Volume 14, Issue 31 — July — December — 2023

ECORFAN

ISSN-Print: 2007-1582

Journal-Mexico

ISSN-On line: 2007-3682

ECORFAN®

ECORFAN Journal Mexico, Volume 14, Issue 31, December-2023, is a biannual Journal edited by ECORFAN. Park Pedregal Business. 3580 – Adolfo Ruiz Cortines Boulevard – CP.01900. San Jerónimo Aculco – Álvaro Obregón, Mexico City, http://www.ecorfan.org/, journal@ecorfan.org. Editor in charge: SERRUDO-GONZALES, Javier. Reserves of Rights for Exclusive Use No: 04-2012-032214353400-203. ISSN: 2007-3682. Title and Content Licenses: 15048 both granted by the Commission for the Qualification of Publications and Illustrated Journals of the Ministry of the Interior. Responsible for the last update of this issue ECORFAN Computer Unit. Imelda Escamilla Bouchán, PhD. Vladimir Luna Soto, PhD. Park Pedregal Business. 3580 – Adolfo Ruiz Cortines Boulevard – CP.01900. San Jerónimo Aculco – Álvaro Obregón, Mexico City, date of last update December 31, 2023.

ECORFAN Journal-Mexico

Definition of Journal

Scientific Objectives

Support the international scientific community in its written production Science, Technology and Innovation in the Field of Social Sciences, in Subdisciplines of Economics, computer science, optimization, risk, finance, business and management.

ECORFAN-Mexico, S.C. is a Scientific and Technological Company in contribution to the Human Resource training focused on the continuity in the critical analysis of International Research and is attached to CONAHCYT-RENIECYT number 1702902, its commitment is to disseminate research and contributions of the International Scientific Community, academic institutions, agencies and entities of the public and private sectors and contribute to the linking of researchers who carry out scientific activities, technological developments and training of specialized human resources with governments, companies and social organizations.

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

Scope, Coverage and Audience

ECORFAN Journal-Mexico is a Journal edited by ECORFAN-Mexico, S.C. in its Holding with repository in Mexico, is a scientific publication arbitrated and indexed with semester periods. It supports a wide range of contents that are evaluated by academic peers by the Double-Blind method, around subjects related to the theory and practice of Economics, computing, optimization, risks, finance, administration and business with diverse approaches and perspectives , That contribute to the diffusion of the development of Science Technology and Innovation that allow the arguments related to the decision making and influence in the formulation of international policies in the Field of Social Sciences. The editorial horizon of ECORFAN-Mexico® extends beyond the academy and integrates other segments of research and analysis outside the scope, as long as they meet the requirements of rigorous argumentative and scientific, as well as addressing issues of general and current interest of the International Scientific Society.

Editorial Board

Arbitration Committee

Assignment of Rights

The sending of an Article to ECORFAN Journal Mexico emanates the commitment of the author not to submit it simultaneously to the consideration of other series publications for it must complement the Originality Format for its Article.

The authors sign the Authorization Format for their Article to be disseminated by means that ECORFAN-Mexico, S.C. In its Holding Mexico considers pertinent for disclosure and diffusion of its Article its Rights of Work.

Declaration of Authorship

Indicate the Name of Author and Coauthors at most in the participation of the Article and indicate in extensive the Institutional Affiliation indicating the Department.

Identify the Name of Author and Coauthors at most with the CVU Scholarship Number-PNPC or SNI-CONAHCYT- Indicating the Researcher Level and their Google Scholar Profile to verify their Citation Level and H index.

Identify the Name of Author and Coauthors at most in the Science and Technology Profiles widely accepted by the International Scientific Community ORC ID - Researcher ID Thomson - arXiv Author ID - PubMed Author ID - Open ID respectively.

Indicate the contact for correspondence to the Author (Mail and Telephone) and indicate the Researcher who contributes as the first Author of the Article.

Plagiarism Detection

All Articles will be tested by plagiarism software PLAGSCAN if a plagiarism level is detected Positive will not be sent to arbitration and will be rescinded of the reception of the Article notifying the Authors responsible, claiming that academic plagiarism is criminalized in the Penal Code.

Arbitration Process

All Articles will be evaluated by academic peers by the Double Blind method, the Arbitration Approval is a requirement for the Editorial Board to make a final decision that will be final in all cases. MARVID® is a derivative brand of ECORFAN® specialized in providing the expert evaluators all of them with Doctorate degree and distinction of International Researchers in the respective Councils of Science and Technology the counterpart of CONAHCYT for the chapters of America-Europe-Asia- Africa and Oceania. The identification of the authorship should only appear on a first removable page, in order to ensure that the Arbitration process is anonymous and covers the following stages: Identification of the Journal with its author occupation rate - Identification of Authors and Coauthors - Detection of plagiarism PLAGSCAN - Review of Formats of Authorization and Originality-Allocation to the Editorial Board-Allocation of the pair of Expert Arbitrators-Notification of Arbitration -Declaration of observations to the Author-Verification of Article Modified for Editing-Publication.

Instructions for Scientific, Technological and Innovation Publication

Knowledge Area

The works must be unpublished and refer to topics of Economics, computer science, optimization, risks, finance, administration and business and other topics related to Social Sciences.

Presentation of Content

In the first chapter we present *Reception and management of agrochemical containers in the CATs*, by OCHOA-ORNELAS, Raquel & GUDIÑO-OCHOA, Alberto, with adscription in the Tecnológico Nacional de México/Instituto Tecnológico de Ciudad Guzmán, as next article we present, *Analysis of the productivity of the construction sector in terrestrial communication routes, of the Central region of the state of Tabasco*, by ELISEO-DANTÉS, Hortensia, LÓPEZ-VALDIVIESO, Leticia, PÉREZ-GARMENDIA, Gloria and MOREJÓN-SÁNCHEZ, Juana María, with adscription in the Tecnológico Nacional de México Campus Villahermosa and Tecnológico Nacional de México Campus Mérida, as a next article we present, *Impact of Creativity and Innovation in the Subdirectorate of Planning and Liaison of a Higher Education Institution in the State of Veracruz, Mexico*, by BALDERRABANO-BRIONES, Jazmín & UTRERA-VELEZ, Youssef, with adscription in the Tecnológico Nacional de México, Campus Úrsulo Galván, as the next article we present, *Training perspectives in the new labor normality*, by GONZÁLEZ-HERRERA, Karina Concepción & MARTÍN-SÁNCHEZ, Stephany Giselle, with adscription in Universidad Tecnológica Metropolitana and Tecnológico Nacional de México, as a next article we present, *Design and development of a comprehensive renewable energy system*, by VALVERDE-CEDILLO, Luis Manuel, LÓPEZ-GARCÍA, C. and SANTIAGO-AMAYA, Jorge, with adscription in the Tecnológico de Estudios Superiores de Chalco. As a next article we present *Discursive hybridity in the chat rooms of university students' WhatsApp* groups, by VELASCO-PALACIOS, María Dolores & AGUILAR-ROJAS, Elías, with adscription in the Universidad Nacional de San Antonio Abad del Cusco

Content

Article **ECORFAN Journal-Mexico**
December 2023, Vol.14 No.31 1-7

Reception and management of agrochemical containers in the CATs

Recepción y gestión de envases de agroquímicos en los CATs

OCHOA-ORNELAS, Raquel†* & GUDIÑO-OCHOA, Alberto

Tecnológico Nacional de México/Instituto Tecnológico de Ciudad Guzmán, México.

ID 1st Author: *Raquel, Ochoa-Ornelas* / **ORC ID:** 0000-0003-1824-5789, **Researcher ID Thomson**: S-4687-2018, **arXiv Author ID**: Raquel Ochoa, **SNI CONAHCYT ID:** 668976

ID 1st Co-author: *Alberto, Gudiño-Ochoa* / **ORC ID:** 0000-0002-2366-7452, **Researcher ID Thomson**: HDN-0235-2022, **arXiv Author ID:** AlbertoGO, **PubMed Autor ID:** albertogudo@orcid, **CVU CONAHCYT ID:** 1135216

DOI: 10.35429/EJM.2023.31.14.1.7 Received: July 10, 2023; Accepted: December 30, 2023

Abstract

The handling of agrochemical containers is subject to compliance with current laws for the operation and certification of systems that reduce contamination risks. The objective of this research is to design a computer system that allows greater control in the Temporary Collection Centers (CAT), from the reception of containers to the exit of waste to destination companies. For the development of the project, an exhaustive analysis was carried out in each of the processes. Requirements gathering techniques and the design of diagrams will be applied to detail the context of the processes using the Unified Modeling Language (UML). The database was designed in MySQL and the programming was carried out in Visual Studio 2023. Results were obtained in various reports and statistics that allow managing the capacity of the CATs and having a reliable record of the origin of the containers, as well as a control and follow-up in the exit and delivery of waste to final destination companies. The project is a challenge of environmental impact and social responsibility that requires the intervention of different sectors, public and private, as well as the direct collaboration of agricultural producers.

Agrochemical, Environmental, Intervention, Systems

Resumen

El manejo de envases de agroquímicos está sujeto al cumplimiento de leyes vigentes para la operación y certificación de sistemas que reduzcan los riesgos de contaminación. El objetivo de esta investigación es diseñar un sistema informático que permita un mayor control en los Centros de Acopio Temporal (CAT), desde la recepción de envases hasta la salida de los residuos a empresas destino. Para el desarrollo del proyecto se llevó a cabo un análisis exhaustivo en cada uno de los procesos. Se aplicaron técnicas de recolección de requerimientos y el diseño de diagramas para detallar el contexto de los procesos utilizando el lenguaje de modelado unificado (UML). La base de datos fue diseñada en MySQL y la programación se llevó a cabo en Visual Studio 2023. Se obtienen resultados en diversos reportes y estadísticas que permiten administrar la capacidad de los CAT y disponer de un registro confiable del origen de los envases, así como un control y seguimiento en la salida y entrega de residuos a empresas de destino final. El proyecto es un reto de impacto ambiental y de responsabilidad social que requiere la intervensión de diferentes sectores, públicos y privados, así como la colaboración directa de los productores agrícolas.

Agroquímico, Ambiental, Intervención, Sistemas

Citation: OCHOA-ORNELAS, Raquel & GUDIÑO-OCHOA, Alberto. Reception and management of agrochemical containers in the CATs. ECORFAN Journal-Mexico. 2023. 14-31:1-7.

* Correspondence to Author (E-mail: raquel.oo@cdguzman.tecnm.mx)
† Researcher contributing as first author.

Introduction

Today's agriculture demands a higher level of food production to sustain the world's population through automation and intelligent decision-making to ensure food security, availability of suitable land for crops, perishability of produce, as well as environmental conditions. Data-driven systems benefit all stakeholders. The approach to agriculture implies including initiatives to reduce inequality and the technology gap, extending to all rural and urban areas, implementing state policies to achieve mainstreaming, and promoting access to the Internet (Beltran, 2022).

Auer (2023) comments in his research that the rural sector seeks to balance the use of chemicals with agricultural demand and the health of the population, through the implementation of good agricultural practices in Argentina. The work considered variables related to territoriality, as well as soil analysis, precision agriculture and pest control and pesticide storage, empty container management, among others. The study made it possible to contribute sustainable measures for the protection of the ecosystem through technological innovations implementing alternative models that improve the quality of the products and safeguard the health of the environment and the population.

Ortíz et al. (2014) explain that the Ley General Para la Gestión Integral de los Residuos (LGPGIR) regulates the management of waste, which can be materials or products that are discarded and must be subject to a management plan. The law states that the incineration of organochlorine pesticides is prohibited, as it generates pollutants such as dioxins and furans. The Federal Plant Health Law provides for a National Pesticide Residue Monitoring Programme and its dissemination.

Auer (2023) affirms the importance of the correct management of containers, which implies their collection and assignment to a controlled and identified final destination, as they imply a high risk of toxicity.

Roque (2023) raises the importance of regulating the commercialisation of pesticides in Honduras by the health sector and governmental agencies, since several samplings have detected products with a high level of danger and easy access to them, with a strong impact on public health. As far as the academic sector is concerned, it is invited to participate in activities to disseminate the use, custody and conservation of pesticides in appropriate places without compromising health and the environment.

Madoery et al. (2023) describe in their study the importance of analysing the territorial dynamics that affect land use and land use planning, based on methodologies, techniques, trends, environmental scanning and others, which allow them to visualise possible scenarios. They carried out surveys of peri-urban producers in order to learn about agricultural practices (technologies used, fertilisation, pests, and phytosanitary products used), with the aim of estimating the knowledge of norms, environment and linkages in order to establish action plans and strategies. Five dimensions and their variables were analysed during the diagnosis. In the physical-environmental dimension, the variables analysed were: peri-urban land use, forestation, climate risk, solid waste and effluent management, as well as phytosanitary management. A strategic map was generated to locate impacts, administrative and regulatory processes as well as actions to guide activities to be carried out in different timeframes, including awareness-raising, sensitisation and training. The research they present allows for the prioritisation of critical trends and uncertainties in the space.

In Mexico, in the state of Jalisco, there was previously no computer system in the CATs to efficiently control the reception and management of agrochemical containers, as well as an automated follow-up for the exit of waste to the final destination companies.

The article presents a theoretical framework related to the problem to be solved as well as the computer elements used for the solution, and also includes details of the phases developed in the methodological description. At the end, the results obtained, conclusions and bibliographical references are presented.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Theoretical framework

Agrochemical packaging

T Chirinos et al. (2020) developed a research to analyse the magnitude of agrochemical use of pests in the most important crops in Ecuador, the research included chemical inputs applied, generic name, active ingredient, acute toxicity and dosage applied, spraying frequency, periods of deficiency and product mixture. The results showed high spraying frequencies, as well as high dosage levels with high toxicity causing imbalances in the agrosystems, as well as significant health and environmental effects. During the research, it was common to observe empty phytosanitary containers abandoned in the fields, which further compromised the ecosystem and the health of the population.

Ortíz *et al*. (2014) describe the regulation of the production, distribution, storage and use of pesticides in Mexico, as well as the consequences and effects on health, locating the places with the highest incidence of morbidity in Mexico. They also present regulations and governmental agencies, civil organisations and research centres involved. However, they comment that despite regulations and restrictions, pesticides represent a serious problem for the health of workers and the population, also generating soil and water contamination. Therefore, it is important to apply regulations on the production, distribution, storage and use of pesticides.

Other research indicates that in Mexico in 2018, more than 61,000 tonnes of pesticides were imported, compared to more than 106,000 tonnes in 2017. The biggest problem in Mexico, as in other countries, is that there is a lack of efficient regulation and monitoring of pesticide use. In the last two decades, total pesticide consumption in Mexico has increased between 57% and 65%, with annual average annual differences of 27%, equivalent to 14,000 tonnes per year (MOO et al. 2020).

In Mexico, the institutions that regulate pesticides are SAGARPA and SSA. At the international level, the Food and Agriculture Organisation of the United Nations (FAO) has produced guidelines for pesticide management. They point out that the environment is one of the main sources of exposure to pesticides and their residues, as they come into contact with the environment, being susceptible to biological, chemical and physical degradation. However, direct exposure is the greatest risk, as chronic effects may manifest as cancer, mutations or degenerative lesions. In terms of production and consumption, SEMARNAT authorises the manufacture, importation, as well as activities related to pesticides, estimating that the average annual consumption in Mexico is 35 thousand tonnes from 1992 to 2007 (Ortíz et al., 2014).

Technologies in agriculture

Beltran (2022) states that platforms are digital tools that, when applied to the agricultural sector, increase competitiveness and production, favouring the development of agriculture as they have the potential to improve the yield and sustainability of crops, increasing the level of quality of products and processes, generating information at all times. The Internet of Things, agri-bots, data analytics, drones, cloud computing, the use of sensors and artificial intelligence are examples of the kind of applications that can be implemented in the agricultural sector. The challenges depend on the development and use of Information and Communication Technology (ICT)-based solutions as they have been recognised in smart and sustainable agriculture.

Information and communication systems have become a relevant tool for sustainability mainly in food systems and in the field; generating an environmental, social and economic impact on food distribution and consumption. The integration of Big Data and data analytics has been shown to improve agricultural productivity with good results, however, the sales margins of agricultural products can be a key factor. Information systems can facilitate the actual situation and logistics of transport, such as ways of selling, increasing productivity and profitability. There are positive impacts such as efficiency of natural resource use, increasing productivity and profitability, facilitating access to information and improving traceability of products (El Bilali, *et al*. 2018).

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Therefore, information systems can contribute to food sustainability, and agriculture is changing significantly with the integration of new technologies and devices for greater connectivity (Misra *et al*. 2020).

Unified Modelling Language

Munthe *et al*. (2020) describe UML (Unified Modelling Language) as a tool for modelling and designing information systems or applications. UML uses diagrams and text to describe a system. The modelling allows the design of useful applications, which must meet requirements and specifications. In this way, it is possible to evaluate the software project from its design. Once it has been approved by the evaluators, the information system software is controlled in an appropriate way through the developed prototype.

Databases and entity-relationship model

Millán (2017) states that the fundamentals of databases include definitions for manipulating data, whether structured and interrelated through a data model. These models are evaluated theoretically as well as practically by implementing them in applications. There are programming languages that allow manipulation of data, either to update it or to retrieve information from the database. These languages are declarative, thus reducing the development and maintenance time of applications. The relational model is defined as a set of relationships that changes over time, includes rules for inserting, updating or deleting, as well as relational algebra concepts. A query language is defined as a tool that uses expressions to make a request to the database.

Kofler (2004) describes a database as an ordered collection of data, which stores one or more files structured in cross-referenced tables in a relational model. Relational database management systems include MySQL, Oracle, Microsoft SQL Server and IBM DB2. These systems integrate security, storage, command processing for queries, data analysis and sorting. The database can be hosted on a computer or on a server. The program that connects to the database is defined as a database client.

Visual studio

Strauss & Strauss (2020) describe Visual Studio as a complete tool for developers, as it allows them to generate various types of applications in a productive way. Visual Studio has grown in recent years with a high power for software development worldwide. The latest versions are very similar so that it can be adapted to continuous development in later versions. It includes tools for pausing execution, as well as breakpoints for debugging errors and visualising results. In addition, it is possible to integrate projects with Git and GitHub in Visual Studio Code.

Methodology

Phase I. Capture of requirements: CATs must ensure the waste reduction procedure, where reception and weighing of packaging, sorting by type of material, compacting or shredding of packaging, as well as storage of bales, bags or sacks is carried out.

Phase II. Definition of processes for each type of system user. Figure 1 shows the diagram of the general use cases of the system.

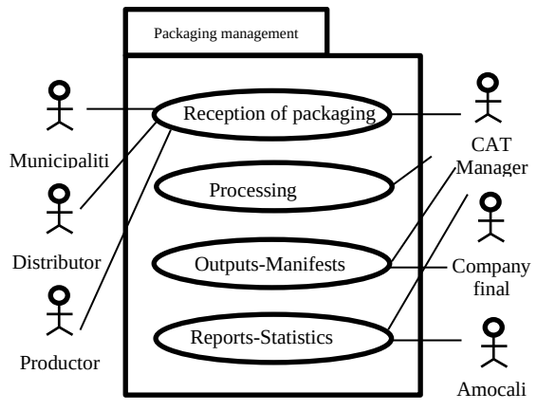


Figure 1 Diagram of general use cases of the packaging management system

Phase III. Design of the database in MySQL: The creation and design of the database was in MySQL locally, as no Internet access was available at the CATs, as they are distributed in remote regions. The application offers an option to download the database and later import it to a cloud server, thus allowing access to the information at the central offices.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Phase IV. Coding: Creation of MySQL stored procedures for the generation of queries and implementation of reports, as well as the coding of logging options. The application code was created using Visual Studio 2023.

Phase V. Testing: Several unit tests and integration tests were carried out periodically, detecting defects that were immediately addressed.

Phase VI. Deployment: The application will be distributed in the CATs by zones in the state of Jalisco, selecting one in particular to carry out an initial pilot test. Users were trained in the use of the application. The implementation was straightforward, as no automated system was previously available.

Results

Forms were designed for capturing incoming containers, generating a record of origin, transport and containers received. At the end of the capture, a receipt of the received material is generated. See Figure 2 and Figure 3.

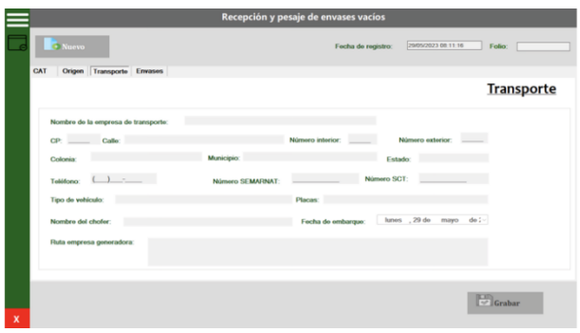


Figure 2 Capture of the origin reception of packaging

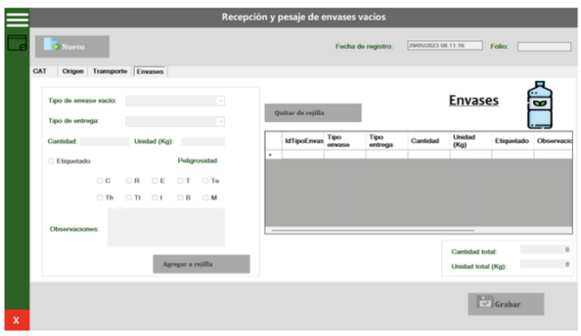


Figure 3 Capture of the type of packaging, hazardousness and weighing of the received packaging

Figure 4 shows an enquiry on the receipt of packaging by a distributor.

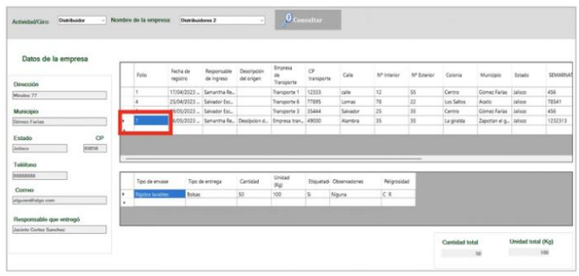


Figure 4 Enquiries on packaging received by distributor

Figure 5 shows the printout of the receipt representing proof of containers received by the CAT.

Figure 5 Printout of the receipt slip

Figure 6 shows the graph of the material sent and received in the destination companies, in the outgoing movements that occurred in a given period in the CAT.

Figure 6 Output of material sent and received in a period

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Figure 7 shows a report of containers received by type in a period. The type can be pails, flexible, metal, lids or drums.

Figure 7 Report of containers received by type in a period

Figure 8 shows a report of outlets in a period classified by type of material including a graph at the end of the report.

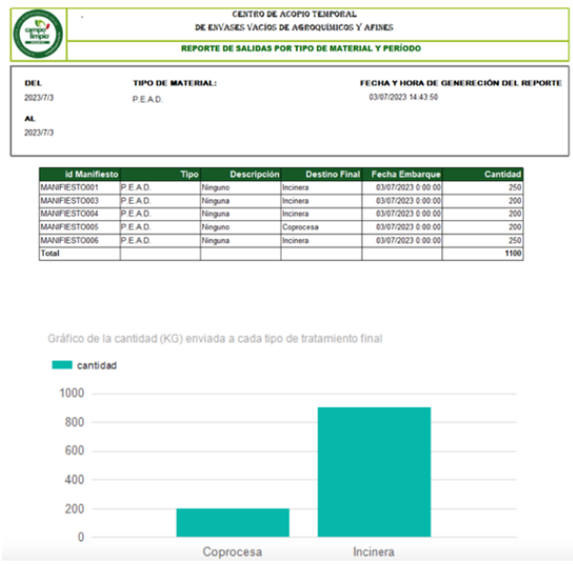


Figure 8 Report of outputs by type of material in a period.

Acknowledgements

This work has been funded by the Tecnológico Nacional de México [17887.23-P].

Conclusions

The development of the project allows for greater control in the administration of inventories within the CATs, generating valuable information in various formats, including receipts at reception as well as exit manifests for interested parties, generating various queries, reports and statistics. The CATs do not have a permanent internet connection, so the desktop application was developed with access to a local MySQL database, to be distributed and installed in each CAT, to be periodically exported and later imported to a cloud server. In this way, the central office will have permanent access to all the information, facilitating decision-making.

The management of agrochemical containers is of great importance, as it provides better inventory control and proper disposal. Some of the regulations and guidelines that support these practices are: hygiene, health and safety of workers, registration and documentation, inventory control, traceability records in packaging control and protection of chemicals and fertilisers. Therefore, it is of vital importance to ensure compliance with regulations and laws that guarantee the safety of people and the environment.

References

Auer, A. (2023). Aportes sobre el vínculo entre buenas prácticas agrícolas (BPA) y territorialidad en la provincia de Buenos Aires, 2002-2018. *Journal de Ciencias Sociales*, *1*(20), 4-29. URL: https://dspace.palermo.edu/ojs/index.php/jcs/article/view/7737
DOI: https://doi.org/10.18682/jcs.v1i20.7737

Beltran, A. O. (2022). Plataformas tecnológicas en la agricultura 4.0: una mirada al desarrollo en Colombia. Computer and Electronic Sciences: Theory and Applications, 3(1), 9-18. URL: https://revistascientificas.cuc.edu.co/CESTA/article/view/3975/4009
DOI: 10.17981/cesta.03.01.2022.02

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

El Bilali, H., & Allahyari, M. S. (2018). Transition towards sustainability in agriculture and food systems: Role of information and communication technologies. Information Processing in Agriculture, 5(4), 456-464. URL: https://www.sciencedirect.com/science/article/pii/S2214317318301367. DOI: 10.1016/j.inpa.2018.06.006.

