which has 18 items that evaluate the sense of belonging. This instrument is self-applied and has a response scale ranging from 1 (Totally agree) to 4 (Totally disagree), allowing to assess the 3 dimensions of the sense of belonging: participation, capability and interaction. According to the parameters of the instrument, the answers scored with 4 indicate a high sense of belonging and those scored with 1 indicate a low sense of belonging.

The aforementioned scale considers the dimension of "Participation" as the feeling of occupying a place within the organization by the desire to make significant contributions, which will cause a level of comfort or discomfort. It is scored with items 1,2,4,6,8, and 10.

The dimension of "Capabilities" refers to feeling able to make decisions based on their knowledge, both about the organization and professional decisions. Behavior that positively motivates and promotes communication, while negatively generates fears, anxieties and conflicts. Included in items 3,9,13,14,16, and 18.

Finally, the dimension of "Interaction" covers the relationships between two or more people through an analysis of shared characteristics. The negative effect contains hatred, emotional distance and resentment. Studied by items 5,7,11,12,15, and 17.

Results

The population studied was integrated by 40 workers, of which 28 were women (70%) and 12 men (30%). The positions held in the company were distributed as follows: 20 Pharmacobiologists Chemists (50%), 11 Administrative (27.5%), 3 from the Maintenance Area (7.5%) and 6 Nurses (15%). See graphic 1.
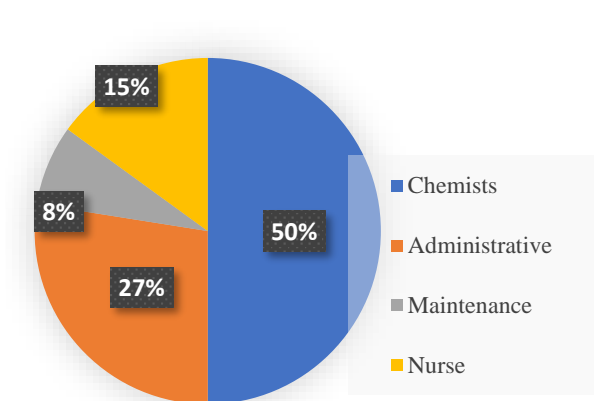
Graphic 1 Distribution of employees by job position
Source: Own elaboration

The age of the participants varies from 18 to 60 years, with a mode of 26 years, an average of 29.5 years and a median of 28. The work seniority was compiled through five categories, obtaining that, 31 workers have a seniority of 0-3 years (77.5%), 5 workers with 3-6 years (12.5%), 0 with 6-9 years (0%), 3 workers with 9-12 years (7.5%) and 1 worker with 12-15 years (2.5%). See graphic 2.
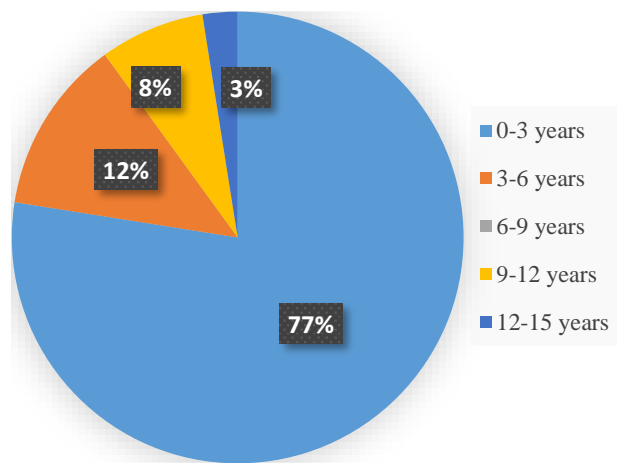
Graphic 2 Distribution of employees by seniority
Source: Own elaboration

Implementation results of the SOBI Instrument

The reliability of Cronbach's Alpha in the applied instrument (SOBI) was 0.925. The results obtained show a mean of 3.45, a median of 4, a mode of 4 and a standard deviation of 0.70. Taking into account that the instrument has 18 items and was applied to 40 participants, the frequency distribution was as follows: 12 answers with 1 point (1.66%), 56 answers with 2 points (7.77%), 246 answers with 3 points (34.16%) and 406 answers with 4 points (56.38%). See graphic 3.
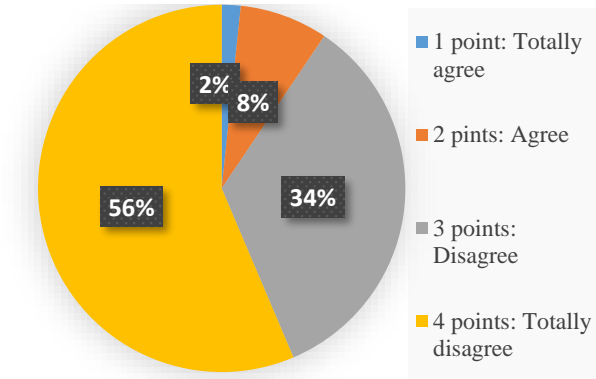
Graphic 3 Total responses obtained in SOBI
Source: Own elaboration

Results by dimension of the SOBI

However, according to the dimensions of the sense of belonging assessed by the SOBI Instrument, in the items corresponding to the area of participation, a mean of 3.35, a median of 3.5, a mode of 3 and a standard deviation of 0.77 were obtained. Taking into account the responses of the total number of participants in the 6 questions corresponding to the dimension of "participation", the frequency distribution was as follows: 7 answers with 1 point (2.91%), 23 answers with 2 points (9.58%), 87 answers with 3 points (36.25%) and 123 answers with 4 points (51.25%). See graphic 4.

