Volume 7, Issue 12 – January – June – 2023

Journal-Industrial Organization

ISSN 2524-2105

RINOE®

Journal - Industrial Organization, Volume 7, Issue 12, January – June 2023, is a journal edited semestral by RINOE. La Raza Av. 1047 No.- Santa Ana, Cusco. Peru. Postcode: 11500, WEB: www.rinoe.org journal@rinoe.org. Editor in Chief: MIRANDA-GARCIA, Marta. PhD. ISSN-2524-2105. Responsible for the latest update of this number RINOE Computer Unit. ESCAMILLA-BOUCHÁN, Imelda. PhD. LUNA-SOTO, Vladimir. PhD. La Raza Av. 1047 No.- Santa Ana, CuscoPeru.Postcode: 11500 last updated June 30, 2023.

Journal-Industrial Organization

Definition of the 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 Market structure, Firm strategy, and Market performance: Production, Pricing, and Market structure, Size distribution of Firms, Monopoly, Monopolization strategies, Oligopoly and Other imperfect markets, Transactional relationships, Contracts and reputation, Information and Product quality, Industrial Organization and Macroeconomics, Macroeconomic industrial structure; Firm objectives, Organization, and Behavior: business objectives of the Firm, Firm organization and Market structure, Vertical Integration, Organization of Production, Firm Size and Performance; Nonprofit organizations and Public Enterprise: Nonprofit institutions, Public enterprises, Boundaries of public and private enterprise, Privatization, Contracting Out; Antitrust policy: Monopolization, Horizontal anticompetitive practices, Vertical restraints, Resale PRICE maintenance, Quantity Discounts, Legal Monopolies and Regulation or Deregulation, Antitrust policy and public enterprise, Nonprofit Institutions, and Professional Organizations; Regulation and industrial policy, Economics of regulation, Industrial policy, Sectoral planning methods; Industry studies: manufacturing, Metals and Metal products, Cement, Glass, Ceramics, Automobiles, Other transportation equipment, Microelectronics, Computers, Communications equipment, Other Machinery, Business equipment, Armaments, Chemicals, Rubber, Drugs, Biotechnology, Food, Beverages, Cosmetics, Tobacco, Other Consumer Nondurables, Appliances, Other consumer durables; Industry studies: Primary products and construction, Mining, Extraction, and Refining: Hydrocarbon fuels, Other nonrenewable resources, Forest products, Construction; Industry studies: Services, Retail and wholesale trade, Warehousing, Entertainment, Media, Sports, Gambling, Recreation, Tourism, Personal and professional services, Real estate services, Information and internet services, Computer software; Industry studies: Transportation and utilities, Transportation, Railroads and Other surface transportation, Air transportation, Electric utilities, Gas Utilities, Pipelines, Water utilities, Telecommunications, Utilities, Government policy.

Market structure, business strategy and market funtioning, Objectives, organization and behavior of the company, Non-profit organizations and public enterprises, Politics of defense of the competition, Regulation and industrial politics, Sectorial studies: Manufactures, Sectorial studies: Primary products and construction, Sectorial studies: Services, Sectorial studies: Transport and basic supplies.

RINOE® 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

RINOE Journal-Industrial Organization is a Journal edited by RINOE® in its Holding with repository in Peru, 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 Market structure, Firm strategy, and Market performance: Production, Pricing, and Market structure, Size distribution of Firms, Monopoly.

