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ECORFAN Journal-Mexico

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Knowledge Area

The works must be unpublished and refer to topics of Production systems design, product quality management, operations research, computer simulation, supply chains, quality certification, hydrometeorology and other topics related to Engineering and Technology.

Presentation of Content

In the first article we present, *Corporate social responsibility (CSR) in two micro, small and medium-sized enterprises (msmes) in Chihuahua, Mexico* by Ontiveros-Gómez. Samantha, Ortega-Montes, Fabiola Iveth, Sánchez-Bernal, Jorge Alberto and Rubio-Arias, Héctor Osbaldo, with adscription in Autonomous University of Chihuahua, as the next article we present, *Analysis of the impact of ICT by socioeconomic level* by Jiménez-García, Martha, Caamal-Olvera, Cinthya Guadalupe, Gómez-Miranda, Pilar and Jiménez-Jiménez, Rosa Sara, with adscription in Instituto Politécnico Nacional – UPIICSA, Universidad Autónoma de Nuevo León and Universidad Nacional Autónoma de México, as the next article we present, *Technology in the classroom: Exploring the student experience with ChatGPT in the educational process* by Eliseo-Dantés, Hortensia, García-Reyes, David Antonio, Castro-De la Cruz, Jucelly and López-Valdivieso, Leticia, with adscription in Tecnológico Nacional de México Campus Villahermosa, as the next article we present, *Administrative Audit of the Subdirectorate of Planning and Liaison of a Higher Education Institution of the State of Veracruz* by Balderrabano-Briones, Jazmín, Martínez-Gutiérrez, Rodolfo, and Utrera-Velez, Youssef, with adscription in Tecnológico Nacional de México, Instituto Tecnológico de Úrsulo Galván and Instituto Tecnológico de Tijuana, as the next article we present, *Rural communities as organizations where human aspects contribute to the preservation of traditional knowledges* by Rivera-González, Gibrán, Ángeles-Tovar, Luis Canek, Escamilla-García, Pablo Emilio and Rivera-González, Ángel Eustorgio, with adscription in Instituto Politécnico Nacional, as the last article we present, *The importance of the use of technology for life care in communities of Mexico* by Flores-Azcanio, Nancy P. & García-Hernández, Alitzel B., with adscription in Universidad Politécnica del Valle de México and CONAHCyT - Centro de Investigación en Química Aplicada (CIQA) - Unidad Monterrey

.

Content

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Article

Corporate social responsibility (CSR) in two micro, small and medium-sized enterprises (msmes) in Chihuahua, Mexico

Responsabilidad social empresarial (RSE) en dos micro, pequeñas y medianas empresas (mipymes) de Chihuahua, México

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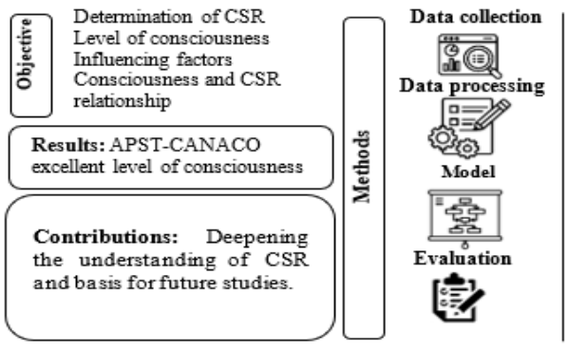
Abstract

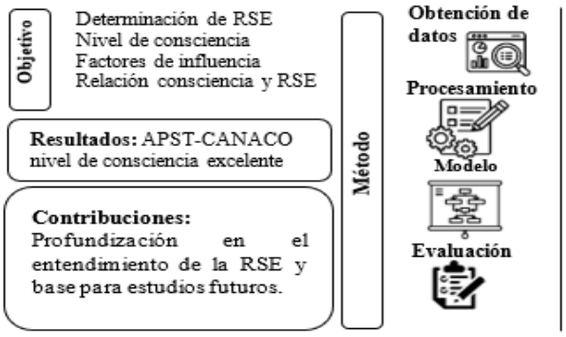
Social responsibility (SR) is not only a guide for the correct actions of companies, but also a way of directing an organization and linking with society. The central objective was to determine the level of awareness about the application of corporate social responsibility (CSR) in two organizations (MiPyME) established in Chihuahua, Mexico. In the organizations, a total of 45 companies (N=45) were identified and a total of 40 companies (n=40) were selected through non-probabilistic sampling. The data and information were obtained through the application of a questionnaire, interviews and observation. The results show that entrepreneurs from both associations have high awareness, particularly in the legal and economic areas. The businessmen from Rosales obtained a higher percentage of answers with excellent awareness compared to the businessmen from Meoqui and it was notable that the businessmen from both municipalities obtained 100% in the questions that talk about "promoting that employees consider a company fair" and "prevent corrupt practices by a company to institutions." It is concluded that the factor of ignorance is not the only thing that influences the level of awareness regarding participation in CSR, given that businessmen obtained excellent weights in the environmental, economic, legal and social areas.



Objective, Awareness, Authentic corporate, Leadership

Resumen

La responsabilidad social (RS) no es sólo una guía para la correcta actuación de las empresas, sino también una forma de dirigir una organización y vincularse con la sociedad. El objetivo principal era determinar el nivel de concienciación sobre la aplicación de la responsabilidad social de las empresas (RSE) en dos organizaciones (MIPYMES) establecidas en Chihuahua, México. Un total de 45 empresas (N=45) fueron identificadas en las organizaciones y un total de 40 empresas (n=40) fueron seleccionadas a través de un muestreo no probabilístico. Los datos y la información se obtuvieron con la aplicación de un cuestionario, entrevistas y observación. Los resultados muestran que los empresarios de ambas asociaciones tienen un alto grado de concienciación, sobre todo en los ámbitos jurídico y económico. Los Los empresarios de Rosales obtuvieron un mayor porcentaje de respuestas con excelente comparados con los empresarios de Meoqui y fue notorio que los empresarios de ambos empresarios de ambos municipios obtuvieron el 100% en las preguntas que hablan sobre "promover que los empleados consideren una empresa justa". Se concluye que el factor de desconocimiento no es lo único que influye en el nivel de concienciación respecto a la participación en RSE, ya que los empresarios obtuvieron excelentes ponderaciones en las áreas medioambiental, económica, jurídica y social áreas.



Objetivo, Concienciación, Auténtica empresa, Liderazgo

Citation: Ontiveros-Gómez. Samantha, Ortega-Montes, Fabiola Iveth, Sánchez-Bernal, Jorge Alberto and Rubio-Arias, Héctor Osbaldo. Corporate social responsibility (CSR) in two micro, small and medium-sized enterprises (msmes) in Chihuahua, Mexico. ECORFAN Journal-Mexico. 2024. 15-32: 1-8.

Introduction

The term corporate social responsibility (CSR), also known as corporate social responsibility (CSR), was born in the mid-twentieth century and, over time, underwent various transformations. Some scholars have perfected this concept, but care has always been taken to encompass and point out the commitment that a given company has with society. More specifically, Correa (2007) mentioned three phases through which this term has passed throughout history. This author specified an initial phase that occurred at the end of the nineteenth century when companies were already carrying out certain philanthropic activities. Then, a second phase occurred in the mid-twentieth century where organizations accepted and assumed a more critical role in their business actions and, finally, a third stage where a solid interrelationship between the State and the company was already noticeable, without forgetting or leaving aside the role and role of society. However, some critics (i.e. Milton Friedman) argued that the company should exist only to generate wealth and not assume a leading role in society and its environment (Carson, 1993).

Scholars Lichtenstein et al. (2004) explained that CSR moved from a theoretical level to a more realistic level, because organizations clearly established their roles in society and applied social and ethical standards to their businesses. It is clear that, over time, some organizations adhered to and were channeled towards the application of the CSR concept (Pinkston & Carroll, 1994), although it was also evident that others had problems in their attempts (Lindgreen et al., 2009). It is important to mention that it is notorious, in the literature, that some research evolved, in a first attempt, to carry out a discussion and analysis at a macro-social level and then move to an organizational level (Lindgreen & Swaen, 2009). Recently, the impact of cultural factors on CSR has been explored. By

For example, Mao, Sun, He, Chen, and Guo (2024) studied how tea culture can influence business behavior, effectively limiting bad corporate behavior and promoting CSR. This type of research provides a new perspective on how specific cultural factors can shape and improve corporate social responsibility practices.

In addition, recent studies have highlighted the importance of long-term orientation (LTO) in small and medium-sized enterprises (SMEs) and its relationship with CSR. Rosecká et al. (2024) found that an SME's CSR is influenced by its LTO, both directly and indirectly, through the mode of deliberate strategy formation. These findings suggest that SMEs with a focus on the future and perseverance in their traditions and values are more willing to invest in CSR practices because of their long-term benefits term. Belas et al. (2024) concluded that the sustainability factors of SMEs, including Human Resource Management (HRM), CSR, and financial management, significantly influence their sustainability in the market. The research showed that the implementation of CSR in business management and the positive perception of human capital are key determinants for the sustainability of SMEs. These results underline the importance of CSR not only as a business promotion tool, but as an integral component for the sustainable growth and long-term competitiveness of SMEs.

In the particular case of Mexico, it can be seen that, to date, there is a considerable delay in the full development of CSR if compared to the knowledge acquired in other nations. This despite the fact that, in Mexico, philanthropic actions had been taking place since pre-Hispanic times. For example, Lozano et al. (2005) mentioned the presence of calpullis, which were groups that represented the social, commercial, economic, political, cultural, and religious sectors in Aztec society. Therefore, the concept of CSR is not a new topic since CSR has been contemplated for several years. This notorious delay in Mexico does not come exclusively from the lack of interest of all actors in this matter, but there are synergies with other factors and sociocultural conditions, which prevent the familiarization, assimilation and promotion of social responsibility. However, in terms of environmental and sustainability, recent studies by Ontiveros et al. (2023), show an example of sustainable practices applied in local agriculture, using mixed fertilization that in addition to improving the productivity and profitability of peanuts, also promotes a form of sustainable production, this type of practices is integrated within the framework of CSR, which demonstrates how companies can balance economic profitability with respect for the environment and social welfare.

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Thus, the objective of this work was to determine the level of awareness about the application of corporate social responsibility (CSR) in two organizations established in Chihuahua, Mexico. A second objective was to identify the factors that influence the level of CSR awareness of merchants and service providers of these companies and their relationship with their personal experience. The results of this study will be relevant because they can be the triggers for the adoption of a culture of social responsibility (SR) of companies established in the south-central region of the state of Chihuahua, Mexico. In addition, it will serve as a model for other chambers of commerce and associations of service providers throughout the State and the country that wish to improve their standards in terms of SR of their affiliates.

Materials and methods

This research was carried out in the period from October 2019 to March 2021. Service providers and merchants who were affiliated with the National Chamber of Commerce (CANACO) Servytur, based in the municipal seat in Meoqui, in the state of Chihuahua, Mexico, participated. The association of service providers Tapacolmes (APST) established in the municipal seat in Rosales, Chihuahua, Mexico, also participated. The CANACO-Meoqui and the APST-Rosales are located in neighboring municipalities, which share both aquatic ecosystems and primary, secondary and tertiary activities. Therefore, the study of CSR awareness in these associations is very promising, since they share legal, economic, social and environmental issues.

The population of interest for this study were the companies that were in the database provided by CANACO-Meoqui and APST-Rosales. The inclusion criterion in the study was that the companies were located in the urban area, both in the city of Meoqui and in the city of Rosales, and that they were engaged in tourism, commerce and service provision activities.

A total of 45 companies (N=45) were identified and a total of 40 companies (n=40) were selected through non-probabilistic judging sampling (Rubio-Arias et al., 2024). The collection and access of information was through the application of a questionnaire, interviews and observation.

The questionnaire was designed with three sections. The first details the instructions and objective of the questionnaire, the second has the purpose of obtaining the general data of the respondent, while the third is broken down into four sections that address the economic, social, environmental and legal areas. Each section contains four questions where you have three answer options, which are written in the affirmative.

It is equivalent to a type of consciousness (intransitive/low, transitive/regular and critical/excellent) through which it is intended to determine the level of CSR awareness that the respondent has. Therefore, the study variable was SR and was weighted according to the classification of the levels of the social responsibility guide. In addition, a table of equivalidation of consciousness was considered, in which an analogy between the levels of human consciousness and that of CSR was reflected.

Due to the presence of the COVID-19 pandemic, on occasions, the state health traffic light established restrictive measures that prevented the application of the questionnaire in person. Under this circumstance, the questionnaire was applied virtually through a link via WhatsApp®. Once the traffic light was changed to yellow, the possibility of applying the remaining surveys in person became viable. Consequently, 18 virtual and 22 face-to-face surveys were applied, giving a total of 40 respondents; that is, n=40.

The perspectives and levels of awareness of entrepreneurs in the municipalities of Meoqui and Rosales in relation to CSR were examined. Four key areas were analyzed: environmental, social, legal, and economic.

In addition, the factors that influence the level of awareness of merchants and service providers were identified, as well as the relationship between awareness and the implementation of CSR.

The SPSS statistical package was used for the coding of the information, and descriptive statistics were used for the analysis and interpretation of the data.

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Results

Table 1 presents general data on the entrepreneurs affiliated to CANACO-Servytur Meoqui and APSP.

It can be seen that 45.46% of the men are originally from the municipality of Rosales, while 54.54% are from Meoqui. Regarding women, 61.11% come from Rosales and 38.89% from Meoqui. The ages of the entrepreneurs range from 18 to 80 years old, providing a wide range of experiences for research.

Box 1

Table 1

General data of the municipalities of Meoqui and Rosales

Variables		Municipio de Rosales						Municipio de Meoqui					
		Hombres			Mujeres			Hombres			Mujeres		
		Comercio	Servicios	Turismo	Comercio	Servicios	Turismo	Comercio	Servicios	Turismo	Comercio	Servicios	Tu
Edad	Entre 18 y 35	0	1	0	1	0	0	4	0	0	2	1	
	Entre 36 y 50	2	1	1	1	1	2	1	2	0	2	1	
	Entre 51 y 65	0	0	3	3	3	0	4	1	0	0	0	
	Entre 66 y 80	0	1	1	0	0	0	0	0	0	0	0	
Nivel de estudios	Básico	1	0	1	3	0	0	2	1	0	0	0	
	Preparatoria	0	1	2	1	1	1	2	1	0	1	0	
	Licenciatura	1	2	0	1	2	0	4	1	0	3	1	
	Posgrado	0	0	2	1	1	1	1	0	0	0	1	
No. de personal	Mujeres	1	5	7	1	1	11	12	2	0	3	19	
	Hombres	3	55	9	1	3	8	16	4	0	2	15	
Antigüedad del negocio	Menos de 1 año	0	0	0	1	1	0	1	0	0	1	0	
	Entre 2 a 4 años	0	2	0	1	1	0	1	0	0	1	0	
	Entre 5 a 7 años	0	0	2	1	2	0	2	1	0	2	2	
	Más de 8 años	2	1	3	1	0	2	5	2	0	0	0	
	Total	10	69	31	17	16	25	55	15	0	17	40	

Source: own elaboration

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As for the educational level by municipality, 25% of entrepreneurs in Meoqui have a bachelor's degree, while 10% have high school, 7.5% basic education and 5% postgraduate. In Rosales, both undergraduate and high school have 15%, 12.5% have basic education and 10% have postgraduate education. As for the business line, 32.5% of entrepreneurs in Meoqui are dedicated to commerce, 12.5% to the service sector and 2.5% to tourism. In Rosales, commerce, services and tourism represent 17.5% respectively. The relationship between age and age of the business shows that, in Meoqui, the highest percentage of entrepreneurs between 18 and 35 years old have businesses that are less than one year old, while in the 51 to 65 age group, the highest percentage belongs to businesses that are more than 8 years old.

The services sector employs 55.32% of the workers, followed by commerce with 23.40% and tourism with 21.28%. Although tourism has the fewest employees, it has the same number of employed men and women.

There is a difference in the percentage of male and female employees under the position of businesswomen (5.4%) and businessmen (52.64%).

Levels of awareness in CSR

The results indicate that, in general, entrepreneurs from both municipalities show a high awareness in all the areas examined, particularly in the legal and economic areas. However, some significant differences are observed between municipalities in certain areas.