As for the area of "capabilities", a mean of 3.51, a median of 4, a mode of 4 and a standard deviation of 0.67 were found. According to the responses of the 6 items belonging to the dimension of "capabilities", the data were distributed as follows: 3 answers with 1 point (1.25%), 16 answers with 2 points (6.66%), 76 answers with 3 points (31.66%), 145 answers with 4 points (60.41%). See graph 4.

The dimension of "Interaction" presents a mean of 3.48, a median of 4, a mode of 4 and a standard deviation of 0.66. The frequency distribution of the analyzed data corresponding to the 6 questions in this area showed 2 answers with 1 point (0.83%), 17 answers with 2 points (7.08%), 83 answers with 3 points (34.58%) and 138 answers with 4 points (57.5%). See graph 4.

LEÓN-MARTÍNEZ, Javier Alejandro, COVARRUBIAS-SALAS, Lizeth Sarahi and HERRERA-VARGAS, Isela Vanessa. Evaluation of the level of sense of belonging in a clinical analysis laboratory company in the City of Durango. Journal of Human Resources Training. 2021
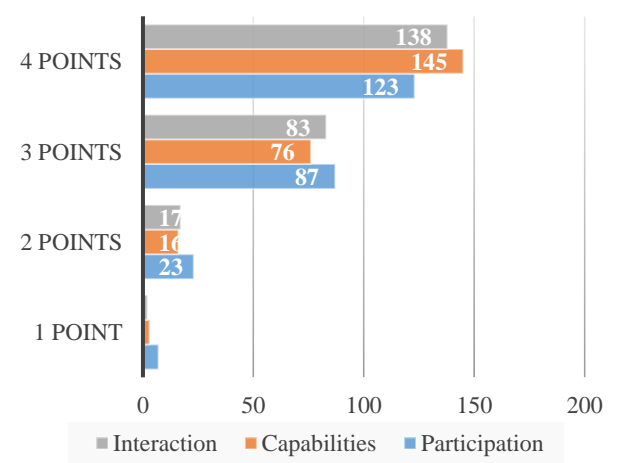
Graphic 4 Frequency distribution by dimension of the sense of belonging
Source: Own elaboration

However, an analysis of the different dimensions of the sense of belonging was carried out, filtering the data by: gender, seniority and position.

Gender and sense of belonging

In the dimension of "participation" the lowest scores were obtained in both women and men, that is, an average of 3.35 and 3.37 respectively; the dimension with the highest scores in both genders, although with a minimum margin was that of "abilities", with an average of 3.50 and 3.52. See table 1.

Participation				
	Stocking	Median	Mode	Standard deviation
Women	3.35	4	4	0.77
Men	3.37	4	4	0.76
Capabilities				
	Stocking	Median	Mode	Deviation from
Women	3.50	4	4	0.68
Men	3.52	4	4	0.66
Interaction				
	Stocking	Median	Mode	Standard deviation
Women	3.47	4	4	0.66
Men	3.49	4	4	0.66

Table 1 Measures of central tendency of the dimensions of the sense of belonging according to gender
Source: Own elaboration

Seniority and sense of belonging

It was observed that the lowest scores, (slightly) in the three dimensions of the sense of belonging (participation, abilities and interaction) was in employees with seniority of 3-6 years, with an average of 3.34, 3.49 and 3.46 respectively in each dimension, while the highest scores were in the seniority of 12-15 years, with a mean 3.66, 3.83 and 3.83, however, only one worker is in that category. See table 2.

Participation				
	Stocking	Median	Mode	Standard deviation
0-3 years	3.36	4	4	0.77
3-6 years	3.34	3	4	0.76
6-9 years	0	0	0	0
9-12 years	3.36	4	4	0.75
12-15 years	3.66	4	4	0.81
Capabilities				
	Stocking	Median	Mode	Standard deviation
0-3 years	3.51	4	4	0.67
3-6 years	3.49	4	4	0.67
6-9 years	0	0	0	0
9-12 years	3.51	4	4	0.63
12-15 years	3.83	4	4	0.40
Interaction				
	Stocking	Median	Mode	Standard deviation
0-3 years	3.48	4	4	0.67
3-6 years	3.46	4	4	0.67
6-9 years	0	0	0	0
9-12 years	3.47	4	4	0.66
12-15 years	3.83	4	4	0.40

Table 2 Measures of central tendency of the dimensions of the sense of belonging according to work seniority
Source: Own elaboration

Article

Position and sense of belonging

It was found that in all three dimensions Pharmacobiologists Chemists are those with a slightly higher score with a mode of 3.38, 3.52 and 3.49 (participation, abilities and interaction) and Nurses show lower scores with a mode of 3.27, 3.42 and 3.35 in the respective dimensions. See table 3.