Kofler, M. (2001). What Is MySQL?. In *The Definitive Guide to MySQL* (pp. 3-19). Berkeley, CA: Apress. URL: https://link.springer.com/chapter/10.1007/978-1-4302-0669-9_1. DOI: https://doi.org/10.1007/978-1-4302-0669-9_1

Madoery, O. A., Guzmán, L. A., Girardo, S., Bodrero, M. D., & Gadban, L. (2023). Prospectiva y Ordenamiento Territorial. Aprendizajes del proceso en el periurbano de Corral de Bustos Ifflinger (Córdoba, Argentina). *Eutopía. Revista de Desarrollo Económico Territorial*, (23). URL: https://revistas.flacsoandes.edu.ec/eutopia/article/view/5922/4486. DOI: 10.1714/EUTOPIA_23_2023.5922

Millán González, M. E. D. S. (2017). Fundamentos de bases de datos: notas de referencia. URL: http://hdl.handle.net/10893/10313
DOI: http://dx.doi.org/10.25100/peu.47

Misra, N. N., Dixit, Y., Al-Mallahi, A., Bhullar, M. S., Upadhyay, R., & Martynenko, A. (2020). IoT, big data, and artificial intelligence in agriculture and food industry. IEEE Internet of things Journal, 9(9), 6305-6324. URL: https://doi.org/10.1109/JIOT.2020.2998584

MOO MUÑOZ, A. J., AZORIN VEGA, E. P., RAMIREZ DURAN, N. I. N. F. A., & Moreno Pérez, M. P. A. (2020). Estado de la producción y consumo de plaguicidas en México. URL: http://ri.uaemex.mx/handle/20.500.11799/109820. DOI: HTTP://dx.doi.org/10.56369/tsaes.3225

Munthe, I. R., Rambe, B. H., Pane, R., Irmayani, D., & Nasution, M. (2020). UML Modeling and Black Box Testing Methods in the School Payment Information System. *Jurnal Mantik*, *4*(3), 1634-1640. URL: https://iocscience.org/ejournal/index.php/mantik/article/view/969. DOI: https://doi.org/10.35335/mantik.Vol4.2020.969.pp1634-1640

Ortíz, I., Avila-Chávez, M. A., & Torres, L. G. (2014). Plaguicidas en México: usos, riesgos y marco regulatorio: Revisión. *Revista Latinoamericana de Biotecnología Ambiental y Algal*, *5*, 1-21. URL: https://www.researchgate.net/publication/354353275_Plaguicidas_en_Mexico_usos_riesgos_y_marco_regulatorio_Revision DOI: 10.7603/s40682-014-0003-9

Roque, C. I. (2023). Plaguicidas en Honduras: Desafíos en la regulación y abordaje científico. *Revista de Ciencias Forenses de Honduras*, *9*(1), 31-36. URL: https://camjol.info/index.php/RCFH/article/view/16394
DOI: https://doi.org/10.5377/rcfh.v9i1.16394

Strauss, D., & Strauss, D. (2020). Getting to Know Visual Studio 2019. *Getting Started with Visual Studio 2019: Learning and Implementing New Features*, 1-60. URL: https://link.springer.com/chapter/10.1007/978-1-4842-5449-3_1. DOI: https://doi.org/10.1007/978-1-4842-5449-3_1

T Chirinos, D., Castro, R., Cun, J., Castro, J., Peñarrieta Bravo, S., Solis, L., & Geraud-Pouey, F. (2020). Los insecticidas y el control de plagas agrícolas: la magnitud de su uso en cultivos de algunas provincias de Ecuador. Ciencia y Tecnología Agropecuaria, 21(1), 84-99. URL: https://doi.org/10.21930/rcta.vol21_num1_art:1276.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Article **ECORFAN Journal-Mexico**
December 2023, Vol.14 No.31 8-18

Analysis of the productivity of the construction sector in terrestrial communication routes, of the Central region of the state of Tabasco

Análisis de la productividad del sector de la construcción en vías de comunicación terrestre, de la región Centro del estado de Tabasco

ELISEO-DANTÉS, Hortensia†*, LÓPEZ-VALDIVIESO, Leticia, PÉREZ-GARMENDIA, Gloria and MOREJÓN-SÁNCHEZ, Juana María

Tecnológico Nacional de México Campus Villahermosa, Mexico.
Tecnológico Nacional de México Campus Mérida, Mexico.

ID 1st Author: *Hortensia, Eliseo-Dantés* / **ORC ID:** 0000-0003-4006-4669, **Researcher ID Thomson:** F-6749-2018, **CVU CONAHCYT ID:** 411079

ID 1st Co-author: *Leticia, López-Valdivieso* / **ORC ID**: 0000-0001-6288-3636, **Researcher ID Thomson:** G-5753-2018, **CVU CONAHCYT ID:** 411079

ID 2nd Co-author: *Gloria, Pérez-Garmendia* / **ORC ID**: 0000-0002-1215-0175, **Researcher ID Thomson:** G-3863-2018, **CVU CONAHCYT ID:** 291627

ID 3rd Co-author: *Juana María, Morejón-Sánchez* / **ORC ID:** 0000-0002-9930-181X, **Researcher ID Thomson:** ABE-2879-2020, **CVU CONAHCYT ID:** 362413

DOI: 10.35429/EJM.2023.31.14.8.18 Received July 15, 2023; Accepted December 30, 2023

Abstract

The study of productivity in the different sectors of the industry is an advance for the development of the same, which allows being a notable factor in developed or developing countries in the current globalized world. For the above mentioned, the present research allows to know the effect of the construction sector and the subsector of terrestrial communication routes, as well as the importance in the accessibility to the different communities and how this helps to strengthen the different branches of the economy. The methodology applied for the research was structural analysis (MICMAC), which allowed a search and selection of factors that directly affect the subject of study. As a result, 15 determining factors for productivity in the sector of study were classified and the level of impact was determined with the help of experts from organizations related to the same sectors, thus creating a real and comprehensive scenario of the situation and giving way to the construction of a development model for the region.

Productivity, Structural analysis, Land roads

Resumen

El estudio de la productividad en los diferentes sectores de la industria es un avance para el desarrollo de la misma, lo que permite ser un factor notable en los países desarrollados o en desarrollo en el actual mundo globalizado. Por lo antedicho, la presente investigación permite conocer el efecto del sector de la construcción y el subsector de vías de Comunicación Terrestre, así como la importancia en la accesibilidad a las distintas comunidades y como esta ayuda a fortalecer a las diferentes ramas de la economía. La metodología aplicada para la investigación fue análisis estructural (MICMAC), la cual permitió una búsqueda y selección de factores que inciden directamente en el tema de estudio. Como resultado, se clasificaron 15 factores determinantes para la productividad en el sector de estudio y del mismo modo se determinó el nivel de impacto con la ayuda de los expertos de las organizaciones relacionadas a los mismos sectores, de ese modo, se creó un escenario real e integral de la situación y dio paso a la construcción de un modelo de desarrollo para la región.

Productividad, Análisis estructural, Vías terrestres

Citation: ELISEO-DANTÉS, Hortensia, LÓPEZ-VALDIVIESO, Leticia, PÉREZ-GARMENDIA, Gloria and MOREJÓN-SÁNCHEZ, Juana María. Analysis of the productivity of the construction sector in terrestrial communication routes, of the Central region of the state of Tabasco. ECORFAN Journal-Mexico. 2023. 14-31:8-18.

* Correspondence author: (E-mail: horteed@hotmail.com)
† Researcher contributing first author.

Introduction

Nowadays, we live in a time of technological development, structural transformations in organisations, modification of economic systems and opening of international markets, which generates competition not only at national but also at international level and consequently, every company has started to modernise processes, machinery, financial systems and train human resources, in order to increase its competitiveness and remain in the market.

In Mexico, as in any other part of the world, people possess skills and abilities with enormous potential to develop them, however, for various reasons they remain underutilised because there are no mechanisms to help them develop in an organised way (González, 2007). This is why it is essential for construction companies to restructure organisationally and achieve a competitive advantage in the construction market.

Despite the national economic downturn, which has affected the construction industry to a large extent, a large number of construction companies have managed to establish themselves in Tabasco. It is a fact that among these, some are more profitable than others, but most of them have a broad and urgent need to consolidate not only in the region, but also in the state and the country. In view of this, it is of great value to apply strategies that help these companies to achieve their medium and long-term objectives.

Methodology

Study design

The design and elaboration of the methodology was carried out through the use of two clearly differentiated but complementary tools: on the one hand, the Delphi Method, which aims to obtain a collective view of experts on a topic through repeated rounds of questions, where its use is truly effective when it comes to gathering information from a group that is considered as a unique set to analyse and solve a specific problem (Cabero and Infante, 2023), on the other hand, the Structural Analysis Method (MICMAC), which is a tool that allows identifying the key variables for the evolution of a complex system, be it an organisation, a sector, a market, a product or a territory, and the possible influences between them (Godet, 2000; Labrin, 2021).

The research has a mixed aspect, the qualitative part being the objective overview of the situation over the last few years of the sector by means of experts, proceeding to the analysis of variables and their corresponding factors, which show an accurate picture of the reality of the sector.

Likewise, this objective reality is complemented by the views of all the experts involved in the development of the sector, which allows the study to incorporate the added value of practical advice based on real experiences.

The interview has been the main methodological tool for the elaboration of this methodology, as it constitutes a qualitative research method in which, through a dynamic interaction between the interviewer and the interviewee, the latter expresses him/herself with total freedom, addressing the subject in question. At the same time, the interpretation of the data by means of statistics gives the quantitative sense to the research.

Application of the Delphi method

From the theoretical framework, it was determined that external factors affect the sector more than internal factors. It was therefore necessary to involve experts on the subject. The Delphi method was used to locate these experts.

Due to the research work carried out and the experience of more than 10 years working in construction companies in the state, we had a good reference of who the experts on the subject could be. Therefore, only two rounds or phases were necessary.

As a first phase, an interview was conducted with the government agencies involved in the construction sector, in the area of the Roads of Terrestrial Communication in the municipality of Centro, in the State of Tabasco.

The first approach was unstructured, without a predefined script, but rather the supposed experts were asked to establish which are the most important events and trends in the area under study.

References were also requested from these agencies as to which companies could be considered as experts on the topic in question.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Once these companies were located, they were asked to give us their general views on the research topic. As a result of this first phase, it was possible to find out which government agencies and companies were knowledgeable about the issue.

Instrument

In the second phase, a questionnaire was applied, which was elaborated with information from the theoretical and contextual framework, as well as the information resulting from the first phase of the Delphi Method.

The questionnaire is shown below:

Questionnaire on the occasion of the investigation of the topic: Analysis of the Productivity of the construction sector, Subsector Roads of Terrestrial Communication, in the municipality of the centre, of the State of Tabasco.		
Instructions: Your organisation has been chosen, as it is considered to know more about the topic in question, as well as a wide experience of it. The answers you provide will be used for teaching purposes only and in full confidentiality.		
1.-	How do you understand the term Productivity?	*R:*_____
2.-	Do you believe that a company certified in quality management has a competitive advantage? Why?	*R:*_____
3.-	Does your organisation work on implementing a culture of leadership and teamwork? Explain.	*R:*_____
4.-	In general terms, what proposals would you make for the reactivation of the sub-sector?	*R:*_____
5.-	Do you consider that the construction sector is of vital importance in the country's environment? Why?	*R:*_____
6.-	How do you consider the road system of our state, comparing it with other states of the Republic? Why?	*R:*_____
7.-	Do you consider that the projects generated in the state are in accordance with the existing climate and type of soil? Why?	*R:*_____
8.-	What work carried out in this sub-sector, do you think has given more benefits to the state?	*R:*_____
9.-	What project do you think would help to improve the road network in the central municipality and metropolitan area?	*R:*_____
10.-	How does it affect the fact that foreign companies are participating in works in the state?	*R:*_____

Table 1 Questionnaire for experts
Source: Own elaboration

Based on the answers obtained in the questionnaire of the second phase, it was possible to determine the experts who are suitable for the application of the Structural Approach, of which 4 agencies and 10 companies remained after the screening.

Procedure

The 14 experts were asked, with respect to their wide experience and knowledge, to name the factors that affect the Productivity of the Construction Sector, Subsector Roads of Terrestrial Communication, of the municipality of the Centre of the State of Tabasco. Using La Moda, one of the statistical tools of central tendency, the most representative factors were obtained.

The factors that emerged were the following:

N°	Factors
F1=	Implementation of new construction procedures
F2=	Training of personnel
F3=	Efficient site supervision
F4=	Feasibility study of projects
F5=	Climate of the region
F6=	Experience of construction companies
F7=	Limited financial support to companies
F8=	Impact of the economic crisis
F9=	Allocation of works to foreign companies
F10=	Reduction in public spending
F11=	Unfair competition
F12=	Irregularity in payment periods by agencies
F13=	Regulation of trade unions
F14=	Teamwork within and outside companies
F15=	Public works planning, programming and budgeting

Table 2 Factors determined by experts
Source: Own elaboration

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

The scheme for identifying the relationship between the factors consists of a double-entry matrix, in which the factors appear in both columns and rows, so that the influence of each factor on the others can be established in each of the crossing cells.

Once the above-mentioned scheme was available, the experts were asked to indicate how each of the factors directly influences the others, whether actual or potential, or whether the influence is null. At this point, the mean, another statistical tool of central tendency, was used to establish, according to all the experts' criteria, which factor did or did not influence the other factors.

After reaching a consensus on the type of influence between the factors, the results were converted into a binary system in which the number 1 was assigned to those factors that have a direct influence, either actual or potential, and 0 to those factors where the influence is null.

When the interdependence between the factors had been analysed, the sum of the rows and columns was calculated.

The sum of the rows indicates the number of factors on which the analysed factor influences and is called the degree of motoricity, which can also be represented as a percentage according to the proportion that its motoricity represents in function of the sum of the motoricity of all the factors, the degree of motoricity expressed as a percentage is called the motoricity index.

In the same way that the sum of the rows was analysed, we proceeded to analyse the sum of the columns, these indicate the degree of dependence that a factor has, that is to say, it indicates how many factors influence it; the degree of dependence expressed as a percentage represents the Dependence Index.

This allowed us to generate the interrelation of factors, obtaining the following Motricity and Dependence Matrix as shown in table 3 and table 4 of Motricity and Dependence Values.

Factor	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	Total Motricity
F1	-	1	1	1	1	1	0	1	0	1	0	0	0	0	0	7
F2	1	-	1	1	1	1	0	0	1	0	0	0	0	1	1	8
F3	1	1	-	0	1	1	0	0	1	0	0	0	1	1	1	8
F4	1	0	0	-	1	1	1	1	1	1	0	0	0	0	1	8
F5	1	0	1	1	-	1	0	1	0	0	0	0	0	0	1	6
F6	1	1	1	0	1	-	0	0	1	0	1	0	1	1	1	9
F7	1	1	0	0	0	0	-	1	1	0	0	1	0	0	0	5
F8	1	1	1	0	0	0	1	-	0	1	0	1	0	0	0	6
F9	0	0	0	0	0	0	0	1	-	0	1	0	0	0	0	2
F10	1	0	0	1	0	0	1	1	0	-	0	1	0	0	0	5
F11	0	0	1	0	0	0	0	1	1	0	-	0	0	1	0	4
F12	0	1	1	0	0	0	1	1	0	0	1	-	0	0	1	6
F13	0	0	1	0	0	0	0	1	0	0	0	0	-	1	1	4
F14	1	1	1	0	0	0	0	0	0	0	1	0	1	-	0	5
F15	1	0	1	1	1	1	0	0	0	0	0	0	0	1	-	6
Dependencia total	10	7	10	5	6	6	4	9	6	3	4	3	3	6	7	89

Table 3 *Motricity and dependency matrix*
Source: Own elaboration

Factor	Description	Motor values	%	Dependency values	%
F1	Implementation of new construction procedures	7	7.87%	10	11.24%
F2	Training of personnel	8	8.99%	7	7.87%
F3	Efficient site supervision	8	8.99%	10	11.24%
F4	Feasibility study of projects	8	8.99%	5	5.62%
F5	Climate of the region	6	6.74%	6	6.74%
F6	Experience of construction companies	9	10.11%	6	6.74%
F7	Limited financial support to companies	5	5.62%	4	4.49%
F8	Impact of the economic crisis	6	6.74%	9	10.11%
F9	Allocation of works to foreign companies	2	2.25%	6	6.74%
F10	Reduction in public spending	5	5.62%	3	3.37%
F11	Unfair competition	4	4.49%	4	4.49%
F12	Irregularity in payment periods by agencies	6	6.74%	3	3.37%
F13	Regulation of trade unions	4	4.49%	3	3.37%
F14	Teamwork within and outside companies	5	5.62%	6	6.74%
F15	Public works planning, programming and budgeting	6	6.74%	7	7.87%
	TOTAL	89	100%	89	100%

Table 4 Motor and dependency values
Source: Own elaboration

Results

The sums of the 1(one) per column can be seen in table 3, and these values represent the number of times each factor is influenced by the others, i.e., the number of times each factor depends on the others. So, for example: "staff training" is influenced by 7(seven) factors which equals 8%.

"Efficient site supervision" (F3) is influenced by 10 (ten) factors, i.e., 11%. And so on for each of the factors. For this reason, these values are called dependency indexes, because they indicate the degree or percentage of subordination of each factor with respect to the others.

For example: "Experience of the construction companies" (F6) is the factor with the highest degree of motoricity, having a value of 9 (nine), corresponding to a percentage of 10%.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Table 4 determines the quadrants in which the values of the table will be located, the procedure is the following, 100/n, where n = number of factors; applying this expression to our data we have 100/15 = 6.67, therefore, in figure 1, we show how the quadrants are located in which the factors that affect the sector will be located, specifying those of greater importance for the same.

In the power zone are the factors that have the highest mobility and the lowest dependence.

In the conflict zone (also called the work zone), there are factors with high mobility and high dependence. These factors are very influential, but also highly vulnerable. They influence the others but are also influenced by them. For this reason, they are in conflict. They are important, because any variation in them will have effects on the output zone and on themselves.

In the output zone are all those that are a product of the previous ones with low motility and high dependence.

The zone of autonomous powers is characterised by factors with low motility and low dependence, so it does not significantly affect any movement they have.

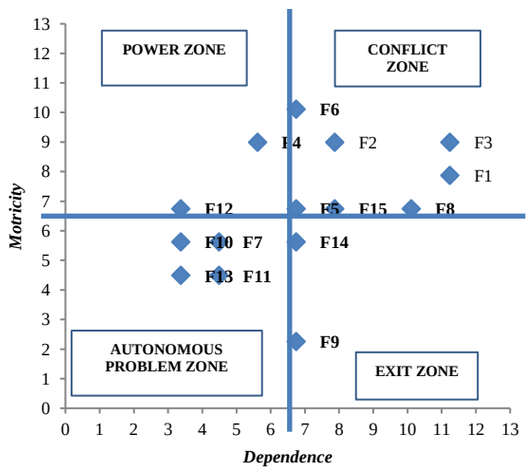


Figure 1 Cartesian plane of motricity and dependence
Source: Own elaboration

As a conclusion of the integral analysis, the factors found in each zone can be observed, which provided the tools to diagnose the problem and design the model, shown in figure 2.

Power zone	
F4 =	Feasibility study of projects
F12 =	Irregularity in payment periods by agencies

Table 5 Factors in the power zone
Source: Own elaboration

Autonomous problem area	
F7 =	Limited financial support for business
F10 =	Reduced public spending
F11 =	Unfair competition
F13 =	Regulation of trade unions

Table 6 Factors in the autonomous problem area
Source: Own elaboration

Conflict zone	
F1 =	Implementation of new construction procedures
F2 =	Training of personnel
F3 =	Efficient site supervision
F5 =	Climate of the region
F6 =	Experience of construction companies
F8 =	Impact of the economic crisis
F15 =	Public works planning, programming and budgeting

Table 7 Factors in the conflict zone
Source: Own elaboration

Exit zone	
F9 =	Assignment of works to foreign companies
F14 =	Teamwork within and outside companies

Table 8 Factors in the exit zone
Source: Own elaboration

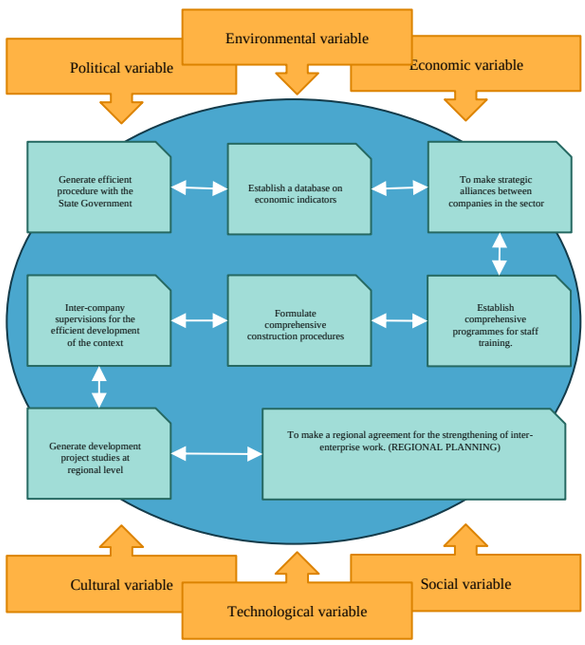


Figure 2 Development proposal
Source: Own elaboration

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Conclusions

In view of the results obtained, the following are determining aspects for productivity in the sector under study:

- Implementation of new construction procedures. The construction industry in general, but mainly in the area of roadways, is lagging behind with respect to: the technological level reached in other sectors of the industry; the technological level reached in research both in construction products and construction techniques, as well as; the level of development of construction in other countries. Several factors influence the slow adoption of new technological advances in our environment. Among these factors are: construction companies are highly conservative and risk-averse; to date they have not found the need to improve their processes since the profitability they have obtained has satisfied them; their competitors are also highly conservative. These factors generate a certain inertia in the construction industry towards change and modernisation. Thus, few companies see technological innovations as powerful opportunities to generate business. However, circumstances are changing substantially due to a number of factors, including increasing domestic and foreign competition. If this situation continues, Mexican construction companies will slowly lose competitiveness, until they disappear in the face of more aggressive local or foreign companies.

- Training of personnel. In this area, the right of all employees to be trained is considered unavoidable and we believe that, as long as they do so, the company will improve its productivity to the same extent, so this position should be considered indispensable and should be considered in accordance with the policies of each company.

Training in the construction industry should be targeted at all levels of organisations, but its seasonality, dispersion and constant rotation make it very difficult.

There are many reasons why an organisation should train its staff, but one of the most important is the current context. By this we mean that we live in a highly changeable context. In this circumstance, behaviour changes and we are constantly confronted with situations of adjustment, adaptation, transformation and development, which is why we must always be up to date. Therefore, companies are forced to find and implement mechanisms that guarantee successful results in this dynamic environment. No organisation can remain as it is, nor can its most valuable resource (its personnel) be left behind, and one of the most efficient ways to prevent this from happening is to provide permanent training.

- People are essential to organisations and now more than ever, their strategic importance is growing, as all organisations compete through their people. The success of an organisation increasingly depends on the knowledge, skills and abilities of its workers. When the talent of employees is valuable, rare and difficult to imitate and above all organised, a company can achieve competitive advantages that rely on people.

- This is why the fundamental reason why training employees is about giving them the knowledge, attitudes and skills they need to achieve optimal performance. Because organisations in general must provide the basis for their employees to have the necessary and specialised preparation that will allow them to face their daily tasks in the best conditions. And for this there is no better way than training, which also helps to achieve high levels of motivation, productivity, integration, commitment and solidarity among the organisation's staff.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

- Efficient site supervision. Site supervision can be a determining factor in both the success and failure of a project. A large number of structural and service problems in construction are not attributable to design or material deficiencies, but mainly to poor supervision. The professional who performs the job of site supervisor is confronted not only with problems of a technical nature, but also with conflicts generated by human interaction. In addition to the competencies needed to deal with technical and human problems, the supervisor must have a set of positive values and attitudes for the proper performance of his or her work. In order to achieve their objectives, supervisors must make proper use of the means of communication available to them, especially the site logbook.

Supervision will be able to fulfil each of its responsibilities as long as it has the support of the company's management, which will be responsible for ensuring that the general operating conditions are in place. To give some examples: if the construction company does not have a safety policy on site and does not provide the necessary resources, the supervisor will be unable to carry out an efficient job in this area; or if materials are not purchased at the right time and arrive late on site, it will be difficult for the supervisor to comply with the execution programmes.

- Project feasibility study. Projects are often carried out without taking into account the feasibility of the project, as there is no analysis of the need for the project, including supply and demand analysis and determination of the relative priority of the project in the sectoral programme or national/regional economic development of the country.

In addition, a project should consider aspects such as:

1. Study and comparison of potentially viable alternatives.

2. Project design (purpose, scope, location, etc.).

3. Analysis of technical feasibility, taking into account natural and site conditions, availability of materials and labour, and possible construction methods.

4. Estimated cost for the project.

5. Implementation schedule and maintenance scheme.

6. Analysis of the technical and financial capacity of the institutions involved in the project.

7. Evaluation of the technical validity, economic and financial feasibility of the executing company.

8. Assessment of the environmental and social impact.

9. Possible risks of the project, and recommendations and procedures necessary for the implementation of the project.

- Climate of the region. This is a factor that has an important effect on road construction, as the region has very rainy days during several months of the year, which causes delays in the works, as most of the roads are asphalt-based, and this material cannot be worked with humidity.

The prevailing water table also causes delays in the works and deterioration of the same; even having to implement new construction processes to lower the water table. This is especially true when working on earthworks.

Heat is another point to consider, as high temperatures can cause heatstroke among personnel. This is because work is always carried out in the open. This means that the productive hours of field personnel are reduced.

- Experience of construction companies. Due to the many factors that can be found in this sector, the experience of the construction companies is very important. This applies to all areas, from the profile of staff recruitment, tendering, execution and control of work, finances, alliances with other companies, facing local and foreign competition.

This results in the delivery of works on time, on cost and on quality.

- An experienced company knows that its staff is a very important part of the company, so it seeks their development by encouraging continuous personal and professional learning, while recognising their skills.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

- Lack of financial support for companies. One of the problems faced by companies in the sector is precisely financial, due to the reduction in bank credit and loans, lack of liquidity of the companies, financing the start-up of the work, etc.

- Small companies in the sector do not have the capacity to compete with companies that belong to large groups and that can invest their assets in other activities (energy sector), thus diversifying their product, improving their negotiation capacity, opening up to internationalisation processes, etc.

- At present, companies consider that financing possibilities and investment are the two key elements to ensure growth.

- Impact of the economic crisis. Construction is the engine of the economy and the real "locomotive" that pulls the other economic sectors along. When it stops, there is a real recession in employment and activity.

- The government must understand, and I am sure it already knows, that without construction there is no life, that investments in infrastructures are decisive and key to the economic and social growth of any territory, and that the construction of land communication routes responds to a social demand and, above all, increases the quality of life of citizens.