Box 2

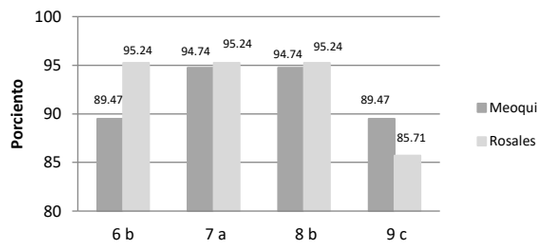

Figure 1

Answers with excellent awareness from the Environmental Section

Source: own elaboration

Figure 1 shows that entrepreneurs from Rosales obtained a higher percentage of responses with excellent awareness compared to entrepreneurs from Meoqui in questions 6, 7 and 8 with 95.24% respectively; however, Meoqui stands out in 9th with 89.47%. In general, it can be observed that in the 7th and 8th there is not much difference between the two, but in the 6th and 9th there is, even though both municipalities exceed 85%, in Meoqui there is a deficiency in the perspective of "reducing water consumption" and in Rosales about "promoting ecological alternatives".

Box 3

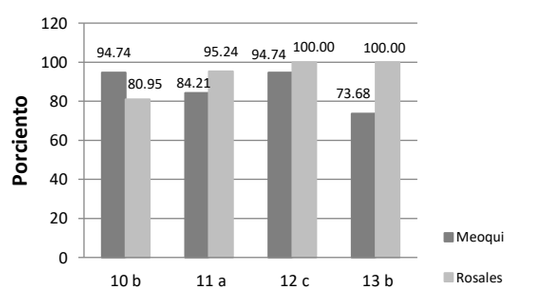

Figure 2

Responses with excellent conscience from the Social Section

Source: own elaboration

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Figure 2 shows that the entrepreneurs of Rosales obtained a higher percentage of answers with excellent awareness compared to the entrepreneurs of Meoqui in question 11 with 95.24%, in 12 and 13 where both obtained 100%, however, Meoqui leads in question 10 with 94.74%. In the case of Rosales, it had a greater deficiency in "preventing issues of discrimination" and in the case of Meoqui "showing itself as a company to the community"

Box 4

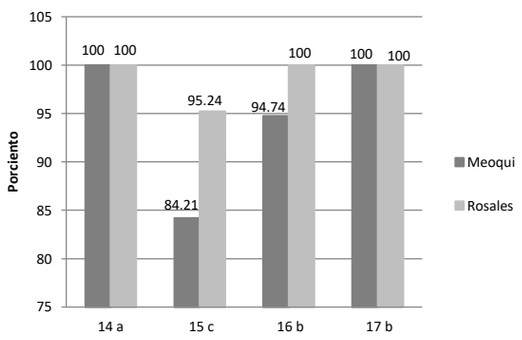


Figure 3

Answers with excellent awareness from the Legal Section

Source: own elaboration

Figure 3 shows that businessmen from both municipalities obtained 100% in questions 14 and 17, which talk about "promoting that employees consider a company fair" and "preventing corruption practices by a company to institutions". In question 16, which talks about "compliance of the company with its obligations to the state or municipality", Rosales achieved 100% and Meoqui 94.74%. In the case of question 15, Rosales achieved 95.24%, which, although it is the lowest of the 4 questions, still exceeds the percentage of Meoqui with 84.21%, denoting the deficiency of the item.

Box 5

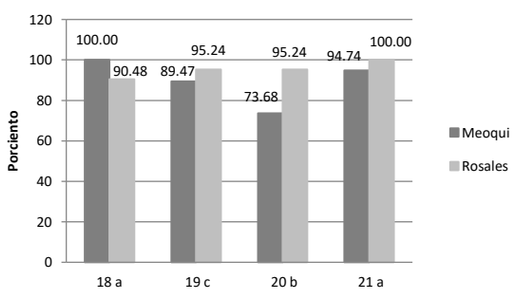


Figure 4

Answers with excellent awareness from the Economic Section

Source: own elaboration

Figure 4 shows that the municipality of Rosales obtained a percentage of more than 90% in all its questions, achieving only in question 21 that talks about "preventing sanctions by competent institutions". In the case of Meoqui he got 100% in question 18 which says about "promoting fair competition", in question 21 he got 94.73%, in 19 89.47% and in question 20 he obtained 73.68%, the lowest value in the series.

Box 6

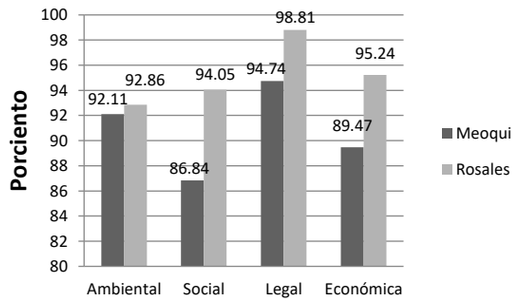


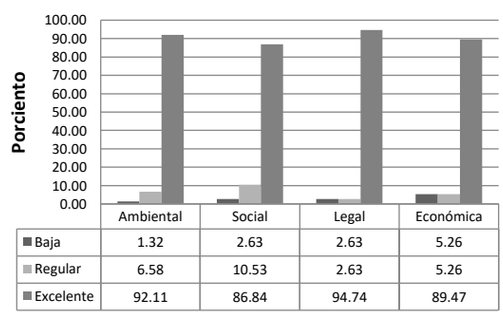
Figure 5

Concentrate of the average of the CSR sections

Source: own elaboration

Figure 5 shows the average of the different questions per section, which shows which areas have the greatest deficiency in each municipality. In the environmental section the difference is .75%, and in the case of Rosales it is the section with the lowest percentage of the 4. In the social area, Rosales increases while Meoqui decreases its percentage, even being the lowest of all areas. In the legal area, both municipalities have the highest scores, and the difference between them is only 4.07%. And in the economic area, Rosales remains at high levels with 95.24%, unlike Meoqui, which achieves the second lowest value in the table.

Box 7



	Ambiental	Social	Legal	Económica
Baja	1.32	2.63	2.63	5.26
Regular	6.58	10.53	2.63	5.26
Excelente	92.11	86.84	94.74	89.47

Figure 6

CSR awareness concentrate in the municipality of Meoqui

Source: own elaboration

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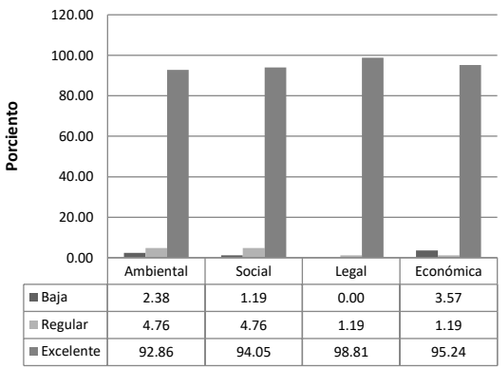
Figure 6 shows the averages of the percentages of the responses corresponding to the types of CSR awareness of the entrepreneurs in the municipality of Meoqui. It can be observed that the consciousness that has the highest percentage is excellent in all areas, followed by regular consciousness and finally the lowest percentage belonging to low consciousness.

Box 8



	Ambiental	Social	Legal	Económica
Baja	2.38	1.19	0.00	3.57
Regular	4.76	4.76	1.19	1.19
Excelente	92.86	94.05	98.81	95.24

Figure 7

CSR awareness concentrate in the municipality of Rosales

Source: own elaboration

Figure 7 shows the averages of the percentages of the responses corresponding to the types of CSR awareness of the entrepreneurs in the municipality of Rosales. The consciousness with the highest percentage is the level of excellent consciousness in the 4 areas, followed by regular consciousness and low consciousness.

Interview results

Several representatives and former representatives of the municipalities of Rosales, Meoqui, Julimes, Saucillo, the Conciliation and Arbitration Board in Delicias and the offices of the State Human Rights Commission (CEDH) also in Delicias were interviewed, to find out the environmental, social, economic and legal situation that the south-central region of the state was going through. in a very general way.

The interviews sought to determine if the conditions of the municipalities of Meoqui and Rosales were different or similar to those of the remaining municipalities. It was found that they shared similar conditions, due to their proximity and main economic activities.

In addition to having common patterns in terms of their problems, such as: unjustified dismissals, termination of the employment relationship by the worker and termination of the employment relationship by the employer (legal area), the monopoly of some products and services, unfair competition, lack of employment, reduction of federal budgets, federal government decisions, informal businesses and the situation of the pandemic (economic area), the constant violation of human rights, despite the decrease in complaints due to the pandemic (social area), contamination of bodies of water (dams, rivers), destruction of flora and fauna, drought in the state (low water catchment) and release of water from dams by government decision (environmental area).

During the application of the questionnaire in person to the entrepreneurs, it was possible to find out through observation and personal talks other factors that could have influenced the responses. That is, factors such as knowledge or lack of knowledge about CSR, environmental, economic, legal and social aspects (since they asked to be explained what the question referred to and some terms). Some participants reported personal experiences (because they considered it necessary for them to understand and for the interviewer to be empathetic with their points of view), priorities of entrepreneurs (investing, saving, among others), type of culture of society (unfair practices "allowed" or that are done out of habit), economic conditions of the company (if there is solvency or financial problems) and of the current economy (inflation, pandemic), action and compliance of authorities (incorruptible or fraudulent authorities), regional economic competition (fair or unfair competition), values (terminal or instrumental) and beliefs.

Relationship that consciousness has with the implementation of CSR

Some respondents mentioned during the application of the questionnaire that they did not know about CSR issues. However, they would have no problem with training in the subject. Some participants were even enthusiastic about the idea of a socially responsible city; however, despite the interest in CSR, they emphasized the difficulties they could face and that the possibility of implementing it would depend on the conditions presented to them.

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It would depend on whether the effort they applied or made was beneficial or with bad results, since a bad result would be the main demotivator to continue making efforts in favor of CSR. They mentioned that the effort should be made by citizens, businessmen and the various authorities to fulfill their part. Because, if one of the three did not participate with the same energy and enthusiasm, then it would be unfair for the others to make an effort. Thus, the relationship between consciousness and the implementation of CSR is based on the interdependence of the influencing factors and the results observed by entrepreneurs in society.

It is important to note that positive results can be observed in the community; However, if the level of consciousness is low or regular, then its implementation will be unlikely in the medium and long term. In addition, it is clear that it is possible to have an awareness of CSR; but, if the results do not convince the entrepreneur, consequently, it is very unlikely that they will be executed.

Conclusions and recommendations

Derived from the results of this study, it is concluded that the factor of ignorance is not the only thing that influences the level of awareness regarding participation in CSR actions, because entrepreneurs obtained excellent weightings corresponding to the environmental, economic, legal and social areas.

A second conclusion is that personal experience, although it is an important influencing factor to participate in CSR actions and projects, there are other elements such as the economic, social, legal and environmental conditions that the individual is going through that alter their perception of CSR.

It is advisable to continue with this type of project that offers relevant information on the factors that influence the adoption of CSR and, thus, implement actions in the medium and long term.

It is also advisable to initiate awareness and sensitization programs at all levels in order to standardize knowledge about CSR and the potential advantages of its implementation.

Declarations

Conflict of interest

The authors declare that they have no conflict of interest. They have no known competing financial interests or personal relationships that would have appeared to influence the article reported in this article.

Authors' contribution

Ontiveros-Gómez, Samantha: I contribute to the idea of the project and the development of the research.

Ortega-Montes, Fabiola Iveth: I contribute to the development of research, data analysis, review and editing.

Sánchez-Bernal, Jorge Alberto: I contribute with revision and editing.

Rubio-Arias, Héctor Osbaldo: I contribute with the research method, data analysis

Availability of data and materials

The datasets used or analyzed during the current study are available from the corresponding author upon reasonable request.

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Abbreviations

APST	Association of service providers Tapacolmes
CANACO	National Chamber of Commerce
LTO	Long term
MSMEs	Micro, Small and Medium Enterprises
RS	Social Responsibility
CSR	Corporate Social Responsibility
CSR	Corporate Social Responsibility

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Article

Analysis of the impact of ICT by socioeconomic level

Análisis del impacto de las Tic por nivel socioeconómico

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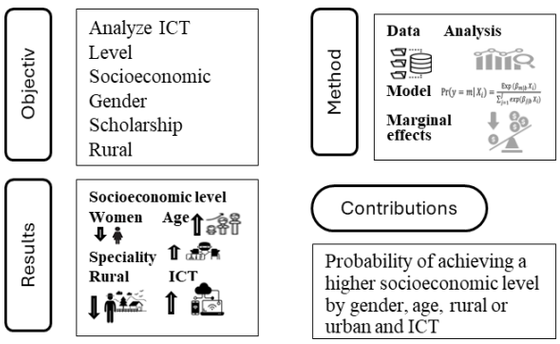
Abstract

Information and communication technologies (ICT) strengthen the economy. Likewise, the socioeconomic level in Mexico is classified into 4 levels. The objective was to analyze ICT by socioeconomic level, considering gender, education and territorial scope. Data from the National Survey of Availability and Use of Information Technologies in Households 2021 were used. The sample was 15,325,746 households. An econometric model was developed using the Logit and Probit methods. The following was found: 1) Women cannot reach high levels, 2) The older they are, the higher the level, 3) The specialty educational level has a higher socioeconomic level, 4) The urban area reaches a higher stratum compared to the rural area, 5) The use of the computer and the Internet also presents high levels. It is concluded that the most vulnerable are rural women with primary level who do not use ICT.

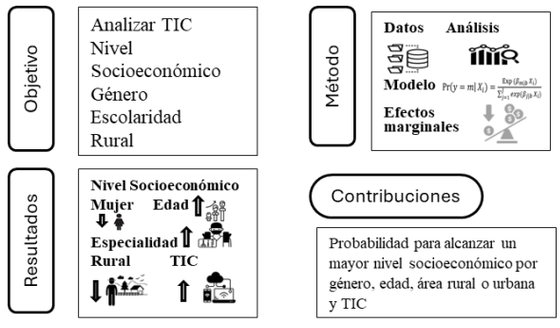


Predictive model of socioeconomic level

Technologies, Socioeconomic, Rural

Resumen

Las Tecnologías de información y comunicación (TIC) fortalecen la economía. Asimismo, el nivel socioeconómico en México está clasificado en 4 niveles. El objetivo fue analizar las TIC por nivel socioeconómico considerando el género y la escolaridad y el ámbito territorial. Se utilizaron los datos de la Encuesta Nacional de Disponibilidad y Uso de Tecnologías de Información en los Hogares 2021. La muestra fue de 15,325,746 hogares. Se elaboró un modelo econométrico por los métodos Logit y Probit. Se encontró lo siguiente:1) La mujer no puede alcanzar niveles altos, 2) A mayor edad mayor nivel, 3) El nivel educativo especialidad tiene un mayor nivel socioeconómico, 4) El área urbana alcanza mayor estrato en comparación con la rural, 5) El uso de la computadora y del internet tambien presenta altos niveles. Se concluye que las más vulnerables son las mujeres rurales con nivel primaria que no usan las TIC.



Modelo predictivo del nivel socioeconómico

Tecnologías, Socioeconómico, Rural

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Introduction

Mexico's socioeconomic stratum is classified by housing according to certain social and economic characteristics of the people who live there, as well as their physical characteristics and equipment (INEGI, 2021). In this research it is necessary to analyze their relationship with information and communication technologies (ICT), which include physical devices that are emerging with digital innovation, such as: fixed, mobile and smart phones, computers, electronic tablets, as well as the Internet, which is based on a technological infrastructure (Sánchez and García, 2020).

It is necessary to consider technology, since the 2030 Agenda for Sustainable Development recognizes that digital technology is an instrument that can help to achieve the 17 Sustainable Development Goals (Sánchez and García 2020). To this end, Mexico presents great heterogeneity in social stratification, this means that, according to the stratification carried out, the bulk of the population is in the middle strata and a small percentage in each of the very high and very low strata, in addition to the fact that in Mexico, the percentage of people who access the Internet varies according to the socioeconomic stratum to which people belong (Sánchez and García 2020), which affects society (Graña, Murillo, and Murillo 2023) . It is worth mentioning that socioeconomic status is related to economic growth, income growth and job creation to reduce poverty and inequality (Barata 2019).

It should be considered that the digital divide is an obstacle to Mexico's economic development in the information and knowledge society, since there are huge economic and social inequalities that restrict both access and productive use of the Internet, which provide direct benefits to the population (Martínez-Domínguez and Fierros-González 2022). Therefore, it is important to close the digital divide by improving access to ICTs, especially for the most vulnerable groups (Díaz de León Castañeda and Martínez Domínguez 2020). To decrease the significant differences between urban and rural living areas (Khan, Ikram, and Saleem 2023). Therefore, this is a justification for the analysis of this work, since the analysis by socioeconomic level by social variables such as gender, age, schooling and the inclusion of ICTs favors economic development.

The objective of this work is to analyze ICTs by socioeconomic stratum considering gender and schooling, as well as the territorial scope considering rural and urban, through a Logit model. The research questions posed in this research are: Do ICTs help to have a higher socioeconomic level, does the educational level facilitate obtaining a high socioeconomic level, these questions will be answered with the results of the econometric model that will be presented later. A review of scientific literature related to the variables of the study is presented below.