Participation				
	Stocking	Median	Mode	Standard deviation
Chemist	3.38	4	4	0.76
Administrative	3.35	4	4	0.77
Maintenance	3.35	3	4	0.73
Nurse	3.27	3	3	0.76
Capabilities				
	Stocking	Median	Mode	Standard deviation
Chemist	3.52	4	4	0.66
Administrative	3.51	4	4	0.67
Maintenance	3.49	4	4	0.65
Nurse	3.42	4	4	0.69
Interaction				
	Stocking	Median	Mode	Standard deviation
Chemist	3.49	4	4	0.67
Administrative	3.48	4	4	0.66
Maintenance	3.47	4	4	0.68
Nurse	3.35	3	4	0.69

Table 3 Measures of central tendency of the dimensions of the sense of belonging according to the position
Source: Own elaboration

Discussion

As reflected in the results section, more than half of the answers obtained (56.38%) indicate the highest level of sense of belonging, this according to the qualification parameters set by the SOBI instrument, however, the rest of the workers according to their answers are at medium (34.16%) and low (9.43%) levels.

It can be seen that, in the three dimensions of the sense of belonging, about a third of the responses (34%) of the participants are positioned in an average level of sense of belonging.

It was observed that in the dimension of "Participation" there is a higher percentage of responses that are positioned at a low level (12.49%), compared to the rest of the other dimensions. According to Haggerty & Patusky (1995), a low score in this dimension can indicate that employees do not feel that they occupy a place within the organization, they may even present "discomfort" of being in it.

In addition to this, it should be noted that the sixth item was the one that obtained the lowest score (average of 2.9), which belongs to the aforementioned dimension, where specifically the worker refers that he would like to be taken into account for the implementing changes in the company but feels that his opinion is not valued. Returning to Chiavenato (2009), when there is a high sense of belonging, the worker seeks that his daily tasks work in favor of the company and its members, so the results obtained in this specific item indicate that although the general results show a "good" level of sense of belonging in the company, there are aspects that its members consider could be improved, and it is not being done, or it is likely that their daily activities are not being carried out with enough effort.

In addition, it is observed that the dimension with the highest values is that of "Capabilities" (60.41%), that is, most workers feel qualified to make decisions based on their knowledge, evidencing that they consider themselves professionally prepared to carry out their work activities and that their roles in the company are properly established. According to the results by gender, it was found that, in both women and men, the highest scores were located in the dimension of "Capabilities" and the lowest scores in the dimension of "Participation".

According to the reported seniority, it is observed that workers with permanence of 3-6 years show a lower level in the three dimensions of the sense of belonging. It should be noted that the majority of the workforce (77%) is made up of workers with a seniority of 0-3 years, an aspect that draws attention to being a company with 14 years of experience.

According to what was established by Flores (2015), the lack of identification towards the company can cause demotivation, rotation, resignation, low performance and dismissal of personnel, comparing this with the results obtained, the aforementioned can be a situation that might present in the company studied, since there is rotation of important personnel and the level of sense of belonging decreases slightly in employees who have remained more than 3 years in the organization compared with those who have a seniority of 0-3 years (although in the category of 12-15 years there is an increase in the level of sense of belonging, only one worker is found in that section, so it is not a significant result).

Finally, according to the task performed by the employees, the information obtained indicates that the highest levels in the three dimensions of the sense of belonging correspond to the position of "Pharmacobiologist Chemist" and the lowest to the position of "Nurse", that is, 15% of the workforce, the above may be related to the turn of the company, however, the ideal would be that the sense of belonging be homogeneous in the workers and thus comply with one of the indispensable components in the profile of the worker, being reflected in each of the activities they perform, as indicated by Goodenow & Grady (1993).

Conclusions

The findings of this study showed that in general there is a high level of sense of belonging in workers, however, the results indicate the variables to which attention should be paid in the future, since, although the differences were minimal, it was observed that it is necessary to analyze in detail the factors involved in the dimension of participation, because it was the one that showed lower scores.

A lower level of sense of belonging was identified in participants with seniority of 3 to 6 years, as well as in the position of "Nurse", so it would be necessary to analyze the role and working conditions of these employees to distinguish if there is any specific issue that causes it.

It is important to continue investigating the issue of the sense of belonging, because it is currently a fundamental part of the NOM-035 and the area of organizational psychology, for future research it would be ideal to expand the study population taking into account different business turns. This study contributes as a precedent in the companies of the City of Durango, since there is currently little scientific information around this aspect, it also leads to raise awareness among employers about the negative impact of not having specific strategies to promote this "sense", or in contrast, the benefits that comes with having a plan where the well-being of the worker is sought.