- The banks bear part of the responsibility for the situation we are experiencing today, together with the voracity of the different public administrations to collect taxes and bleed companies economically, taking away their liquidity to undertake new projects and invest.

- Investment in infrastructures, such as roads, has been historically proven, not only here, but in any part of the world, to be the basis for strengthening the economic system and a sure way out of any crisis. Furthermore, it generates economic activity not only directly in construction, but also indirectly and above all in the creation of employment in other productive sectors, which leads to the generation of income that would allow for the satisfactory maintenance of fundamental services in any society.

- Allocation of works to foreign companies. Although there are few foreign companies competing in the same sector, offering the same type of product/service, they have gradually been gaining ground, especially in works involving a high contract value.

- The degree of rivalry between these companies and the local ones will increase as the number of foreign companies increases, as they are companies with a large infrastructure and production capacity.

- In addition, these companies do not know the environment, such as the climate, the culture of the workers, the types of soil in the region, etc., which puts the execution of the works at risk; this is already being seen in the "Libramiento de Villahermosa" project, assigned to a Spanish company and which to date is considerably behind schedule.

- Reduction in public spending. The cutback in investment plans undertaken by the public sector to comply with deficit reduction has had a substantial impact on the road construction sector. Budget cuts should never be made in the investment chapter; there are other items that could be reduced or eliminated, and their absence would not even be noticeable. And we are referring to so many superfluous expenditures that we see in administrations at all levels of government.

Road construction has been a sector that has not only been left without investment, but also without air, and has been left without breath by the banks and the public administration, both federal, state and municipal.

- Unfair competition. The awarding, in some cases, of works to the lowest proposal, without it necessarily having been solvent, based on a deficient evaluation of the technical proposals. This promotes unfair competition, as companies lower their prices exaggeratedly in order to be awarded the works.

This weakens the profitability argument in terms of costs, regardless of the effect on the quality of the product and the quality of the service, a situation that does not contribute to the client's interest in achieving the best quality construction, in the shortest time and at the best price.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Another situation that is killing the patience of many businessmen and entrepreneurs is the unfair competition from a multitude of public companies that distort the local market. Entities that often operate in the heat of a political and family clientelism that is unacceptable at a time when the survival of many private companies hangs in the balance.

- Irregularity in payment periods by agencies. The administrative practices of public entities for the payment and amount of advance payments, estimates, cost and scope reviews and financial costs mean that builders largely assume the financial and project risks without compensation.

In addition, we have increasingly delinquent public administrations, which not only allow themselves to be late in making payments, but also use all kinds of tricks to either not accept the works or not recognise the debt.

Government debts to construction companies, which in some cases are several months in arrears, sometimes make it impossible for companies to pay their workers and suppliers. In many cases, the situation of small and medium-sized local construction companies in this sector is desperate and dramatic.

- Trade union regulation. The road construction industry is currently living with a situation of overflow, extortion and delinquency on the part of trade unions and pseudo-unions. They operate with impunity to extort money not only from new construction sites, but also to demand quotas of up to 5% of the workers' wages.

The construction industry is a driving force in the country and has led to crime seeing illicit activities in it. Nowadays, there are fronts of unemployed people everywhere and they demand the list of building permits from the municipalities, and before the construction starts they are already looking for the entrepreneurs.

- Teamwork inside and outside the companies. Teamwork is one of the psychological working conditions that has the most positive influence on workers, because it allows for companionship. It can have very good results, as it usually generates enthusiasm and produces satisfaction in the tasks recommended.

The strength that integrates the group and its cohesion is expressed in the solidarity and the sense of belonging to the group that its components manifest. The more cohesion there is, the more likely the group is to share common values, attitudes and norms of behaviour.

Working in a team is beneficial not only for one person but for the whole team involved. It will bring us more satisfaction and make us more sociable, it will also teach us to respect each other's ideas and to help colleagues if they need our help.

In recent years, globalisation and the increasing involvement of multinational companies in infrastructure development have forced the country's companies to take drastic and innovative actions to survive and improve their competitiveness. It is foreseeable that the construction sector will see mergers between companies or large investments with the main objective of acquiring a considerable size and sufficient resources to continue to position themselves as industry leaders and to deliver higher quality products and/or services.

Companies have as an option to generate income, grow and position themselves in the market, the formation of consortiums, strategic alliances, mergers or even new companies to meet the demand for infrastructure that the country requires.

- Planning, programming and budgeting of public works. This is an important part in which government agencies often give little importance, resulting in works that do not work properly, do not meet expectations, or the budget is insufficient.

Conclusions and recommendations

The construction sector, specifically in land communication roads, in the region of Centro, Tabasco, is an area with many needs and red spots that must be urgently addressed, since productivity in this sector is of vital importance for the growth of the state and the nation, and hundreds of populations depend on this sector.

Some very important points to be taken into account by the agencies are the following:

1. Obtain the authorisation document of the resource to carry out the work.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

2. Drawing up the Executive Project. In addition to the design, this includes the definition of standards, specifications and applicable technologies.

3. If necessary, obtain permits if the work affects rights of way and/or requires crossings of state or federal highways, railroad tracks or railroad tracks.

4. Prepare the environmental impact study and obtain authorisation from the corresponding regulatory agency.

5. If applicable, obtain a municipal building permit.

6. Obtain the feasibility of municipal services: water, drainage, etc., if applicable.

7. Obtain the feasibility and/or validation from the corresponding regulatory agency, if the type of work requires it.

8. To have the economic resources destined to cover the expenses derived from the actions of planning, project elaboration, execution, supervision and quality control of the work.

9. To draw up the tender conditions.

10. To program and schedule the events required for the awarding of the works contract when it is by tender.

11. Programming and scheduling the execution of the work.

12. Validate the execution and supervision contracts.

13. Coordinate with the financial area the payment of work estimates and/or settlement.

References

Alonso Velasco, I. y Velázquez Torres, D. (2019). El contexto geopolítico de la explotación forestal en la Península de Yucatán, México. Perspectiva Geográfica, 24(1), 116-137. https://doi.org/10.19053/01233769.8427

Carpio-Silva, J. (2021). Vías de comunicación en el estado soberano de Bolívar durante el liberalismo radical 1860-1880. [Tesis para optar el Título Profesional de Historiador, Universidad de Cartagena]. Universidad de Cartagena. https://repositorio.unicartagena.edu.co/handle/11227/13499

DGST/SCT. (2020). Datos viales por estado de 2019, de las estaciones permanentes de conteo de vehículos. Dirección General de Servicios Técnicos de la SCT. Disponible en: http://www.sct.gob.mx/carreteras/direccion-general-de-servicios-tecnicos/datos-viales/2019/ (Consultado el 25 de noviembre 2020.)

González, J. (2007). La reestructura organizacional como ventaja competitiva para una empresa constructora enfocada en la rama de movimientos de tierra y urbanizaciones. [Tesis para optar el Título Profesional de Licenciado en administración de empresas, Atlantic International University]. https://www.aiu.edu/applications/documentlibrarymanager/upload/la%20reestructura%20organizacional%20como%20ventaja%20competitiva%20para%20una%20empresa%20constructora%20enfocada%20en%20la%20rama%20de%20movimientos%20de%20tierra%20y%20urbanizaciones.pdf

IMT. (2020). Red nacional de caminos. Archivo vectorial. Instituto Mexicano del Transporte: México. Disponible en: http://189.254.204.50:83/# (Consultado el 25 de noviembre de 2020.)

Infante, A. y Cabero, J. (2014). Empleo del método delphi y su empleo en la investigación. *EDUTEC, Revista Electrónica de Tecnología Educativa*. 48. 1-16.

Labrin-Mesia, J. A. (2021). Análisis estructural para la caracterización de variables clave del mercado peruano de crossfit [Tesis para optar el Título Profesional de Ingeniero Industrial, Universidad de Lima]. Repositorio institucional de la Universidad de Lima. https://hdl.handle.net/20.500.12724/13732

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Palomino, E. (2019). Caracterización de las Vías de Comunicación Terrestre de las Provincias Que Integran el Vraem en la Contribución del Desarrollo Económico de la Región Junín. [Tesis para optar el Título Profesional de Maestro en ciencias militares con mención en Planeamiento Estratégico y Toma de Decisiones, Escuela Superior de Guerra del Ejército]. Repositorio Escuela Superior de Guerra del Ejército. http://repositorio.esge.edu.pe/handle/20.500.14141/228

Pilares, E. (2021). Rutas de comunicación marítima y terrestre en los reinos hispánicos durante la Baja Edad Media. Movilidad, conectividad y gobernanza. Espacio, Tiempo y Forma: Historia Medieval, Serie III; Madrid (34), 1007-1011. DOI:10.5944/etfiii.34.2021.30031

Soto, R., Muñoz, J. y Cáceres, Y. (2021). Impacto social y económico del Corredor Vial Cañete – Perú. Dataismo, 1(3), 40–52. https://doi.org/10.53673/data.v1i3.15.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Article **ECORFAN Journal-Mexico**
December 2023, Vol.14 No.31 19-23

Impact of creativity and innovation in the subdirectorate of planning and liaison of a higher education institution in the State of Veracruz, Mexico

Impacto de la creatividad y la innovación en la subdirección de planeación y vinculación de una institución de educación superior en el Estado de Veracruz, México

BALDERRABANO-BRIONES, Jazmín†* & UTRERA-VELEZ, Youssef

Tecnológico Nacional de México, Campus Úrsulo Galván, Mexico.

ID 1st Author: *Jazmín, Balderrabano-Briones* / **ORC ID:** 0000-0002-2925-3234, **Researcher ID Thomson:** G-3202-2018, **arXiv ID Author:** babj841127fz1, **Open ID:** 104130704661358144909, **CVU CONAHCYT ID:** 453555

ID 1st Co-author: *Youssef, Utrera-Velez* / **ORC ID:** 0000-0001-6189-8238, **Researcher ID Thomson:** JAO-1053-2023, **arXiv ID Author:** UEVY780502U68, **CVU CONAHCYT ID:** 436695

DOI: 10.35429/EJM.2023.31.14.19.23 Received July 25, 2023; Accepted December 30, 2023

Abstract

The Impact of Creativity and Innovation in the Planning and Linkage Subdirectorate of a Higher Education Institution in the State of Veracruz, Mexico, has as its main purpose to collect information regarding the area of Creativity and Innovation, studying its impact to prepare a proposal of a development model. Through three instruments that measure the Creativity and Innovation of the different departments that make up the Planning and Liaison Subdirectorate, we can assess analysis, open-mindedness, communication, empathy to mention some of the skills that can be rediscovered or come to light with the support of this series of questions that are posed exclusively for the well-being of the Institution. The objective of the research is to provide the Institution with the information resulting from the diagnosis, which allows addressing each of the indicators, receiving feedback from the five departments that make up the Planning and Liaison Subdirectorate. Contributing to continuous improvement, through the planning of strategies that contribute to the fulfillment of the organization's objectives.

Innovation, Linkage, Institution

Resumen

El Impacto de la Creatividad y la Innovación en la Subdirección de Planeación y Vinculación de una Institución de Educación Superior en el Estado de Veracruz, México, tiene como propósito principal recopilar información referente al ámbito de Creatividad e Innovación, estudiando su impacto para elaborar una propuesta de un modelo de desarrollo. Por medio de tres instrumentos que miden la Creatividad y la Innovación de los diferentes departamentos que conforman la Subdirección de Planeación y Vinculación, podemos valuar el análisis, apertura mental, comunicación, empatía por mencionar algunas de las habilidades que pueden redescubrirse o salir a la luz con el apoyo de esta serie de preguntas que son planteadas exclusivamente para el bienestar de la Institución. El objetivo de la investigación es otorgar a la Institución la información resultado del diagnóstico, que permita abordar cada uno de los indicadores, recibiendo retroalimentación de los cinco departamentos que conforman la Subdirección de Planeación y Vinculación. Contribuyendo a la mejora continua, a través de la planificación de estrategias que contribuyan al cumplimiento de los objetivos de la organización.

Innovación, Vinculación, Institución

Citation: BALDERRABANO-BRIONES, Jazmín & UTRERA-VELEZ, Youssef. Impact of creativity and innovation in the subdirectorate of planning and liaison of a higher education institution in the State of Veracruz, Mexico. ECORFAN Journal-Mexico. 2023. 14-31:19-23.

* Correspondence to Author (E-mail: jazmin.bb@ugalvan.tecnm.mx)
† Researcher contributing first author.

Introduction

Nowadays, innovation and creativity contribute to boost companies, not only economically, but also commercially, in the consolidation of their brands, products, goods and/or services, and the incursion into new markets. We can confirm that innovation and creativity strengthen business success, leading them to reduce costs, sustain a high level of satisfaction among their customers and help them to seduce new customers and stand out from the competition.

The Higher Education Institution on which this study is based, is an Institution that has a Quality Management System, which allows it to have a competitive advantage since it is very important to provide a quality service in the educational sector, satisfying the needs of our customers, the students.

The evaluation instruments (questionnaires) applied, ranging from the general to the particular, were answered by the heads of the departments that make up the ITUG's organisational structure: the five departments that make up the Sub-Directorate of Planning and Liaison: Department of Planning, Programming and Budgeting, Information Centre, Technology Management and Liaison, School Services and Extracurricular Activities.

The objective is to analyse the impact of creativity and innovation in the top management of the ITUG's Sub-Directorate of Planning and Liaison, through the application of questionnaires, which will allow the creation of a development model.

The results of the Planning and Liaison Sub-Directorate with respect to the three questionnaires applied and the tabulation of the data obtained with a range of 51 - 70%, with a rating of 65.07 - 72% which represents a level of innovation and creativity of “good” to “very good”.

Methodology to be developed

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

1. Documentary research.
2. Collection of information.
3. Elaboration of the three valuation instruments.
4. Application of the three instruments
5. Tabulation and integration of the information
6. Proposal for the development of creativity and innovation.

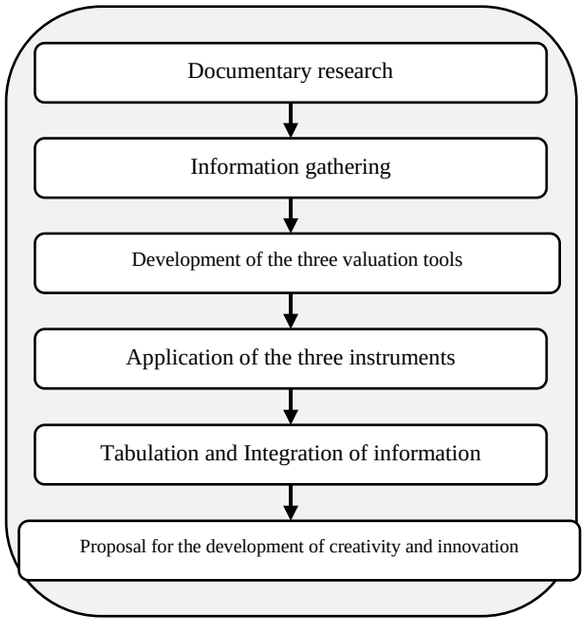


Figure 1 Methodology for research
Source: Own elaboration, (2023)

Instrument to be used

The purpose of the questionnaires used for this research is to obtain information regarding the activities and functions of each department, and at the same time to be useful as a self-diagnosis, focusing on the participation of intellectual capital (collaborators).

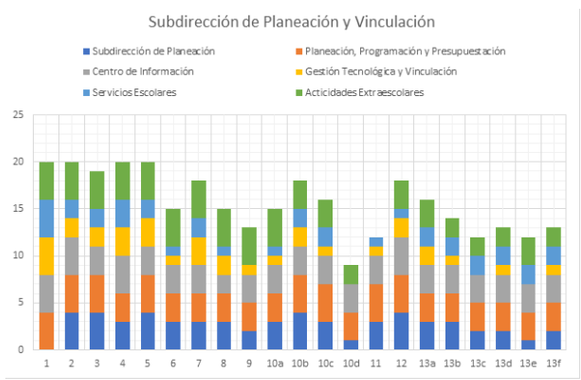
The study was done based on an instrumental approach, Majaro (1994), where three assessment instruments were taken, consisting of a series of questions with different aspects of the level of creativity that exists in the different areas of the organisation. The questions were worded in such a way that “yes” or “no” are the obvious answers. However, for better analysis five answers were taken for each question: No, Very rarely, Sometimes, Often, Yes.

Based on the research carried out in the different departments of the Subdirección de Planeación y Vinculación, we proceeded to tabulate the information to have a specific result of the data about creativity and innovation in the corresponding area.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Planning and Liaison Sub-Directorate							
		Planning Sub-Directorate	Planning, Programming and Budgeting	Information centre	Technology Management and Liaison	School Services	Extracurricular Activities
1	Does your institution's <<mission statement>> mention the words <<creativity>> or <<innovation>> or both, as part of the institution's culture or <<ethos>>?	0	4	4	4	4	4
2	Is top management involved and strongly interested in activities related to idea generation?	4	4	4	2	2	4
3	Is there a supportive climate in the institution for idea-generating processes?	4	4	3	2	2	4
4	Can employees approach members of senior management with new ideas and get them to listen carefully?	3	3	4	3	3	4
5	Do staff talk about <<creativity>>, <<ideas>> and <<innovation>>?	4	4	3	3	2	4
6	Do staff know where to present their ideas?	3	3	3	1	1	4
7	Does the institution conduct regular training programmes or idea-generating exercises in order to stimulate a general climate in the institution that is conducive to creativity?	3	3	3	3	2	4
8	Does the institution conduct regular training programmes or brainstorming exercises in order to solve problems and/or identify opportunities?	3	3	2	2	1	4
9	Is there a communication system to <<sell>>internally the top management's approach to creativity and innovation?	2	3	3	1	0	4
10*	Does the institution actively encourage communication and the channelling of ideas between: § The different hierarchical levels of the institution?	3	3	3	1	1	4
10b	§ The different functions or posts.	4	4	3	2	2	3
10c	§ The different operational units	3	4	3	1	2	3
10d	The different national markets	1	3	3	0	0	2
11	Is there a system in place in the institution to screen and evaluate ideas, or only ad hoc approaches?	3	4	3	1	1	0
12	Do senior management consider the number of innovations made to be satisfactory?	4	4	4	2	1	3
13*	In general terms, is the level of creativity in the following functional areas satisfactory? § Department of Extracurricular Activities (Communication and Dissemination)	3	3	3	2	2	3
13b	§ Academic departments	3	3	3	1	2	2
13c	§ Human Resources Department	2	3	3	0	2	2
13d	§ Division of Professional Studies	2	3	3	1	2	2
13e	§ Financial Resources Department	1	3	3	0	2	3
13f	§ Department of Material Resources and Services	2	3	3	1	2	2
TOTAL		57	71	66	33	36	65

Table 1 Instruments of innovation and creativity at high levels of management (Subdirección de Planeación y Vinculación) at high levels
Source (Perception of the departments that make up the SPyV)



Graphic 1 Graph of innovation and creativity instruments in the sub-directorate of planning and liaison
Source: Results obtained in the first evaluation instrument

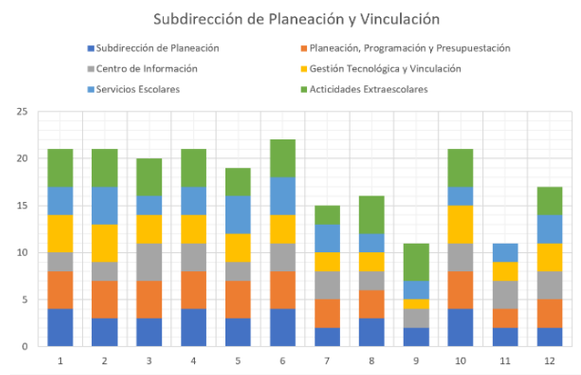
Table 1 shows that the results obtained at the managerial level are 57, 71, 66, 33, 63 and 65: Rating obtained = (57 + 71 + 66 + 33 + 63 + 65) / (84*6) = 328 / 504x100 = 65.07 % This rating is in the range of 51-70 %. This rating represents a level of creativity from “good” to “very good”, but this rating should not be taken as an invitation to complacency.

There is room for improvement and efforts to increase creativity levels will always be valuable. Levels are already developing, but further efforts are still needed.

The comparative audit is as follows:

Planning and Liaison Sub-Directorate							
		Planning Sub-Directorate	Planning, Programming and Budgeting	Information centre	Technology Management and Liaison	School Services	Extracurricular Activities
1	Is there a general climate of support for idea generation processes in the department or operational area?	4	4	2	4	3	4
2	Do the management levels of the department show a strong interest in idea generation, or do they <<sit back>> and wait for other areas to generate ideas?	3	4	2	4	4	4
3	Do the department's objectives mention the words <<creativity>> or <<innovation>> or both?	3	4	4	3	2	4
4	Do department staff talk about <<creativity>>, <<ideas>> and <<innovation>>?	4	4	3	3	3	4
5	Is it easy to approach management levels in the department? Are they receptive to ideas?	3	4	2	3	4	3
6	Do department staff know how and to whom to submit their ideas?	4	4	3	3	4	4
7	Does the department run training programmes or use idea generation exercises to stimulate creativity?	2	3	3	2	3	2
8	Does the department conduct training programmes or use brainstorming exercises to solve problems and/or to identify opportunities?	3	3	2	2	2	4
9	Does the department have a system in place to <<sell>> internally the concepts of <<creativity>> and <<innovation>>?	2	0	2	1	2	4
10	Does the department make efforts to communicate and implement cross-fertilisation processes with other departments, units, etc.?	4	4	3	4	2	4
11	Is there a system in place in the department to screen and evaluate ideas?	2	2	3	2	2	0
12	Is the number of innovations produced in the department considered satisfactory?	2	3	3	3	3	3
TOTAL		36	39	32	34	34	40

Table 2 Instruments of innovation and creativity at senior management level (Subdirección de Planeación y Vinculación) in operational areas
Source: Perception of the departments that make up the SPyV with respect to the operational areas



Graphic 2 Graph of Innovation and creativity instruments at top management level
Source: Results obtained in the second evaluation instrument

The audit of "Graph 2" gives a quick comparative overview of the existing quality level in each department. You could simply compare the “gross” rating or use more elaborate percentage calculations following the evaluation method explained in the previous audit.

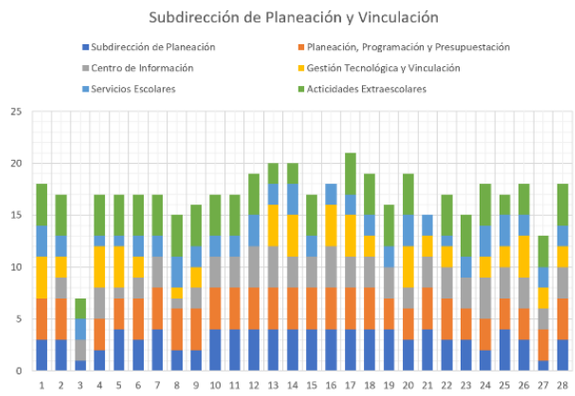
ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

(In this case, the maximum score is 48 points.) In both cases, the audit tells you which areas of the organisation could benefit most from an increase in quality.

The specific quality aspects specific to each operational area are analysed in the following "audits of the operational areas".

Planning and liaison sub-directorate							
		Planning Sub-Directorate	Planning Programming and Budgeting	Information centre	Technology Management and Liaison	School Services	Extracurricular Activities
1	Does your institution's <<mission statement>> mention the words <<creativity>> or <<innovation>> or both, as part of the institution's culture or <<ethos>>?	3	4	0	4	3	4
2	Is the top management involved and strongly interested in activities related to idea generation?	3	4	2	2	2	4
3	Is there a supportive climate for idea generation processes in the institution?	1	0	2	0	2	2
4	Are employees able to approach members of senior management with new ideas and get them to listen carefully?	2	3	3	4	1	4
5	Does the institution's staff talk about <<creativity >>, <<ideas>>> and <<innovation>>?	4	3	1	4	1	4
6	Do staff know where to present their ideas?	3	4	2	2	2	4
7	Does the institution conduct regular training programmes or idea-generating exercises in order to stimulate a general climate in the institution that is conducive to creativity?	4	4	3	0	2	4
8	Does the institution conduct regular training programmes or brainstorming exercises in order to solve problems and/or identify opportunities?	2	4	1	1	3	4
9	Is there a communication system in place to <<sell>> internally the top management approach to creativity and innovation?	2	4	2	2	2	4
10	Does the institution actively stimulate communication and the flow of ideas between and among staff?	4	4	3	0	2	4
11	Has the cost-benefit ratio of promotional campaigns been improved in recent years?	4	4	3	0	2	4
12	Has the Institution developed its own promotional ideas, or does it always rely on external agencies for creative thinking processes?	4	4	4	0	3	4
13	Has the institution regularly experimented with new ideas for communication activities (e.g. new technologies)?	4	4	4	4	2	2
14	Does the management of your department actually identify and evaluate good ideas that are used in your markets or in other markets?	4	4	3	4	3	2
15	Has the Institution been able to improve the quality and/or reduce the costs of its logistical structure during the last years?	4	4	3	0	2	4
16	Has the Institution evaluated the use of alternative channels in order to increase consumer and client satisfaction levels?	4	4	4	4	2	0
17	Has the Institution been able to increase the loyalty levels of its intermediaries and improve customer service over the last few years?	4	4	3	4	2	4
18	Do the staff in your department involve other members of the Institution in the idea generation or strategic planning processes?	4	4	3	2	2	4
19	Compared to your main competitor, is the institution's outreach creative enough?	4	3	3	0	2	4
20	Are the staff in your department sufficiently creative?	3	3	2	4	3	4
21	Is there a procedure in place to utilise cross-office cross-fertilisation of ideas within your department?	4	4	3	2	2	0
22	Are staff members in your department involved in brainstorming activities to find answers to problems that exist in other departments?	3	4	3	2	1	4
23	Does your department take care to determine what your "star performers" do differently from other staff?	3	3	3	0	2	4
24	Are staff in your department sufficiently encouraged to submit ideas for evaluation?	2	3	4	2	3	4
25	Has the department been able to increase the ratio of time spent in media contacts in recent years?	4	3	3	2	3	2
26	Has the institution been creative in the way it monitors its various departmental activities (e.g. effectiveness of communication, efficiency of publicity and promotion, etc.)?	3	3	3	4	2	3
27	Does the Institution react quickly to threats from its competitors?	1	3	2	2	2	3
28	Can the institution respond quickly to market opportunities?	3	4	3	2	2	4
TOTAL		90	99	75	57	60	94

Table 3 Instruments of innovation and creativity in the top management of the sub-directorate for planning and liaison
Source: Perception of the departments that make up the SPyV with respect to the top management



Graphic 3 Graph of Innovation and creativity instruments at the top management levels of the planning and liaison sub-directorate
Source: Results obtained in the third evaluation instrument

From the results obtained in "Graphic 3" the following formula is applied: (Individual audit + Comparative audit) / (Total rating) x 100 Substituting values: (36 + 90 + 39 + 99 + 32 + 75 + 34 + 57 + 34 + 60 + 40 + 94) / ((112+48)*6) x 100 = 72 %.