Literature Review

This section presents an analysis of socioeconomic level, education, gender and age, internet access at home and at work, information and communication technologies, rurality related to socioeconomic level, socioeconomic level and working hours. The analysis of this literature gives us a guideline to continue with the research to later formulate a series of variables that are presented in the methodology, as well as to propose an econometric model directly related to the socioeconomic levels of Mexico.

Socioeconomic level

It is important to consider that low socioeconomic factors reflect the lack of opportunities for access to education, employment, income and public health services (Gómez-Ugarte and García-Guerrero 2023). On the other hand, in Turkey socioeconomic status was considered by parental educational level (both mother's and father's educational level) and household income (Kobul, 2023), so it is important to consider parental educational level in socioeconomic status.

Moreover, socioeconomic conditions impact people's lives in contemporary societies (Antonoplis 2023). Therefore, more socioeconomic studies are needed to establish how spending considers the type of household and socioeconomic level. (Lozada-Urbano et al. 2022). Since households of lower socioeconomic levels are the most dissatisfied in various aspects, especially with their housing (Manríquez 2023), people of a higher socioeconomic level relate to their environment and to people who live in other places and who are of the same level (Lenormand and Samaniego 2023). So this tells us that studying socioeconomic level implies including several variables to find possible associations.

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Education

In relation to education, we have that in some countries such as India, the government understands the importance of education to improve the socioeconomic status in rural areas and is committed to ensure that everyone has access to education (Utpal 2023).

Regarding the educational level of the head of household, it should be considered that parents with higher education provide a warmer home environment and develop closer ties and better communication with their children (Kobul 2023), which leads to greater welfare and income, such that the maximum level of education attained by the head of household is an indicator of access to economic and social resources (Mejía-Guevara and Fuentes 2024).

Likewise, it should be considered that the time young people spend online and what they do on the Internet are strongly influenced by the educational level of their parents and household income. For these young adults are not as tech-savvy as assumed. So, they may spend too much time online, even too much, but this does not necessarily guarantee that they make the most of their time for academic purposes and improve their educational level. Since they mainly connect to the Internet for social networking and gaming purposes (Kobul 2023). Similarly, in Argentina, students who have access to a computer with Internet connection at home achieve higher educational attainment in both language and mathematics (Alderete and Formichella 2023).

Gender and Age

Gender differences are important and become powerful when they interact with age and socioeconomic differences, as women spend fewer hours in paid productive activities than men, in almost all age ranges. For people of higher socioeconomic status tend to spend almost an extra hour doing personal activities that give them well-being, compared to people of lower socioeconomic status.

This could be the result of the need for people of lower socioeconomic status to work longer hours to meet their basic needs, thus reducing the total amount of time they can devote to personal activities (Avolio and Moreno 2023).

In some sub-Saharan African countries, the gender of the household head, age, education level, household size, income, poverty, and food prices are the problem of household food security (Drammeh, Hamid, and Rohana 2019), which also relates socioeconomic status to well-being and income and provides an impetus to look at gender, age, and education to achieve higher socioeconomic statuses

Internet access at home and at work

Regarding the internet, in 2016 a study was conducted through an analysis of the National Survey of Availability and Use of Information Technologies in Households, and it was found that internet access can become an efficient resource to boost economic development, which is determined by the characteristics of human capital; since through a Logit model in Mexico, it was found that the level of schooling, has different effects in the rural and urban sectors, where the impacts are greater for urban areas that have greater educational infrastructure in the heads of households (0.056***). Similarly, the probability that an individual living in the rural or urban sector can access the Internet increases significantly if the age of the person is between 33 and 64 years compared to any other age range, in addition, the probability of having access to the Internet increases in both sectors, by approximately 3% in the rural sector and 14.6% in the urban sector (Mora-Rivera and García-Mora 2021).

Similarly in Mexico, another study was conducted in 2018 with data from the National Survey of Availability and Use of Information Technologies in Households, through a Probit model and it was found that for online health information searches, the significant variables were: being a woman (1.51***); being an adult (1. 67***); having a higher level of education (6.01***); having low strata (-1.29**); having superior digital skills (1.82***) ;and living in an urban area (Díaz de León Castañeda and Martínez Domínguez 2020), and the influence of educational level with internet use and a negative influence with low levels of economic strata is observed. Likewise, in 2020, in another research with the countries of Uruguay and Mexico on internet access and the deep digital divide, through certain indicators by means of a chi-square association analysis and found for the Mexican case that the deep digital divide is based on internet access.

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Since this is the first approach to technologies and is positively related to socioeconomic stratum. However, once the population in Mexico can access this resource, the difference by gender is almost nonexistent (Sánchez and García 2020).

Regarding the internet at work, there is a need to modernize workplaces and develop employees' competencies in Information and Communication Technologies (Anikin 2021) for due to the popularization of the internet in rural areas, mobile internet use has become an essential part of the life and work of rural residents (Nie, Ma, and Sousa-Poza 2021).

Information and Communication Technologies

In Medellín, Colombia, they found that Internet adoption fosters economic growth and development, and the most important variables for adaptation are monthly income, education, having a computer and cable TV at home (Ramírez-Hassan and Carvajal-Rendón 2021). Likewise, in Colombia the economic gaps generated by the pandemic became technological gaps, so it is necessary to design policies to compensate for the adverse effects of the increase in economic gaps (Palacios Mena and Ariza Bulla 2023).

On the other hand, in China, technology related to Big Data and artificial intelligence was found to reduce labor production costs and increase economic income (Ye and Xu 2023).

Likewise, the rapid progress of information and communication technologies (ICT) creates a new image of the economy, transforming from a conventional economy to a digital economy, which includes e-commerce, which in turn produces economic growth (Barata 2019). Similarly ICT focused on online marketing, to expand market segments, optimize marketing partners, find potential partners and promotion to get new consumers, are effective in maximizing sales and increasing revenue for a company (Muhammad, Iskandar, and Yusuf 2023). On the other hand, in India they conducted research on the technology gap in the population and in their findings they determined the urgent need to address educational and income inequality among different social class groups, with a special focus on the most disadvantaged classes.

For they considered education to be a crucial factor in explaining the digital skills gap, such as knowledge of computer and Internet use, as a disadvantaged class group is more likely to be poor and less educated and therefore less likely to have a computer at home (Rajam, Reddy, and Banerjee 2021).

Mobile ICT can also provide more opportunities for rural entrepreneurship and innovation, particularly by motivating young farmers to actively participate in rural e-commerce enterprises that can increase nonfarm income (Nie et al. 2021). For ICT infrastructure improved digital literacy and strengthened the economy and community activities (Ko, Routray, and Ahmad 2019).

However, it should be considered that the digital native also depends on the socioeconomic level (Kobul 2023). On the other hand, in Pakistan socioeconomic and digital disparities are reproduced in the use of digital knowledge and skills, as people of low socioeconomic levels are at risk of being victims of cyber threats (Khan et al. 2023).

Rural

COVID-19 pandemic was associated with different indicators of well-being, and concluded the urgent need to take measures to support vulnerable groups, in particular women, households with children, and those in the lowest socioeconomic status (Vilar-Compte et al. 2022) Children from lower and lower-middle socioeconomic strata and living in rural areas have fewer opportunities to access, use and engage in online activities (homework, courses and blogs) on the Internet, in contrast, students living in urban areas and high strata, so these households are the most likely to be part of the information and knowledge society (Martínez-Domínguez and Fierros-González 2022).

In addition, digital literacy contributes significantly to increasing the income of rural residents. (Liu and Zhou 2023). Another important point is the globalization of markets, which represents a challenge for addressing the new rurality; therefore, it is necessary to improve production conditions and patterns to influence the quality of life of rural families (González-Félix et al. 2021).

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Thus, local governments should invest in Internet infrastructure to promote agricultural activities and develop specific rural services to increase agricultural incomes through better access to information on agricultural production and market networks (Nie et al. 2021).

Hours

Higher socioeconomic status is associated with a decrease in hours spent on productive activities. This means that people of lower socioeconomic status have a higher total workload than people of higher socioeconomic status. This can be explained by the fact that people with a lower socioeconomic level require more hours of paid work to satisfy their needs. This can also be explained by the fact that those from a lower socioeconomic level do not have access to external services that can support unpaid productive activities (Avolio & Moreno, 2023). Methodology. The National Survey on the Availability and Use of Information Technologies in Households 2021 was used; this survey aims to obtain information on the availability and use of information and communication technologies in households and their use by individuals aged six years or older in Mexico, to generate statistical information on the subject and support decision-making in terms of public policies (INEGI 2021).

Participants

Data on heads of household in Mexico from the National Survey on Availability and Use of Information Technologies in Households 2021 (INEGI 2021) were considered, including gender, age, schooling, rural or urban residence, as well as some ICT data, such as the use of computer equipment at home or at work, as well as Internet use.

Study variables

The variables considered were those presented in Figure 1 and described in Table 1. The dependent variable was socioeconomic stratum and the independent variables were sex, age, schooling, working hours, use of computer equipment, use of computer at work, use of internet, use of internet at work, all variables corresponding to the head of household. The household factor provided by the survey was also considered as an estimation variable for the Logit model.

Box 1

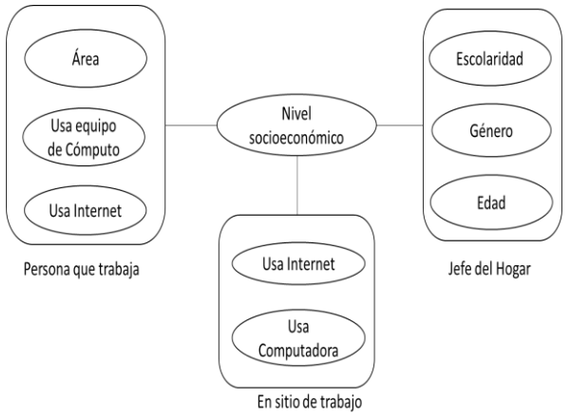

Figure 1

Variables of analysis of socioeconomic level

Box 2

Table 1

Variables used in the model

Variable	Description
Socioeconomic level	Refers to the socioeconomic level of households, which is determined by INEGI based on physical characteristics and equipment. These strata are categorized as follows: 1= Low, 2= Lower middle, 3= Upper middle, 4= High. It is a polytomous categorical variable.
Genre	It is the gender of the head of household, classified using the following values: 1 = Male, 0 = Female.
Age	Is the age of the head of the household in years completed
Schooling	It is the level of schooling of the head of household, measured as years of study, and was classified with the following categories: None=0, Primary=6, Secondary=9, High school=12, Bachelor's or engineering= 16 Specialty=17, Master's=18, Doctorate= 20
Area	Refers to the area where the worker resides and his/her home is located, being its classification as: 1 = urban, 0= rural.
Uses computer equipment	Refers to whether the worker uses the computer, laptop or Tablet, printer, scanner, cloud computing, either at work or at home: 1=Yes, 0=No
Uses Computer at Work	Is the worker's use of the computer only for work activities: 1=Yes, 0=No
Use the Internet	Is the worker's use of the Internet in general, either at home or at work, for different activities: 1=Yes, 0=No
Use the Internet Work	Uses the Internet at work: 1=Yes, 0=No

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AnálData Analysis

The data were collected from the National Survey on Availability and Use of Information Technologies in Households for the year 2021, provided by INEGI.

These data were segmented in such a way that only the heads of household were selected, and then several filters were applied to select and classify the variables mentioned in the previous section and subsequently an econometric model was elaborated by the Logit and Probit methods.

Econometric model

An econometric model was made with a predictive analysis of multinomial Logit estimation, since the dependent variable included 4 categories of values.

For the Logit model, the model of equation 1 was used.

In addition, the assumption of independence of irrelevant alternatives was considered. In the same way, a Probit estimation was performed.

$$\Pr(y = m|X_i) = \frac{\text{Exp}\,(\beta_{m|b}\,X_i)}{\sum_{j=1}^{J} exp(\beta_{j|b}\,X_i)} \qquad (1)$$

Results

Analysis of descriptive data

Table 2 presents the data by socioeconomic stratum of the heads of household using ICTs and Table 3 shows the same data, but using the expansion factor provided by the survey.

Box 3

Table 2

Frequency of data by socioeconomic stratum

Socioeconomic level	Frequency	Percentage
1	4,492	17.99
2	12,631	50.6
3	5,597	22.42
4	2,243	8.99
Total	24,963	100

Box 4

Table 3

Frequency of data by socioeconomic level using Factor

Socioeconomic level	Frequency	Percentage
1	2,750,621	17.95
2	7,365,927	48.06
3	3,521,146	22.98
4	1,688,052	11.01
Total	15,325,746	100

In terms of schooling, Figure 2 shows that most of the population has basic education, with primary and secondary education being the main ones, while the number of people with professional or higher education has decreased drastically..

Box 5

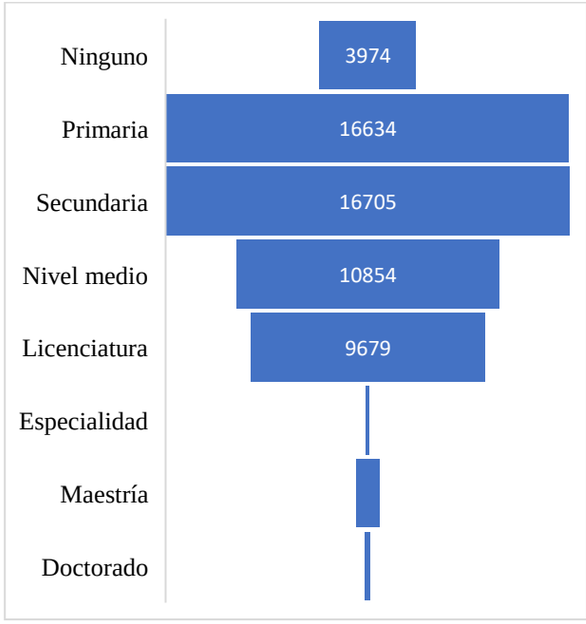

Figure 2

Frequency of data by socioeconomic level using expansion factor.

Logit and Probit model

Table 4 shows the results of the Logit and Probit regression, as well as their respective p-values of the estimated coefficients, and the validity of the models through a chi-square p-value.

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Box 6

Table 4

Logit and Probit regression

	Logit Model		Probit Model	
Variables	**Coef.**	**P> |z |**	**Coef.**	**P> |z |**
Gender of head of household Male	-0.1938	0.0011 ***	-0.1124	0.0006 ***
Age of head of household	0.0343	0.0000 ***	0.0194	0.0000 ***
Schooling Primary	0.8755	0.0025 ***	0.4709	0.0013 ***
High school	1.4842	0.0027 ***	0.8123	0.0015 ***
High school	1.9790	0.0029 ***	1.1024	0.0016 ***
Bachelor's degree	2.6005	0.0030 ***	1.4666	0.0016 ***
Specialty	2.8818	0.0082 ***	1.6281	0.0047 ***
Master's Degree	2.8780	0.0044 ***	1.6183	0.0025 ***
Doctorate	2.7973	0.0080 ***	1.5776	0.0046 ***
Urban Area	3.3119	0.0018 ***	1.8695	0.0009 ***
Uses computer equipment	0.4404	0.0019 ***	0.2574	0.0011 ***
Uses computer at work	0.2438	0.0021 ***	0.1443	0.0012 ***
Uses Internet in general	0.4190	0.0016 ***	0.2374	0.0009 ***
Uses Internet at work	0.1520	0.0015 ***	0.0859	0.0009 ***
Observations	24,927		24,927	
	Prob > chi2 =0.000		Prob > chi2 =0.000	

*** p<0.01, ** p<0.05, * p<0.1

Box 7

Table 5

Marginal effects of Logit models

	Logit Model			Probit Model	
Variables	**Coef. dy/dx**	**P> |z |**	Variables	**Coef. dy/dx**	**P> |z|**
Gender Male			Schooling Master's degree		
Socioeconomic level 1	0.0148	0.000	Socioeconomic level 1	-0.2394	0.000
2	0.0162	0.000	2	-0.2178	0.000
3	0.0144	0.000	3	0.2413	0.000
4	0.0166	0.000	4	0.2159	0.000
Age			Schooling Doctorate		
Socioeconomic Level 1	0.0026	0.000	Socioeconomic level 1	-0.2354	0.000
2	0.0028	0.000	2	-0.2081	0.000
3	0.0025	0.000	3	0.2401	0.000
4	0.0029	0.000	4	0.2034	0.000
Primary Schooling			Urban Area		
Socioeconomic level 1	0.0953	0.000	Socioeconomic level 1	-0.4566	0.000
2	0.0072	0.000	2	0.0933	0.000
3	0.0768	0.000	3	0.2439	0.000
4	0.0258	0.000	4	0.1192	0.000
Secondary Schooling			Uses computer equipment		
Socioeconomic level 1	0.1487	0.000	Socioeconomic level 1	-0.0333	0.000
2	0.0533	0.000	2	-0.0408	0.000
3	0.1427	0.000	3	0.0360	0.000
4	0.0593	0.000	4	0.0380	0.000
High School			Uses computer at work		
Socioeconomic level 1	0.1860	0.000	level 1	-0.0184	0.000
2	0.1074	0.000	2	-0.0217	0.000
3	0.1928	0.000	3	0.0188	0.000
4	0.1006	0.000	4	0.0212	0.000
Undergraduate Schooling			Uses Internet in general		
Socioeconomic level 1	0.2250	0.000	level 1	-0.0331	0.000
2	0.1839	0.000	2	-0.0346	0.000
3	0.2343	0.000	3	0.0346	0.000
4	0.1747	0.000	4	0.0331	0.000
Schooling Specialty			Uses the Internet at work		
Socioeconomic level 1	0.2396	0.000	Socio E	-0.0116	0.000
2	0.2183	0.000	2	-0.0129	0.000
3	0.2414	0.000	3	0.0117	0.000
4	0.2165	0.000	4	0.0128	0.000

Discussion of results

For the marginal effects of the Logit Model, we have the following. For the case of gender: Recall the base category 0=female, so then the probability of the household reaching high levels of socio-economic stratum 3 and 4) is reduced with respect to the head of household being female. Likewise, the probability of reaching level 2 socio-economic stratum for the male is 1.6%. For the age of the head of household: the socio-economic level, it is observed that the older the head of household, the higher the socio-economic level, as there is a small probability of 0.2% of belonging to level 4 of the stratum at an older age.