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Trends of higher education institutions with the productive sector in the formation of human capital and the generation of innovation and development: challenges and challenges in the face of COVID-19

Tendencias de las instituciones de educación superior con el sector productivo en la formación del capital humano y la generación de innovación y desarrollo: retos y desafíos ante el COVID-19

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Abstract

This article aims to distinguish the interaction that exists between higher education institutions with the productive sector and the results of its linkage as a fundamental pillar of the formation of human capital, knowledge transfer and the impact for economic and social development . A quantitative research was carried out applying 465 surveys to companies of commercial, industrial and service lines, the STATA12 Software and for the analysis of results and their validation As part of the results of the Factorial Analysis of Correspondences (CFA) they allowed to identify the groups related, which share in common a set of characteristics of the relationship between higher education institutions (HEIs) and the productive sector that makes them interdependent and that at the same time represents a profile for the subjects that are being analyzed, based on of the coordinates of the categories of variables in relation to axes or dimensions represented in a two-dimensional graph (Lizasoain, L., & Joaristi, L., 2012). With the help of the STATA12 software, the simple factorial correspondence analysis was performed, as well as the obtaining of graphs. In this sense, the related groups between HEIs, companies and their forms of interaction, given the impact of COVID-19.

Higher education, Productive sector, Human capital, Innovation and development

Resumen

El presente artículo, tiene como objetivo distinguir la interacción que existe entre las instituciones de educación superior con el sector productivo y los resultados de su vinculación como pilar fundamental de la formación de capital humano, transferencia de conocimiento y el impacto para el desarrollo económico y social. Se llevó a cabo una investigación cuantitativa aplicando 465 encuestas a empresas de giro comercial, industrial y de servicios, el Software STATA12 y para el análisis de resultados y su validación Como parte de los resultados del Análisis Factorial de Correspondencias (AFC) permitieron identificar los grupos afines, los cuales comparten en común un conjunto de características de la relación existente entre las instituciones de educación superior (IES) y el sector productivo que los hace interdependientes y que al mismo tiempo representa un perfil para los sujetos que se están analizando, a partir de las coordenadas de las categorías de variables en relación a ejes o dimensiones representadas en gráfico bidimensional (Lizasoain, L., & Joaristi, L., 2012). Con ayuda del software STATA12 se realizó el análisis factorial de correspondencias simple, así como la obtención de gráficos. En este sentido, los grupos afines entre IES, las empresas y sus formas de interacción, ante el impacto del COVID-19.

Educación superior, Sector productivo, Capital humano, Innovación y desarrollo

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Introduction

Higher Education Institutions generate their educational proposals which are supported by their educational model and the pretension with the formation of the student, in addition they satisfy a social need, so considering their nature and processes they must identify the subjects that are immersed in their proposal, in such a way that in interacting with them, they establish the bases that will form their curricular proposal and with it the forms of interaction, However, the proposals are designed under a normative process in which the productive sector is left isolated, with the understanding that the trend in the 21st century will be to interact with them and to insert innovation and development in a broad context as part of the proposal.

The objective of this paper is to distinguish the interaction between higher education institutions and the productive sector and the results of their linkage as a fundamental pillar of human capital formation, knowledge transfer and the impact for economic and social development, being important to consider the impact of COVID-19 for the linkage and therefore of the activities derived from such interaction.

Theoretical framework

Education today must adapt to changes not only in technology as a determining factor in the 21st century, but also to the requirements of labor markets and the productive structure; the governance of the system has increased its complexity due to the greater number of actors and functions required of higher education institutions SEP (2010). The participation of new actors as part of the linkage between Higher Education Institutions (HEI) and the productive sector derived from the new approaches and social requirements allow interacting in this hegemonic struggle of educational proposals both for the formation of human capital and in the requested programs that have an impact on the new challenges of innovation and technology. It is through education that the foundations for the economic development of a society are laid. It is largely responsible for the possibility of countries to increase their innovation, productivity and economic growth rates, allowing them to reduce poverty and inequality levels (Mosquera, 2011).

Under a sphere of globalization in which the productive sector is impacted as established by Ochoa Silva & Wendlandt Amexaga (2016) present results in situations of companies regarding variables among some of them improvement in the quality of the product or service, improvement in the image of the company which gave us a reference in the results obtained to contextualize according to the needs of company or productive sector as is the focus of this article, shows its participation, that is to say, it considers a gap of analysis of what are the pretensions of the businessman and based on it will be then the way of interacting with the IES in its contribution for the formation of students according to its industrial, commercial or service line of business.

Therefore, it is necessary for the IES to have a pertinent educational offer that takes into account the needs of the context. To achieve this, it is essential that institutional management in educational communities is carried out in a collaborative manner, in order to establish training projects aimed at mobilizing the knowledge of educational actors, including teachers, managers or students, to contribute to the solution of existing problems in society, as well as to enable the change of educational practices focused only on the teaching of content dislocated from the action.

However, the pandemic that occurred before the COVID-19 put into question the link that existed between HEIs and the productive sector. Schmelkes S. (2020) establishes that three major impacts were produced as a result of the pandemic in higher education in Mexico: economic, technological and organizational-pedagogical.

Methodology used

Quantitative research was carried out by applying 465 surveys to commercial, industrial and service companies, using STATA12 software, in addition to using data reduction techniques such as factor analysis, as well as Chi-square statistics, in order to establish hypotheses on the relationship between the productive sector and Higher Education Institutions (HEI) and the formation of human capital.