As can be seen in the case of the Sub-Directorate of Planning and Liaison, 72% represents that the levels have reached several schemes. Such as teamwork, communication, situational leadership and empathy. Ramifying throughout the organisation, however, a "maintenance" plan is suggested.

Results

Based on the research techniques implemented and the results obtained. In this sub-directorate there is good communication and above all the different ideas of each of the areas are taken into account. And that creative and analytical capacities are combined to generate ideas. In this sense the need to set objectives.

Krell, H. (2010) mentions that there are two ways to learn about innovation: 1. Discovering possibilities and limits at the moment of innovation and 2.

In this sense, it is necessary to maintain an innovative attitude, by searching for opportunities, being persevering until the objectives are achieved, generating and objectively evaluating innovative solution alternatives.

For this reason, the following is a proposal for a development model for the integral improvement of top management.

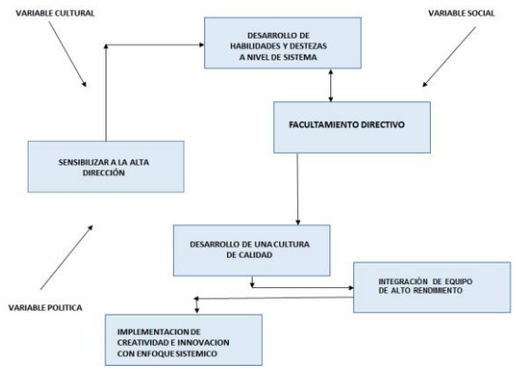


Figure 2 Development model for creativity and innovation in ITUG's Sub-Directorate for Planning and Liaison
Source: Own elaboration, 2023

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Conclusions

The data from the assessment instruments applied in the Subdirección de Planeación y Vinculación, concluded that it is necessary to sensitise the top management in order to create ideas that make a significant difference with respect to the competition, allowing to be in constant learning and development.

As a result of this project, it was concluded that it is important to implement strategies such as the generation of ideas, provocative thinking, collective intelligence, collective thinking, teamwork, motivation, learning to express and transmit emotions. To innovate is not to do something new, it is to rebuild what already exists.

Recommendations

In accordance with the challenges imposed by the socio-economic environment, it is recommended that the ITUG's Sub-Directorate of Planning and Liaison aims to present innovative ideas that contribute to keeping the institution within a dynamic market and thus create new value for the client (students). In this sense, the aim is to increase the involvement of the top management in adapting and making better use of the capacities and skills of the members of this institution.

It is recommended to train the management with the aim of integrating a high performance team that allows the development of a quality culture, implementing Creativity and Innovation with a systemic approach, showing, as part of a whole, from the general to the particular.

To the extent that ITUG's Planning and Liaison Department, in general, uses and reuses its knowledge, promotes ideas in a creative way, innovates, develops new strategies and methodologies, it will give the institution an added value that will help it to link with the environment and contribute to social development, benefiting itself with fresh and innovative ideas.

References

Bono, E. D. (2007). Creatividad: 62 ejercicios para desarrollar la mente. Buenos Aires: Paidós.

De Prado, D. 2011). Innovación y creatividad en la empresa y en las organizaciones. Santiago de Compostela. Meubook, S. L.

Esquivias, S. M. T. (2004). Creatividad: Definiciones, Antecedentes Y Aportaciones. Revista Digital Universitaria. 5 (1), 1-17.

Fernández, P. F. (1976). Test de Creatividad Escolar (Formas I y II). Innovación Creadora, 1.

Gringberggia, R. (2014). Liderazgo creativo. Harvard Business Review Brasil.

Krell, H. (2010). “Innovation, creation, invention”. Recuperado de: http://www.ilvem.com.ar/shop/otraspaginas.asp?pagina=279&t=innovaci%C3%B3n,-Ceaci%C3%B3n,-Inveci%C3%B3n.htm

Warner, J. (2012). Creatividad e innovación. Perfil de competencias. Madrid: Editorial Universitaria.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Article **ECORFAN Journal-Mexico**
December 2023, Vol.14 No.31 24-38

Training perspectives in the new labor normality

Perspectivas de capacitación en la nueva normalidad laboral

GONZÁLEZ-HERRERA, Karina Concepción†*´ & MARTÍN-SÁNCHEZ, Stephany Giselle´´

´Universidad Tecnológica Metropolitana.
´´Tecnológico Nacional de México.

ID 1st Author: *Karina Concepción, González-Herrera* / **ORC ID:** 0000-0002-1743-2614, **Researcher ID Thomson:** R-3825-2018, **CVU CONAHCYT ID:** 256147

ID 1st Co-author: *Stephany Giselle, Martín-Sánchez* / **ORC ID:** 0000-0001-9724-2943, **CVU CONAHCYT ID:** 1082157

DOI: 10.35429/EJM.2023.31.14.24.38 Received: July 25, 2023; Accepted: December 30, 2023

Abstract

Training is a process that allows the specialization of the personnel and the support of the activities impregnated in the work areas, guaranteeing improvements in the results. The object of study consisted of determining the training perspective based on the new ways of working considering the organizational climate present in the Covid-19 period, for the design of content according to the needs of employees and companies. It was a quantitative study using the relationship of variables, in 6 dimensions (quality of working life, work design, interpersonal relationships, leadership, performance management and participation management) with a classified assessment on the Likert scale, which was addressed to the economically active-occupied population (PEA-O), with the study sample of 234 people, covering 94%. With the results, the proposals for the training of the personnel who worked from home were determined, seeking a social and economic impact of collaborating and that would stimulate an improvement in the organization to achieve the objectives established during the pandemic, the main one being the prevalence in the market.

Training, Human capital, Organizational climate

Resumen

La capacitación es un proceso que permite la especialización del personal y el respaldo de las actividades impregnados en las áreas de trabajo, garantizando mejoras en los resultados. El objeto de estudio consistió en determinar la perspectiva de capacitación con base en las nuevas formas de trabajo considerando el clima organizacional presente en el periodo de la Covid-19, para el diseño de contenidos de acuerdo con las necesidades de los colaboradores y las empresas. Fue un estudio cuantitativo utilizando la relación de variables, en 6 dimensiones (calidad de vida laboral, diseño del trabajo, relaciones interpersonales, liderazgo, gestión del desempeño y la gestión de la participación) con una valoración clasificada en la escala Likert, que se dirigió a la población económicamente activa-ocupada (PEA-O), siendo la muestra de estudio de 234 personas, cubriendo un 94%. Con los resultados se determinaron las propuestas encausadas para la capacitación del personal que trabajó desde casa, buscando una incidencia social y económica del colaborar y que estimulara una mejora en la organización para el alcance de los objetivos establecidos durante la pandemia, siendo el principal la prevalencia en el mercado.

Capacitación, Capital humano, Clima organizacional

Citation: GONZÁLEZ-HERRERA, Karina Concepción & MARTÍN-SÁNCHEZ, Stephany Giselle. Training perspectives in the new labor normality. ECORFAN Journal-Mexico. 2023. 14-31:24-38.

* Correspondence to Author (E-mail: karina.gonzalez@utmetropolitana.edu.mx)
† Researcher contributing first author.

Introduction

The area of human capital is undergoing radical changes in its responsibilities and tasks within companies, according to (Gómez-Mejía, *et. al*., 2001) cited in (Barreto & Azeglio, 2013) it is observed that human capital over time obtains greater competencies that become the competitive advantage of the organisation. On the other hand, Chiavenato (1992, cited in Valencia, et. al., 2019), indicates that the organisational climate is the quality of the organisational environment experienced by employees and included in the behaviour that they reflect within it, issuing their individual perception outside it. The organisational climate plays a fundamental role when it comes to integrating into the work scenario or environment, this is perceived in the attitudes of the collaborators, therefore, by their effort and the sense of belonging at work, among others. In other words, it is the atmosphere that is experienced in the performance of work activities and is the result of the interrelationships in this scenario. Therefore, there are differences due to the constant interaction, as well as the disposition towards work and the leadership styles applied by bosses, supervisors and/or management towards subordinates.

In companies there are actual and certain training needs which can be deduced from the observation of concrete problems. For Böhrt, (2000) problems exist when the best end product is not obtained or the highest level of service provided is not applied. There is a risk of not having adequately trained employees to respond to the needs of the company and the demands of the market. The absence of training leads to difficulties in work performance, generating stress, difficulty in advancing the tasks delegated to human capital, detracting from the sense of belonging and representing the organisation externally.

Caro, *et. al*., (2017) contributes that the problems associated with the absence of training and/or specialisation of human capital is that the staff does not have sufficient knowledge for the performance of their work activities, likewise promoting the presence of errors or omissions affecting the organisational purposes (p. 94). It should be noted that, based on the training of personnel, they achieve greater security with respect to the activities to be performed and better performance in the workplace, there is greater feasibility in the quality of the actions undertaken in the work.

However, in the absence of the above, an imbalance and lack of a sense of belonging on the part of the employee can occur.

This requires the identification of education, training and specialisation needs, which should allow, organise and plan educational processes, for integration into the offer based on information generated directly by employees and the organisation, generating topics that strengthen and influence an improvement in the conduct and performance of human capital in companies (Machado & de la Fuente, 2006; Maya-Ampudia, et. al., 2014). However, to achieve this, the starting point is knowledge of the organisational climate from different perspectives, considering the presence of COVID-19 and the new ways of working, which involves working from home (home office), increased hygiene measures to avoid contagion within the organisation, as well as rotation of working days, to avoid the concentration of all employees, among other measures.

Objective

To determine the training perspective based on the new ways of working, considering the organisational climate present in the COVID-19 period, in order to design content in accordance with the needs of employees and companies.

Justification

The knowledge obtained about the organisational climate has an impact on decision-making, with respect to the assignment of responsibilities and commitments in the workplace, as well as the orientation itself on issues that influence an improvement in this, with respect to training, among other scenarios. The training in human capital derives from aspects in knowledge and techniques of the collaborators, for this reason (Tovar, 2016) sustains that the training programmes are of relevance for the area of human capital of the organisations, since it represents the scheme of information to provide so that this, possesses greater knowledge of the activities to carry out in the position or position to occupy, potentiating their talents.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

In the labour integration process, the induction or integration (onboarding) is the initial approach of the human capital with the processes, the organisational philosophy and the work space of insertion. This is the period in which the staff takes with them the corporate and business image with a sense of belonging. In other words, it is the procedure that is not exempted, but is used to prepare the staff with respect to the desired behaviour, the quality immersed in the activities to be carried out, as well as communication and direct contact to achieve the objectives of this.

On the other hand (Bonilla, 2018) comments that:

The importance of the training of human resources is linked to the improvements in efficiency that they experience in their areas of work, a greater and better knowledge of quality allows them to perform their work better, open the possibility of mobility within the organisation, occupy areas of work of greater responsibility and better economic retribution. This is why workers strive to acquire knowledge at school and within the organisation where they work, i.e. to advance in their academic degrees and to train themselves (p. 269).

In the current era of knowledge (Agudelo-Orrego, 2019) states that organisations are eager for trained personnel to join the workforce, as processes require updating and innovation, which will have an impact on their competitiveness and sustainability in the market. In other words, the search for the specialisation of human capital once they have entered the labour market, for better job performance that results in reciprocal benefits (human capital & company).

Theoretical framework

Human capital: theoretical approach

The appreciation of human capital has prospered to become a conclusive variable of productivity oriented to economic progression and social comfort, first glimpsed with the classical current, especially in the literary works referring to the economic disseminated in the second half of the twentieth century (Pérez and Castillo, 2016; Ramírez, 2015; Valencia, 2005), emphasising the importance of the training of individuals received through the experiences developed at home, their education and formal learning, leading to an increase in the productive and competitive capacity of States (Gérald, 2006).

Adam Smith (1976), writer of one of the first classic economic writings that inserted the concept of human capital, enunciated national wealth as the ability of countries to produce and market satisfiers, a competence that could be executed through the combination of labour, land and capital, which implied the matching of the worker with the productive team, highlighting that the increase in his competences would amplify his capacity to work; This representation was preceded by the approaches that Taylor (1911), Fayol (1916) and Weber (1923, as cited in Beltrán and López, 2018) contributed to the administrative sciences, complementing the conceptualisation of the worker as a profitable productive asset if appropriately oriented, but conclusively substitutable. The appreciation of human capital is finally modified with the emergence of the humanistic current, located mainly in the works of Follet (1933, as cited in Beltrán and López, 2018), Maslow (1943), Mayo (1945), Tead (1956, as cited in Beltrán and López, 2018) and Barnard (1961, as cited in Beltrán and López, 2018), observing the worker as a valuable resource and essential agent in the achievement of organisational goals, resulting in the expansion of their productivity levels and, consequently, in the economic performance of the company. However, it is the contributions of Schultz (1960), Becker (1964) and Mincer (1974) that set out the ideological approaches to human capital, which, over the years, were incorporated and acclimatised to the economic-administrative sciences (Didier, 2013; Pérez and Castillo, 2016).

Education is understood as the gradual acquisition of new knowledge and skills, boosting the productivity of the individual, which adds value to the context in which he or she operates. This premise has encouraged the inclusion of education in theoretical models of human capital, arguing that new knowledge optimises worker's profitability and fosters sustainable economic development (Pérez and Castillo, 2016). The main precursor of human capital, Schultz (1960), developed the term based on this reasoning, conceptualising it as the knowledge and skills that an individual obtains through education and training, which represents an investment in human resources that is expected to return over a period of time. His theory was guided by the economic studies of the time, highlighting Solow (1956), whose doctrine of thought was oriented towards making visible new investment formats for the increase of capital and production, accentuating the need for educational and professional training as a pillar of growth.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

In this way, the theory of human capital was governed by the improvement of the comfort of the population through advances in knowledge and the improvement of skills, the latter being acquired through schooling and investment in terms of health, generating an effective return in the economic, political and social development of nations Schultz (1960).

Subsequently, Becker (1964) consolidated the contributions of Theodore Schultz to specify the theory of human capital aimed at increasing the generation of income of the population through training; he states that individuals invest in obtaining new knowledge to meet their learning needs and produce an economic benefit from it, since he argues that the level of income is directly proportional to the particularities of the subject, such as their degree of schooling and productivity index (Pérez and Castillo, 2016; Tovar, 2017). In other words, under the same approach with respect to the substance of the investment in the education of human capital, he incorporated the individual's resolution to the analysis of the costs and benefits that would be achieved with timely training; therefore, his theory of human capital focused on the segmentation of the training offered by organisations: (1) general, applied by any company, since the investment is directed to the competitive increase of the worker; and (2) specific, applied only to the institution that grants it, therefore, the investment is directed to the increase of the company's productive capacity, but not the individual one (Becker, 1964).

The generalisation of the human capital theory - created by Schultz (1960), formalised by Becker (1964) - was complemented by Mincer in 1974 who, for the first time, studied the correlation between the allocation of remuneration and human capital, as well as the conception of the return on investment of educational training (Acevedo et al., 2007). In view of this, he instituted a model that made it possible to measure the increase in pay in relation to the individual's training, determining the degree of increase that these actions generate in the wage gap; he also contributed to the implementation of the income equation based on the statement of net present value, determining the performance that the individual produces based on his training; in other words, he expresses the amount of remuneration for work in terms of the level of studies and experience acquired by Mincer (1974).

It is conclusive to state that the performance of each subject is recognised by his or her ratio. Consequently, the greater the educational and professional experience, the higher the remuneration, with the demand for education being dependent on the investment required and the economic benefits that the individual can acquire in the future (Herrera, 2010).

Organisational climate and its assessment: a theoretical approach

In the modern business structure, the difference of the organisational climate is inescapable in view of the consonance it presents with work performance, influencing, therefore, the stimuli and conduct of the human capital that makes up a holistic, convoluted and fluctuating collective system, denoting the relevance of its work and, notoriously, of the conception of the organisational climate (Iglesias and Sánchez, 2015). As previously mentioned, the classical and humanist current is attributed to the indications of the organisational study oriented to human relations, however, the focus on the appreciation of human capital in terms of its working environment, as a key element of business success, is addressed for the first time in the theory of organisational climate established by Rensis Likert in 1968 (Iglesias, et al., 2019); in other words, a correlation between the perception that workers hold in the company and its factors, and their actions (Rodríguez, 2016) emerges (Rodríguez, 2016). The organisational climate theory, therefore, establishes that the behaviour of workers is, rightly, proportional to the organisational circumstances perceived by them, using variables related to the situational environment, technology, structure, rank, salary remuneration, character, attitude and degree of complacency (Likert, 1968). According to the study conducted by Rodríguez (2016), any institution that has methodologies that consolidate the achievement of professional and personal goals, tends to a supreme productivity; in the understanding of this argument, authors such as Brunet (1987), García and Bedoya (1997), and Méndez (2006).

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

In this regard, they paid particular attention to the evaluation of the organisational climate, relying on diagnostic instruments whose intention is focused on revealing the perceived attitudes and impressions that affect the professional motivation of workers and, clearly, their operability (García, 2009), (García, 2009), highlighting Likert (1968), Litwin and Stringer (1968), Schneider and Hall (1972), Robbins (1999), and Heskett, Sasser and Schlesinger (2003) as the promoters of the models and planning of organisational climate (Mejía, 2018; Corichi, et al. , 2013; García, 2009).

As a distinguished precursor of the concept, Likert's (1968) organisational climate theory proposes an assessment technique based on different (1) causal dimensions, which point towards organisational development and the achievement of its goals; (2) intermediate dimensions, which assess the intrinsic condition of the organisation; and (3) final dimensions, which are the product of the impact of the first two; The interrelation of these two results in the identification of the organisational climate model conducted in the company, being authoritarian with an exploitative or paternalistic profile, concerning a hermetic, tense and clearly unfavourable scenario; or participative with a consultative or group profile, referring to a free, ductile and, therefore, favourable framework for the organisation. Based on McClelland's theory in the field of motivation, Litwin and Stringer (1968) devised an evaluation tool consisting of 50 questions along nine dimensions: structure, responsibility, reward, risk, warmth, support, standards, conflict and identity; to demonstrate the conjectures raised by the link between the influence of the leadership model and the organisational climate with the motivation and behaviour of human capital, showing that the organisational climate integrates multiple circumstances of the work environment that are perceived by workers, resonating in their behaviour and, consequently, in organisational performance. On the other hand, Schneider and Hall (1972) dictate that organisational climate is nothing more than the glimmer of the interrelationship between individual and organisational particularities; thus, their model decrees that human capital behaviour does not depend on the endogenous factors of the firm, but rather on the worker's own representation of these factors.

Subsequently, Robbins (1999), complementing the previously described approach, proposes that workers' behaviour does not depend on endogenous and exogenous organisational agents, but on human capital itself, in other words, on the experiences and interactions acquired throughout their personal and professional development, which is why it is essential to provide feedback to workers as a way of knowing their perception and improving their productivity. Finally, Heskett, Sasser and Schlesinger (2003) present the most recent contribution of the organisation climate with their theory of the Value Profit Chain, based on the assumption of a reciprocal relationship between the organisation and the human capital to produce a lasting bond; in this way, if the worker receives an attractive and equitable remuneration, adequate training and a satisfactory working environment, he will see his needs stimulated and will have a reciprocal attitude with the organisation, improving his performance and providing a quality service to the consumer. It is unquestionable that the evolution of approaches in administrative sciences gave way to the consideration of human capital as an elementary component for organisational success, however, the theories and models of organisational climate favoured the full understanding of workers' perception of their environment, being finally evaluated to enrich their experiences and improve their performance (Iglesias, et al., 2019).

Assessment of the organisational climate and training in relation to the study variables

The study of organisational climate favours the understanding of the central context of companies, externalising the behaviours, practices, statutes and regimes imposed on human capital in order to intervene in the redesign of this, improving the labour landscape (Cota, 2017). In turn, training brings with it the absorption of wisdom and experiences that provide workers with the necessary tools to improve their performance and participate in a more enjoyable way in the work environment (González and Cereceda, 2020). Therefore, the purpose of this section is to identify the impact that organisational climate and training have on organisational performance, discerning their relationship with the study variables: job performance, quality of work life, work design, interpersonal relations, leadership, performance management and participation management.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

That said, job performance refers to the worker's productivity and effectiveness at work (Schermerhom, 2006), which is guided both by objectivity and by the particular perception of the organisational climate of the human capital and the environment in which it operates (García, 2009). These statements strengthen the presumption of the work climate as a guiding point for the conduct and performance of individuals. Likewise, Brunet (1987) states that this variable of study is conditioned by the organisational climate, being feasible to locate flaws through the dimensions of leadership, resolution, retribution, work stimulus, communication and training; where the latter is appreciated as an effective technique to encourage the improvement of their professional occupations as opposed to practice and training (González and Cereceda, 2020).

González (2007), complementing, states that the quality of life of human capital exerts pressure on their personal and professional development, stimulating their productivity, acclimatisation and innovation in the work context; therefore, a prominent quality of life is aimed at the production of an adequate organisational climate that reduces the risk of reaching low levels of performance. Also, Fernandez et al. (2007) point out that, for the most part, the literature on quality of work life varies in the selection of study variables, but they agree on their grouping into three solid dimensions, highlighting internal motivation. The essence of this axis is based on the satisfaction of the professional needs of the human capital, among which the demand for instruction and training is predominant, producing security to execute the functions that it occupies in the organisation.

Work design, on the other hand, is a variable that involves the restructuring of functions in order to establish optimal results in a personal, community and business horizon. After all, numerous studies have revealed that job properties are related to worker productivity, especially in (1) independence and self-determination, and (2) knowledge particularities (Ramirez-Vielma and Nazar, 2019).

The aforementioned refers, firstly, to the influence of work design on the attitudes and behaviour of the worker, stimulating their professional needs to create a work climate that animatively, collaboratively and organisationally drives the individual to the achievement of institutional goals; and, secondly, to the training and coaching of staff as a professional need that must be satisfied by obligation and derives from the work occupation itself (Polo, 2012; Ramírez-Vielma and Nazar, 2019).

According to Hunsaker and Cook (1986), interpersonal relationships are essential in the representation of the development of human relationships within the work context, involving esteem, affection, need and functionality in the individual's performance, causing a positive and beneficial atmosphere in the work climate that involves human capital. Moreover, social interaction in the business context can greatly impair the operability of organisations, which is why training is essential as a method for increasing the social skills of workers, improving the affective dimension of the individual to create a harmonious panorama (Molina and Pérez, 2006).

In relation to leadership, Robles et al. (2008) distinguish it as the technique of influencing a group to achieve specific purposes. When the variable is focused on the dimension of organisational climate, the good judgement of leaders and their management skills foster a pleasant nexus with the human capital in their charge, promoting good work performance and a harmonious environment (Díaz et al., 2014). Also, the dimension of training is required to be an individual capable of making objective decisions aimed at meeting organisational goals, fairly assessing their workers, identifying areas of opportunity and giving them a positive outcome (Pautt, 2009).

When the topic of organisational climate is discussed, the correspondence is found with performance management derived from the function of human capital within the institution and the worker's appreciation of their environment, generating a positive or negative scenario, depending on their response, it being evident that a positive outlook will increase their commitment to the company by achieving institutional goals (Pajuelo, 2018).

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Thus, labour performance is focused on achieving the highest productivity of human capital through the management of their knowledge, which is why training is the primary strategy in the development of vocational education to generate the expected value in workers (Jara et al., 2018).

Finally, the participation management variable is linked to the motivation of human capital to collaborate in the achievement of objectives, intervening in decision-making and, consequently, satisfying their needs to be incorporated into the organisation, stimulating their performance and generating a pleasant working environment (Segredo et al., 2016; González, 2020). Notoriously, human capital represents a decisive factor in the functions of decision, direction, operation and management, whose active participation generates the success that organisations aspire to; therefore, training is visualised as a strategy beyond the transfer of knowledge, developing the talent of workers to form experts with the reasoning, understanding and acting skills to respond effectively to the unknowns produced in the company (Hernández and Martí, 2006; González, et al., 2021).

Methodology

The set of activities involved in the development of this study included various aspects that allowed for its support, therefore the research approach used was quantitative (Hernández, Fernández, & Baptista, 2014), considering that the results were interpreted descriptively, with a correlational approach, with the data being expressed in numerical and percentage terms, using graphs and tables to support the information. In such a way that the instrument for the collection of information used was the questionnaire, which allowed for the collection of information from the subjects of the study, in order to respond to the proposed research topic.

Sample size

To determine the sample size according to the universe, the following formula was used according to (Fox, Hunn and Mathers, 2009) and (Bennett, Briggs, and Triola, 2011) cited in (García-García, Reding-Bernal, & López-Alvarenga, 2013) represents a subset of the population, the sample was representative, the sample size calculation was made for finite populations:

$$n = \frac{N\, Z_a{}^2\, p\, q}{d^2\,(N-1)+Z_a{}^2\; p\; q}$$

N = population size = EAP-Occupied (wage earners, self-employed) = 989,186

Z = confidence level = 94% equivalent to a value for Z = 1.88

p = probability of success, or expected proportion = 0.5

q = probability of failure = 0.5

d = precision (maximum permissible error in terms of proportion) = 0.062

n = sample size = 180.3 = 181

n= 230 questionnaires calculated & 234 applied

Of the estimated sample equivalent to 230 questionnaires, 234 instruments were applied, validated as effective in relation to the responses generated by the study subjects. The subjects of the study were the employees who, during the period May-August 2020, were working, and who, through their performance, received an economic retribution (a salary or payment). They were also sought to be working in the Yucatan state and aged 18 years and older.