For the schooling of the head of household: the socio-economic level shows that the higher the level of education, the higher the socio-economic level, as the levels of stratum 3 and 4 have a higher probability. The probability is 2.5% for primary school, 5.9% for secondary school, 10.06% for high school, 17.4% for bachelor's degree, 21.65% for specialisation, 24% for master's degree and 20.34% for doctorate, so that in general it is observed that the higher the level of education, the higher the level of stratum 4, with the exception of doctorate, although the percentage of schooling with a doctorate is very low in Mexico.

For the area level: Rural=0, Urban=1, it is found that the urban area is the one that reaches the highest level of socio-economic stratum, compared to the rural area. It was found that the urban area has the highest percentage of probability of 24.39% for level 3 and 11.92% of probability for level 4.

For the use of Hardware: In terms of computer or Tablet, the use of hardware also reaches the levels of socio-economic stratum 3 and 4, as there is a probability of 3.6% and 3.8% respectively for the levels mentioned. For the use of the computer at work: The levels of socio-economic stratum 3 and 4 are also reached when it is used in work activities. There is a 1.8% and 2.1% probability of reaching these levels respectively. For internet use, and internet use at work: Use reaches socio-economic stratum levels 3 and 4. In the case of internet use, there is a probability of 3.4% and 3.3% for socio-economic stratum levels 3 and 4 respectively, while for internet use at work there are percentages of 1.1 and 1.2 for these levels.

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Comparison of results with other studies

The results coincided with Díaz de León Castañeda & Martínez Domínguez (2020), in terms of women using the internet, as well as the level of education and living in an urban area, as these are positive factors that are related to socio-economic status, although our results present a segment by stratum and indicate greater detail. Similarly, the educational level of the heads of household coincides with Mora Rivera & García-Mora (2021), they present an estimator 0.056 and this work indicates a probability with a primary level of 2.5%, secondary of 5.9%, baccalaureate of 10.06%, bachelor of 17. 4%, speciality of 21.65%, master's degree of 24%, doctorate of 20.34%, so that in general it is observed that the higher the level of schooling, the higher the level of stratum 4 can be reached, with the exception of the doctorate, although the percentage of schooling with a doctorate is very low in Mexico. It should also be considered that education promotes economic progress (Gui & Alam, 2024). Regarding the rural area that does not reach a high socio-economic level compared to rural areas, it should be considered that investment in telecommunications infrastructure should be distributed equitably so that rural areas can achieve a greater digital economy (Boma Sonimiteim Jacks et al. 2024).

Conclusions

After analysing the results and remembering that the socio-economic levels were classified from 1 to 4, where 4 is the highest and 1 the lowest, the main conclusions to reach the highest socio-economic stratum are the following: 1) Being male, 2) Having a specialised schooling, 3) Living in an urban area, 4) Using computer equipment and 5) Using the internet in general. This is in line with certain economic theories that indicate that both human capital based on education and the use of technology generate higher economic income.

On the other hand, age is an important factor in achieving high socio-economic status. For people with only primary and secondary schooling, they reach the lowest socio-economic level. For people with a high school or bachelor's degree, they are concentrated in socio-economic level 3, for those with a master's degree and doctorate, they reach socio-economic level 3. For those who live in urban areas, they reach level 3.

As for the Internet in general, level 3 is reached, but when the Internet is used at work, the highest level is reached. The main conclusion is that age and ICTs based on computer equipment and the internet at work achieve the highest levels of socio-economic status.

Statements

Conflict of interest

The authors declare no interest conflict. They have no known competing financial interests or personal relationships that could have appeared to influence the article reported in this article.

Author contribution

Jiménez-García, Martha: Contributed to the introduction, scientific literature search, data management and validation, revision and editing of the final paper, supervision of results, discussion of results and conclusions.

Caamal-Olvera, Cinthya Guadalupe: Contributed to the scientific literature search, econometric model elaboration and discussion of results.

Gómez-Miranda, Pilar: Contributed to the scientific literature search, methodology and results of descriptive analysis.

Jiménez-Jiménez, Rosa Sara: Contributed to the methodology, scientific literature search, data management and results.

Availability of data and materials

The data is publicly available in the "Encuesta Nacional de Disponibilidad y Uso de Tecnologías de Información en los Hogares 2021", on INEGI's website.

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Article

Technology in the classroom: Exploring the student experience with ChatGPT in the educational process

Tecnología en el aula: Explorando la experiencia estudiantil con ChatGPT en el proceso educativo

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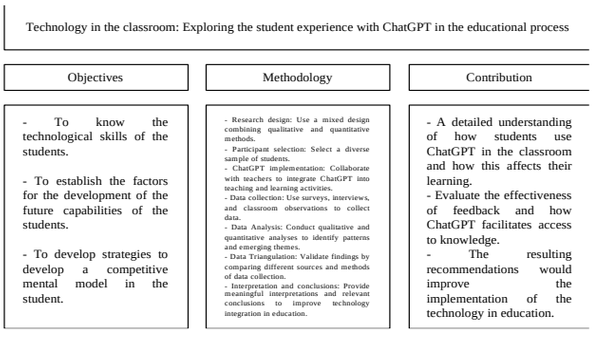
Abstract

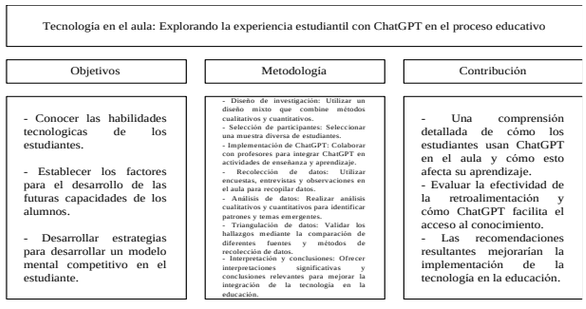
Among current technologies, artificial intelligence (AI) systems have a high level of importance in the teaching and learning process. An example of this is ChatGPT, a language model developed by OpenAI that uses neural networks to generate human responses and realistic conversations. This research seeks to understand how students perceive the effectiveness of ChatGPT compared to other forms of educational support, as well as to identify factors that influence its acceptance and adoption. This study adopts a mixed approach, has an experimental design comprising data collection through surveys and semi-structured interviews, to gain a comprehensive understanding of students' experiences and perceptions. The study aims to provide a comprehensive understanding of how ChatGPT technology impacts students' educational experience and offers valuable insights for improving classroom teaching and learning.



Artificial intelligence, ChatGPT, Educational process

Resumen

Entre las tecnologías actuales, los sistemas de inteligencia artificial (IA) tienen un alto nivel de importancia en el proceso de enseñanza y el aprendizaje. Ejemplo de ello es ChatGPT, un modelo de lenguaje desarrollado por OpenAI que utiliza redes neuronales para generar respuestas humanas y conversaciones realistas. Esta investigación busca comprender cómo los estudiantes perciben la efectividad de ChatGPT en comparación con otras formas de apoyo educativo, así como identificar los factores que influyen en su aceptación y adopción. Este estudio adopta un enfoque mixto, tiene un diseño experimental que comprende la recopilación de datos a través de encuestas y entrevistas semiestructuradas, para obtener una comprensión completa de las experiencias y percepciones de los estudiantes. El estudio pretende proporcionar una comprensión integral de cómo la tecnología de ChatGPT impacta en la experiencia educativa de los estudiantes y ofrece valiosas perspectivas para mejorar la enseñanza y el aprendizaje en el aula



Inteligencia artificial, ChatGPT, Proceso educativo

Citation: Eliseo-Dantés, Hortensia, García-Reyes, David Antonio, Castro-De la Cruz, Jucelly and López-Valdivieso, Leticia. Technology in the classroom: Exploring the student experience with ChatGPT in the educational process. ECORFAN Journal-Mexico. 2024. 15-32: 19:22.

Introduction

Integrating technology in the classroom has been a cornerstone in the evolution of the educational process. In this context, the incorporation of innovative tools such as ChatGPT has opened a new horizon of possibilities. This paper explores how interaction with ChatGPT in the classroom can enrich the student experience and transform learning into a dynamic and personalized journey. From creating stimulating dialogues to fostering critical thinking, it will examine how this technology can enhance students' academic and cognitive development. As you delve into this exploration, you will discover how ChatGPT becomes an invaluable ally in the contemporary educational process.

For the results of this paper, a representative sample of students from different careers is taken. It is relevant the use in the research technique (structural analysis), it is intended to associate the tangible and intangible part of the student as such. This technique allows the development of factors in general, associated with the cognitive and attitudinal responses in the students' learning.

It is intended to study in an integral way the problematic in relation to the use of platforms that generate information and how they are used, as well as their real contribution, starting from the hypothesis that the student uses the ChatGPT platform to generate a more dynamic analysis capacity in the development of general capabilities.

Research development

As already mentioned, a sample of 10 students from different higher-level careers was taken in order to obtain all the information, both tangible and intangible, in relation to student learning, with the use of the ChatGPT platform.

For which direct rounds were established with this sample of students, so that the information was obtained directly from the direct source, which allows that there are no biases since it is obtained from the actors involved in the research.

The participation of the students was generated in a dynamic way, since the factors involved in the student's activity were provided directly from the student.

They were able to understand their actions in practice, which resulted in a general understanding by the sample of students. It should be noted that we start from the intangible to the tangible in the handling of information.

Methodology

The structural analysis of the work is very broad, since it is directly immersed in the study population, extracting information without bias, however, it is necessary to work strongly with the interaction of the actors involved.

To move from the intangible to the tangible, it is important to work with the binary system, i.e. 0 means that the factor obtained does not influence and 1 means that it does influence, placing as results the study's motricity (influence) and dependence.

The above mentioned allows to place in Cartesian plane the results obtained, after the structuring of the double entry matrix, (motricity and dependence).

Box 1

Table 1

Motricity and dependence *matrix*

Influence of / on		Direct influence													Total
Factor	Description	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	Motricity
F1	Knowledge		1	1	1	0	0	0	0	0	1	0	0	0	0	4
F2	Personal skills	1		1	1	0	0	0	0	0	1	0	0	0	0	4
F3	Culture	1	0		1	0	0	0	0	0	0	0	0	0	0	2
F4	Educational process	1	1	1		0	0	0	0	0	0	0	0	0	0	3
F5	Student attitude	0	0	0	0		1	1	0	0	0	0	1	1	0	4
F6	Teacher's approach	0	1	0	0	1		0	1	0	0	0	0	1	0	4
F7	Access to information	0	1	1	0	1	1		1	0	0	0	0	0	0	5
F8	Customs	0	0	0	0	0	0	0		1	1	1	0	1	0	4
F9	Technological training	0	0	0	0	1	0	0	1		0	0	0	1	0	3
F10	Network access	0	1	0	0	0	0	0	0	0		1	0	1	0	3
F11	Academic productivity	0	0	0	0	0	0	0	1	0	1		0	0	0	2
F12	Technological skills	0	1	0	0	0	0	0	1	0	0	1		1	1	5
F13	Teamwork	1	0	0	0	1	0	0	0	0	0	1	0		0	3
F14	Technological means	1	1	0	0	1	0	0	1	1	0	1	1	1		8
	Total dependence	5	7	4	3	5	2	1	6	2	4	5	2	7	1	54

Source: Own elaboration

The above table was obtained with the active participation of 10 students from different careers, generating 14 factors involved in this research. This allows establishing the priorities in the Cartesian axes: In order to define the quadrants in which each of the factors belong, the total number of factors, which in this case are fourteen, must be divided by one hundred, (100/14) = 7.14, and the initial quadrant (zone of autonomous problems) is placed, counting on the X axis, seven spaces by drawing a line vertically upwards and on the Y axis seven spaces and drawing a line horizontally.

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Box 2

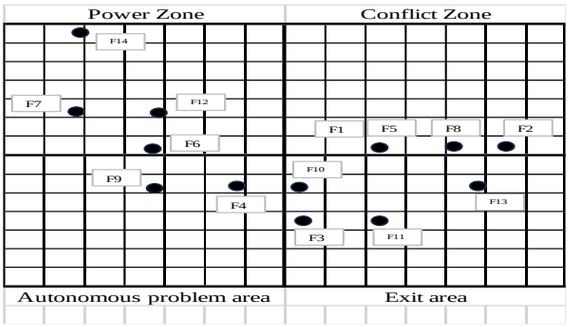

Figure 2

Definition of factors in quadrants
Source: Own elaboration

Box 3

Table 2

Percentage values of motor skills and dependence

Factor	Dependency values (X)	Motricity values (Y)
F1	9.26%	7.41%
F2	12.96%	7.41%
F3	7.41%	3.70%
F4	5.56%	5.56%
F5	9.26%	7.41%
F6	3.70%	7.41%
F7	1.85%	9.26%
F8	11.11%	7.41%
F9	3.70%	5.56%
F10	7.41%	5.56%
F11	9.26%	3.70%
F12	3.70%	9.26%
F13	12.96%	5.56%
F14	1.85%	14.81%

Source: Own elaboration

Results

The model is influenced by the six variables of the context, either directly or indirectly on the elements that will support the increase of skills, abilities, knowledge and synthesis capacity, as well as in each of the steps that make up this model, this begins with the commitment of the actors involved, without this commitment it will not be possible to comply with the other points, The next step is the training of the students, they must remain at the forefront in order to be able to effectively face the complications that may arise; The knowledge of the equipment will help them to perform their work in a correct way, that is why this step is suggested; to make the resources efficient refers to perform the functions using the resources in an appropriate way; the generation of agreements in the teaching-learning process, are of utmost importance to be able to have a support before the society that make up the communities.

Box 4

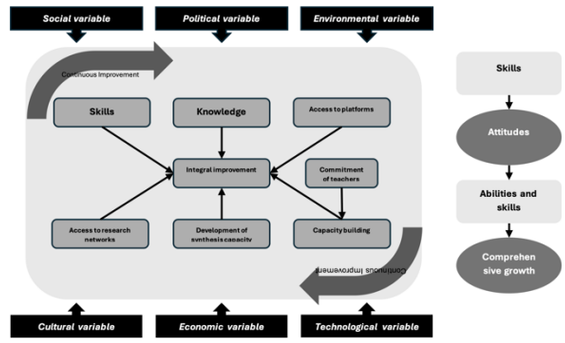

Figure 3

Proposed model

Source: Own elaboration

A. Commitment of students and professors: they are the actors of the research.
B. Sensitization of the actors: that they perform their functions in an effective and efficient manner to exceed the expectations of their functions.
C. Training of actors: this element refers to the fact that students and teachers must have the necessary skills, aptitudes and attitudes to provide constant feedback.
D. Updating of equipment: Personnel must be provided with constant updating of equipment.
E. Efficient use of resources: This represents great economic benefits for the program, since cost reduction and increased competitiveness can be achieved.
F. Increased productivity: The objective of the model is to increase personal productivity, which is why it is placed at the center of this model, this is obtained with the fulfillment of each of the elements.

Conclusions

The structural analysis generated the detection of elements with a low level of weighting, which means that the variables of the context significantly influence the priority elements and obtained factors that are in a zone of conflict, indicating that these factors have a high incidence as well as a high dependence between them, the application of the proposed model is recommended since it directly attacks the areas of opportunity found, in order to increase personal productivity in students through the use of platforms such as ChatGTP.