Article

A practical way of establishing this relationship is through the probability value -p value-, which represents the lowest probability at which the null hypothesis can be rejected (Gujarati, N., & Porter, D., 2010), Table 2 describes the result of the test using the probability value as a decision criterion to establish association.

Correspondence factor analysis (CFA) allows studying the interrelation between a set of row and column variables, for the simplest case of only two variables the interrelation can be identified from the coordinates of the categories of the variables in relation to the axes or dimensions represented in a two-dimensional graph (Lizasoain & Joaristi, 2012). With the help of the STATA12 econometrics software, the simple correspondence factor analysis was performed, as well as obtaining its graphs.

Results

Table 1 shows a contingency table for the study of the relationship between educational institutions and the business line of the business sector based on the opinion of industrial consultants.

Turn IES	Commercial	Service	Industrial	Educational	Don't know or don't answer	Totals
Universities universities	86	112	65	12	12	287
Technological institutes	41	33	46	3	4	127
Private schools	20	56	6	1	1	84
Other public schools	25	31	14	5	1	76
Don't know or don't answer	2	6	3	1	1	13
Totals	174	238	134	22	19	587

Table 1 Contingency table describing the association between the productive sector and the educational institutions

The test statistic calculated from the Chi-square contingency table is shown in equation 1, which allows us to reject or not the null hypothesis of independence between the variables.

$$\chi^2 = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n}(n_{ij}-e_{ij})^2}{e_{ij}} \qquad (1)$$

With a calculated Chi-Square value equal to 51.1307 greater than the table Chi-Square value $\chi_{(\alpha,gl)}^2$ with a confidence level α=5% and with degrees of freedom gl=(r-1)(c-1)=16 (where r is the number of rows in the table and c is the number of columns) equal to 28.84 for a bilateral test, the null hypothesis of independence is rejected and it is confirmed that there is an association between the variables.

Chi-square	Degrees of Freedom	P-value	Cramer's V
9.7174	1	0.002	0.4323

Table 2 Chi-Square Test -Higher Education Institutions and Business Sector Line of Business-with a confidence level α=5%

Since the p-value=0.002 is less than the α=5% confidence level, the null hypothesis of independence between the variables can be rejected. A contingency coefficient that helps to establish the degree of association between the variables is defined in equation 2 by means of the Cramer's V coefficient

$$V = \sqrt[2]{\frac{\chi^2/n}{mín(r-1)\ o\ (c-1)}} \qquad (2)$$

Cramer's V coefficient can assume values between 0 and 1 (V∈[0,1]), which according to Malhotra (2008), a large value of V only indicates a high degree of association and not the way in which the variables are related, in this sense being equal to 0.4323, it makes clear the existence of a moderate association between the variables, which not being defined in ordinal scale the sense of the relationship cannot be observed.

Correspondence Factor Analysis (CFA) between Higher Education Institutions and the Productive Sector

Total inertia and contribution of the factorial axes to inertia

$$IT = \frac{\chi^2}{N} \qquad (3)$$

Equation 3 measures the contribution to inertia of each of the dimensions or axes, defined as the percentage by which they help to explain the relationship between the row and column variables (Santesmases Mestre, 2001), the numerator of equation 3 is the Chi-Square statistic and the denominator the total number of observations in the sample, so that table 3 and figure 1 show the inertia of each of the calculated axes, which by default are equal to the number of categories of the column variable minus 1.

Axes	Eigenvalues	Inertia	Chi2	(%)	(%) cumulative
1	0.2670298	.0713	41.86	81.86	81.86
2	0.0944449	.0089	5.24	10.24	92.10
3	0.0764661	.0058	3.43	6.71	98.81
4	0.0321453	.0010	0.61	1.19	100.00
Total		.0871	51.13	100	

Table 3 Characteristics of the factorial axes

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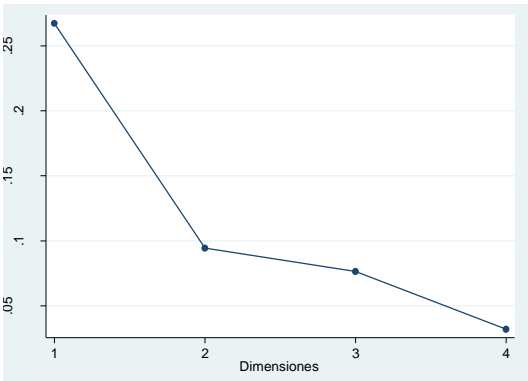
Graphic 1 Singular values of dimensions

The contribution of the axes to the explanation of inertia is decreasing given the singular values resulting from the application of the principal component analysis as can be seen in Figure 1 (Santesmases Mestre, 2001). According to Table 3, the first and second axis together contribute 92% of the inertia or association between the variables, with the first axis being the most important contributing 81.86% of the inertia.

Interdependence between Higher Education Institutions and the Productive Sector

Table 4 shows the coordinates of each category of the column variable with the axes obtained from the roots and characteristic vectors, as well as their correlation with each of these and the percentage contribution to the inertia of each category.

It is observed that the service and industrial categories are the most important to explain their interrelation with the productive sector, since they are highly correlated with the first dimension and together contribute 95% of the inertia.