Reliability of the items

To determine the reliability of the items, the Cronbach's alpha formula was used, with the variance of the items, the result indicates a high reliability in the items.

$$\propto = \frac{k}{k-1}\left[1 - \frac{\sum Vi}{Vt}\right] = 0.983$$

k = number of items = 58

Vi = Variance of each item = 99.24

Vt = Total variance = 2951.71

$\propto =$ Cronbach's alpha = 0.983 (high consistency)

The data obtained indicate with 0.983 a high consistency with respect to the information collected, these were analysed in Microsoft office 365 (Excel) and Spss version 26 for the comparison of the results, thus ensuring the confidence of the instruments applied and the information provided in it.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Instrument

The instrument used was a questionnaire adapted from (Hernandez, 2013), for its design it was integrated of 2 sections, the first one contemplates the general data of the employee giving rise to the generation of the profile of this, it is composed of 5 multiple choice questions, and 1 decision question that is associated with the topics for the growth of knowledge in the workplace. The second section has 58 of the 64 items, classified into 6 dimensions focusing on the following scenarios (see table 1 and table 2):

Scale	Value
Strongly disagree	1
Partially disagree	2
Neither agree nor disagree	3
Partially agree	4
Strongly agree	5

Table 1 Likert scale according to assigned value
Source: Own elaboration

Name of the dimension	Dimension	Authors
Quality of working life	Quality of working life (QWL) is classified in two scenarios. One from the employees' perspective (it is associated with the satisfaction of personal, work and professional needs) and the second considering the work aspect (considering the physical, economic and organisational conditions). In the present research, LVC is considered from the employee's perspective.	(González Ruiz, 2017, p. 33).
Design of the work	Work design is associated with the activities and implications of the job, its dynamism, variation and interaction with other areas and departments in the company. To this end, commitment, responsibility, flexibility and ethics are valued from the employee's perspective. Thus, work design "is an expression that describes the content, structure and organisation of tasks, activities and roles that are performed by individuals and groups in work environments".	(Ramírez, 2013, p. 12)
Interpersonal relations	Interpersonal relationships in the workplace are generated through verbal, non-verbal and extra-verbal communication, ethics and morals are involved in the links that are present in the environment with respect to work interactions.	(Del Toro, 2015)
Leadership	Leadership is associated with "management practices that constitute suitable alternatives for influencing and attempting to modify the organisational culture, by integrating leaders in management positions, for the transmission of cultural and organisational values in the performance of their functions".	(Reyes Hernández & Alfonso Porraspita, 2020, p. 103)
Performance management	Performance management is the action that occurs in various work situations, seeking to know the performance (the way in which the employee executes and/or performs the work or tasks) and the ability to solve problems, for the development of the employee in the organisation. It allows the organisation to make decisions regarding training, personnel development, job fluctuation, career plan and verification of the selection process.	(Bustamante Chong, Bustamante Chong, & Varas Chiquito, 2019, p. 193-194)
Participation management	Participation management refers to the involvement of the employee in the communication flows of general company information and specific information at the level of the area or department to which he/she belongs, as well as its activities, through different communication mechanisms. Human Resource Management (HRM) seeks a participatory approach where employees influence activities and decision-making.	(Cuesta, 2005) citado en (Becerra Alonso & Ogando Ramos, 2010)

Table 2 Conceptualising the dimensions of the applied instrument

Results

Based on the information collected, the reliability of the dimensions per item is assured, Cronbach's alpha per dimension (table 3) identifies a high consistency (in the range of 0.8 to 1).

Dimension	Ítems	Total	Media	Cronbach's alpha
Quality of working life (QWL)	10	58	3.712	0.949
Work design (WP)	10		3.866	0.941
Interpersonal Relations (IR)	12		3.844	0.968
Leadership (L)	10		3.636	0.969
Performance management (PM)	8		3.825	0.928
Participation management (PM)	8		3.511	0.936

Table 3 Cronbach's alpha by study dimension
Source: Own elaboration

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

According to figure 1, existing consistency is identified between the items, according to the dimension established, the dimensions that stand out for their association with the items are interpersonal relationships (IR), leadership (L) and quality of working life (QWL) as shown in figure 1.

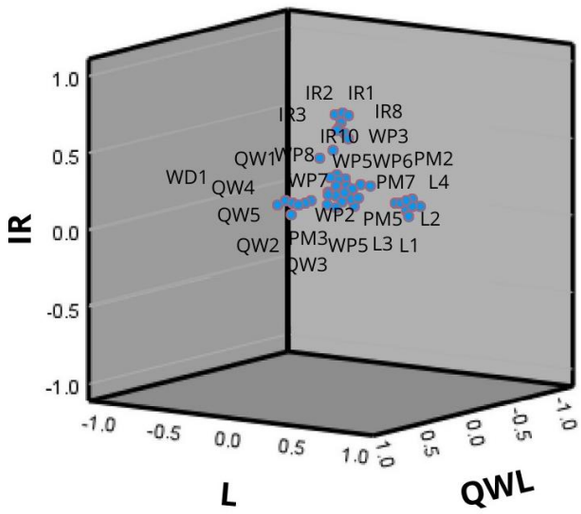


Figure 1 Components in the rotated space
Source: Own elaboration

It was found that the profile of the subjects of the study, where the highest prevalence stands out, is represented by the male sex, single with 69%, representative age from 20 to 24 years old for 46%, with a degree or engineering degree completed for 44%. When relating sex, average monthly income and age, it was obtained that the average monthly salary (AMS) according to the representativeness is equivalent to <= 1.5 minimum monthly salaries (MMW) 25.6%, with 58.3% of women receiving this amount, while 74.4% obtain incomes > 1.5 MMW, with men receiving more than 1.5 MMW. 5 SMM, where men with 56.9% have a higher remuneration [specifying the age range, it was obtained that 51.3% is <= 32.5 years old {male with 59.2% and 40.8% of women and > 32.5 years old are women with 62.1%, greater representation, who obtain this income}. But with respect to the age of the people who receive the highest pay (>1.5 SMM) for the work performed, people <= 42.5 years old (55% of men and 45% of women) and > 42.5 years old, it is also men with higher income than women with 68% of these [people who receive <= 3.5 SMM {$9,366.5} are 46.6%, with an age <= 32.5 years old, made up of men with 56%. Those earning > 3.5 SMM {$9,366.5}, have an age between 32.5 and 42.5 years, represented mostly by men with 90.9% (figure 2.).

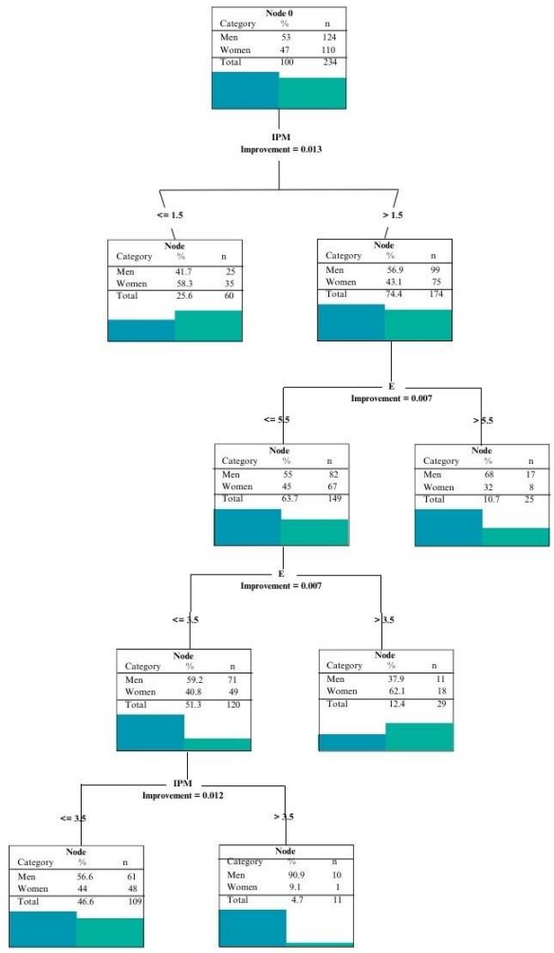


Figure 2 Income ratio by gender and age
Source: own elaboration

On the other hand, the association of sex is detailed, according to perception (figure 3) in relation to the data generated according to the dimension of study, it was obtained that node 0 of RI is made up of 53% of men and 47% of women (the evaluation less than or equal to [22.5] and is associated with <= regular RI to deficient, is made up of 79.2% of the opinion of women) and the equivalent data > (22.5) has a greater representation of men's opinion with 56.7% being this from regular to excellent. The GP has a 50.9% response from men and according to the mean of the dimension of <= 23.5 (in the scale it is equivalent to regular or deficient GP) it had a greater response from men with 74.4%, with respect to the result equivalent to (>23.5) 52.1% of the perception was from men. The DG presents a dimension mean of 30.5, with a valuation of <= 63.3% of men (regular to deficient) actions in the company, however, it stands out that 36.7% of women mention this position (data associated [which is equivalent to 30 study subjects] directly to <= regular of the GP), but women do not assign relative value to > regular in this dimension, only men are reflected with the opinion of 13 of them.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Next it is identified that the L has a dimension average of 31.5 and 71.4% that gave an answer to > regular [of the GP and that is associated to the L, 59.1% has the same tendency, being the men with greater answers with 56.4% and the differential conformed by women] with respect to the relation of the GP and the L [but that presents a perception <= regular of the L is equivalent to 11.5%, but it emphasizes that the woman with 70. 4%]; then L and WP represent 5.1% of the data <= regular [men are 91.7%] and > regular by 54.7% [whose opinion stands out from men with 53.1%]; WP and its association with LVC [42.5] reflected that 25.6% is <= regular [where women represent 60%] and WP with LVC had opinion > regular [men with 64.7% feel better about the work and its environment than women].

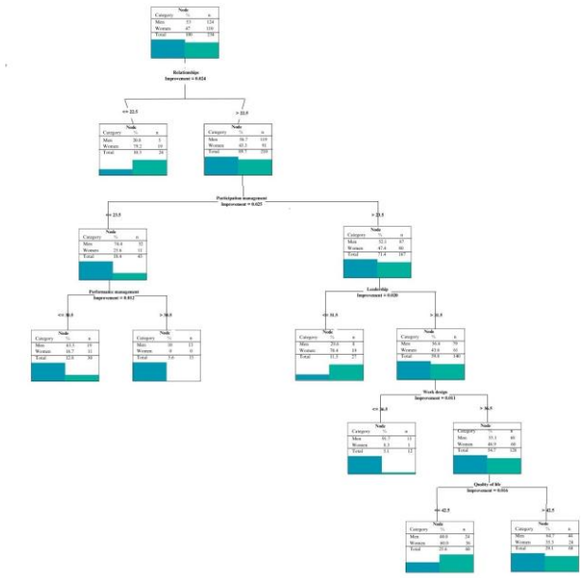


Figure 3 Sex ratio by dimensión
Source: Own elaboration

The perception of the organisational climate by the study subjects indicates that it prevails with 82.9% > a good organisational climate and 17.1% consider that the CL is <= regular to deficient, but aspects such as leadership and participation management are highlighted as areas of opportunity to work on in the organisations with respect to the perception of the staff (Graphic 1).

Graphic 1 Behaviour of the assessment of the organisational climate according to dimension
Source: Own elaboration

To determine the following hypothesis test:

Hi: The perspective of organisational climate influences with ≠ 50% on the decision of the training topic in the new way of working according to the studied dimensions of human capital.

Ho. The organisational climate perspective does not influence with ≠ 50% the decision of the training topic in the new way of working according to the studied dimensions of human capital.

With the results obtained, it can be inferred that the organisational climate does not influence ≠ 50% in the decision on the subject of training.

In such a way that, when assessing the VC with the data obtained by dimension, this reported with the Student's t-test that:

$$x^2 = \sum \frac{(o_i - e_i)^2}{e_i} = 65.06$$

Data:

Sample mean ($\bar{x}$) = 6.75

Population mean (μ) = 6.10

Deviation (S) = 12.68

Data (n) = 8.00

Degrees of freedom (n - 1) = 7.00

Significance level (α) = 0.062

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = 1.0362$$

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Minimum critical value = -2.2187

Maximum critical value= 2.2187

p-value = 0.3346

Ho: μ≠ The components of quality of work life (QWL) influence the elements of human capital performance management in firms.

Since -2.2187 < t = 1.0362 < 2.2187, the null hypothesis Ho is not rejected.

Conclusions

Stress, the accumulation of activities in the same space (working from home - home office -, home responsibilities and interaction with collaborators outside work hours) caused job dissatisfaction, with more than 45% rating the quality of working life as deficient. In view of this, it was proposed that work objectives be established in a scheduled manner and that performance be evaluated based on the fulfilment of these objectives. To reduce the flow of extraordinary communication (outside working hours) in order to improve dialogue and generate an optimal work design, based on the COVID-19 pandemic reality. Whose scheduling will be able to reduce the stress caused by the multiplicity of actions that are located in the same space.

Given that interpersonal relations within the companies were damaged, it was decided to hold meetings less frequently, in order to speed up business results.

Leadership, although it was the dimension with the lowest results, is the one that influenced the variables that sustained data above 50% negatively and directly influences job satisfaction and quality of working life, reducing the organisational climate. Affecting the processes of performance management and participation. Women were the most limited during this period, in three important aspects: general responsibility for the household, the decrease in salary and the request for temporary withdrawal from work. The training was entitled: organisation and objectives, designed for the distribution and administration of activities in reduced spaces for the fulfilment of their work responsibilities.

References

Acevedo, M., Montes, I., Maya, J., Villegas, M., & Brito, T. (2007). Capital humano: una mirada desde la educación y la experiencia laboral. *Cuadernos de investigación, 56*, 1-40. http://publicaciones.eafit.edu.co/index.php/cuadernos-investigacion/article/view/1287

Agudelo-Orrego, B. E. (June 24, 2019). Formación del talento humano y la estrategia organizacional en empresas de Colombia. *Universidad del Valle, Cali -Colombia*. doi:https://orcid.org/0000-0001-8579-5292

Barreto, A., & Azeglio, A. (2013). *La problemática de la gestión del capital humano en las MiPyMES de alojamiento turístico de la ciudad de Buenos Aires - Argentina* (Vol. 22). Buenos Aires, Argentina, Argentina: redalyc. Recuperado el 05 de marzo de 2021, de https://www.redalyc.org/pdf/1807/180729918007.pdf

Becerra Alonso, M. J., & Ogando Ramos, R. (2010). La participación de los trabajadores en la toma de decisiones de sus empresas. Realidades y regulaciones. *Ingeniería Industrial, XXXI*(3), 1-5. Recuperado el 12 de Noviembre de 2020, de https://dialnet.unirioja.es/servlet/articulo?codigo=3639669

Becker, G. (1964). *Human capital: a theoretical and empirical analysis, with special reference to education* (National Bureau of Economic Research).

Beltrán, J., & López, J. (2018). *Evolución de la Administración* (Fondo Editorial Universidad Católica Luis Amigó).

Bermúdez, C. L. (Abril de 2015). Capacitación: una herramienta de fortalecimiento de las pymes. *Revista de las Sedes Regionales, XVI*(33), 1-25. Recuperado el 13 de marzo de 2021, de https://www.redalyc.org/pdf/666/66638602001.pdf

Böhrt, P. M. (14 de septiembre de 2000). Capacitación y desarrollo de los recursos humanos: reflexiones integradoras. *Revista Ciencia y Cultura*. Recuperado el 05 de marzo de 2021, de http://www.scielo.org.bo/scielo.php?script=sci_arttext&pid=S2077-33232000000200015

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Bonilla, J. D. (8 de Junio de 2018). La importancia de la capacitación en el rendimiento del personal administrativo de la Universidad Técnica de Ambato. *Conrado*. Recuperado el 05 de marzo de 2021, de http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1990-86442018000300268#:~:text=La%20importancia%20de%20la%20formaci%C3%B3n,ocupar%20%C3%A1reas%20de%20trabajo%20de

Brunet, L. (1987). *El Clima de Trabajo en las Organizaciones: Definición, diagnóstico y consecuencias* (Editorial Trillas).

Bustamante Chong, C., Bustamante Chong, M., & Varas Chiquito, M. (septiembre-diciembre de 2019). Análisis de pertinencia en empresas con gestión del desempeño por competencias: Cantón Jipijapa. *INNOVA Research Journal, 4*(3.2), 188-204. doi:https://doi.org/10.33890/innova.v4.n3.2.2019.1256

Caro, B. A., Morelas, N. D., & Bohórquez, A. L. (2017). Impacto de la Capacitación del Personal en la Productividad Empresarial. *Universidad Distrital Francisco José de Caldas*. doi:http://dx.doi.org/10.15665/rde.v15i1.868

Corichi, A., Hernández, T., & Velázquez, M. (2013). El clima organizacional: un factor clave de éxito, que debe evaluarse de manera permanente en las empresas. *Boletín Científico de las Ciencias Económico Administrativas del ICEA*, *2*(3). https://doi.org/10.29057/icea.v2i3.62
Cota, J. (2017). Método para evaluar el clima organizacional del área docente de un centro de bachillerato tecnológico de CD. Obregón, Sonora. *Ciencias Administrativas*, *5*(10), 39-45. http://sedici.unlp.edu.ar/bitstream/handle/10915/61103/Documento_completo.pdf-PDFA.pdf?sequence=1&isAllowed=y

Del Toro, C. A. (enero-junio de 2015). Gestión de las relaciones interpersonales para lograr el éxito en las empresas de servicios. *Revista Interamericana de Ambiente y Turismo, 11*(1), 73-83. doi:http://dx.doi.org/10.4067/305

Díaz, M., Peña, M., & Castellanos, B. (2014). El liderazgo y las relaciones interpersonales dentro del clima organizacional. *Revista Global de Negocios*, *2*(1), 1-10. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2324967

Didier, N. (2013). A través de las nociones de Capital Humano. *Revista Iberoamericana de Psicología: Ciencia y Tecnología*, *6* (2), 7-15. https://reviberopsicologia.ibero.edu.co/article/view/rip.6201/230

Fayol, H. (1916). *Administración industrial y general* (Dunod Editeur).

Fernández, A., Santa, E., y Casado, M. (2007). Calidad de vida profesional de los profesionales de enfermería en atención primaria de Soria. *Biblioteca Las Casas*, *3*(1). http://www.index-f.com/lascasas/documentos/lc0213.pdf

García-García, J. A., Reding-Bernal, A., & López-Alvarenga, J. C. (2013). Cálculo del tamaño de la muestra en investigación en educación médica. *Investigación en Educación Médica, 2*(8), 217-224. doi:10.1016/S2007-5057(13)72715-7

García, M. (2009). Clima Organizacional y su Diagnóstico: Una aproximación Conceptual. *Cuadernos de Administración*, (42), 43-61. https://www.redalyc.org/pdf/2250/225014900004.pdf

García, M., & Bedoya, M. (1997). *Hacia un clima organizacional plenamente gratificante en la división de admisiones y registro académico de la Universidad del Valle* (Universidad del Valle).

Gérald, A. (2006). *El capital humano en las teorías del crecimiento económico* (Textos Universitarios, Universidad Autónoma de Chihuahua).

González, K. C. (2020). Learning under the assessment of the higher-level student, in times of COVID-19. Journal Computer Technology, 4(12), 24-33. https://doi.org/10.35429/JCT.2020.12.4.24.33

González, K. C., Solís, Y. B. y Martín, S. G. (2021). Transition Of Women's Economic Activity to Contribute to Family Income as An Effect Of COVID-19. Estudios De Economía Aplicada (EEA). 39(12), https://doi.org/10.25115/eea.v39i12.6397

González, R. (2007). *Calidad de vida en el trabajo: elaboración y validación de un instrumento en prestadores de servicios de salud* (Universidad de Guadalajara).

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

González, Ruiz M. M. (2017). Justicia organizacional, calidad de vida laboral y salud de los trabajadores. *Tesis doctoral*. Huelva. Recuperado el 01 de noviembre de 2020, de https://dialnet.unirioja.es/servlet/tesis?codigo=230834

Gonzales, Y., & Cereceda, Y. (2020). Capacitación y desempeño laboral en trabajadores de Serenazgo. *Avances*, *22*(4), 536-551. http://www.ciget.pinar.cu/ojs/index.php/publicaciones/article/view/568/1631

Hernández, S. R., Fernández, C. R., & Baptista, L. P. (2014). *Metodología de la Investigación* (Sexta Edición ed.). México: McGraw-Hill/ Interameticana Editores SA de CV.

Hernández, F., & Martí, Y. (2006). Conocimiento organizacional: la gestión de los recursos y el capital humano. *Acimed*, *14*(1). http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1024-94352006000100003

Hernández, U. A. (2013). Redefinición de los procesos y estructura organizacional a través de la gestión del cambio en una institución educativa. Recuperado el 02 de septiembre de 2020, de https://idus.us.es/bitstream/handle/11441/24058/K_D_Tesis-PROV58.pdf?sequence=1&isAllowed=y

Herrera, S. (2010). La importancia de la educación en el desarrollo: la teoría del capital humano y el perfil edad - ingresos por nivel educativo en Viedma y Carmen de Patagones, Argentina. *Revista Pilquen - Sección Ciencias Sociales*, (13), 1-9. https://www.redalyc.org/articulo.oa?id=347532057007

Heskett, J.; Sasser, E.; & Schlesinger, L. (2003). *The Value Profit Chain* (Simon & Schuster Ltd).
Hunsaker, P., & Cook, C. (1986). *Managing organizational behavior* (Addison-Wesley Publishing Company).

Iglesias, A., & Sánchez, Z. (2015). Generalidades del clima organizacional. *Medisur*, *13*(3), 455-457. http://scielo.sld.cu/pdf/ms/v13n3/ms02313.pdf

Iglesias, A., Torres, J., & Mora, Y. (2019). Referentes teóricos que sustentan el clima organizacional: revisión integrativa. *Medisur*, *17*(4), 562-569. http://medisur.sld.cu/index.php/medisur/article/view/4267/2924

Jara, A., Asmat, N., Alberca, N., & Medina, J. (2018). Gestión del talento humano como factor de mejoramiento de la gestión pública y desempeño laboral. *Revista Venezolana de Gerencia*, *23*(83), 740-760. https://www.redalyc.org/articulo.oa?id=29058775014

Keeley, B. (2007). *Capital Humano. Cómo influye en su vida lo que usted sabe.* México: OCDE.

Likert, R. (1968). *El factor humano de la empresa* (Devito).

Litwin, G., & Stringer, R. (1968). *Motivation and organizational climate* (Division of Research, Graduate School of Business Administration, Harvard University).

Madero-Gómez, S. M., & Rodríguez-Delgado, D. R. (diciembre de 2018). Relación entre las teorías X y Y de McGregor, las formas de retribuir y la satisfacción de las personas en su trabajo. *CienaUAT*, *13*. doi:https://doi.org/10.29059/cienciauat.v13i1.1014

Maslow, A. (1943). A theory of human motivation. *Psychological Review*, *50*(4), 370–396. https://doi.org/10.1037/h0054346

Maya-Ampudia, C. C., Ángeles-Zavala, O., & Camarena-Olmedo, J. A. (2014). Diagnóstico de necesidades de educación continua mediante un método grupal y un método individual. *Investigación en Educación Médica*, *3*(14), 177-186. Obtenido de https://www.redalyc.org/pdf/3497/349733967002.pdf

Mayo, E. (1945). *Social problems of an industrial civilization* (Harvard University Press).

Mejía, A. (2018). Revisión de la literatura de clima organizacional, estado del arte. *Tecnociencia Chihuahua*, *12*(3), 170-181. https://148.229.0.27/index.php/tecnociencia/article/view/191/175

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Méndez, C. (2006). *Clima organizacional en Colombia. El IMCOC: Un método de análisis para su intervención* (Universidad del Rosario).

Mincer, J. (1974). *Schooling, experience and earnings* (National Bureau of Economic Research Cambridge).

Molina, N., & Pérez, I. (2006). El clima de relaciones interpersonales en el aula un caso de estudio. *Paradigma, 27*(2), 193-219. http://ve.scielo.org/scielo.php?script=sci_arttext&pid=S1011-22512006000200010

Pajuelo, J. (2018). *Clima organizacional y la gestión del desempeño docente en el colegio honores de San Martín de Porres, 2018* (Universidad Peruana de las Américas).

Pautt, G. (2009). Liderazgo Gerencial. La Experiencia De Suits 101 Park House. *Revista Sotavento*, (17), 18-27. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1857635

Pérez-Fuentes, D., & Castillo-Loaiza, J. (2016). Capital humano, teorías y métodos: importancia de la variable salud. *Economía, Sociedad y Territorio*, *XVI*(52), 651-673. https://www.redalyc.org/articulo.oa?id=11146910004

Pérez, G., Pineda, U., & Arango, M. D. (mayo-agosto de 2011). La capacitación a través de algunas teorías de aprendizaje y su influencia en la gestión de la empresa. *Revista Virtual Universidad Católica del Norte*(33), 1-22. Recuperado el 13 de marzo de 2021, de https://www.redalyc.org/pdf/1942/194218961006.pdf

Polo, J., Fernández, M., & Ramírez, R. (2012). Diseño del trabajo y satisfacción con la vida. *Revista Venezolana de Gerencia*, *17*(59), 466-481. https://www.redalyc.org/articulo.oa?id=290241660005

Ramírez, D. (2015). Capital humano: una visión desde la teoría crítica. *Cuadernos EBAPE.BR*, *13*(2), 315-331. https://www.redalyc.org/articulo.oa?id=323236212007

Ramírez, V. R. (2013). Diseño del trabajo y desempeño laboral individual. *Tesis Doctoral*, 290. Madrid. Recuperado el 10 de noviembre de 2020, de https://repositorio.uam.es/bitstream/handle/10486/13039/62525_Ram%C3%ADrez%20Vielma%20Raul%20Gonzalo.pdf?sequence=1

Ramírez-Vielma, R., & Nazar, G. (2019). Factores motivacionales de diseño del trabajo y su relación con desempeño laboral. *Revista Psicología: Organizaciones y Trabajo*, *19*(4), 791-799. http://dx.doi.org/10.17652/rpot/2019.4.17517

Reyes Hernández, J., & Alfonso Porraspita, D. (enero-abril de 2020). Entrenamiento en liderazgo dinámico para directivos de empresas. Un desafío en la actual coyuntura económica. *Cooperativismo y Desarrollo [COODES]*, *8*(1), 99-114. Recuperado el 01 de noviembre de 2020, de http://coodes.upr.edu.cu/index.php/coodes/article/view/281

Robbins, S. (1999). *Comportamiento organizacional* (Pearson).