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Statements

Conflict of interest

The authors declare that they have no conflicts of interest. They have no known competing financial interests or personal relationships that might have appeared to influence the article reported in this article.

Authors' contribution

Eliseo-Dantés, Hortensia: Contribution to the main research idea, as well as the methodology to be used and design of the proposal.

García-Reyes, David Antonio: Contribution to the design of the methodology and data collection.

Castro-De la Cruz, Jucelly: Contribution to the design of the methodology and data collection.

López-Valdivieso, Leticia: Contribution to the design of the proposal.

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Article

Administrative Audit of the Subdirectorate of Planning and Liaison of a Higher Education Institution of the State of Veracruz

Auditoria Administrativa a la Subdirección de Planeación y Vinculación de una Institución de Educación Superior del Estado de Veracruz

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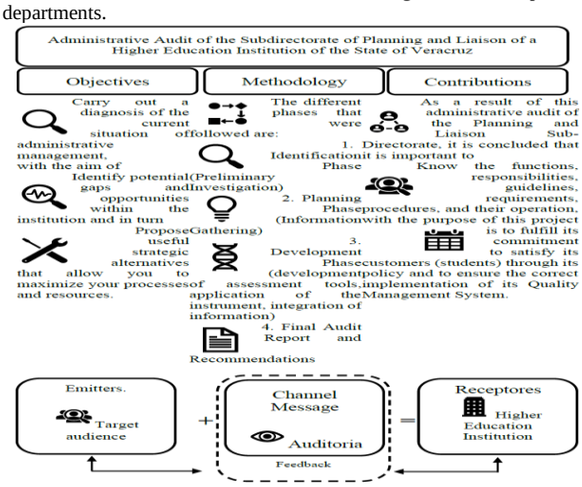
Abstract

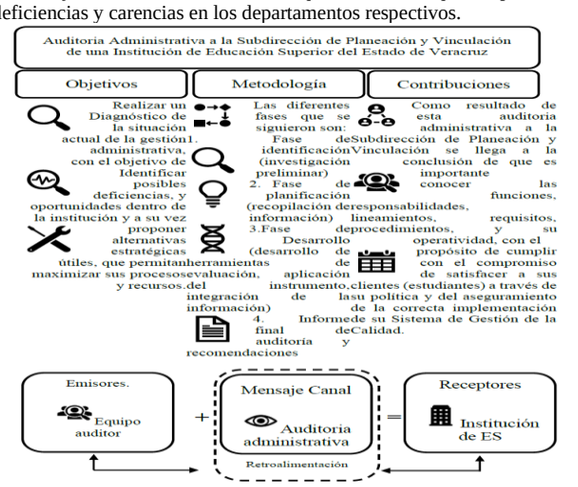
This research and development work of administrative audit was carried out in the area of Planning and Liaison Subdirectorate of a Higher Education Institution in the state of Veracruz. It is a field research, descriptive and documentary; through instruments and interviews with the Planning, Programming and Budgeting Departments; Linkage and Technology Management; School Services; Extracurricular Activities and Information Center; on the management of their administrative processes. Based on the results, it was detected that the Planning and Liaison Sub-Directorate has an excellent organizational culture, since the staff cooperates with their bosses, has good communication and supports each other with their activities to be carried out. However, some employees are unaware of their area since they do not have training, so the administrative processes are not being executed as they should be, which leads to deficiencies and shortcomings in the respective departments.



Administrative, Deficiencies, Development

Resumen

Este trabajo de investigación y desarrollo de auditoria administrativa se realizó en el área de Subdirección de Planeación y Vinculación de una Institución de Educación Superior del estado de Veracruz. Es una investigación de campo, descriptiva y documental; a través de instrumentos y entrevistas a los Departamentos de Planeación, Programación y Presupuestación; Vinculación y Gestión Tecnológica; Servicios Escolares; Actividades Extraescolares y Centro de Información; sobre la gestión de sus procesos administrativos. Con base a los resultados, se detectó que la Subdirección cuenta con una excelente cultura organizacional, ya que el personal coopera con sus jefes, cuenta con buena comunicación y se apoyan con sus actividades a realizar. Sin embargo, algunos empleados desconocen de su área ya que no cuentan con capacitaciones, por lo que los procesos administrativos no están siendo ejecutados como se debe lo que conlleva a que se presentan deficiencias y carencias en los departamentos respectivos.



Administración, Deficiencias, Desarrollo

Citation: Balderrabano-Briones, Jazmín, Martínez-Gutiérrez, Rodolfo, and Utrera-Velez, Youssef. Administrative Audit of the Subdirectorate of Planning and Liaison of a Higher Education Institution of the State of Veracruz. ECORFAN Journal-Mexico. 2024. 15-32: 23:27

Introduction

The management audit is the total or partial analytical evaluation of an organization for the purpose of determining its level of performance and listing opportunities for improvement to innovate value and achieve sustainable competitive advantage. That is why it is essential to carry it out at least once a year in order to investigate and make sure that administrative activities are being carried out correctly, analyze what is missing, and where they can be improved and supervise what is being carried out effectively, with the priority being the strengthening of the company.

The evaluation instruments used were Questionnaires, Questionnaires of Relevant Aspects, Questionnaires of Documentary Analysis and Formulation of the Administrative Diagnosis. These were applied and answered by three employees from each horizontal line of the organizational structure. The ITUG (Instituto Tecnológico de Úrsulo Galván) offers the educational service of higher education.

The objective is to carry out a preliminary investigation that allows providing information to institutions to obtain a complete and objective vision of their organization, initiate a process of business reconversion and professionalization of management that allows them to increase their competitiveness and grow in the local or regional market and eventually, in the national market.

The results showed that subordinates must have competence and awareness of the objectives and their activities since they are not entirely clear, there is good leadership from the sub-management so there is a good working relationship of respect, they use information technologies as a work tool for the fulfillment of their functions, They do not have the ideal distribution of space for the development of their activities, in general the resources are used according to their areas and activities.

It is important to raise awareness and consider the risks of not performing the functions that are their responsibility, and thus generate the necessary strategies for the fulfillment of institutional objectives.

Methodology

The methodology for the research is graphically represented in Figure 1, where the different phases that were followed are listed:

1. Identification Phase (Preliminary Investigation)
2. Planning Phase (Information Collection)
3. Development Phase (Development of Assessment Tools, Implementation of the Instrument, Integration of Information)
4. Final Audit Report and Recommendations

Box 1

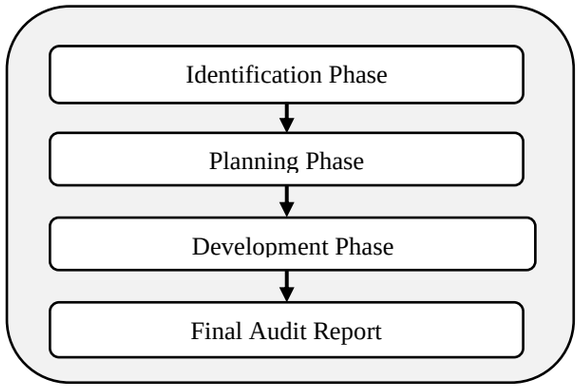


Figure 1
Methodology for research

Note: The image indicates the methodology used in the research.

Instrument to be used

The purpose of the evaluation instruments used for this research is to obtain information related to the activities and functions of the Planning and Liaison Sub-Directorate.

The preliminary questionnaire consists of 10 items with open-ended questions. The audit questionnaire consists of 40 items with open-ended, multiple-choice, and Likert questions. The relevant aspects and document analysis sheets are filled with information about the company obtained through observation, survey, interview, findings and evidence, and then the Final Audit Report is generated.

Box 2

Table 1
Assessment Tool

Administrative process	Maximum Points
Planning	250
Organization	250
Address	250
Control	250

Note: The figure indicates the scoring criteria chosen for the audit.

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Box 3

Table 2

Performance Measurement

Likert scale	
Score	**Interpretation**
801-1000	Excellent
601-800	Very Good
401-600	Well
201-400	Regular
0-200	A Little

Note: The figure indicates the scoring criteria chosen for the audit

Results

This methodology helps to decide specific aspects of the organization, which can be positive or negative. With the results obtained, recommendations are made that, if implemented, bring improvement and growth to the company.

The results are as follows:

Box 4

Table 3

Relevant aspects ballot.

Stage	Specific Element	Result of the analysis
Planning	Mission-Vision	They know the mission and vision, some don't.
	Objectives	Each area has its own objectives.
	Procedures	Procedures are declared in the Quality Management System.
Organization	Organizational Structure	There are constant changes.
	Division and distribution of duties	The functions of the Department of Technology Management and Liaison are not clear.
	Organizational Culture and Human Resources	There is a good working environment.
Dirección	Leadership & Communication	Communication is good and there is leadership.
	Motivation and Work Teams	Motivation is weak as they only do the activities but there is no 100% support.
	Technological information	They have experience in the management of Information and Communication Technologies.
Control	Systems	They are certified under the ISO 9001:2015 Standard.
	Distribution of space	Spaces are cramped, which can be lacking.
	Quality	A Quality Management System is in place.

Note: The Cédula indicates relevant aspects by Stage of the administrative process

Box 5

Table 4

Document Analysis Certificate.

Document	Result of the analysis
Quality Manual	It is updated based on the ISO 9001:2015 Standard
Strategic Quality Process	In this process, the Procedures for Document Control, Internal Audit, Non-Conforming Product Control, Service Audits are declared.
Strategic Linkage Process	In this process, the Procedures for Visits to Companies, Social Service, and Cultural, Sports and Civic Promotion are declared.

Note: The Cédula indicates relevant aspects by Stage of the administrative process.

Box 6

Table 5

Maximum Points Earned.

Stage	Specific Element	Maximum Points	Points Earned	%
Planning	Mission-Vision	80	70	**20**
	Objectives	80	60	
	Procedures	90	70	
	Total	250	200	
Organization	Organizational Structure	100	90	**20**
	Division and distribution of duties	100	60	
	Organizational Culture and Human Resources	50	50	
	Total	250	200	
Direction	Leadership & Communication	100	90	**20**
	Motivation and Work Teams	100	60	
	Technological information	50	50	
	Total	250	200	
Control	Systems	100	100	**20**
	Distribution of space	100	60	
	Quality	50	40	
	Total	250	200	
	Total by Processes	**1000**	**750**	**80%**

Note: The image shows the maximum points obtained from the administrative stages.

The institution is in the "VERY GOOD" range, so they are in the expected result, but not in the optimal one.

Conclusions

The following is a description of the data provided by the evaluation instruments applied in the Sub-Directorate of Planning and Liaison of the Higher Education Institution by stage of the administrative process.

Planning: Planning exists; however some activities are not executed as indicated by your school calendar or are carried out as stated in your procedures.

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Organization: There is a good organizational culture and communication, the staff cooperates with their bosses, and supports each other for the fulfillment of their activities.

Management: There is leadership, the Sub-Directorate supports its bosses in the fulfillment of institutional objectives.

Control: Although there is a Quality Management System, there is still work to be done on measurement and monitoring.

As a result of this administrative audit of the Planning and Liaison Subdirectorate, it is concluded that it is important to know the Quality Management System. The Quality Manual contains the Organizational Chart, Objectives, Leadership, Planning, Mission, Vision, Policies, Scope, Customer Requirements, Support, Operation, Performance Evaluation and Improvement. And also the procedures of the Strategic Planning and Linkage Process: Procedure for Visits to Companies, Procedure for Social Service and Procedure for Cultural, Sports and Civic Promotion; This is in order to carry out a better planning to later meet the organizational objectives.

Recommendations

Based on the challenges posed by the organizational environment and context, it is recommended that the Higher Education Institution implement the recommended actions and develop actions that meet its objectives declared in its Quality Management System.

It is recommended in Planning and Organization: Publicize the Manual and the Operating Procedures and the importance of knowing the Quality Management System, so that everyone knows their roles, responsibilities and the repercussions in case of not complying with them, through training, awareness and awareness.

In Management and Control, carry out an evaluation and profile analysis of department heads, implement training courses to improve their skills and knowledge that are reflected in the efficiency of their functions, digitize processes so that they facilitate and speed up information both to customers (students) and to interested parties and those involved in these processes.

It is recommended to publicize the QMS manual, the procedure manuals of the areas, training, awareness of the organization manual so that they clearly know the functions to be performed and that the staff does not lose the direction of the organization and improve their performance.

It is important that an administrative audit is carried out at least twice a year, together with the internal audit of the Quality Management System, in order to comply with the Follow-Up Phase and measure the results with the previous one, which allows us to know and evaluate the performance of the organization.

Declarations

Conflict of interest

The authors declare no interest conflict. They have no known competing financial interests or personal relationships that could have appeared to influence the article reported in this article.

Author contribution

Balderrabano-Briones, Jazmín: Writing the draft version of the manuscript

Martínez-Gutiérrez, Rodolfo: Carefully proofread and revise the final version following the format and guidance; and

Utrera-Velez, Youssef: Fill out the required forms to submit the article

Availability of data and materials

The data obtained in the investigation are available in the final report of the administrative authority.

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Abbreviations

ITUG: Instituto Tecnológico de Úrsulo Galván.
QMS manual: Quality Management System Manual.

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As it is a field research, only basic references are taken where the methodology is consulted, the data of this article were taken from the administrative audit.

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Article

Rural communities as organizations where human aspects contribute to the preservation of traditional knowledges

Comunidades rurales como organizaciones donde los aspectos humanos contribuyen a preservar conocimientos tradicionales

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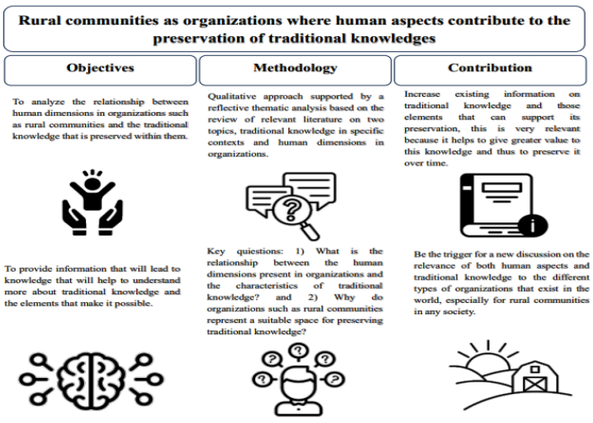
Abstract

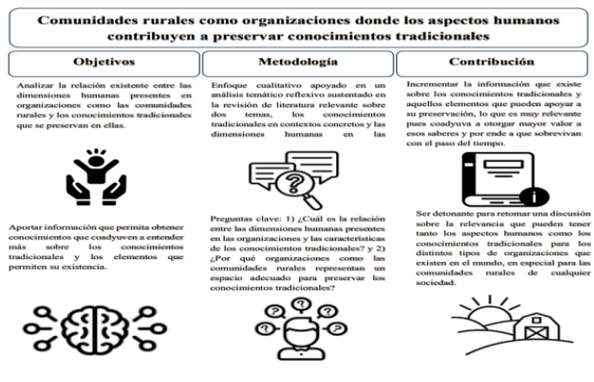
This research aims to analyze the relationship between human dimensions in organizations such as rural communities and so-called traditional knowledge. This allows to provide information that will help to obtain knowledge that helps to understand more about this type of knowledge and the elements that allow its existence in certain organizations. This is done by using a qualitative approach supported by a thematic analysis based on literature review, which examines traditional knowledge in specific contexts, as well as documents addressing the relevance of human dimensions in organizations. It is concluded that there is a broad relationship between the characteristics of traditional knowledge studied in rural communities and the human dimensions present in any organization. This correspondence is possible because rural communities are a type of organization where various human aspects remain relevant within the daily life



Human dimensions, Traditional knowledge, Rural communities

Resumen

El presente documento tiene por objetivo analizar la relación que las dimensiones humanas presentes en organizaciones como las comunidades rurales, tienen con los llamados conocimientos tradicionales. Esto para aportar información que permita obtener conocimientos que coadyuven a entender más sobre ese tipo de saberes y los elementos que permiten su existencia en ciertas organizaciones. Para lograrlo se utiliza un enfoque cualitativo apoyado en un análisis temático sustentado en la revisión de literatura donde se estudian los conocimientos tradicionales en contextos concretos, así como documentos donde se aborda la relevancia de las dimensiones humanas en las organizaciones. Se concluye que existe una relación amplia entre las características que presentan los conocimientos tradicionales estudiados en comunidades rurales y las dimensiones humanas presentes en cualquier organización. Esa correspondencia es posible porque son las comunidades rurales un tipo de organización donde diversos aspectos humanos, se mantienen como relevantes dentro de la dinámica cotidiana.