	Dimension 1			Dimension 2		
	Coordinate	Correlation	Contribution to inertia	Coordinate	Correlation	Contribution to inertia
Commercial	0.161	0.494	0.029	0.035	0.008	0.004
Services	-0.572	0.988	0.497	-0.080	0.007	0.027
Industrial	0.728	0.964	0.453	-0.202	0.026	0.099
Educational	0.141	0.026	0.003	1.415	0.940	0.794
Don't know	0.392	0.220	0.019	0.470	0.112	0.076

**Table 4** Study of the columns by simple CFA

Table 5 shows now in the same way the analysis of the row variable through its coordinates with the axes, its correlation with each one and its contribution to the inertia in each factorial axis.

|	Dimension 1			Dimension 2		
	Coordinate	Correlation	Contribution to inertia	Coordinate	Correlation	Contribution to inertia
Technological universities	0.046	0.144	0.004	0.130	0.410	0.087
Technological institutes	0.684	0.904	0.379	-0.366	0.091	0.307
Private schools	-1.066	0.954	0.609	-0.391	0.046	0.232
Other public schools	-0.119	0.084	0.007	0.433	0.394	0.257
Don't know	-0.113	0.019	0.001	0.708	0.264	0.117

Table 5 Study of the rows by the simple CFA

According to the study of the rows in Table 5, the most important categories are private schools and technological institutes, both contribute 98% of the inertia that explains the first axis and are highly correlated with it.

Graphic 2 shows a graphical representation of the coordinates for each of the categories of the row and column variables in the axes or dimensions of tables 4 and 5, those that appear aligned or at the same height on the same axis show a relationship or dependence, as is the case of technological institutes and industrial companies, technological universities and commercial companies, the service sector and private schools.
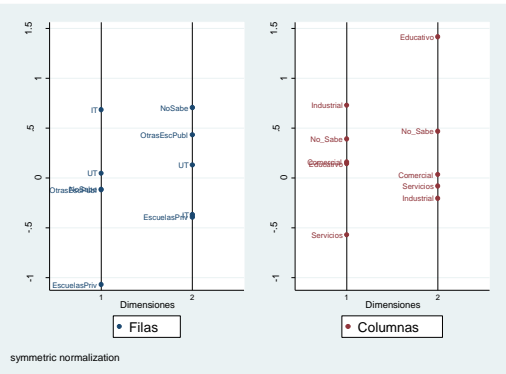
Graphic 2 Coordinates of the row and column categories on axes 1 and 2 of the CFA.
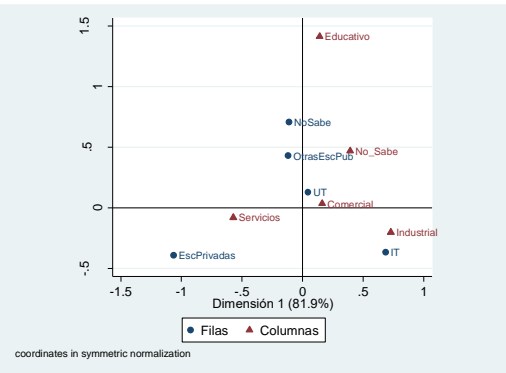
Graphic 3 Simple Correspondence Analysis between the Productive Sector and Higher Education Institutions

According to the coordinates of the row and column categories resulting from the correspondence factor analysis, Graph 3 shows an interdependence between technological institutes and industrial companies, private schools and service companies, and finally between technological universities and commercial companies.

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Correspondence Factor Analysis (CFA) between forms of interaction, HEIs and the Productive Sector

Table 6 shows the categories corresponding to the projects that have been carried out in the companies as a result of the linkage with higher education institutions (HEIs) according to the opinions of the industrial consultants.

Projects	Basic or applied research
	Product or service innovation
	Process innovation
	Organizational innovation
	Innovation/marketing
	Other

Table 6 Definition of the forms of interaction through which HEIs and the Productive Sector are linked

The analysis of the interdependence between the forms of interaction, the educational institutions (HEI) and the commercial line of business of the companies is now carried out on the basis of a contingency table.

IES	Turn Commercial	Service	Industrial	Educational	Don't know or don't answer
Technological universities	86	112	65	12	12
Technological institutes	41	33	46	3	4
Private schools	20	56	6	1	1
Other public schools	25	31	14	5	1
Don't know about IES	2	6	3	1	1
Basic or applied research	44	57	36	10	6
Product or service innovation	29	57	19	7	5
Process innovation	47	49	34	7	9
Organizational innovation	14	25	16	0	1
Innovation/marketing	14	27	6	1	5
Other forms of interaction	28	26	17	2	2
Do not know the forms of interaction	2	4	4	1	0

Table 7 Contingency table between the forms of interaction and the commercial line of business

According to the results of the correspondence factor analysis (CFA) performed in STATA 12, the value of the Ji-Square χ^2 statistic is equal to 83.60 with 44 degrees of freedom and a significance level α equal to 5%, so the null hypothesis of independence between the three variables can be rejected and is confirmed with a probability value p equal to 0.0003 and less than α.