Robles, F., Garza, R., & Medina, Q. (2008). El liderazgo de los gerentes de las Pymes de Tamaulipas, México mediante el inventario de las prácticas de liderazgo. *Cuad. Adm. Bogotá (Colombia)*, *21*(37), 293-310. http://www.scielo.org.co/pdf/cadm/v21n37/v21n37a13.pdf

Rodríguez, E. (2016). El clima organizacional presente en una empresa de servicio. *Revista Educación en Valores, Universidad de Carabobo*, 1(25), 3-18. http://servicio.bc.uc.edu.ve/multidisciplinarias/educacion-en-valores/v1n25/art01.pdf

Secretaría de Trabajo y Previsión Social [STPS]. (2020). *Perfil Yucatán.* Recuperado el 05 de noviembre de 2020, de http://siel.stps.gob.mx:304/perfiles/perfiles_detallado/perfil_yucatan.pdf

Schermerhorn, J. (2006). *Administración* (Limusa).
Schneider, B., & Hall, D. (1972). Correlates of organization as a function of career pattern and organization type, administrative science. *Administrative Science Quarterly*, *17*(3), 340-350. https://doi.org/10.2307/2392147

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Schultz, T. (1960). Capital formation by Education. *Journal of Political Economy*, *68*(6), 571-583. https://www.journals.uchicago.edu/doi/abs/10.1086/258393

Segredo, A., García, A., León, P., & Perdomo, I. (2016). Desarrollo organizacional, cultura y clima organizacionales. Una aproximación conceptual. *Revista de Información científica para la Dirección en Salud, INFODIR*, (24), 86-99. http://revinfodir.sld.cu/index.php/infodir/article/view/200/476

Smith, A. (1976). *An Inquiry into the Nature and Causes of the Wealth of Nations. The Glasgow Edition of the Workds and Correspondence of Adam Smith, vol. II* (Edited by R.H. Campbell and A.S. Skinner) Oxford University Press (1776).

Solow, M. (1956). A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics*, *LXX*, 56-94. https://pages.nyu.edu/debraj/Courses/Readings/Solow.pdf

Taylor, F. (1911). *Principios de la administración científica* (Editorial Ateneo).

Tovar, M. B. (2016). La teoría del capital humano llevada a la práctica en las ciudades de aprendizaje. *Revista de Ciencias Sociales y Humanidades*. Recuperado el 05 de marzo de 2021, de https://dialnet.unirioja.es/servlet/articulo?codigo=5480847

Tovar, B. (2017). La teoría del capital humano llevada a la práctica en las ciudades de aprendizaje. *Nóesis: Revista de Ciencias Sociales y Humanidades, 26*(51), 45-56. http://dx.doi.org/10.20983/noesis.2017.1.3

Valencia, M. (2005). El capital humano, otro activo de su empresa. *Entramado*, *1*(2), 20-33. https://www.redalyc.org/articulo.oa?id=265420471004

Villalobos, M. G., & Pedroza, F. R. (2009). Perspectiva de la teoría del capital humano acerca de la relación entre educación y desarrollo económico. *Tiempo de Educar, 10*(20), 273-306. Recuperado el 12 de agosto de 2020, de https://www.redalyc.org/pdf/311/31112987002.pdf.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Article **ECORFAN Journal-Mexico**
December 2023, Vol.14 No.31 39-45

Design and development of a comprehensive renewable energy system

Diseño y desarrollo de sistema integral de energías renovables

VALVERDE-CEDILLO, Luis Manuel†, LÓPEZ-GARCÍA, C.* and SANTIAGO-AMAYA, Jorge

Tecnológico de Estudios Superiores de Chalco, Carretera México Cuautla s/n, La Candelaria Tlapala, Chalco Estado de México. C.P. 56641, México.

ID 1st Author: *Luis Manuel, Valverde Cedillo* / **ORC ID:** 0000-0003-3730-000X, **CVU CONAHCYT ID:** 420833

ID 1st Co-author: *C., López-García* / **ORC ID:** 0000-0002-8361-8249, **CVU CONAHCYT ID:** 333862

ID 2nd Co-author: *Jorge, Santiago-Amaya* / **ORC ID:** 0000-0003-3432-4305, **CVU CONAHCYT ID:** 490214

DOI: 10.35429/EJM.2023.31.14.39.45 Received: July 25, 2023; Accepted: December 30, 2023

Abstract

The electrical energy supplied by the Federal Electricity Commission (CFE) in Mexico suffers from disconnections due to failures due to overloads, short circuits or vandalism; leaving the user without this service for minutes or even for a few hours. Through the analysis by Quality Functions Deployment (QFD) we proceeded to the development of this work, the performance of a vertical position wind generator is designed and analyzed by software for the estimation of initial parameters, which due to its design Savonius multi-blade type makes it ideal for areas with very slow winds and speeds below 10 m/s. In order to meet the generation and energy saving needs, the implementation of a park of three vertical generators that will have the capacity to supply electrical energy to homes, offices or luminaries in public parks proposed. Finally, it is an opportunity to achieve one of the challenges set out in the 2030 sustainable development agenda and thereby guarantee one of the main objectives, which is universal access to energy services.

Renewable energy, Eolian, Electricity generation, Savonius, Wind

Resumen

La energía eléctrica suministrada por la Comisión Federal de Electricidad (CFE) en México, sufre de desconexiones debido a fallas por sobrecargas, cortocircuito o vandalismo; dejando al usuario sin este servicio por minutos o incluso por algunas horas. Mediante el análisis por Despliegue de Funciones de Calidad (QFD) se procedió a el desarrollo de este trabajo se diseña y se analiza mediante un software el desempeño de un generador eólico de posición vertical para la estimación de parámetros iniciales, los cuales debido a su diseño tipo Savonius multiaspas lo hace ideal para zonas con vientos muy lentos y con velocidades por debajo de los 10 m/s. Para atender las necesidades de generación y ahorro de energía, se propone la implementación de un parque de tres generadores verticales que tendrán la capacidad de suministrar energía eléctrica a hogares, oficinas o luminarias en parques públicos. Finalmente, es una oportunidad para lograr uno de los desafíos planteados en la agenda 2030 de desarrollo sostenible y con ello garantizar uno de los principales objetivos que es el acceso universal a servicios energéticos

Energía Renovable, Eólico, Generación eléctrica, Savonius, Viento

Citation: VALVERDE-CEDILLO, Luis Manuel, LÓPEZ-GARCÍA, C. and SANTIAGO-AMAYA, Jorge. Design and development of a comprehensive renewable energy system. ECORFAN Journal-Mexico. 2023. 14-31:39-45.

* Correspondence to Author (E-mail: claudio_lg@tesch.edu.mx)
† Researcher contributing first author.

Introduction

The theory of aerodynamics developed during the first decades of the 20th century, allowing us to understand the nature and behaviour of the forces that act around the turbine blades. In Russia, Joukowski, Drzewiechy and Sabinin, in Germany, Prandtl and Betz, in France, Constantin and Enfield were some of the scientists who developed the theory of aerodynamics for aeronautical uses and established the basic criteria that the new generations of turbines had to meet wind.

In 1927, Betz demonstrated that the performance of turbines increased with the speed of rotation and that in no wind system could exceed 60% of the energy contained in the wind. The theory also showed that the higher the rotational speed, the less important the number of blades was, so a single-blade turbine can built without significantly decreasing its aerodynamic performance.

The project focused on the production of electrical energy through a hybrid model of alternative energy from wind and solar energy (Lee, 2023), showing efficiency and a reduction in energy dependence on the supply company. As well as avoiding the production of polluting gases, effluent liquids, solid waste and the use of a hydraulic flow to generate electricity in a conventional way (Zheng, 2023).

The annual variation of the wind was approximated using the accessibility of the wind in the area (see image 1) and proposing as a viable alternative the vertical design that favors it (see Figure 2), since it has the capacity to work well at low heights. (Venture, 2023)

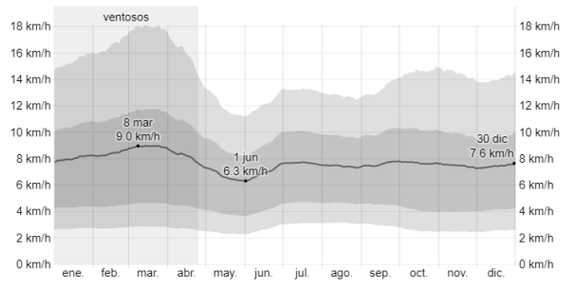


Figure 1 Average wind speed in the Chalco area during the course of the year
Source: Wheaterspark, 2023. (Venture, 2023) Both general and synoptic winds are linked to atmospheric circulation and maintain the same characteristics over large areas of land (Orozco,2014)

Using the principle of lift, Betz's law (López, 2013) and the principle of electromagnetic induction, we proceed to the CAD analysis (see image 2) and continue with the construction of a compact and efficient wind turbine. Using the principle of lift, Betz's law (López 2013) and the principle of electromagnetic induction, we proceed to the CAD analysis (see Figure 2) and continue with the construction of a compact and efficient wind turbine (Rivkin, 2013).

Figure 2 Design made in mechanical and architectural design software
Source: Own elaboration

For the correct use of general winds and the location of machines, the Bjerknes axiom taken into account, which indicates the movement or direction of rotation: "when the pressure gradient and the temperature gradient have different directions, a circulation occurs of air from the pressure gradient to the temperature gradient (Cueva, 2015).

While the synoptic winds allow to schematize its movement by a vector oriented in the direction towards which it blows and whose origin is located in the place of observation. The regional winds governed by synoptic type displacements of the air mass, which is finer and more precise than the general circulation of Hadley and whose characteristics are determined based on given and very precise meteorological situations; such as the isobaric configuration and the position of the fronts.

The direction of the wind at ground level is influenced by the topographic situation of the considered place, the frequency of the directions is not always a general characteristic in line with the average isobaric situation, as is the respective average position of anticyclones and depressions along of the year, the particular and local winds are proof of this.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Methodology

The calculation, design and construction memory of a vertical generator prototype developed based on wind statistics in the eastern part of the state of Mexico, particularly in the town of Chalco. The relevant calculations for this work were: area of the blades, gear ratio, rotation speed, the generator, the required power, the electric power according to the Bentz efficiency (for the wind turbine), the power of the solar panel and the total power of the system. Within this project, the materials that initially used for the blades were glass wool, catalyst and resin; obtaining a porous surface that presented more resistance to the passage of the wind. The solution for this mishap was to use commercial fiberglass plates, since these plates have a smooth surface and are ideal for prototyping.

QFD

Quality Function Deployment (QFD) used worldwide as a methodology that translates the voice of the customer into design parameters so that they can be deployed horizontally within planning, engineering, manufacturing, assembly, and service departments. (Gonzalez, 2001)

This methodology used in the present project since it helped to identify what is important and thereby provide a system based on logic and thus replace decision-making based on emotions.

The quality house for this project consists of the eight base areas of the QFD, those numbered from one to four make up the basic parameters and the following four originate their relationship matrices (see Figure 3) (Hunt, 2013)

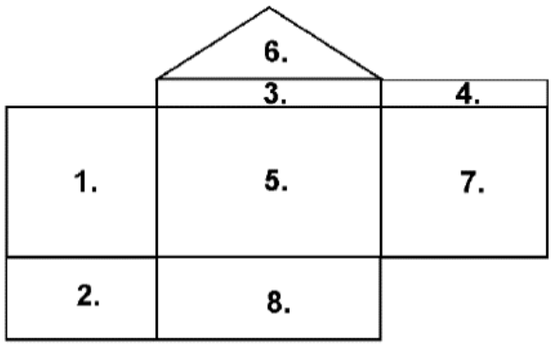


Figure 3 General scheme of the QFD quality house of the proposed wind turbine
Source: Own elaboration

The areas and matrices listed in Figure 3 are:

1. User requirement area.

2. Technical evaluation area.

3. Area of quality characteristics.

4. Evaluation factor area.

5. Correlation matrix.

6. Sensitivity matrix.

7. Evaluation matrix.

8. Scoring matrix.

Figure 4 shows the four main areas and the four matrices applied to the wind turbine that developed in this work. This methodology applied with the purpose of having a product developed in a preventive way and having a very small number of corrections. When developing the engineering specifications, measurable parameters were established based on the characteristics of a wind turbine, therefore, it was investigated in order to obtain the values or characteristics of each of the competitors that met each of the specifications of previously established engineering. The satisfied engineering objectives are the values that the new equipment to be designed should present, while the unsatisfied ones are values that the new equipment should not present (Ullman, 2010).

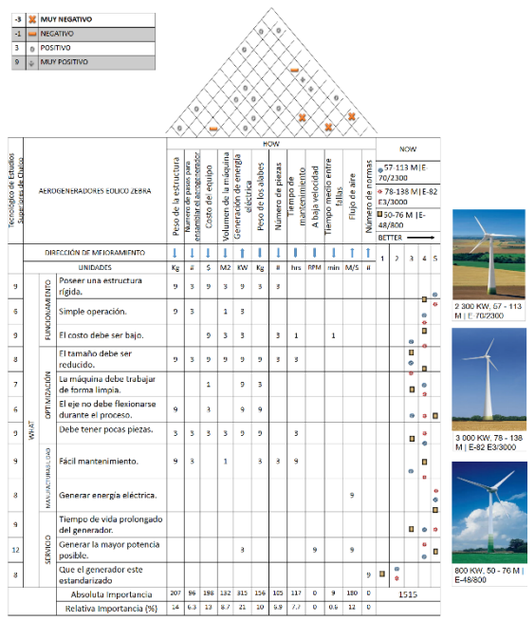


Figure 4 QFD quality house of the proposed wind turbine
Source: Own elaboration

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

The criteria for the direction of improvement shown in image 4 "to make it easier to attach requirements" can be measured by the number of steps needed to attach, the time to attach, the number of parts and the number of standard tools used.

An important point here is that every effort should be made to find as many ways as possible to measure customer requirements. A possible solution is to divide the requirement into finer independent parts or to redo the customer needs identification step with specific attention to that requirement, especially in the detailed design and thereby achieve a competitive team proposal.

Results

Wind power

The average speed in Chalco is 6.3 km/h, equivalent to 1.75 m/s (Ventures, 2018), which is the tangential speed of our turbine. And a blade radius of 0.50 m is proposed. Having these variables, we proceed to calculate the value of the angular velocity using equation 1. 8 (Orozco,2014)

$$v = w.r \quad (1)$$

Where; v is the average velocity, r is the radius of a blade, and ω is the angular velocity.

Solving for angular velocity, we get:

$$\text{w} = \frac{(1.75)(60)}{1} = 105\ rpm$$

Therefore, if we use mechanically with a 6 to 1 ratio band, the angular speed will be raised to 630 rpm.

For the calculation of the power, because you are working with a fluid, you must calculate the wind flow, this is done using equation 2.(Orozco, 2014)

$$Q = A * v \quad (2)$$

Where; Q is the flow rate, A is the area of one of the blades, and v is the average velocity.

$$\text{Q} = \left(1.75\ \frac{m}{s}\right)(0.782\ m^2) =$$

$$Q = 1.37\ \frac{m^3}{s}$$

In addition, to calculate the power we will use equation 3.

$$P = Q\rho gh \quad (3)$$

Where; P is power, Q is the flow rate, ρ is the air density, g is the gravitational constant, and h is the ideal height.

$$P = \left(1.37\frac{m^3}{s}\right)\left(1.225\frac{kg}{m^3}\right)\left(9.81\frac{m}{s^2}\right)(10\ m) =$$

$$P = 164.63\ \text{W}$$

According to the Betz efficiency, a wind turbine has an efficiency of 40%, equation 4 (López, 2013)

$$P = (164.63\ W)(0.40) = 65.852\ W \quad (4)$$

Therefore, our power is 65,852 W, but multiplying this power by the five blades that our turbine has and by a time period of 24 hours (equation 5), we obtain (Talavero, 2011).

$$P = (65.852)(5)(24\ ) = 7.9\ kW/h \quad (5)$$

The total power produced in the turbine will be: 7.9 kW/h

According to the calculations proposed, the use of 5 blades would generate more power increasing the surface area where the wind currents impact.

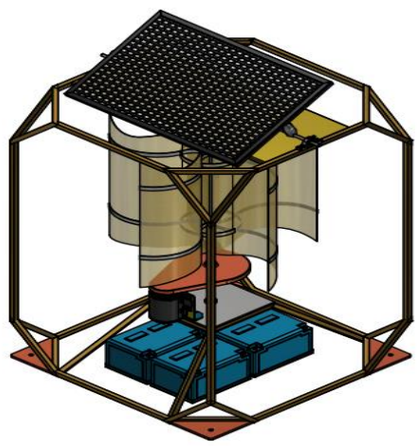


Figure 5 Design with 5 blades

For the analysis of the results, the aerodynamic theory of machines considered, in which one of the first considerations is the drag force:

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

$$F_{arr} = R * sen \propto = K_x * S * V_2 * F_{asc} = R * cos \propto = K_y * S * V_2 \quad (6)$$

Where:

The force R considered normal to the chord of the profile, which is at the same time its characteristic length; the buoyancy increases as α decreases. The chord considered from the leading edge of the air foil to the trailing trailing edge. If the shape of the profile is not flat, R can be decomposed based on two types of coefficients, drag kx, and lift ky, with the x axis parallel to the wind direction.

The axial force and the torque evaluated from

$$dF_{par} = dR_y sen\theta - dR_x cos\theta = \frac{1}{2}\rho(c^2)dS(C_y sen(\theta) - C_x cos(\theta)) \quad (7)$$

Being θ the angle formed by the apparent (relative) wind direction. The values involved in the calculation of these differential elements are a function of the speeds in each zone [Figure 1] and, therefore, of the angle of attack α, since this is known, it is possible to obtain the values of Cx and Cy as a function from it, getting:

$$dF_{par} = \frac{1}{2}\rho v^2 dSC_y \frac{sen\,(\theta - \alpha)}{sen^2\theta cos\alpha}$$

$$dF_{par} = \frac{1}{2}\rho v^2 dSC_x \frac{cos\,(\theta - \alpha)}{sen^2\theta cos\alpha} \quad (8)$$

The equation for the centrifugal force responsible for providing the thrust on the blades towards the outside, is taken into consideration since it could tear the blades from the hub:

$$F_{cent} = \frac{1}{2} G \frac{u^2}{r_G} = \frac{G(\frac{\pi r_G n}{30})^2}{2r_G}$$

$$F_{cent} = \frac{0.1034G\{(kv(SR)_G\}^2}{2r_G} \quad (9)$$

The calculation of the force generated by the wind and the speed was carried out with the help of a CFD tool (Computational Fluid Dynamics) which shows the maximum result of 6 m/s for the use of 5 blades while maintaining structural stability.

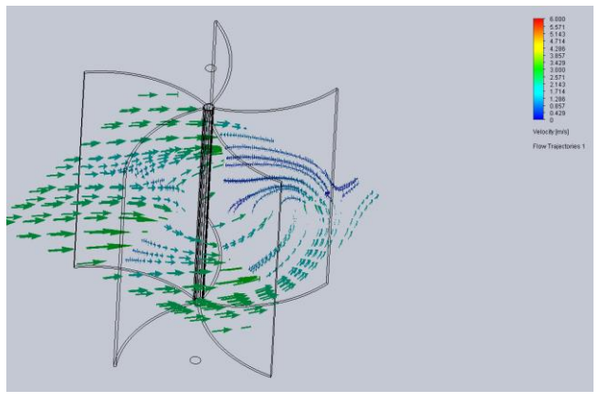


Figure 6 CFD Test for velocity

In the same way, using the CFD tool, the maximum pressure generated in the blades obtained, which is very close to atmospheric pressure, for which it observed that the integrity of the blades would not be affected.

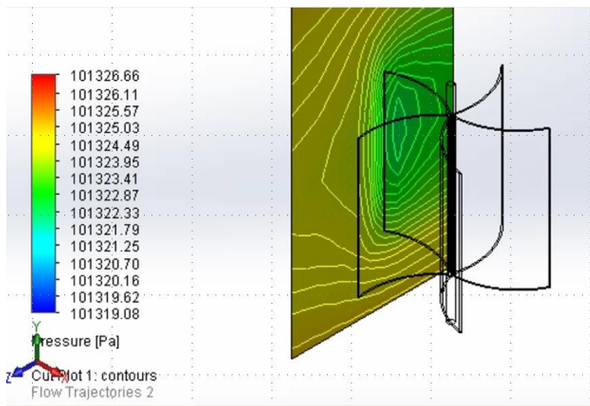


Figure 7 CFD Test for pressure

Solar energy: the solar cell under standard conditions provides us with a maximum power of 250 W per hour, so a period of 8 hours considered:

$$P = (250\ W/h)(8h) = 2\ kW/h$$

If it is considered that during those 9 hours the temperature exceeds 25°C and under these conditions the efficiency drops to 88%, then:

$$P_{88\%} = (2\ kW/h)(0.88) = 1.76\ kW/h$$

Considering that there could be very cloudy days, the efficiency would drop up to 25%, leaving:

$$P_{25\%} = (2\ kW/h)(0.25) = 0.5\ kW/h$$

Therefore, the maximum and minimum power considered on a sunny day and a cloudy day respectively, calculating the average power.

$$P_{prom} = [(1.76 + 0.5)kW/h]/2 = 1.13\ kW/h$$

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Total power:

With the calculation of the power of wind and solar energy (Le, 2023), the total power of the hybrid system estimated, obtaining a value of 9.03 kW per hour.

$$P_{total} = 7.9 + 1.13 = 9.03\ kW/h$$

As can be seen in the calculations, the power generated can satisfy various needs, so its use is suitable in offices, 1-story houses, and even in 2-story houses.

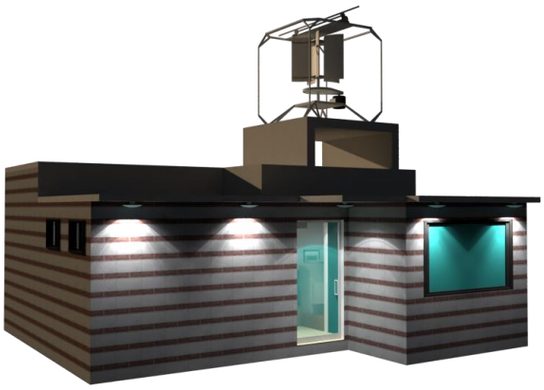


Figure 8 Example of use in offices

On average in Mexico, a single-family home consumes 6.59 kW/h according to the World Data Bank, less than the 9.06 kW/h calculated for the total power generated for the proposed system.

Figure 9 Example of use in houses

Conclusions

It was observed that the surface of the blades should have the lowest possible roughness, which is why the lowest roughness [image 2] was used as design for the material of the product through computer programs such as SolidWorks and Revit since the roughness will depend on the material and depending on a lower roughness coefficient, the drag generated by the blade will be less. Based on the material used in this work, there is a roughness coefficient of 0.1 mm.

Another observation that made was that for greater wind efficiency, the wind turbine could be placed in areas close to roads with a large influx of vehicles, so as a second stage it is intended to develop new prototypes in these areas to optimize the generation of electrical energy.

References

Cueva, B., 2015. *Diseño y construcción de un generador eólico de eje vertical tipo Savonius para producir 20W.*. Escuela Politécnica Nacional ed. Quito : s.n.

Gonzalez, M. E., 2001. *QFD La función despliegue de la calidad; una guía práctica para escuchar la voz del cliente.*. Mc Graw-Hill ed. México : s.n.

Hunt, R. X. F., 2003. *The leading adge in strategic QDF*. West Yorkshire ed. England : s.n.

Le, TS, Nguyen, TN, Bui, DK y Ngo, TD (2023). *Optimal sizing of renewable energy storage: A techno-economic analysis of hydrogen, battery and hybrid systems considering degradation and seasonal storage*. Applied Energy, 336,120817.

Lee, J., Lin, KYA, Jung, S. y Kwon, EE (2023). *Hybrid renewable energy systems involving thermochemical conversion process for waste-to-energy strategy*. Chemical Engineering Journal, 452, Part 2, 139218.

López, M., 2013. *Ingenieira de la Energía Eólica.* Alfaomega ed. México : Marcombo.

Orozco,M. E., 2014. *Comparacion de herraminetas de diseño para alabes de aerogeneradores eólicos de baja velocidad de viento.* Universidad Autónoma del Estado de Hidalgo ed. Pachuca, Hidalgo: s.n.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Rivkin, D. e. a., 2013 . *Wind Turbine Technology and Desing.* Jones & Barllet Learning ed. United States of America : s.n.

Talavero, N. &. T. M., 2011. *Energía Eólica.* Universitarias de Zaragoza ed. España : Prensas.

Ullman, D., 2010. *The mechanical desing process.* McGraw-Hill ed. Michigan, United States of America: s.n.

Ventures, C., 2018. *Wheaterspark.* [En línea] Available at: https://es.wheaterspark.com/y/6691/Clima-promedio-en-Chalco-México-durante-todo-el-año
[Last access: July 13, 2023]

Zheng, J., Du, J., Wang, B., Klemeš, JJ, Liao, Q. y Liang, Y. (2023). *A hybrid framework for forecasting power generation of multiple renewable energy sources*. Renewable and Sustainable Energy Reviews,172,113046.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Article **ECORFAN Journal-Mexico**
December 2023, Vol.14 No.31 46-58

Discursive hybridity in the chat rooms of university students' WhatsApp groups

Hibridación discursiva en las salas de chat de los grupos de WhatsApp de los estudiantes universitarios

VELASCO-PALACIOS, María Dolores & AGUILAR-ROJAS, Elías

Universidad Nacional de San Antonio Abad del Cusco, Cusco, Perú.