Dimensiones humanas, Conocimientos tradicionales, Comunidades rurales

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Introduction

At present, human beings suffer many problems (destruction of ecosystems and species, global warming, excessive pollution, proliferation of harmful foods due to the use of chemicals, among others), a consequence of a lifestyle that prioritises the benefit of a few people, regardless of the harmful effects on the planet and the beings that inhabit it. Specifically, climate change has come about as a result of an exponential increase over the years in the emission of carbon dioxide as a result of the use of fuels such as oil and its derivatives, natural gas or coal (Fernández, 2011), all of which are the main inputs for the production of a variety of products, resulting in the generation of biophysical waste that affects nature (Murray, 2005) and therefore all living beings. Derived from the above, the presence of climate change is recognised, where the temperature of the planet has been increasing (Equihua et al, 2016), which is why it is considered that human beings through their actions have reached the point of impacting the world as a whole (Crutzen, 2002), becoming what Steffen et al (2007) call a global geophysical force.

Thus, for the past two decades, the earth has been referred to as being in the Anthropocene epoch (Crutzen and Stoermer, 2000), a term that refers to a new geological stage (Brown, 2014) where human activities have significantly altered the global environment (Waters et al, 2014).

This has caused a variety of problems that are not only limited to the environment, but also to health issues (increase in people with cancer, diabetes, high blood pressure, thyroid problems, allergies, as well as neurological problems), given the exponential growth of the chemical industry that has generated substances that are harmful to people and that are used in different commercial activities (Fernández, 2011). As Romano (2009) mentions, the harmful effects of these chemicals have become known and documented over time.

Faced with such a scenario, it has become imperative to seek alternatives to address these problems, which affect more and more people, living beings and entire ecosystems every day.

In this sense, scientific knowledge has been taken up in the first instance, which, although helpful, with the passage of time does not seem to be sufficient to combat this deterioration, so the search for solutions has been emphasised. One of these is what is known as traditional knowledge (TK) or traditional ecological knowledge (Huntington, 2000; Inglis, 1993).

It is necessary to clarify that, although there is no single definition for the concept of traditional knowledge, according to several authors (Eun et al, 2017; Dudgeon and Berkes, 2003; Luna, 2002; Berkes et al, 1995; Wenzel, 1999), traditional ecological knowledge is an extension of traditional knowledge, so it is possible to use it as a synonym for traditional ecological knowledge.

This is due to the diversity of research where it has been proven that they can provide solutions that allow societies to achieve adequate development, by offering ancestral knowledge that is respectful of nature and other living beings (Gómez-Baggethun et al. 2012; Borah et al, 2024; Bussey et al, 2016; Berkes and Turner, 2006; Berkes et al, 2000; Guadarrama et al, 2022; Huntington, 2000; Jiao et al, 2024; Martin et al, 2010; Pérez et al, 2014). This is why Olivé (2007) asserts that taking up TK has great potential for economic and social development that does not contribute to the destruction of the planet. In the words of Guadarrama et al (2022, p. 45):

‘Traditional knowledge impacts human well-being through contributions to health, agriculture, food security, environmental and natural resource management, land use, livelihoods, management of natural phenomena, arts and culture, among many others’.

Thus, TK has increased its visibility in many nations; for example, in Kenya, the relevance of TK has been so high that policies and legal frameworks have been sought to protect it, although so far they have not been adequate (Nakitare et al, 2024).

In another case, the Baduy tribe, an indigenous people in Indonesia, possesses TK that enables them to sustainably care for the region's forests, which is why the government is seeking to translate some of this knowledge into forest conservation laws (Asteria et al, 2022).

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In Tehran, Iran, Sabet and Khaksar (2024) found that the participation of people in rural communities can contribute a great deal to their development; in this context, TK contributes to knowledge that supports social policies and programmes.

However, despite this importance, TK in organizations such as companies (those with the greatest presence in the world), seems to have little or no value to be taken up due to what Olivé (2007) mentioned, the existence of a 'scientistic bias' in today's societies, where it is assumed that the only knowledge that drives economic and social development is scientific and technological knowledge; Lertzman (2006) complements this by commenting that in a context where the economic and the political are predominant, building links between TK and scientists seems destined not to materialise. An example of this is mentioned by Schafer and Reis (2008), who share that for more than a decade, fishing activity has been based almost exclusively on scientific methods, ignoring the TK that different communities have about fishing and which is respectful of both ecosystems and living beings in bodies of water.

It is then evident that outside of some governments (Boafo et al, 2016; Endere and Mariano; 2013; Usher, 2000) and educational organizations around the world that have started to consider TK as relevant to solve current problems, this kind of knowledge is mostly reproduced in rural communities, not in companies, urbanised societies or other types of organizations. But why does this happen, what is it about that particular type of organization that seems to be conducive to the use and preservation of traditional knowledge? In seeking to address these questions, the authors of this text start from the premise that, in organizations such as rural communities, although they are still immersed in the logic of capitalism, their 'nature' allows them to value human aspects that are normally omitted in companies and other forms of organization.

These aspects or human dimensions (HD) are considered relevant elements that contribute to TKs being able to maintain and even reproduce themselves over time, since they present certain characteristics that suitably match organizations where the economic aspect is not the only thing that guides their functioning.

Considering the above, the objective is to analyse the relationship between HD present in organizations such as rural communities and TKs. The aim is to provide information that will allow us to obtain knowledge that will help us to understand more about the TK and the elements that allow them to exist. In this way, the document is structured as follows: first the methodological design is presented, followed immediately by the concept of organization, after which we talk about human rights in organizations, to continue with the characteristics of TK. With all of this on the table, we proceed to reflect on the relationship between HD and TK, and finally offer the corresponding conclusions.

Methodology

Based on the aforementioned objective, this paper seeks to answer two questions: 1) What is the relationship between the human dimensions present in organizations and the characteristics of traditional knowledge? 2) Why do organizations such as rural communities represent an adequate space for preserving traditional knowledge? What is expected to be achieved after the analysis is to obtain relevant information on how HD could collaborate in the preservation and dissemination of traditional knowledge in organizations such as rural communities.

Considering the above, the research has a qualitative approach supported by a thematic analysis, which Braun and Clarke (2006) define as a method that allows identifying, analysing and exposing patterns or themes derived from the collection of information, while Joffe (2012) mentions that it is used to develop themes based on patterns in the data. It is flexible and can be used for both deductive and inductive research (Guest et al, 2012; Nowell et al, 2017), for Braun et al (2019) it can be used for interpretative, subjective and reflexive analysis, and it also allows reporting experiences, meanings and realities, as well as using different theoretical approaches (Braun and Clarke, 2006).

Lochmiller (2021) shares that the components necessary to carry it out are: 1) codes, 2) categories and 3) the themes that the researcher generates based on them.

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It is worth clarifying that according to Braun and Clarke (2019) there are currently three versions of thematic analysis; one of them is the reflexive approach, which stands out because subjectivity in analysis is conceived as an advantage and not as something to be avoided (Braun et al, 2019), therefore, coding is generally done deductively (Terry et al, 2017) using information contained either in published academic literature, observations, documents, notes, interviews, images, photographs, etc. (Lochmiller, 2021).

Thus, a reflexive thematic analysis is conducted inductively, based on the review of academic materials on TK and HD related to organizations. The choice of documents (in English, Spanish or French) initially considered that they were highly cited, to later review others based on the snowball technique, stopping the search once no new elements of study were found, in accordance with the theoretical saturation proposed by Glaser and Strauss (1967). To support the generation of ideas and better structure the information, the qualitative software Atlas Ti version 24 was used, which made it possible to code and categorise the most relevant elements identified throughout the research.

Results

The concept of organization

It is pertinent to begin by commenting that the aim of this section is not to offer a universal definition of the term, but rather to establish an adequate one for the purposes of this text, as organizational scholars have so far not been able to reach a broad consensus. That said, the first element to consider is that organizations are human constructs that pursue common goals (Hall, 1983; Scott, 1981), usually in a rational, albeit constrained, manner (Scott, 1981; Simon, 1988). In addition, Pfeffer (2000) shares that an organization is a collectivity where clear limits, norms, authority ranks and forms of communication are established, not necessarily formalised or documented, and, furthermore, regardless of the objectives, they seek to last as long as possible.

For Smircich and Stubbart (1985), organizations are groups of people who share both values and beliefs that help to strengthen the actions of their members.

As is evident, the people who make up an organization need to collaborate, so they need to communicate adequately (Cooper, 1986) in order to carry out actions aimed at achieving objectives. In addition, Kast and Rosenzwig (1997) state that organizations establish goals to be achieved, are made up of people who collaborate in a relatively structured way by means of the techniques and knowledge they possess.

Thanks to the above elements, it is possible to affirm the following: an organization is a group of human beings that are integrated to achieve objectives that would be difficult to achieve individually, where its members generally share values and beliefs that allow them to collaborate and generate actions in order to achieve what is proposed. In addition, they are embedded in a given context and have a structure that allows them to function, where the most important goal is to survive the passage of time.

The definition makes it possible to conceive of rural communities as organizations, as well as companies, governments, universities, hospitals, prisons, etc. This needs to be determined, as the research starts from considering rural communities as a type of organization. Having made this clear, the following section presents the human aspects, encompassed in various dimensions, that exist in any type of organization.

Human dimensions in organizations

For decades, efforts have been made to re-evaluate the human aspects that are present in any type of organization, since for a long time they have been omitted due to the priority given to the economic sphere, resulting in a domination of management and companies in the lives of people, which was accompanied by the vision of the human being as a homo economicus, that is, a ‘being’ (rather seen as an object) that is completely rational and whose motivations are exclusively economic (Chanlat, 1998). In this sense, one of the proposals stands out for giving greater relevance to inherent human issues present in organizations, but at the same time avoids minimising the economic aspect, conceiving it as important but not the only one that affects the functioning of organizations.

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Prior to specifically addressing various human aspects within organizations, there was critical thinking among various scholars who began to conceive of organizations from a sociological, historical, dialectical, actionist and emancipatory perspective (Bouilloud and Lécuyer, 1994; Castoriadis, 1975; David et al., 2001; Golsorkhi et al., 2009). Based on this, culture and ethnography, elements directly related to anthropology, became relevant to the study of organizations (Aguilera, 1996; Corsín, 2007; Czarniawska, 2012; Luthans et al, 2013; Schwartzman, 1993).

Thanks to these efforts, an Anthropology of Organizations was generated where, as Mauss (1958) said, sciences where people are considered living, conscious and social beings are important. This organizational perspective has been promoted mainly by the French academic and researcher Jean François Chanlat for many years (1994, 2001, 2006, 2009, 2012, 2023, 2014, 2019), through which, with the support of various scholars and taking knowledge from various human sciences such as sociology, psychology and anthropology itself, he managed to build a proposal that can be summarised in the following dimensions (Chanlat, 2019) that take up human aspects generally omitted in organizations.

The first dimension considers people in organizations as social actors in relationship, i.e. every human being has the capacity to relate to others in their daily work, which is why they should be considered as social actors who interact with others. This requires speech, a human aspect through which a person constructs his or her reality and with which he or she can communicate for various purposes, hence people need to talk to others in any type of organization.

The second dimension sees people as subjects in action, which means that they are mobilised not only on the basis of objectivity, but also on the basis of subjectivity. In other words, human beings have dreams, ambitions, desires and drives, through which they try to give meaning to their existence and to be recognised by others, hence the psychic life of people must be considered important in organizations, otherwise negative emotional consequences can occur.

The third dimension visualises people in organizations as actors and subjects who carry identities, who are very different due to aspects such as gender, age, physical, family or religious characteristics, as well as relationships with other people resulting from the family and social context they have lived in.

This implies that they are active and reflective beings who can think and make their own decisions while relating to others, as the social element is generally inseparable from everyday life.

This is why human beings are both generic, in sharing biological characteristics, and singular in having particular identities. Moving on to the fourth dimension, it mentions that people are situational workers, in other words, any individual adjusts their behaviour based on their actions, their subjective aspects and their identity, so that they can be functional in the organizations where they are, which helps them to be recognised by colleagues, friends, family or society in general.

Regarding the fifth dimension, it is mentioned that people in organizations are actors and subjects in search of meanings, given that human beings are symbolic, since through images, signs, symbols, myths, legends, metaphors, stories, among other expressions, they create meanings that give meaning to the world, hence all these elements are related to culture and guide the actions of people in any type of organization. Here the word again plays a fundamental role by serving as a means of expressing these constructed meanings.

The sixth dimension affirms that the human being is rooted in space and time. On the one hand, every person belongs to a space, be it at work, at home, at leisure or in their relationships with others, within which they not only seek to survive in the biological sense, but also in the psychological sense, which is why no human being can live without a space.

For example, each person is born, lives and dies at different times, and is happy or has failures at other times, which is why it is said that time is qualitative and subjective, because for some it can be very long and for others very short, as well as very significant in symbolic terms or very unimportant in a quantitative perspective.

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The seventh dimension emphasises that every human being within the organization is an embodied actor and subject, which implies that people can touch, move, act, reflect, feel happy or suffer. Moreover, through the body it is possible to communicate with others through gestures and movements, which, in turn, contribute to giving meaning to the behaviour of each individual. In this sense, emotions are an element that cannot be separated from each human being, thanks to them, others can understand certain behaviours that occur in particular circumstances, for example, anger, rage, sadness, happiness, anxiety, are manifested through the body, either with gestures or particular movements that help communication. As for the eighth and last dimension, it mentions that, within any organization, human beings are ethical subjects, which is why their actions should not stray from social values such as respect, tolerance, honesty, solidarity, empathy, among others. Sticking to ethics contributes to a better coexistence between people within organizations and to their respect for other living beings, as well as for the environment, which contributes to achieving an ecological and social balance.

Having exposed the HD present in any type of organization, the following section addresses those characteristics that make up the TK, which will later allow us to fully reflect on the relationship between these and the dimensions of the human being.

TK: characteristics

The relevance that TKs can have in the modern life of human beings was previously mentioned, but before moving on, it is appropriate to have a notion of what they are. In this regard, there are several definitions for the concept, after analysing them and based on the objective of this work, it is considered that the one provided by Berkes et al (2000, p.1252) is the one that initially offers clarity before knowing its characteristics specifically; ‘cumulative body of knowledge, practices and beliefs, which evolve through adaptive processes and which are inherited through cultural transmission, addressing the relationship between living beings (including humans) and their environment’.

Having a reference to the term, it is now appropriate to present the characteristics that traditional knowledge presents based on the diversity of research that has studied it in a variety of rural communities, which ensures that these elements have been identified within specific realities.

Firstly, traditional knowledge is linked to the existing customs and traditions of each place, which are part of the culture (Batchuluun, 2021; Guadarrama et al., 2022). Customs or traditions serve as a basis for generating traditional knowledge that reaffirms the identity, values, relationship with nature and the role of people with other living beings, elements that are transmitted to other generations due to the relevance they acquire over time (Khiri, 2022; Lertzman, 2006; Batchuluun, 2021). In that sense, research has been done where the above has been corroborated in different latitudes and cultures (Gómez-Baggethun et al., 2012; Boafo et al., 2016; Gruberg et al., 2022; Martin et al. 2010; McCarter and Gavin, 2014; Paneque et al., 2018; Pérez et al., 2014; Sánchez et al., 2015).

The next characteristic is subjectivity, which is closely related to customs and traditions. It has been found that traditional knowledge includes subjective elements that are part of the cosmovision of each place, for example, songs, tales, stories, legends, prayers, dreams, stories or myths, as well as spiritual practices that give meaning to the world where people live, which accounts for a close relationship between the natural and the supernatural (Bussey et al., 2016; Gruberg et al., 2022; Guadarrama et al., 2022; Martin et al., 2010). The spiritual and emotional are therefore important (Batchuluun, 2021) and carry sufficient weight to determine actions to be taken as part of TKs. For several years this has been found in various communities in different regions (Boafo et al., 2016; Camacho-Villa et al., 2021; Lertzman, 2006; McCarter and Gavin, 2014; Paneque et al., 2018; Ríos-Cortés et al., 2023).

The third characteristic is orality as TK needs to be passed on to others, this is achieved by word of mouth, reaching children, grandchildren, relatives, friends or others in the community and thus new generations (Bussey et al., 2016; Berkes et al. 2000; Oteros et al., 2013; Thennakoon and Gamachchige, 2020).

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It is in informal spaces such as parties, meals or family gatherings, where TK can be widely expressed, although there are also cases where schools transmit it, but it is within the family where there is usually the greatest opportunity to share it (Batchuluun, 2021). Thanks to various research studies, it has been documented that the orality of TK is essential for it to be preserved over the years (Berkes et al., 2000; Bussey et al., 2016; Gruberg et al., 2022; Lertzman, 2006; Pérez et al., 2014; Ríos-Cortés et al., 2023; Usher, 2000).