Table 8 shows the contribution to inertia of each of the axes or dimensions, taking into account that their contribution to inertia is decreasing, the first two axes concentrate 81.24%.

Axes	Eigenvalues	Inertia	Chi2	(%)	(%) cumulative
1	0.2119769	0.0449342	53.83	64.39	64.39
2	0.108413	0.0117534	14.08	16.84	81.24
3	0.0900949	0.0081171	9.72	11.63	92.87
4	0.0705482	0.0049771	5.96	7.13	100.00
Total		0.069781	83.60	100	

Table 8 Characteristics of the factorial axes

The eigenvalues resulting from applying the principal components method to the contingency table can be visually represented by means of graph 4, where it can be observed that the contribution to the inertia of the axes is decreasing, as well as in these eigenvalues.
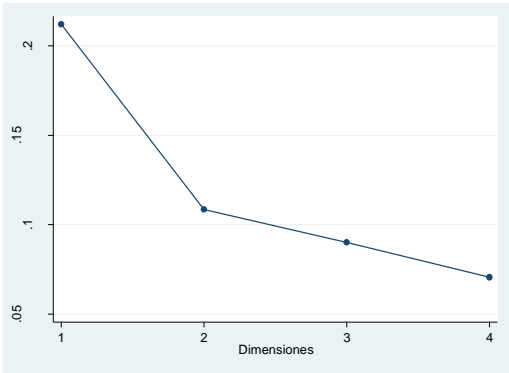
Graphic 4 Singular values of dimensions

Analysis of the interdependence between forms of interaction, HEIs and the business line of the companies.

	Dimension 1			Dimension 2		
	Coordinate	Correlation	Contribution to inertia	Coordinate	Correlation	Contribution to inertia
Commercial	0.177	0.371	0.044	0.005	0.000	0.000
Services	-0.510	0.965	0.495	-0.109	0.022	0.044
Industrial	0.661	0.905	0.458	-0.203	0.044	0.084
Educational	0.126	0.015	0.003	1.076	0.551	0.445
Don't Know	0.035	0.001	0.000	1.085	0.544	0.426

Table 9 Study of the simple CFA columns

	Dimension 1			Dimension 2		
	Coordinate	Correlation	Contribution to inertia	Coordinate	Correlation	Contribution to inertia
Technological universities	0.050	0.680	0.003	0.032	0.137	0.002
Technological institutes	0.794	0.882	0.316	-0.374	0.100	0.137
Private schools	-1.173	0.896	0.455	-0.555	0.103	0.199
Other public schools	-0.090	0.041	0.002	0.045	0.005	0.001
Don't know about IES	-0.203	0.062	0.002	0.645	0.319	0.042
Basic or applied research	0.124	0.196	0.009	0.240	0.375	0.068
Product or service innovation	-0.415	0.748	0.079	0.240	0.127	0.052
Process innovation	0.227	0.387	0.030	0.335	0.430	0.126
Organizational innovation	0.030	0.002	0.000	-0.793	0.823	0.271
Innovation/marketing	-0.625	0.475	0.081	0.420	0.110	0.072
Other forms of interaction	0.206	0.231	0.013	0.420	0.139	0.029
Do not know the forms of interaction	0.466	0.197	0.009	-0.135	0.008	0.002

**Table 10** Study of the rows of the simple CFA

From the study of the columns in Table 9, the commercial services and industrial sectors are identified as those productive sectors that contribute in a greater proportion to the interdependence between the forms of interaction that higher education institutions and the productive sector have carried out by contributing 95% of the inertia. Next in order of importance are the commercial and educational sectors. The CFA makes it possible to reduce the dimensionality of the categorical variables in the most important ones that account for the highest percentage of inertia.

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From the study of the rows in Table 10, technological institutes and private schools are identified as the higher education institutions that contribute to a greater extent to the interdependence between the forms of interaction that the productive sector and higher education institutions have carried out. The most significant forms of interaction due to the inertia with which they contribute to this interdependence are projects aimed at generating product or service innovations, marketing innovations and process innovations.
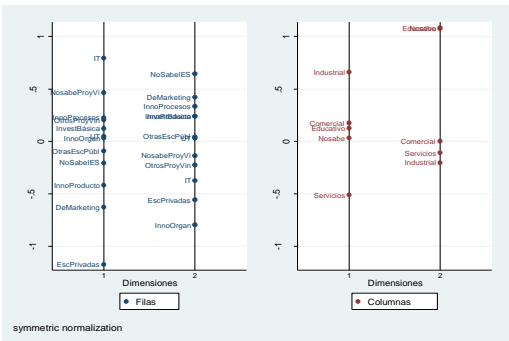

Graphic 5 Coordinates of the row and column variables of the CFA of the forms of interaction and productive sector.