ID 1st Author: *María Dolores, Velasco-Palacios* / **ORC ID:** 0000-0001-6978-4112

ID 1st Co-author: *Elías, Aguilar-Rojas* / **ORC ID:** 0000-0002-2096-104X

DOI: 10.35429/EJM.2023.31.14.39.45.58 Received: July 25, 2023; Accepted: December 30, 2023

Abstract

The central purpose of this research article is to describe and analyze the hybrid character of the discourses that occur in the chat rooms of the WhatsApp groups of university students of the Universidad Nacional de San Antonio Abad del Cusco, semester 2023-I. El enfoque de investigación que se ha seguido es de tipo cualitativo y alcance descriptivo-analítico con una aproximación a lo cuantitativo. El diseño es el fenomenológico porque describe el fenómeno de la hibridación discursiva. Además, es de diseño de teoría fundamentada por su tratamiento teórico. La investigación se realizó en una muestra conformada por 70 estudiantes de los grupos de WhatsApp de las escuelas profesionales de Economía y Farmacia y Bioquímica cuyas edades oscilan entre 17 a 20 años seleccionada de manera no aleatoria. El instrumento que nos permitió fue la ficha de análisis documental. This research concludes that the discourses in the chat rooms of WhatsApp groups are of a hybrid and multimodal nature due to the variety of codes and discursive forms used in communication. Likewise, there is a hybridization in the use of different orational modalities, types of texts, play of hybrid tenses, symbolic games and the creative and hybrid combination of different mathematical and linguistic signs; they perform morphological hesitations; they break with orthographic and conventional norms. In addition, those who communicate via WhatsApp use different communicational spaces such as interpersonal and interdiscursive spaces, metadiscursive, paradiscursive, presuppositional, prosodic, intersemiotic spaces, etc.

Discursive hybridization, Cybernetic Language, Discursive And Interdiscursive spaces, discursive modalities.

Resumen

El propósito central del presente artículo de investigación es describir y analizar el carácter híbrido de los discursos que se dan en las salas de chat de los grupos de WhatsApp de los estudiantes universitarios de la Universidad Nacional de San Antonio Abad del Cusco, semestre 2023-I. El enfoque de investigación que se ha seguido es de tipo cualitativo y alcance descriptivo-analítico con una aproximación a lo cuantitativo. El diseño es el fenomenológico porque describe el fenómeno de la hibridación discursiva. Además, es de diseño de teoría fundamentada por su tratamiento teórico. La investigación se realizó en una muestra conformada por 70 estudiantes de los grupos de WhatsApp de las escuelas profesionales de Economía y Farmacia y Bioquímica cuyas edades oscilan entre 17 a 20 años seleccionada de manera no aleatoria. El instrumento que nos permitió fue la ficha de análisis documental. En esta investigación se concluye que los discursos en las salas de chat de los grupos de WhatsApp son de carácter híbrido y multimodal por la variedad de códigos y formas discursivas utilizadas en la comunicación. Así mismo, hay una hibridación en el uso de diferentes modalidades oracionales, tipos de textos, juego de tiempos híbridos, juegos simbólicos y la combinación creativa e híbrida de diferentes signos matemáticos y lingüísticos; realizan vacilaciones morfológicas; rompen con las normas ortográficas y convencionales. Además, los que se comunican por WhatsApp utilizan diferentes espacios comunicacionales como los espacios interpersonales e interdiscursivos, espacios metadiscursivos, paradiscursivos, presuposicionales, prosódicos, intersemióticos, etc.

hibridación discursiva, lenguaje cibernético, espacios discursivos e interdiscursivos, modalidades discursivas

Citation: VELASCO-PALACIOS, María Dolores & AGUILAR-ROJAS, Elías. Discursive hybridity in the chat rooms of university students' WhatsApp groups. ECORFAN Journal-Mexico. 2023. 14-31:46-58.

† Researcher contributing first author.

Introduction

The linguistic reconceptualization of the global superstructures of the text.

Likewise, Mikhail Bakhtin (1895-1975) in his study on discursive genres argues that secondary or complex discursive genres contain primary discursive genres both in their discursive characteristics and structures. Bakhtin's translinguistic and transtypological theory of discourse accounts for discursive hybridity in both its oral and written forms, which distances it from Saussurean theory and even from Vossler's linguistic school.

In these times of the digital era, at the height of the scientific and technological revolution where the discursive structure has taken on a different structure and nature of an electronic language. It is necessary to carry out a linguistic study of the current panorama of discourses in the cybernetic spaces of chat in its written and oral forms from a synchronic-evolutionary and diachronic perspective. Studies on cyber discourses are still scarce or non-existent. However, the context of the pandemic has made discursive modalities more electronic and digital. Such a context has been the driving force behind the transformation from a traditional discursive modality to a virtual or electronic discursive interaction. Given this need, we proposed, in the present research article, to conduct a study on the discursive hybridity present in chat rooms in these virtual times in whose study, we have proceeded with a pragmalinguistic analysis of the WhatsApp chat discourse.

Without linguistic studies in the context of modern discursive forms, we would be stuck in the conservatism of classical discursive theories of face-to-face personal communication. The diachronic nature of a language and discursive transformations calls for linguistic studies in the context of cybernetic language. Therefore, the task of a linguist is also to innovate and renew linguistic theory, according to the new contexts brought about by modernity and the digital era.

To conduct a discursive analysis from a pragmatic point of view, a scientific research method was followed in all stages of the study up to the qualitative and quantitative analysis of the body of discourses in relation to the process of hybridization present in the discursive spaces of the chat rooms of WhatsApp groups through the collection of the chats or conversations, the analysis and categorization of the information and the conclusion of the research. The research technique that allowed us to conduct the study was the documentary analysis technique and the analytical-phenomenological method from the sociolinguistic point of view.

It is very relevant to carry out a scientific and epistemic study of electronic discourses in environments of the digital era in order to reconceptualize and rethink the linguistic nature of languages as a system and the pragmatic use according to the transformation process and diachronic and synchronic criteria.

The importance of this research article lies in the theoretical contribution and pragmatic analysis of the text in electronic discourse and its transformation process to be carried out in real communicative contexts.

This article has theoretical, pragmatic, epistemic and social importance. Its theoretical value lies in the contribution of linguistic, diachronic and synchronic constructs and theories of electronic discourse to the existing knowledge on sociolinguistics, discursive linguistics and pragmalinguistics. These theories will serve to make a modern linguistic analysis and treatment of cyber discourses that have a hybrid structure. The results of the research will serve as a theoretical source of reference for linguists, teachers and future researchers.

This research is of great methodological and social importance, since it will provide methodological tools for discourse analysis in the field of sociolinguistics in a cybernetic context. This contribution will help linguists, trainers and social actors to understand an electronic discourse and thus solve problems related to the communication process in virtual environments. Citizens in the digital era use and will continue to use this type of electronic discourse through chat with varied and multiple textual structures and codes.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Likewise, the instruments that have been developed for the study and analysis of the phenomenon of hybridization can be used by other researchers and teachers in the linguistic field in this same or related topics.

Conceptual framework

Discursive hybridization

The discursive act is a production of linguistic communication in which heterogeneous realities such as knowledge, beliefs, myths that the discursive constructs about reality from perception are made known. Musialek (2015) states that every discursive act is, also, an act of knowledge representation, therefore, discourse is a carrier of such knowledge and opinions about reality. From the cognitive and psychosocial perspective, human beings elaborate discourses about the world, concepts and points of view as social representations that imply and determine "social practices, norms and rules" (p. 30). Likewise, the situational, cultural and momentary aspects and factors in which the discourse is given.

The hybrid terminology according to the dictionary of the RAE means: "set of elements of different nature". From this meaning, the hybrid is conceptualized as an alloy and mixture of different elements or components. In the discursive field, it is the combination and mixture of different textual typologies, codes, modalities, etc. Indeed, discursive hybridization is understood as the variety and multiplicity of codes of use, voices, enunciative modalities, styles, combinations with iconic representations (the latter in written discourse), and plausible and doxic discursive representations that occur within the different electronic communicational spaces.

In discursive production there are two representations of reality that are emitted by the communicators: The first is the cognitive representation and the other, the social representation (Musialek, 2015). The cognitive discursive representation are the ideologies, also known as beliefs, thoughts, reasoning that the discursive person has which are transmitted and shared socially within a social group. They are mental representations or interpretative realities formed within mental schemas, which are integrated by basic principles such as perception, understanding, knowledge. They are all conceptions and interpretations of the world (Van Dijk, 1998).

On the other hand, social representation refers to collective norms, collective ways of life, collective uses and customs which are accepted; they are socially established knowledge and in many cases of hegemonic character. According to Musialek (2015), the conceptualizations that occur in social representations present the following elements: "commonplace, ideology, common sense, doxa, opinion, attitude, prejudice, stereotype, values, etc." (p. 30).

According to Van Dijk (1998) in discursive representations there are "mental models of knowledge and contextual models of the communication situation". The former refer to the representation of individual, experiential and episodic thinking that relate to people's concrete actions. On the other hand, contextual models are semantic and cognitive models that control and contextualize the production of discourse, the different discursive forms to be used according to each communicative situation, "the syntactic structures, the type of lexicon, the different modalities", as well as the type of implicit or explicit message. In the same way, they define and redirect the comprehension of listeners or readers according to the purposes, interaction roles and interpretation of the meanings underlying the discourses.

Discourse, in its cognitive dimension, is defined by Pfleger (2021) as a creative communicative construction of language that the discourse speaker elaborates in the interaction with other people, a space where he/she constructs meanings by putting into play the elements of "cognition, social phenomenon and linguistic instantiation". From the cognitive dimension, discourse is a construction of meanings, knowledge and experiences, experiences, etc. "that constantly triangulates between social structures, discursive structures and cognitive structures" (p. 1). In a virtual environment, such constructed experiential meanings are transmitted in a heterogeneous or hybrid manner in terms of the use of different codes, modalities and discursive forms.

Discursive analysis

According to Charaudeau (2004), the central criterion in discourse analysis is truth, i.e., how much the discourse influences, persuades or makes the listener or reader believe with the construction of meanings enunciated in his discourse.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

The construction of meaning in a discourse, according to the author in question, "arises from the constant interaction of three types of individual and social activities: the activity of relating to others, of categorizing the world, and of semiology" (Charaudeau, 2004, Charaudeau, 2004). (Charaudeau, 2004, cited in Musialek, 2015). In that understanding, for Charaudeau the discursive is the producer of senses in an act of communication in a relationship of communicative intercomprehension.

Categories of discursive knowledge according to basic semantic and functional properties.

The categories of discursive knowledge are presented in a relationship of ideology and knowledge. Van Dijk (1998) classifies into seven categories of discursive knowledge. (1) referential knowledge (referring to the representation of objective reality) and procedural knowledge (corresponding to processes and actions); (2) social category (personal, interpersonal, group, professional, institutional, regional, national, cultural, international and universal); (3) category of generality or specificity of the referenced knowledge of events or situations; (4) ontological category of events or occurrences (knowledge alluding to concrete or abstract entities, fictitious, historical, etc.); (5) category according to the generality or specificity of the referenced knowledge of events or occurrences (knowledge alluding to concrete or abstract entities, fictitious, historical, etc.); (6) category according to the category of the event or occurrence (knowledge alluding to concrete or abstract entities, fictitious, historical, etc.).); (5) category according to the degree of intensity (referring to the degree of veracity: certain or uncertain); (6) theoretical or empirical (according to the type of knowledge constructed or assumed); (7) category according to the forms of dissemination of formal or informal, specialized or non-specialized (esoteric or profane) knowledge.

The same author states that these discursive categories can be given in a combined manner; as well as, the modalities, means of diffusion or interaction, discursive, persuasive or informative typologies, etc. In the same way, he stresses the importance of the communicative situation that occurs in every discourse within the framework of semantic and pragmatic properties.

In the same line, as Musialek (2015) states in relation to what Van Dijk (1998) established, the fact of producing and understanding a discourse, whether political, academic, scientific, etc., implies the handling of different knowledge by the addressee or interlocutor.

Discursive and interdiscursive spaces

Discursive and interdiscursive spaces are the spaces where the communicative act takes place between interlocutors who share the roles of communicators and receivers. Exactly, within the socio-communicative spaces, discursive hybridization arises in a dynamic of discursive interaction (Ramírez Almansa, 2021); these spaces can be spaces of direct face-to-face communication, virtual spaces such as chat rooms, asynchronous or synchronous communication spaces.

For Pfleger (2021) such discursive exchanges are processes of transmission and contact known as communicative spaces. For the author "each discourse opens a space of exchange and interaction in which the actors communicate about a given reality" (p. 3). She also emphasizes the relational nature of discourse where all the necessary cognitive and social elements circulate, which she calls socio-cognitive structures. Consequently, assuming the Plegerian logic, discursive spaces are equivalent to communicative spaces.

According to Charaudeau (2004) interlocutors select the topic; they issue messages explicitly as well as implicitly; they focus on the objects of knowledge they share; they make judgments to such knowledge or messages within an interdiscursive discursive space. In the same way, they form an opinion according to their stance. The author also calls interdiscursive spaces as space of thematization.

In order to attest to the existence of the knowledge entities issued or to be issued, the interlocutors and/or discursors resort to actions of "identification, qualification, representation of facts and actions, as well as explanations" (Charaudeau, 1995).

Types of discursive operations

According to Pop (2000) there are nine fundamental types of discursive operations that occur simultaneously in practice in different discursive spaces.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

1. Interdiscursive spaces. These are spaces where discursive exchanges of an intertextual and bidirectional nature take place, i.e., messages are related and combined with other texts or discourses. In these discursive spaces, there are reiterations, emphases, citations of other discourses or versions, etc.

2. The metadiscursive space. This is a communicational space that goes beyond a conventional discourse. The nuances that identify this type of discourse are: reformulations, clarifications, precisions, justifications, explanations, exemplifications, demonstrations, etc.

3. Interpersonal space. It is a medial space between people, that is to say, it is a relational discursive space in which the issuers make appeals, appeals, exhortations to the interlocutor, likewise, greetings, imperatives, vocations of how the speaker addresses the receiver are identified.

4. Subjective spaces. These are subjective and connotative discursive practices. On the one hand, they are evaluative, appreciative discourses whose purpose is to evaluate, judge or examine facts, realities or beings; on the other hand, they are affective and emotive discourses where the discursor externalizes his emotional states.

5. Referential discursive space. This is the space that describes an objective or abstract reality. The nuances that characterize this type of discourse are reports, descriptions, factual statements, demonstrations.

6. Presuppositional discursive space. These are communicative spaces that focus on conjectures, hypotheses, demonstrations whose purpose is to get to the bottom of knowledge. They are presuppositional nuances: thematizations, assumptions, explanations, verifications, framings, systematizations, crossings of information.

7. The paradiscursive space. These are discourses in which operations of formulation of discursive modalities for other discourses, preparation of expositions, agreements, search for appropriate words, hesitations, choice of ideas, elimination of errors or corrections are carried out.

8. Prosodic space. Discursive space in which suprasegmental elements such as accent, intonation, pauses or communicative silences, which are interpreted by the interlocutors, are put into practice.

9. Intersemiotic communicative spaces. These are non-verbal communicative acts, i.e., non-linguistic communication such as gestural, oculistic, proxemic, haptic, mimic, etc. communication.

Communicative operations as discursive forms or ways in which the discursive organizes and structures the ideas of the text he produces, are concrete actions that take place in different spaces as they have been classified based on Pop's proposal (2000). These discursive acts are linguistic practices of a cognitive nature because they originate in the psychic phase and then become concrete in the speech act in different spaces.

Hybrid discursive forms

Digital discourses offer us a renewed heterogeneity of appropriateness and mixing of codes in communicative interaction over the internet through the application of different social networks such as WhatsApp, Instagram, Facebook, etc. Written discourses on the web, mostly by WhatsApp in terms of its uses and forms, is closer to oral communication than written" (Ramirez, 2019; Dackow, 2020). Hybrid forms are mixed endogenous-exogenous type communications or discourses (Musialek, 2015). Among the different hybrid forms of discourse we have:

a. Hybrid written language. The hybrid textual genre is a discursive form that contains a mixture of different textual genres such as literary, expository, cinematographic, etc. (Ramírez Almansa, 2021; Moreno, 2000). There is a combination of languages, codes (Errico, 2013). In the digital era, texts are heterogeneous. This heterogeneity occurs both at the level of discourse organization and the enunciative level (Musialek, 2015).

Hybrid discourses originate from different phenomena: cultural (Ramirez, 2021), social, cybernetic, temporal or epochal; in current times discourses are even more hybrid and variegated.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

When in a textual genre the presence of another type of text or inserted genre is appreciated, it is called hybridity (Lavob & Fanshel, 1977). A text is mixed when it contains, in its organizational structure, different types of texts such as informative, descriptive, argumentative, narrative, dialogic, etc. For Ramírez Almansa (2021) these discursive acts occur in the textual media analyzed from a pragmatic perspective.

In this type of texts different voices, styles, varied discursive forms, different relations of text and context intervene (Ramírez Almansa, 2021; Van Leeuwen, 1993), alternative codes such as iconic and onomatopoeic languages, etc.

b. Multimodal codes. A discourse is considered hybrid when it uses multimodal codes, that is, a multitude of discursive modes or forms ranging from the use of iconic codes (images, photographs, emoticons), written codes (different types of written texts, abbreviations), oral codes (voice recordings), phonetic codes (onomatopoeic voices), symbolic codes, etc. Within the oral and written codes, academic (formal) and non-academic (informal) speeches are introduced.

In written and oral codes, hybrid forms occur in the use of enunciative, interrogative, interrogative, exhortative, dubitative, exclamatory, and desiderative sentence modes; these forms are mixed with other codes such as symbolic, iconic, etc.

According to Hulst (1995), textual means are those that make it possible for texts to have a multitude of functions (multifunctionality) in a given context. According to the author in question, what matters in multimodal and multifunctional use is the communicative purpose or objective and these are of an extratextual character and the textual media would be of an intratextual character; therefore, the discursive act is the sum of both characters.

Hybrid discursive and sociodiscursive imaginaries

In hybrid discourses, sociodiscursive imaginaries occur when the speaker, group of discursives or discursive communities create plausible, fictitious or doxic realities about some aspect related to the society or social context where they are in a specific sociohistorical moment (Medina Audelo, 2019). (Medina Audelo, 2019).

"It is the internal freedom of man as creation, institution, invention and discovery, associated with reality and the symbolic functions of language" (p. 3).

Imagination is part of individual and collective creation in the formation of concepts, meanings and ideas about perceived reality, which are concretized in different discursive spaces. Collective ideas, whether beliefs or knowledge, have been constructed on the basis of social imaginaries.

The social imaginary is classified into two types or forms:

a) in the instituting imaginary that refers to the creation of a "human collective entity of new meanings that subvert the existing historical forms and b) the instituted imaginary that is the product of this creation: it is the set of people or discursive groups that embody and construct these meanings and confer reality, whether they are material (tools, techniques, instruments of power) or immaterial (languages, norms, laws)" (Poirier, 2006, p. 62; Medina Audelo, 2019).

The discourses in chat rooms have as instituting discursive imaginaries all the members of the group who interact and create and construct meanings about the reality and topic of conversation in relation to the communicative situation. On the other hand, the discourse created, and the meanings already assumed as a cultural product accepted by all, is the instituted imaginary; and, as material products, are the manufactures or technological products.

Multidiscursive Spaces of WhatsApp Chat Rooms

WhatsApp is an application most used by individuals and groups of people as a means of communication to exchange messages or share information, videos, images, links to websites, location maps, etc. in real time. It is a multidiscursive space because there are different types and discursive formats, as well as types of texts. The multidiscursive character is even more evident in WhatsApp groups where many people interact through multimodal discourses such as text messages (SMS), audios, videos, images, Gifs, emoticons, cartoons, abbreviations or geographic location.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

In the context of remote education, WhatsApp has also been used as a means of teaching and interaction with students, therefore, as stated by Mamani Sanchez (2019) it would have a pedagogical force and from a linguistic point of view presents a simple discursive structure.

WhatsApp is not only used by young people - although it is true that this population group uses it more frequently - adults and older adults also use it; the difference is in the type of discourse and the variety of multimodal discursive forms they use according to age and gender. In communication, linguistic codes (text messages and voice recordings) and non-linguistic codes (emoticons, images, moving images, etc.) are used (Ongallo, 2007; Mamani Sánchez, 2019)). Communication through non-linguistic codes reinforces linguistic communication (Chempén, 2017).

Regarding the grammatical and stylistic nature according to Mamani (2019) in WhatsApp communication "Punctuation rules are not respected, just as words are not usually stressed, i.e., there is syntactic relaxation, discursive sloppiness, lack of concordance; incorrect uses of syntactic spelling". These characteristics of WhatsApp writing respond to the nature of spontaneous, natural and free conversation.

Methodology

In the present scientific study, the qualitative methodological line has been followed with a quantitative approach. The qualitative paradigm has been chosen because of the nature of the study of the problem addressed, since it will allow describing the linguistic phenomenon in data that are not necessarily quantifiable, but a qualification on the phenomenon of hybridization.

As for its scope, this research article has a descriptive phenomenological scope because of its qualitative type. It is descriptive phenomenological because what it intends is to describe through a textual analysis the phenomenon of discursive hybridity present in communication through WhatsApp group chat. Furthermore, it is close to explanatory because it supports certain discursive factors that condition users of chat communicative spaces to opt for the use of multiple forms of written conversation in a virtual context.

In terms of design, the present study is a phenomenological design of analytical type; likewise, due to its theoretical nature, it is a grounded theory design.

On the one hand, it is a phenomenological study in its analytical-interpretative treatment because the phenomenon of discursive hybridity present in WhatsApp group chat rooms at a given time was described and analyzed.

The population under study were the students of the first semester of the National University of San Antonio Abad del Cusco, made up of 70 students of the WhatsApp groups of the professional schools of Economics and Pharmacy and Biochemistry whose ages range from 17 to 20 years between males and females.

To determine the sample, the non-random or non-probabilistic technique was used, i.e., the group of subjects, and its corresponding WhatsApp group, was selected intentionally for working with them on a general education subject.

The instrument that facilitated our analysis and description of the phenomena of discursive hybridization present in the chat rooms of the WhatsApp groups was the documentary analysis sheet. The discourses extracted from the WhatsApp group or collected were in a number of 40 to 50 conversations or chat.

In the stage of analysis and hybrid description of the speeches, categorization was carried out according to the forms of hybridization in relation to codes, discursive spaces, orational, stylistic, form, enunciative modes, etc. Triangulation was also carried out to determine the points of encounter or recurrences. Based on these procedures, knowledge was constructed following the grounded theory design.

Analysis

From the analysis of the WhatsApp group chat discourses collected with methodological supports and resources such as the documentary analysis sheet, the following results were obtained:

The analysis focuses on the linear, modal, stylistic structure and structure behind the lines of the texts or conversations held by the students in the discursive and interdiscursive virtual spaces in the chat rooms.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Likewise, it focuses on the morphosyntactic, lexical-semantic analysis, as well as the cybernetic characteristics present in the virtual conversations. The set of texts of the conversations was retrieved from the WhatsApp group of the different days collected from the month of May to October 2023. The phenomenon of discursive hybridity present in the conversations in the chat rooms of WhatsApp groups is as follows:

Chat Room: WhatsApp group Text Writing, Economics students, semester 2023-I:

[7:01 a.m., 9/26/2023] +51 997044790: Guys good morning ! 💁‍♀️ ...
Before the contemplations regarding the teachers' strike and the dispersion of verbatim and non-verbatim information ...Let's keep an eye on the group. There is a certain probability of doing the virtual classes in the hour of writing ... (depending on whether or not a formal resolution is issued). Otherwise the classes are face-to-face, if there is no communication.

[8:48 p. m., 11/10/2022] +51 932633099: Good morning, everyone. The university is closed

[8:48 p. m., 11/10/2022] +51 9731176169: Noooo.... I'm on my way

[8:48 p. m., 11/10/2022] +51 928508751: Then confirm that it will be by meet

[7:01 a.m., 11/10/2022] +51 944017430: Definitely, they don't let in the university.

We have checked with the professor.

[7:00 a. m., 11/10/2023] +51 930346759: Ala, I am about to arrive at the U.

[7:01 a. m., 11/10/2022] +51 917265789: They are entering from the top.

[7:00 a. m., 11/10/2023] +51 900423900: X2

[7:01 a. m., 11/10/2023] +51 917265789: Ahh?

[7:01 a. m., 11/10/2023] +51 930346759: Those are from cepru xd. Hahaha

[7:03 a. m., 11/10/2023] +51 922621404: Cepru never stops, they are hard workers.

[7:03 a. m., 11/10/2023] +51 917265789: The cgd haha.

[7:18 a. m., 11/10/2023] +51 931141594: Those in the mate group vote for option 2.

[7:24 a. m., 11/10/2022] +51 927132640: The jalados are winning :(

[7:25 a. m., 11/10/2023] +51 928508751: Xddd

[7:30 a. m., 11/10/2023] +51 997044790: Guys! Join the Classroom for writing classes! Teacher is sending out the invitation.

In this space of interpersonal conversation, the members of the discursive group use vocatives, imperatives, appeals, exhortations. That is, the use of different sentence modalities is recognized, such as enunciative sentences (They are entering from above), exclamatory sentences (Guys! Join the Classroom of the writing classes!), dubitative sentences (There is a certain probability of doing the virtual classes during the writing hour), which configure the multimodal character and, consequently, the hybrid nature of the discourse. The other discursive space present in these conversations are the referential ones, because they allude to an entity such as the university (The university is closed), in addition, in the conversation the interlocutors inform, make statements of facts, objects, places as in the following emission: 'they do not let you enter the university. We have checked with the professor'.

Subjective and evaluative spaces are also evident; they make appreciations; they examine facts, realities or beings as in 'Cepru never stops, they are very hard-working'. According to Charaudeau (2004), it is knowledge that is transmitted by the discursors on which they make judgments within an interdiscursive space. Symbolic representations are frequent in chat conversations, there is a creative mixture of symbols and abbreviations such as 'X2', 'xd' or 'Xddd' to mean 'by God'; the duplication of phonemes in 'Xddd' has a connotative charge of admiration or surprise and signifies greater expressive intensity that replaces the double exclamation mark. Also, the use of different types of discursive texts such as informative ('They are entering from above'. 'Los jalados están ganando'), persuasive (Los q están en el grupo de mate voten por la opción 2) and, predominantly, they are dialogic texts in a real context of communication via WhatsApp. Likewise, all the conversations held in the different discursive spaces via WhatsApp are cognitive metaphors constructed with a hybrid semantic load.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

In this other WhatsApp conversation block, the hybrid character of the chat discourses from one interlocutor to another is even more evident.

[4:34 p. m., 10/23/2023] +51 997044790: Hi! Guys good afternoon ... 🤌 Tomorrow starts with the exhibitions✨ "Prevean chicos" !!!!! 🙋‍♀️

[4:50 p. m., 10/23/2023] +51 953 625 711: Here a video so you can learn one more flake.

[4:54 p. m., 10/23/2023] +51 930346759: It was mandatory that it is related to economics?