In line with the above, fourthly, it is identified that TK is interactive, i.e. it relies on the interrelationships of human beings to be transmitted and preserved. Socialisation between people is the basis for passing on knowledge, whether with co-workers, friends, family, neighbours or even people who are not well known but are inhabitants of the community (Boafo et al., 2016; Gruberg et al., 2022; Ríos-Cortés et al., 2023; Sánchez-Olarte et al., 2015; Setalaphruk and Leimar, 2007). Without such interactivity, traditional knowledge would be of no use to people, as it would not be used in reality due to the lack of socialisation of knowledge. Several authors have confirmed this in their research (Batchuluun, 2021; Camacho-Villa et al., 2021; Jiménez et al., 2021; Pérez et al., 2014; Ríos-Cortés et al., 2023; Schafer and Reis, 2008).

Another characteristic is that TK must be practised, as only by using them in reality can they have an impact on people's lives thanks to the experiences they offer (Batchuluun, 2021; Gruberg et al., 2022; Usher, 2000). So relevant is it to practice them that not doing so contributes to them being forgotten over time because if one does not know how they should be used, there is unlikely to be a genuine interest in them. This has been proven in previous research, highlighting that practising in the company of other people leaves significant experiences that contribute to the validity of TK when shared with new generations (Halbrendt et al., 2014; Oteros et al., 2013; Pearce et al., 2015; Ríos-Cortés et al., 2023; Sánchez-Olarte et al., 2015; Setalaphruk and Leimar, 2007).

A sixth characteristic is the fact that TK varies according to a person's gender, a consequence of the division of roles that exist in many societies based on being a man or a woman (Aubel, 2006).

Thanks to research carried out in different cultures throughout the world, it became evident that, in the same communities, men possessed certain TK and women others, in fact, there seems to be a condition of exclusion, that is, what men know is not learned by women because it is not of interest to them and vice versa, so marked is the differentiation in this area, that in certain cases it is possible to speak of the existence of exclusive TK for each gender depending on the locality in question (Boafo et al, 2016; Gruberg et al., 2022; Jiménez et al., 2021; Oteros et al., 2013; Ríos-Cortés et al., 2023; Setalaphruk and Leimar, 2007).

The seventh characteristic is that they change based on the age of the individuals, which is due to the fact that the role they play changes as the years go by (Gruberg et al., 2022). In this sense, the constant identified by various research studies is that it is adults who generally possess a large amount of traditional knowledge, while children and adolescents play the role of apprentices who, as the years go by, increase this knowledge and change their role to an active one that tends to preserve it (Aubel, 2006; Boafo et al., 2016; McCarter and Gavin, 2014; Oteros et al., 2013; Setalaphruk and Leimar, 2007; Si, 2020; Thennakoon and Gamachchige, 2020).

Finally, TKs adapt to contextual changes because the environment cannot be predicted and it is necessary to adjust to the modifications it presents (Batchuluun, 2021; Berkes et al., 2000; Setalaphruk and Leimar, 2007). For this reason, Pearce et al. (2015) and Leonard et al. (2013) consider them to be flexible, fluid, dynamic and adaptive. This even allows TK to combine with so-called scientific knowledge to remain functional and offer benefits to people (Newmaster et al., 2011). Over the last few years, several cases have shown that this adaptability has enabled communities to remain relevant in difficult situations (Aubel, 2006; Berkes et al., 2000; Fredriksson, 2022; Gómez-Baggethun et al., 2012; Leonard et al., 2013; Oteros et al., 2013; Sánchez-Olarte et al., 2015; Oteros et al., 2013).

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Box 1

Table 1

Human dimensions and characteristics of traditional knowledge

Human dimensions in organizations. Human beings as:	Characteristics of traditional knowledge
Social actors in relation	Linked to customs and traditions
Subjects in action	They consider many subjective aspects
Actors and subjects carrying identities	Orality to be transmitted
Workers in situation	They are interactive
Actors and subjects in search of meanings	The following should be practised
Actors and subjects rooted in space and time	They vary according to gender
Actors and subjects embodied	They are modified on the basis of age
Ethical subjects	Adapt to changing contexts

Discussion. HD and TK in organizations such as communities

Based on the above, it is possible to say at the outset that TK is built with elements that are inherent to people in any organization. In this sense, when it is said that human beings are social actors in relationship and also workers in situation, this is directly related to the fact that TK is oral, interactive and practical, since these three characteristics require interrelationships between people, whether within the family, among friends or with co-workers, recognition of others as part of a group that has common objectives, the use of words to communicate and to carry out actions based on the personality and convictions of each individual to achieve an end. It is thanks to the collaboration between human beings that the knowledge transmitted through words can be put into practice, which to a large extent is what helps traditional knowledge to be shared so that it can last through the years, generally when more people live together. This is evidence of the relational nature of human beings with others of their species.

On the other hand, the fact that people are subjects in action, who are also bearers of identities, in search of meanings and ethical subjects, is largely related to the fact that TK is constructed on the basis of customs, traditions and subjectivity.

People build part of their identity thanks to the existing customs and traditions where they live; in turn, these elements help to give meanings to the things that surround people and allow them to give meaning to their daily lives. Within traditional knowledge, much relevance is given to customs and traditions, since it is from them that aspects that shape them are extracted, together with subjectivity, such as the existence of deities, stories, myths, tales, legends, etc.; it also plays an important role in the definition of shared beliefs that, among other things, address the relationship with nature and other living beings. Subjectivity is inherent to human beings and therefore forms a fundamental part of their identity construction, hence TK may have more value in places where subjectivity is considered important. As for the ethical part of the human being, this is evident when TK takes into account the relationship of people with their environment, including flora and fauna, one in which there is generally a broad respect and supernatural meanings that explain these interactions. All this denotes a subjective-cultural element that human beings possess.

The next dimension of human beings in organizations mentions that they are rooted in space and time, which is linked to the fact that traditional knowledge is modified based on the age of the people and that they adapt to changes in the context. As mentioned, a person is always rooted in places and times, be it at work, school, home, or other living spaces, which is very evident when traditional knowledge first changes over time in people. At each stage of human life, different roles are played in society, which means that the knowledge that is obtained is modified by learning more, living experiences and modifying the role to be played, for example, in childhood one is only a receiver of TK, learning and practising it, but in adulthood, one acts as an active disseminator, as this knowledge is mastered. Furthermore, traditional knowledge adapts to changes in the context because human beings need a space in which to live and develop; not considering the space where TK exists would mean that there would be no adjustments, which could contribute to it ceasing to be beneficial and therefore to be considered of little use. In short, there is a spatio-temporal aspect.

The remaining dimension considers people in organizations as actors and embodied subjects, which is related to the fact that TKs vary according to gender.

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Human beings possess feelings and emotions, have a body through which they express themselves and complement their personality to communicate and define a role in society, these elements come to determine in a very general way some aspects for each gender. In that sense, at least in the vast majority of rural communities, the roles to be played are different for men and women, which may also be due to the customs and traditions of the places, based on that role is how TK should be learned and used, for example, men may have the traditional knowledge about harvesting vegetables, but women do not, although they have the traditional knowledge about harvesting vegetables, but women do not, although they have traditional knowledge on the use of plants and vegetables for cooking food, an aspect that men do not even try to learn because in their social role, it is not necessary to know it, just as in the case of women it is not necessary to learn about work in the fields.

Addressing the relationship between HD and what characterises TK allows us to better visualise the question of why in rural communities the latter seem to be valued and reproduced, as opposed to, for example, enterprises. The fundamental starting point is to know what distinguishes rural communities from corporations. Corporations are driven by economic goals, they need to make a profit to survive or else they will disappear, that is their main guide; whereas rural communities, in essence, do not pursue economic goals (obviously there are some) but rather social ones and ones that benefit their members in various ways with the goal of continuing to survive.

This helps to understand the 'nature' of both types of organization; businesses are places dedicated to ultimately generating money, which is mostly for one person or a small group, that is the most important thing, so all actions must be aligned to this, what is not perceived as useful to achieve this contributes nothing, e.g. most if not all of the human aspects already mentioned. In contrast, the 'nature' of rural communities, without denying the importance that the economic sphere may have for them, also seeks the subsistence of its members, but with actions of a different nature, not only focused on the economic, as it is not the only one that helps to achieve this end.

For example, in these places, the celebration of festivities such as patron saint festivals, the end of school years, the coexistence with others through family celebrations or with friends, the resolution of common problems through community assemblies or the support of their members in difficult times through solidarity actions are very important. Therefore, it can be said that they are a type of organization that values more the human aspects within them, since in them the family is usually very relevant, the coexistence with others through personal interrelationships, the use of the word to communicate, having a history, a present, a future, as well as having a place to live, having a collective identity and shared culture, respecting the subjectivity that surrounds daily life; all of these elements are found in one way or another in traditional knowledge.

Box 2

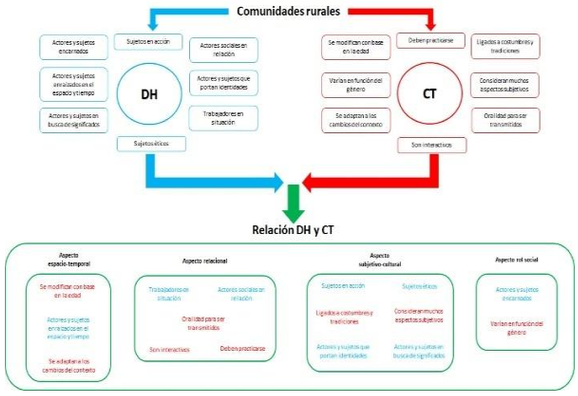

Figure 1

Relationship between human dimensions and traditional knowledge in rural communities

Source: Own elaboration

Due to the above, rural communities represent ideal spaces where the human development that the anthropology of organizations takes up is very present, and therefore, they are places where TK is valued, to the extent of promoting its dissemination and seeking to ensure that it endures over the years. In other types of organizations, such as schools or universities, although they seem to give some relevance to TK in recent times, they are still based on scientific knowledge, so they are not organizations where they can really be reproduced, but rather studied in order to learn from them.

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Within organizations such as governments, some of them may be giving importance to TK in order to take advantage of its potential benefits, but they are not places where there are conditions for replication, because as such, the various human aspects mentioned are not relevant. In the case of companies, although they have incorporated issues where human aspects figure, these are conceived as completely controllable or predictable, which denotes that they are taken into account out of convenience and not out of conviction to improve people's conditions; then, by not giving importance to HD, which are often even omitted, TK is seen as information that is not productive because it has no scientific basis. Thus, it is considered that rural communities, being a type of organization where HD are important, value TK because of the direct relationship they have with those aspects inherent to any person in any organization.

Conclusions

Based on what has been exposed throughout the document, it is possible to conclude that there is a broad relationship between the characteristics of the TK studied in rural communities and the HD present in any organization. This correspondence is possible because rural communities are a type of organization where the aforementioned human aspects are kept as relevant within the daily dynamics, which encourages that TK can be important and useful for its members. This is why, unlike other organizations (especially companies), in such organizations, TK continues to be transmitted and reproduced, at least to a large extent. Of course, this does not mean that rural communities are completely exempt from problems related to the preservation of their TK, since the influence of different factors, such as the extension of the vision of companies to societies (where the most important thing is to generate money and be productive regardless of future consequences), is causing that in some cases, even in those suitable spaces, problems are beginning to arise in order to preserve TK or even to disseminate it to young people.

To conclude, it is considered that this work contributes, on the one hand, to increase the existing information on TK and those elements that can support its preservation.

On the other hand, what has been presented hopes to be a trigger to resume a discussion on the relevance that both human aspects and TK can have for the different types of organizations that exist in the world, because even today, organizations are still made up of human beings (although the trend is that there are fewer and fewer of them in companies to optimise profits) who can affect nature and other living beings.

Declarations

Conflict of interest

The authors declare that they have no conflicts of interest. They have no known competing financial interests or personal relationships that might have appeared to influence the article reported in this paper.

Authors' contribution

Rivera-González, Gibrán: Contributed to generating the subject matter, objectives and methodology, as well as writing the paper, reviewing and validating the information.

Ángeles-Tovar, Luis Canek: Contributed to generating the subject matter, objectives and methodology, as well as to writing the document, reviewing and analysing the literature, obtaining information and validating it.

Escamilla-García, Pablo Emilio: Contributed to the writing of the document, literature review and analysis.

Rivera-González, Ángel Eustorgio: Contributed to the writing of the document, literature review and analysis.

Availability of data and materials

All the documents reviewed can be consulted in their respective electronic databases or in the physical libraries of various institutions.

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Abbreviations

TK	Traditional Knowledge
HD	Human Dimensions

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Article

The importance of the use of technology for life care in communities of Mexico

La importancia del uso de la tecnología para el cuidado de la vida en comunidades de México

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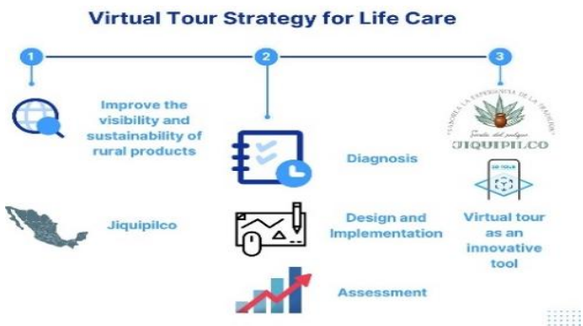
Abstract

The aim of this study was to examined how technology can constitute a fundamental tool for caring for life in communities in Mexico. Through a qualitative approach, the relevance of technology and its implementation in improving the well-being of communities in vulnerable situations was investigated. First, a systematic literature review was carried out to demonstrate the relevance of technology in marginalized environments. The essential theoretical concepts that are linked to the care and maintenance of life are presented. Second, an analysis of the case of Jiquipilco, of the local products that rural producers want to spread. Finally, technological strategies were studied by the implementation of the design of a virtual tour in Jiquipilco rural zone, to optimize both the productivity and well-being of this community.



Virtual tours, Life care, Rural communities.

Resumen

El propósito de este estudio fue examinar cómo la tecnología puede constituir una herramienta fundamental para el cuidado de la vida en comunidades de México. A través de un enfoque cualitativo se investigó la relevancia de la tecnología y su implementación en la mejora del bienestar de comunidades en situación de vulnerabilidad. Para ello, se realizó una revisión sistemática de la literatura que demostró la relevancia de la tecnología en entornos marginados, incluyendo los conceptos teóricos esenciales que están vinculados al cuidado y mantenimiento de la vida. A continuación, se realizó un análisis del caso de Jiquipilco, de los productos locales que desean difundir los productores rurales. Finalmente, se estudiaron las estrategias tecnológicas mediante la implementación de un recorrido virtual en dicha zona rural, con el objetivo de optimizar tanto la productividad como el bienestar de esta comunidad.

Recorridos virtuales, Cuidado de la vida, Comunidades rurales

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Introduction

Life care is a broad concept that incorporates practices and values aimed at preserving and improving the quality of life in various dimensions. In this context, technological advances have revolutionised different aspects of society, including the way in which life care needs are addressed in vulnerable communities in Mexico and Latin America. Thus, this documentary and interpretative study focuses on analysing the importance of technology today, exploring the referents of the notion of life care and presenting the case of Jiquipilco, a pulque trail of rural producers, where the impact of the use of technology for productivity is observed.

The problem addressed focuses on the adverse socio-economic and environmental conditions faced by many communities in the region, exacerbated by the lack of access to basic services, adequate resources and development opportunities. The objective of this study was to analyse how the use of technology can contribute to the care of life in these contexts, showing how some tools, for example, virtual tours, can reduce the technological gap, promoting the inclusion of remote communities and encouraging the support of distant populations.

The importance of the study lies in understanding how these technological tools can be used effectively to improve the care of life in vulnerable communities, providing insights to improve public policies and innovative development strategies, adapted to the specific needs of each community. It also seeks to contribute to the existing body of knowledge, offering practical ideas and informed recommendations that promote more inclusive and sustainable development in the region, and serve as a basis for future research focused on intervening in marginalised communities to improve productive conditions.

In this way, it also highlights the importance of integrating technologies in the care of life in vulnerable communities in Mexico and Latin America, considering their socio-cultural, economic and environmental characteristics. In recent years, the use of technology has become increasingly important, being a crucial element to improve the quality of life and promote sustainable development in these regions.

However, although technology offers significant possibilities, there are barriers that limit its access and use at the community level. It is precisely in this context that the relevance of this study emerges as it seeks to address these goals and contribute positively to the lives of individuals and communities, despite the obstacles present.