Graphic 5 shows the coordinates for each of the categories of the row and column variables; it is of interest to identify those that appear aligned at the same height for each of the axes respectively, For example, it can be observed that on the first axis the service companies are almost at the same height as the innovations in products and services as well as the innovations in marketing and on the same axis with negative values in their coordinates are the private schools, this shows an interdependence between the categories of the variables that define at the same time a profile between the HEIs and the productive sector according to the ways in which they have interacted.
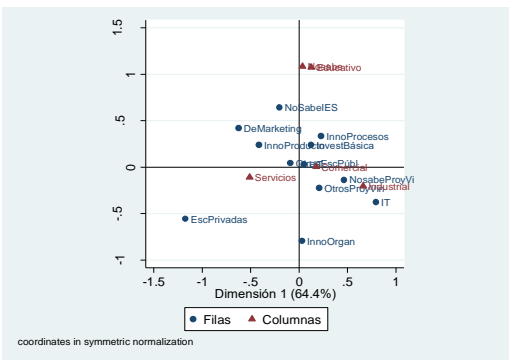
Graphic 6 Analysis of Simple Correspondences between the Forms of Interaction, the Productive Sector and Higher Education Institutions (HEI)

The results of the Correspondence Factor Analysis (CFA) allow the identification of affinity groups, which share in common a set of characteristics that make them interdependent and at the same time represent a profile for the subjects under analysis. In this sense, the affinity groups between higher education institutions, companies and their forms of interaction can be identified on the basis of the proximity between them by the coordinates they assume with each of the dimensions.
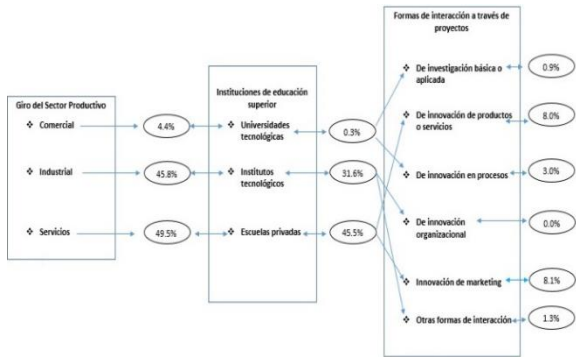
Graphic 7 Interdependence between the forms of interaction between the productive sector and higher education institutions, $\chi^2=83.60$, gl=44, p-value=0.000

Graphic 7 summarizes the interdependence by most representative groups according to the percentages with which each of the categories contribute to the inertia of the first dimension, this percentage appears enclosed in a circle, the arrows show the interdependence between HEIs, companies and the forms of interaction between both, considering that technological universities their high percentage is in the service companies, thus showing the way in which the productive sector establishes its participation in the type of project requested.

Year	Total projects	Projects not linked to the productive sector	% representing academic/research projects
2020	234	2	0.85%
2021	237	42	17.72%

Table 11 Representation of the impact on the insertion of students for the linkage with the productive sector and to carry out their internship projects

As shown in Table 11, it is shown that COVID-19 had an impact on the placement of students for the realization of their projects linked to the productive sector, which represented 17.72% of those who developed projects linked to the academic body of the Business Development educational program, which according to Graph 7 focused on the marketing area.

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Conclusions

Undoubtedly, this is a topic that allows us to reflect on two dimensions, the link between the productive sector and the HEIs and the forms of interaction in which it occurs, thus identifying the degree of impact it has on the company, in addition to visualizing that according to the type of company and the type of HEI is the elaboration of proposals to be developed, generating tendencies towards proposals that according to the type of company and the participation of the institution impact the level reached, as was observed in Table 7.

As for the realization of applied projects with the productive sector, it was diminished due to the sanitary regulations, the non-permissibility regarding the number of people who perform activities within the company, causing that the companies did not accept students for the realization of their practical training, social service and internships.

As a consequence, strategies were sought in which the students who were left without the opportunity to carry out their internships, carried out projects in accordance with the lines of research of the Business Development educational program, thus increasing research projects in the service sector with a focus on marketing innovation, considering that the greatest demand of the projects requested by the productive sector are focused on marketing innovation as well as product or service innovation.

Acknowledgement

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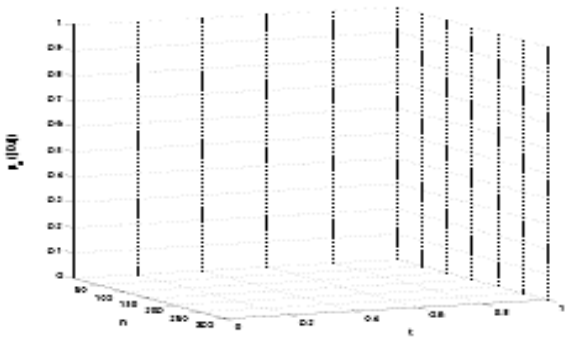
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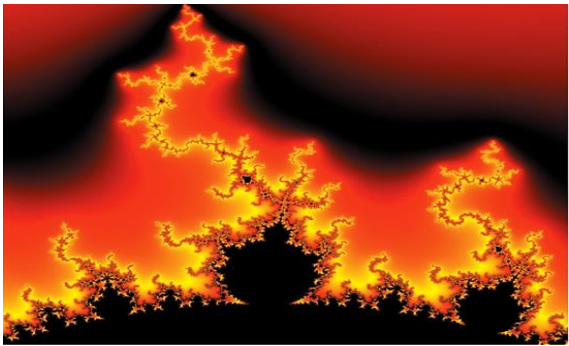Should not be images-everything must be editable.

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