[4:57 p. m., 10/23/2023] +51 997044790: ... Mandatory: No But it was recommended by the teacher ... 👀

[4:57 p. m., 10/23/2023] +51 930346759: Ah weno thank you.

[7:08 a. m., 10/24/2023] +51 997044790: Guys .... Log in to the virtual classroom please 🙋‍♀️

[7:09 p. m., 10/24/2023] +51 930346759: What time was the Expo class today?

[7:10 a.m., 10/24/2023] +51 997044790: - The teacher said he would come in at 8:00 to 8:30 or so ...
So let's keep waiting ...

[7:11 a. m., 10/24/2023] +51 992621404: We'll wait for you 👌

[7:12 a. m., 10/24/2023] +51 973117616: The teacher is already or not yet?

[7:12 a. m., 24/10/2023] +51 930346759: Maybe the prof forgot.

[7:13 p. m., 10/24/2023] +51 930346759: I think the teacher is in the group bro hahahaha

[10:15 a.m., 10/25/2023] +51 997044790: The teacher sent me the following video link https://fb.watch/nK9jPrCgFd/?mibextid=VhDh1V

[7:00 a. m., 26/10/2023] +51 997044790: Guys good morning ! 🙋‍♀️😃 Please be informed that today we have: 🙌 Classes 7.00am 🙌 Unit exam 8.00am 🙌 Exhibitions 9.00am (Before any situation, foresee your camera) 🙋‍♀️

[7:08am, 10/26/2023] +51 997044790: Guys good morning !!!! Here you have the material of the session developed so far of the second unit 😊 🙋‍♀️...

In this conversation we observe hybrid multimodal discursive forms such as text messages (SMS), images, video links, gifs, emoticons, abbreviations. There is a discursive heterogeneity in the organization of discourse and in the enunciative plane as stated by Musialek (2015). Written texts are presented in their different types as informative texts (Be informed that today we have: 🙌 Classes 7.00am 🙌 Unit exam 8.00am), expository texts (Here you have the material of the session developed so far of the second unit).

Discursive hybridity in the use of sentence modalities is presented in the following cases: enunciative sentences ('Tomorrow we start with the expositions', 'The teacher sent me the following video link'), interrogative (Is the teacher already there or not yet?), exclamatory (✨ "Prevean chicos" !!!), dubitative ('Maybe the profe forgot'. 'Creo q el profe está en el grupo bro jajajaj'). In the use of the written code, the discursors also use abbreviations such as 'q' for 'que', apocopated abbreviations such as 'Expo' for 'exposición', 'bro' to refer to the English term for 'brother' -in this last case, even an idiomatic hybridization is appreciated as linguistic borrowings-.

In the morphosyntactic aspect, there is morphological hesitation such as the inversion of words in 'flake' instead of 'little', 'weno' instead of 'good'. As for spelling, there is absence of punctuation marks such as commas and periods (Ah weno gracias), absence of squeeze question marks (A q hora era la clase de Expo hoy hoy?), etc.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

The multimodal character is also present in the transcription of onomatopoeic voices such as laughter (jajaj), icon-symbolic codes (✨ 👐) etc. The types of discourses according to their level of formality, introduce academic discourses ('Here you have the material of the session developed so far of the second unit', 'Here a video to be able to learn') and non-academic discourses (Yo creo q el profe está en el grupo bro jajajaj).

In this conversation group the different interpersonal and interdiscursive spaces can be appreciated, because they make appeals, greetings, vocatives, appeals, exhortations to the interlocutor as in 'Guys good morning ! 💁', 'Guys .... Enter the virtual classroom please 💁'; as well as metadiscursive spaces, because the interlocutors make reformulations, clarifications, precisions, precisions, justifications, explanations, exemplifications as in 'Tomorrow we start with the expositions ✨ "*Prevean chicos" !!!!* 💁', 'It was obligatory to be related to economics? PRECISION= Mandatory: No But recommended by the teacher ... 👀'. In the same way, referential spaces are present ('Enter the virtual classroom please', 'Is the teacher already there or not yet?', etc.), paradiscursive spaces when they make agreements and prepare speeches as in 'Tomorrow we start with the expositions ✨ "Prevean chicos"', 'Was it mandatory that it is related to economics? ', presuppositional spaces (*'Mañana se empieza con las exposiciones', 'El docente dijo que entría 8.00 a 8.30 más o menos'*), prosodic when they vary the intonation with interrogations and exclamations, likewise, when they make pauses that in the written plane represent it with suspensive points as in 'Chicos

.... Please enter the virtual classroom'. Also, communication takes place in an intersemiotic space in order to express communication through oculistic, haptic, kinesic, etc., they resort to emoticons or icons that allow them to express meanings and intentions.

Chat Room: WhatsApp Group Copywriting, Pharmacy and Biochemistry students:

[8:20 p. m., 7/7/2023] +51 991267922: :v how can I get in touch with tacher :V

[5:52 p. m., 8/8/2023] +51 951701111: Guys we will do classes from 11-12 Xq the professor can't earlier.

[5:52 p. m., 10/8/2023] +51 951701111: Guys, remember that the texts are due tomorrow and the exam is on Thursday.

[6:40 p. m., 10/8/2023] +51 984209947: I am passing this PPT of the first part, to remind you of the part of this second unit that was worked on.

[8:13 a. m., 10/8/2023] +51 913864921: Q

[8:13 a. m., 10/8/2023] +51 991267922: uwur :Vvvvvvvvvvvvvvvvvvvvv:

[4:43 p. m., 8/13/2023] +51 982591984: The meet meeting at what time is it going to be held...or the test?

[4:43 p. m., 8/13/2023] +51 982591984: Don't worry fellas about that we won't say I'll tell you myself.

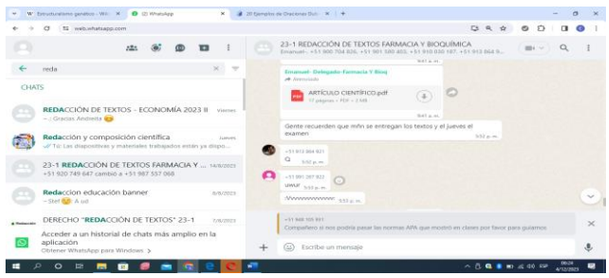


Figure 1

In this other WhatsaAp group of Pharmacy and Biochemistry students, we can appreciate the play of tenses -what is called chronological hybridity in the discourses-, that is, the tenses: present, future and past are combined in the same discursive space ('Guys we will do 11-12 classes', 'I pass you this PPT of the first part, to remember the part that was worked of this second unit'). WhatsApp conversations break, many times, with grammatical rules and syntactic construction, because they flow naturally and freely; that is, there is a kind of logical-grammatical relaxation, discursive sloppiness; the non-use of punctuation marks as in 'Don't worry fellows of that we won't say I will tell you myself.'.

They insert intersubjective and little understandable codes, but with connotative and semantic load as in 'uwur :Vvvvvvvvvvvvvvvvvvvvv:' which does not correspond to any other language different from the code used; moreover, it is different from the creative or invented abbreviations also used by cybernauts as in 'mñn' which would abbreviate the word 'mañana', 'Xq' for 'porque'.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Discursive hybridization is also notorious because communication occurs in interpersonal, interdiscursive, paradiscursive spaces (how can I communicate with the tacher), presuppositional spaces (Guys we will do 11-12 classes Xbecause the teacher can't before), etc. These conversations involve different styles, varied discursive forms, hybridization or jumping of topics and contexts in line with what Ramírez (2021) affirms.

The analysis of the discourses poured by cybernauts in the chat rooms within the WhatsApp group of the subjects studied allows us to elaborate a theory on textual hybridity in discursive and interdiscursive spaces based on the existing literature.

For Ramirez (2021) many of the texts are hybrids analyzed from different points of view and pragmatic criteria. In relation to what Ramírez affirms, the hybrid character of texts is present in different types of discourses, even more so in discourses through digital or virtual media such as WhatsApp and other social networks.

Conclusions

In line with the analysis of the conversations held by the members of the two WhatsApp groups and in response to the research problem, the following conclusions have been reached:

The discourses in the WhatsApp groups are hybrid and multimodal in nature due to the variety of codes used in communication; the cybernaut dialoguers make use of a variety of sentence modalities such as enunciative ('The teacher sent me the following video link'), interrogative (Is the teacher already there or not yet?), exclamatory (✨ "Prevean chicos" !!!), dubitative ('Maybe the teacher forgot'. 'Creo q el profe está en el grupo bro jajaj'), etc. There is hybridization of tenses in the discourses, that is, present, future and past tenses are combined in the same discursive space. Likewise, they insert onomatopoeic voices such as laughter (jajaj), mix icon-symbolic codes (✨ 👐); deliberate use of informal and academic discourses, etc.

Conversations held in chat rooms via WhatsApp tend to the use of different discursive modalities and codes; this hybridity is evident in the use of codes such as text messages (SMS), images, link to videos, Gifs, emoticons, abbreviations, etc. Consequently, messages are transmitted using different codes.

As for the written text messages, they are heterogeneous from one interlocutor to another, i.e., they intersperse informative text types ('They are entering from above'. 'The pullers are winning'), persuasive (Those who are in the mate group vote for option 2), expository texts (Here you have the material of the session developed so far of the second unit).

Symbolic games and the creative and hybrid combination of different mathematical and linguistic signs are frequent in chat conversations. This combination is presented in abbreviations such as 'X2', 'xd' or 'Xddd' to mean 'by God'; the doubling of phonemes in 'Xddd' has a more intensifying connotation of either admiration or surprise replacing the double exclamation mark. Apocopated abbreviations such as 'Expo' for 'exposición', 'profe' instead of profesor, 'bro' to refer to the English term for 'brother' are also appreciated.

In WhatsApp speeches there are frequent hesitations with altered and recreated morphology of words such as the inversion of words in 'flake' instead of 'little', 'weno' instead of 'good', syntactic disarrangements, etc.; that is, there is a kind of logical-grammatical relaxation. As for spelling, they break with syntactic grammatical rules, because they flow naturally and freely there is absence of use of accents, punctuation marks such as commas, periods and many other signs (Ah weno gracias), incorrect use of capital letters (A q hora era la clase de Expo hoy hoy?).

WhatsApp discourses use different communicational spaces such as interpersonal and interdiscursive spaces, metadiscursive spaces -the latter when reformulations, clarifications, precisions, justifications, explanations, exemplifications are made-, as well as paradiscursive spaces (see analysis), presuppositional, prosodic, intersemiotic spaces, etc.

The messages elaborated in the different discursive spaces via WhatsApp are cognitive metaphors constructed with a hybrid semantic load.

Authors' contribution

Elías Aguilar Rojas and María Dolores Velasco Palacios as authors responsible for the research, our degree of contribution and contribution as authors is shared throughout the work as a whole.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

That is to say, from the gestation of the idea of the topic of study, the identification of the problem, the elaboration of the project, data collection, analysis and interpretation of the data, the conclusions and the whole research process, we have assumed an equal contribution.

Acknowledgement

Our thanks to the Academic Department of Linguistics of the Universidad Nacional de San Antonio Abad del Cusco, in her person to the director Mgt. Roxssana Arredondo García for her excellent direction and guidance.

Funding

The entire research process up to the writing of the scientific article has been self-financed.

Conflict of interest

Elías Aguilar Rojas and María Dolores Velasco Palacios, authors of the manuscript of the research carried out, are responsible for the article to be published and have no conflict of interest with third parties in relation to authorship.

References

Bajtín, M. M., (1982). *Estética de la creación verbal* (1.ª ed.). Siglo XXI editores, S. A. https://www.academia.edu/43340210/ESTETICA_DE_LA_CREACION_VERBAL_por

Charaudeau, P. (2004). La problemática de los géneros. De la situación a la construcción textual. *Revista Signos*, *37*(56), 23-39.

Charaudeau, P. (1995). Une analyse sémiolinguistique du discours. *Langages*, *29*(117), 96-111. https://doi.org/10.3406/lgge.1995.1708.

Chempén, K. (2017). *Influencia del uso de la mensajería WhatsApp sobre la comunicación interpersonal, en los estudiantes del quinto año de secundaria de la I.E. Manuel Seoane Corrales del distrito de Mi Perú, 2017* [Tesis, Universidad César Vallejo]. https://repositorio.ucv.edu.pe/handle/20.500.12692/15526

Dackow, C. (2020). El Ethos híbrido en el discurso político. Análisis de caso en Twitter: Jeanine Áñez. *Acta Académica*, 1-28.

Errico, E. (2013). Traducir textos híbridos: Apuntes sobre la traducción al castellano de Johnny Tenorio de Carlos Morton. *Cuadernos AISPI*, *2*, Article 2. https://doi.org/10.14672/2.2013.1072

Hulst, J. (1995). *De doeltekst centraal: Naar een functioneel model voor vertaalkritiek*. Thesis Publishers.

Mamani Sánchez, H. H. (2019). *Uso del WhatsApp en la comunicación entre los docentes y estudiantes de la Escuela Profesional de Ciencias de la Comunicación de la Universidad Nacional de San Agustín de Arequipa, en el primer semestre 2019* [Tesis, Universidad Nacional de San Agustín de Arequipa]. http://repositorio.unsa.edu.pe/handle/UNSA/10391

Medina Audelo, R. (2019). Imaginario sociodiscursivo: La integración sociocultural de los inmigrantes latinoamericanosen Nueva York. *Sociológica*, *34*(97), 291-326. https://doi.org/10.24275/uam/azc/dcsh/sm/2019v34n97/Medina

Moreno, P. (2000). Los géneros periodísticos informativos en la actualidad internacional. *Ámbitos Revista internacional de comunicación*, 5, 169-190.

Musialek, D. S. (2015). *Fenómenos de hibridación lingüístico-discursiva y epistémica en textos de Bioética* [Tesis, Universitat de Lleida En *TDX (Tesis Doctorals en Xarxa)*. https://www.tdx.cat/handle/10803/383066

Labov, W. & Fanshel, D. (1977). *Therapeutic discourse: Psychotherapy as conversation.* New York: Academic Press.

Ongallo, C. (2007). *Manual de comunicación* (2.ª ed.). Dykinson S. L. https://www.academia.edu/26042459/Manual_de_comunicacion_Ongallo

Pfleger, S. (2021). El discurso como un espacio comunicativo, relacional e identitario: Framing y construcción de la identidad. *Andamios*, *18*(47), 19-43. https://doi.org/10.29092/uacm.v18i47.864

Poirier, N. (2006). *Castoriadis. El imaginario radical*. Nueva Visión.

Pop, L. (2000). *Espaces discursifs: Pour une représentation des hétérogénéités discursives*. Peeters Publishers.

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

Ramírez Almansa, I. (2021a): Metodología de análisis para los textos híbridos: Ceremonia, clasificación de los textos enojurídicos y su potencial didáctico en el aula de traducción. *Pragmalingüística*, *29*, Article 29. https://doi.org/10.25267/Pragmalinguistica.2021.i29.17

Sanabria Salazar, M. L. (2016). *Análisis pragmático-textual de los anuncios publicitarios de productos de belleza* [Universidad Nacional Mayor de San Marcos]. *https://renati.sunedu.gob.pe/handle/sunedu/2876429*

Van Dijk, T. A. (1979). *La ciencia del texto: Un enfoque interdisciplinario* (2.ª ed.). Paidós Ibérica. https://dialnet.unirioja.es/servlet/libro?codigo=102422

Van Dijk, T. A. (1998). *Ideology: A Multidisciplinary Approach*. SAGE Publications Ltd. https://doi.org/10.4135/9781446217856

Van Leeuwen, T. (1987). Generic strategies in press journalism. *Australian Review of Applied Linguistics*, *10*(2), 199-220. https://doi.org/10.1075/aral.10.2.12van

ISSN-Print: 2007-1582
ISSN-On line: 2007-3682

[Title in Times New Roman and Bold No. 14 in English and Spanish]

Surname (IN UPPERCASE), Name 1st Author†*, Surname (IN UPPERCASE), Name 1st Co-author, Surname (IN UPPERCASE), Name 2nd Co-author and Surname (IN UPPERCASE), Name 3rd Co-author

Institutional Affiliation of Author including Dependency (No.10 Times New Roman and Italic)

International Identification of Science - Technology and Innovation

ID 1st Author: (ORC ID - Researcher ID Thomson, arXiv Author ID - PubMed Author ID - Open ID) and CVU 1st author: (Scholar-PNPC or SNI-CONAHCYT) (No.10 Times New Roman)

ID 1st Co-author: (ORC ID - Researcher ID Thomson, arXiv Author ID - PubMed Author ID - Open ID) and CVU 1st co-author: (Scholar or SNI-CONAHCYT) (No.10 Times New Roman)

ID 2nd Co-author: (ORC ID - Researcher ID Thomson, arXiv Author ID - PubMed Author ID - Open ID) and CVU 2nd co-author: (Scholar or SNI-CONAHCYT) (No.10 Times New Roman)

ID 3rd Co-author: (ORC ID - Researcher ID Thomson, arXiv Author ID - PubMed Author ID - Open ID) and CVU 3rd co-author: (Scholar or SNI-CONAHCYT) (No.10 Times New Roman)

(Report Submission Date: Month, Day, and Year); Accepted (Insert date of Acceptance: Use Only ECORFAN)

Abstract (In English, 150-200 words)

Objectives
Methodology
Contribution

Abstract (In Spanish, 150-200 words)

Objectives
Methodology
Contribution

Keywords (In English)

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

Keywords (In Spanish)

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

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

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

Introduction

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

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

What is your added value with respect to other techniques?

Clearly focus each of its features

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

Explanation of sections Article.

Development of headings and subheadings of the article with subsequent numbers

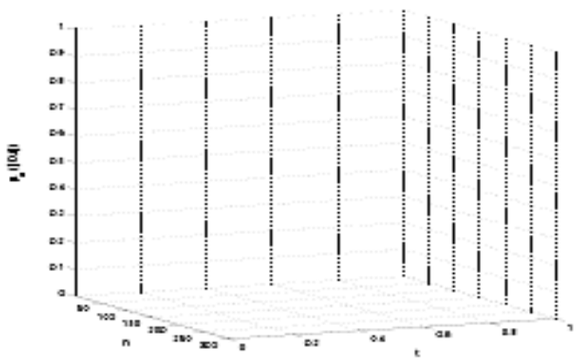
[Title No.12 in Times New Roman, single spaced and bold]

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

Including graphs, figures and tables-Editable

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

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



Graphic 1 Title and *Source (in italics)*

Should not be images-everything must be editable.

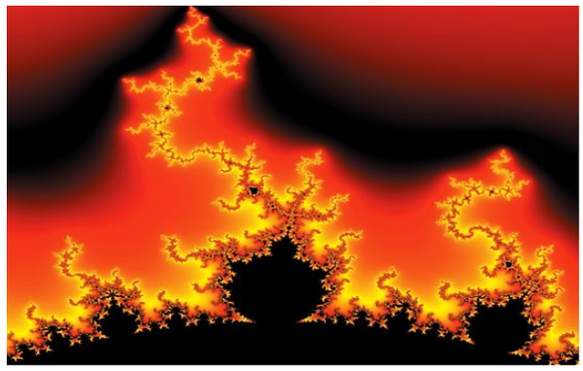


Figure 1 Title and *Source (in italics)*

Should not be images-everything must be editable.

Table 1 Title and *Source (in italics)*

Should not be images-everything must be editable.

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

For the use of equations, noted as follows:

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

Must be editable and number aligned on the right side.

Methodology

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

Results

The results shall be by section of the article.

Annexes

Tables and adequate sources

Thanks

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

ISSN 2007-3682

Conclusions

Explain clearly the results and possibilities of improvement.

References

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

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

Technical Specifications

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

Journal Name
Article title
Abstract
Keywords
Article sections, for example:

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

Author Name (s)
Email Correspondence to Author
References

Intellectual Property Requirements for editing:

- Authentic Signature in Color of Originality Format Author and Co-authors.

- Authentic Signature in Color of the Acceptance Format of Author and Co-authors.

- Authentic Signature in blue colour of the Conflict of Interest Format of Author and Co-authors.

ISSN 2007-3682

Reservation to Editorial Policy

ECORFAN Journal Mexico reserves the right to make editorial changes required to adapt the Articles to the Editorial Policy of the Journal. Once the Article is accepted in its final version, the Journal will send the author the proofs for review. ECORFAN® will only accept the correction of errata and errors or omissions arising from the editing process of the Journal, reserving in full the copyrights and content dissemination. No deletions, substitutions or additions that alter the formation of the Article will be accepted.

Code of Ethics - Good Practices and Declaration of Solution to Editorial Conflicts

Declaration of Originality and unpublished character of the Article, of Authors, on the obtaining of data and interpretation of results, Acknowledgments, Conflict of interests, Assignment of rights and Distribution

The ECORFAN-Mexico, S.C Management claims to Authors of Articles that its content must be original, unpublished and of Scientific, Technological and Innovation content to be submitted for evaluation.

The Authors signing the Article must be the same that have contributed to its conception, realization and development, as well as obtaining the data, interpreting the results, drafting and reviewing it. The Corresponding Author of the proposed Article will request the form that follows.

Article title:

– The sending of an Article to ECORFAN Journal Mexico emanates the commitment of the author not to submit it simultaneously to the consideration of other series publications for it must complement the Format of Originality for its Article, unless it is rejected by the Arbitration Committee, it may be withdrawn.

– None of the data presented in this article has been plagiarized or invented. The original data are clearly distinguished from those already published. And it is known of the test in PLAGSCAN if a level of plagiarism is detected Positive will not proceed to arbitrate.

– References are cited on which the information contained in the Article is based, as well as theories and data from other previously published Articles.

– The authors sign the Format of Authorization for their Article to be disseminated by means that ECORFAN-Mexico, S.C. In its Holding Mexico considers pertinent for disclosure and diffusion of its Article its Rights of Work.

– Consent has been obtained from those who have contributed unpublished data obtained through verbal or written communication, and such communication and Authorship are adequately identified.

– The Author and Co-Authors who sign this work have participated in its planning, design and execution, as well as in the interpretation of the results. They also critically reviewed the paper, approved its final version and agreed with its publication.

– No signature responsible for the work has been omitted and the criteria of Scientific Authorization are satisfied.

– The results of this Article have been interpreted objectively. Any results contrary to the point of view of those who sign are exposed and discussed in the Article.

Copyright and Access

The publication of this Article supposes the transfer of the copyright to ECORFAN-Mexico, SC in its Holding Mexico for its ECORFAN Journal Mexico, which reserves the right to distribute on the Web the published version of the Article and the making available of the Article in This format supposes for its Authors the fulfilment of what is established in the Law of Science and Technology of the United Mexican States, regarding the obligation to allow access to the results of Scientific Research.

Article Title:

Name and Surnames of the Contact Author and the Co-authors	Signature
1.	
2.	
3.	
4.	

Principles of Ethics and Declaration of Solution to Editorial Conflicts

Editor Responsibilities

The Publisher undertakes to guarantee the confidentiality of the evaluation process, it may not disclose to the Arbitrators the identity of the Authors, nor may it reveal the identity of the Arbitrators at any time.

The Editor assumes the responsibility to properly inform the Author of the stage of the editorial process in which the text is sent, as well as the resolutions of Double-Blind Review.

The Editor should evaluate manuscripts and their intellectual content without distinction of race, gender, sexual orientation, religious beliefs, ethnicity, nationality, or the political philosophy of the Authors.

The Editor and his editing team of ECORFAN® Holdings will not disclose any information about Articles submitted to anyone other than the corresponding Author.

The Editor should make fair and impartial decisions and ensure a fair Double-Blind Review.

Responsibilities of the Editorial Board

The description of the peer review processes is made known by the Editorial Board in order that the Authors know what the evaluation criteria are and will always be willing to justify any controversy in the evaluation process.

In case of Plagiarism Detection to the Article the Committee notifies the Authors for Violation to the Right of Scientific, Technological and Innovation Authorization.

Responsibilities of the Arbitration Committee

The Arbitrators undertake to notify about any unethical conduct by the Authors and to indicate all the information that may be reason to reject the publication of the Articles. In addition, they must undertake to keep confidential information related to the Articles they evaluate.

Any manuscript received for your arbitration must be treated as confidential, should not be displayed or discussed with other experts, except with the permission of the Editor.

The Arbitrators must be conducted objectively, any personal criticism of the Author is inappropriate.

The Arbitrators must express their points of view with clarity and with valid arguments that contribute to the Scientific, Technological and Innovation of the Author.

The Arbitrators should not evaluate manuscripts in which they have conflicts of interest and have been notified to the Editor before submitting the Article for Double-Blind Review.

Responsibilities of the Authors

Authors must guarantee that their articles are the product of their original work and that the data has been obtained ethically.

Authors must ensure that they have not been previously published or that they are not considered in another serial publication.

Authors must strictly follow the rules for the publication of Defined Articles by the Editorial Board.

The authors have requested that the text in all its forms be an unethical editorial behavior and is unacceptable, consequently, any manuscript that incurs in plagiarism is eliminated and not considered for publication.

Authors should cite publications that have been influential in the nature of the Article submitted to arbitration.

Information services

Indexation - Bases and Repositories

LATINDEX (Scientific Journals of Latin America, Spain and Portugal)
DIALNET (Dialnet Foundation - University of La Rioja, Spain)
V|LEX (Global Legal Intelligence Platform)
ESCI (Index of Appointments of Emerging Sources, Thomson Reuters)
CLASS (Citations Social Sciences and Latin American Humanities-UNAM)
DULCINEA (Spanish scientific journals)
HISPANA (Information and Bibliographic Orientation, Spain)
SHERPA (University of Nottingham, England).
UNIVERSIA (University Library, Madrid)
RESEARCH GATE (Germany)
GOOGLE SCHOLAR (Citation indices, Google)
REDIB (Ibero-American Network of Innovation and Scientific Knowledge, CSIC)
MENDELEY (Bibliographic References Manager)
REBIUN (Network of Spanish University Libraries, Spain)

Publishing Services

Citation and Index Identification H
Management of Originality Format and Authorization
Testing Article with PLAGSCAN
Article Evaluation
Certificate of Double-Blind Review
Article Edition
Web layout
Indexing and Repository
ArticleTranslation
Article Publication
Certificate of Article
Service Billing

Editorial Policy and Management

Park Pedregal Business. 3580 – Adolfo Ruiz Cortines Boulevard – CP.01900. San Jerónimo Aculco – Álvaro Obregón, Mexico City.

ECORFAN-Journal Mexico

2007 3682
ISSN 2007 - 3682