Background

Technology has been key to the development of productive communities in Mexico, improving both the quality of life and the sustainability of their economic activities. However, social inequalities generate gaps in access to these innovations, especially in rural and semi-urban areas. These communities face challenges such as resource scarcity, climate change and the need to optimise production processes, which requires the incorporation of appropriate technologies. These innovative tools not only increase efficiency and productivity, but also promote more sustainable and environmentally responsible practices, which are essential for the care of life in these environments.

Uses of Technology in Life Care

Technological innovations have transformed various aspects of human life, but its impact on life care is one of the most significant. In countries of the Global South, where it faces challenges in health, environment and economic development, it has become an essential tool for improving quality of life and promoting sustainability.

One example of the uses of technology is in the implementation of advanced agricultural technologies, such as automated irrigation systems, drones for crop monitoring and sensors for water resource management, which have proven to be effective in increasing yields and reducing resource wastage (Garcia, 2020).

Another example is renewable energies, such as solar and wind, which have provided viable and environmentally friendly alternatives to meet the energy needs of these communities. This has contributed to the reduction of dependence on fossil fuels, mitigation of environmental impact and consequent improvement of energy security (López & Pérez, 2019; IRENA, 2019).

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A third example can be found in the field of health, where we recognise that in southern countries, limitations in infrastructure and access to health services are persistent challenges; however, through the use of telemedicine and mobile technologies, a viable solution was found by revolutionising access to medical services and allowing health professionals to provide quality care to remote communities without the need to travel long distances. This is particularly relevant in the Mexican context where geography can be a significant barrier to the provision of health services (Martínez, 2018).

Another example is the use of mobile devices for disease diagnosis and monitoring in rural areas of Africa (WHO, 2019). Similarly, the implementation of electronic health information systems has improved the management of medical data, as well as facilitating better patient monitoring and optimising available resources (UNAIDS, 2020).

Another area where technology has had a significant impact is in education and training, as online learning platforms have advanced access to education by enabling students from disadvantaged regions to access high-quality educational resources (UNESCO, 2020). In this regard, massive open online courses (MOOCs) have been particularly effective in providing technical and vocational training, preparing people for jobs in the digital economy (World Economic Forum, 2021).

Regarding the use of information and communication technologies (ICTs), they facilitate the creation of collaborative and supportive networks among productive communities by promoting education, knowledge sharing and access to wider markets (Rodriguez, 2021). In this way, when digital tools are socialised, they can be essential to empower local producers by improving their ability to compete in the global market and ensure the sustainability of their productive activities.

Finally, while all of these areas require attention for the development and improvement of quality of life and care, the environment and sustainability are also important, and it is in the fight against climate change and the management of natural resources in the South where the use of technology has been crucial.

In short, technology has played and continues to play a fundamental role in caring for life from Southern perspectives by addressing specific challenges in areas such as health, agriculture, education and the environment.

Classical sociological perspectives on life care

Care for life from the sociological perspective emphasises the importance of the protection and preservation of human life in society and the environment; it promotes the idea that all people should be responsible for caring for our own lives, the lives of others, and the lives of the animal and plant species that inhabit our planet. Among the authors who have put forward this proposal in sociology is Leonardo Boff, in his book *Ecology: Cry of the Earth, Cry of the Poor* (1992), who mentions the importance of caring for life in the construction of a more just and equitable society, and defends the idea that ecology and social justice are intrinsically linked, and that only through caring for life can we build a more sustainable and humane world.

Contemporary Sociological Proposals on Care for Life

Several sociological approaches to care for life have been studied. In the first instance, Joan Tronto's Theory of Care in her work *Moral Boundaries: A Political Argument for an Ethic of Care* (1993), where she proposes an ethic of care that challenges the traditional boundaries between the public and the private, and between the moral and the political. For Tronto, care is an essential activity for human life and must be recognised and valued in all its forms, for which he establishes four phases of care: attending, assuming responsibility, caring and receiving care, all with moral components (Tronto, 1993).

The second proposal is found in Harold Garfinkel's *Ethnomethodology and Care*, the founder of ethnomethodology, which offers a perspective on care, focusing on how people produce and sustain the social order in their daily lives. Furthermore, in his text *Studies in Ethnomethodology* (1967), Garfinkel explores how social actors use practical methods to manage their daily activities and care, as, from this perspective, care is understood as an everyday practice that requires situated skills and knowledge (Garfinkel, 1967).

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In this context, the aim of this work was to apply technological tools for the development of a virtual tour of a community in the State of Mexico and to evaluate how the implementation of this technological tool affects the care of life and the sustainable development of the area.

Methodology

Selection of a rural area as a case study

The case study was selected through purposive sampling, looking for a locality that illustrated different geographical, socioeconomic and cultural contexts, representative of Mexico and Latin America. In this context, Jiquipilco was selected as the site for this case study.

Jiquipilco is a municipality located northeast of the Toluca Valley in the State of Mexico, widely recognised as a producer of maguey and, particularly, of pulque. However, given its geographic location, it has faced significant challenges due to the lack of technology that would allow them to make their products known at a national level.

Therefore, in collaboration with the Universidad Politécnica del Valle de México and the Universidad Politécnica de Atlacomulco, technologists, experts and students developed a 'Virtual Tour of the Pulque Trail', taking into consideration two lines of action: 1) methodology to explore and digitally represent the route associated with the cultural route and 2) as a technological tool to maximise the production of maguey and thus have a positive impact on the care of the lives of the inhabitants.

Virtual tour

The development of the virtual tour was carried out in two stages: the identification of nodes or access points and the development and implementation of the virtual tour.

Identification of nodes

In order to understand the context of the municipality of Jiquipilco and to identify the stages of an itinerary that fully represents the local customs and traditions of the municipality, semi-structured interviews were conducted with maguey producers.

Through this means, the most appropriate nodes (access points) for the virtual tour were identified, as well as the main services and tourist attractions that should be highlighted in it.

The nodes were selected on the basis of factors such as:

1) **Cultural and productive importance**, i.e. strategic points were selected with reference to the elaboration of pulque and other items made from maguey;
2) **Social and economic impact**, according to their relevance for community welfare, with the goal of improving the living conditions of rural farmers;
3) **Interconnection with the user experience**, as the nodes provide a meaningful experience for users of the virtual tour, delivering valuable data about pulque production, regional culture and ongoing sustainability initiatives.

Thus, these factors allowed for the creation of a real and informative virtual tour of Jiquipilco, with the potential to promote traditions and market regional products, to encourage care for the lives of the inhabitants of this rural area.

Development and implementation of the virtual tour

The development of the virtual tour was divided into two stages: 1) image capture and 2) image processing. The first stage consisted of carrying out a photographic survey in the Jiquipilco area in each of the previously established nodes, combining internal and external shots via land. The images and interactive video were captured with a 360° camera (RICOH-PENTAX, Theta Z1 - 51GB, Japan) with a resolution of 23 megapixels and a professional camera (Nikon, D7000, USA).

The second stage was to process the images in order to develop the virtual tour website. The virtual tour entitled 'La Senda del Pulque' was designed with the software Virtual Tour Pro (V. 2023), a programme specialised in the generation of virtual environments and immersive 360° experiences.

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Application of surveys and interviews

After the launch of the website, a qualitative and quantitative analysis was carried out by means of surveys directed at visitors to the tour and follow-up interviews with producers to measure the impact of the virtual tour on the visibility and commercialisation of the products and on the producers' livelihoods.

Finally, the frequency of visits to the site and the sale of pulque (one of the products of greatest economic income for the producers) during the first six months after the publication of the virtual tour were counted, with the intention of evaluating the impact of the publication of this technological tool on the care of the lives of the people of Jiquipilco.

Results

Publication of the virtual tour

The virtual tour was published on the server *https://proyectosva.com.mx/RVSP/*; it was designed to give access to visitors through any device, desktop or mobile, in order to reach a wider audience.

In addition, elements were implemented to provide a user-friendly, understandable and easy-to-use design and access for all types of users. Some of the elements used were: direction or guide arrows to go through the whole 'Senda del Pulque'; information capsules identified with a , *to* provide information of interest to the visitor; photographs and videos, which are of interest and encourage the permanence in the virtual tour, but above all to promote the visit to the rural spaces of Jiquipilco, and, thus, highlight the artisan and field work that is done in these communities.

On the one hand, Figure 1 shows a full screen of the main page of the virtual tour 'Senda del Pulque', visualised on a desktop device.

Figure 2, on the other hand, presents several screenshots of the same site, but from a mobile device. In both views it is possible to visualise clear, dynamic and 360° images.

Box 1

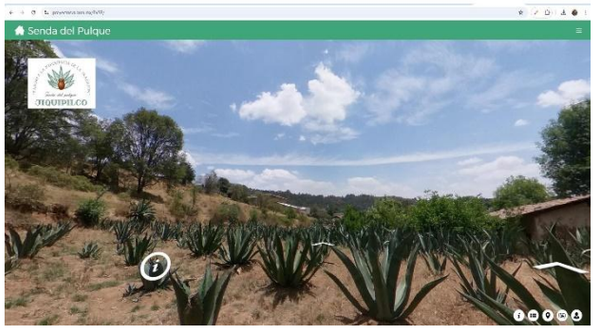

Figure 1

Main screen of the virtual tour "Senda del Pulque" from a computer on the server: https://proyectosva.com.mx/RVSP

Own source

Box 2

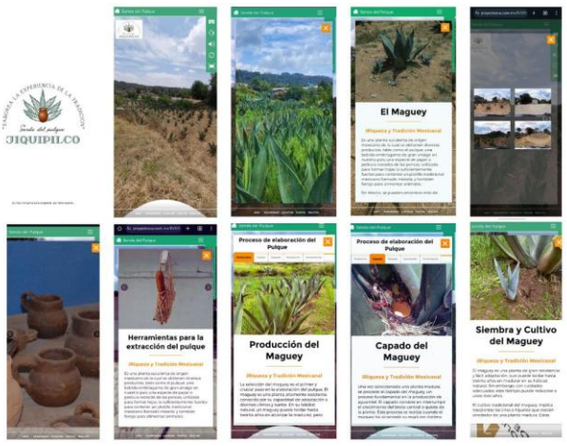

Figure 2

Screenshots of the virtual tour "Sendero del pulque" published on the server: https://proyectosva.com.mx/RVSP

Evaluation of the socio-cultural and life-care impact after implementation of the virtual tour

In the surveys, platform users highlighted both the immersive and educational experience provided by the virtual tour and also expressed a greater interest in maguey products, which translated into an increase in both enquiries and potential sales.

On the other hand, producers, in addition to the increase in sales, reported an increase in the visibility of agricultural activities and in obtaining strategic allies.

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Thus, Figure 3 shows graphically the unique visits to the virtual tour 'Sendero del Pulque' and the litres of pulque sold before and after the launching of the website; in each of these parameters it is highlighted that month by month the interest in visiting the virtual site increased, as well as the sale of pulque. It can be seen that the increase is relevant, as increased visibility resulted in more occasions for customers to become familiar with the product and the maguey tradition.

Box 3

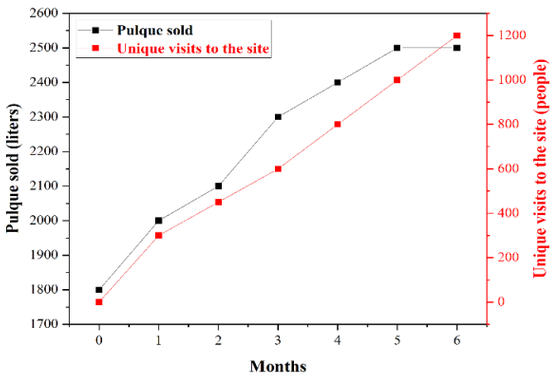

Figure 1

Graphical representation of the unique visits to the "Sendero del Pulque" virtual tour and litres of pulque sold before and after the launch of the technological tool

In this sense, it can be observed that pulque sales increased by 15% during the first quarter of the tour's launch and by 38% six months later, according to the producers. In this way, the increase in sales is attributed to the visibility of the product, facilitated by the implementation of the virtual tour; in addition, this same tour made the agricultural activities known, which resulted in new consumers, the formation of strategic alliances and the strengthening of demand, both locally and in larger markets.

The interviews also explored the progress made with the sale of other maguey-related products, which rose from 10 to 150 pieces, according to the producers, in the same period of time.

Similarly, another important fact is the rapprochement of commercial associations, from 1 to 5, in the six months analysed, as well as the participation in fairs and other events.

Finally, user satisfaction stood at 90% of positive responses after completing the tour. The findings show the positive effect of the virtual tour on the visibility and promotion of local products. This made it possible to observe a significant increase in the purchase and sale of pulque, as well as products derived from the maguey.

Conclusions

This study highlights the fundamental role of technology in the care of life and economic development of vulnerable rural communities in Mexico, as seen in the case of the 'Senda del Pulque' in Jiquipilco. The implementation of the virtual tour made it possible to overcome geographical and economic barriers, facilitating the connection of producers with a wider public, without the need to travel, which contributed both to productivity and to the strengthening of local cultural and tourist identity. In addition, accessibility, through technology, has encouraged community participation in training workshops, promoting the use of technological tools to optimise production processes and improve efficiency in resource management, key elements for the care of life in these environments.

The visibility provided by this platform also expanded the demand for maguey-derived products, such as pulque, and attracted the interest of investors who see growth potential in this production, thus fostering strategic partnerships that support the expansion of infrastructure and technological development in the community.

Following Smith's assertion that virtual tour technologies can be a powerful tool for education and awareness-raising about sustainable practices, it is particularly relevant in this context, as these tours allow knowledge about traditional and sustainable agricultural techniques to be shared with a global audience, facilitating the transmission of knowledge that contributes to the replication of these practices elsewhere. This global access also opens doors to financial and volunteer support through donations and volunteer programmes, increasing the possibilities for sustainability and expansion of rural productive projects.

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Furthermore, technology acts as an essential pillar for the care of life in these communities, improving the productivity and well-being of their inhabitants. Sociological perspectives on the use of technology underline the importance of designing tools that not only increase efficiency, but also respect and value local care practices and promote equity and genuine communication at the community level. Thus, the design and application of technologies should focus on these values in order to maximise their positive impact.

The case of the 'Senda del Pulque' represents a significant initiative in terms of food security, environmental education and social inclusion, promoting practices that contribute to sustainability and resilience in the face of modern challenges. To ensure the continuity of these benefits, constant support from both the community and institutions is required, so that the sustainability of these initiatives is guaranteed in the long term.

Ultimately, the implementation of virtual tours and other innovative tools in rural areas reflects the transformative potential of technology to care for life in Mexico. The integration of these resources allows for building a future in which accessibility, wellbeing and sustainability are within the reach of all productive communities, demonstrating that, through technology, it is possible to promote inclusive and just development for those who face the greatest challenges.

Declarations

Conflict of interest

The authors declare that they have no conflicts of interest. They have no known competing financial interests or personal relationships that might have appeared to influence the article reported in this paper.

Authors' contribution

Flores-Azcanio, Nancy P: Conceptualisation, methodology, software, validation, analysis, research, resources, writing-drafting, writing-revising and editing, visualization.

García-Hernández, Alitzel B.: Validation, writing-revision and editing, visualization.

Availability of data and materials

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Abbreviations

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Introduction

Text in TNRoman No.12, single space.

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

What is your added value with respect to other techniques?

Clearly focus each of its features.

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

Explanation of sections Article.

Development of headings and subheadings of the article with subsequent numbers

[Title No.12 in TNRoman, single spaced and bold]

Products in development No.12 TNRoman, single spaced.

Including figures and tables-Editable

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

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Box

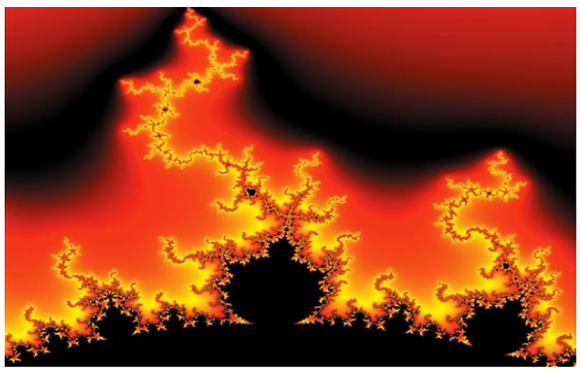

Figure 1

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Table 1

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

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Methodology

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

Results

The results shall be by section of the article.

Conclusions

Clearly explain the results and possibilities of improvement.

Annexes

Tables and adequate sources.

The international standard is 7 pages minimum and 14 pages maximum.

Declarations

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Author contribution

Specify the contribution of each researcher in each of the points developed in this research.

Prot-
Benoit-Pauleter, Gerard: Contributed to the project idea, research method and technique.

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Indicate the availability of the data obtained in this research.

Funding

Indicate if the research received some financing.

Acknowledgements

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

Abbreviations

List abbreviations in alphabetical order.

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ANN	Artificial Neural Network

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