Monopolization strategies, Oligopoly and Other imperfect markets, Transactional relationships, Contracts and reputation, Information and Product quality, Industrial Organization and Macroeconomics, Macroeconomic industrial structure; Firm objectives, Organization, and Behavior: business objectives of the Firm, Firm organization and Market structure, Vertical Integration, Organization of Production, Firm Size and Performance; Nonprofit organizations and Public Enterprise: Nonprofit institutions, Public enterprises, Boundaries of public and private enterprise, Privatization, Contracting Out; Antitrust policy: Monopolization, Horizontal anticompetitive practices, Vertical restraints, Resale PRICE maintenance, Quantity Discounts, Legal Monopolies and Regulation or Deregulation, Antitrust policy and public enterprise, Nonprofit Institutions, and Professional Organizations; Regulation and industrial policy, Economics of regulation, Industrial policy, Sectoral planning methods; Industry studies: manufacturing, Metals and Metal products, Cement, Glass, Ceramics, Automobiles, Other transportation equipment, Microelectronics, Computers, Communications equipment, Other Machinery, Business equipment, Armaments, Chemicals, Rubber, Drugs, Biotechnology, Food, Beverages, Cosmetics, Tobacco, Other Consumer Nondurables, Appliances, Other consumer durables; Industry studies: Primary products and construction, Mining, Extraction, and Refining: Hydrocarbon fuels, Other nonrenewable resources, Forest products, Construction; Industry studies: Services, Retail and wholesale trade, Warehousing, Entertainment, Media, Sports, Gambling, Recreation, Tourism, Personal and professional services, Real estate services, Information and internet services, Computer software; Industry studies: Transportation and utilities, Transportation, Railroads and Other surface transportation, Air transportation, Electric utilities, Gas Utilities, Pipelines, Water utilities, Telecommunications, Utilities, Government policy 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 RINOE® 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 RINOE Journal-Industrial Organization 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 Format of Authorization for their Article to be disseminated by means that RINOE® In its Holding Peru 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 Market structure, Firm strategy, and Market performance: Production, Pricing, and Market structure, Size distribution of Firms, Monopoly, Monopolization strategies, Oligopoly and Other imperfect markets, Transactional relationships, Contracts and reputation, Information and Product quality, Industrial Organization and Macroeconomics, Macroeconomic industrial structure; Firm objectives, Organization, and Behavior: business objectives of the Firm, Firm organization and Market structure, Vertical Integration, Organization of Production, Firm Size and Performance; Nonprofit organizations and Public Enterprise: Nonprofit institutions, Public enterprises, Boundaries of public and private enterprise, Privatization, Contracting Out; Antitrust policy: Monopolization, Horizontal anticompetitive practices, Vertical restraints, Resale PRICE maintenance, Quantity Discounts, Legal Monopolies and Regulation or Deregulation, Antitrust policy and public enterprise, Nonprofit Institutions, and Professional Organizations; Regulation and industrial policy, Economics of regulation, Industrial policy, Sectoral planning methods; Industry studies: manufacturing, Metals and Metal products, Cement, Glass, Ceramics, Automobiles, Other transportation equipment, Microelectronics, Computers, Communications equipment, Other Machinery, Business equipment, Armaments, Chemicals, Rubber. Drugs, Biotechnology, Food, Beverages, Cosmetics, Tobacco, Other Consumer Nondurables, Appliances, Other consumer durables; Industry studies: Primary products and construction, Mining, Extraction, and Refining: Hydrocarbon fuels, Other nonrenewable resources, Forest products, Construction; Industry studies: Services, Retail and wholesale trade, Warehousing, Entertainment, Media, Sports, Gambling, Recreation, Tourism, Personal and professional services, Real estate services, Information and internet services, Computer software; Industry studies: Transportation and utilities, Transportation, Railroads and Other surface transportation, Air transportation, Electric utilities, Gas Utilities, Pipelines, Water utilities, Telecommunications, Utilities, Government policy and other topics related to Social Sciences.

Presentation of Content

In the first article we present, *Strategy for staff rotation in a Department Store from the perspective of organizational psychology*, by MÁRQUEZ-AMARO, Raymundo, DE LOS SANTOS-DE DIOS, Raquel Olivia, SÁNCHEZ-TRINIDAD, Rosa del Carmen and NAHUATT-VALENZUELA, María Isabel, with ascription in the Universidad Popular de la Chontalpa, as following article we present, *Marketing plan: radio station in Villahermosa Tabasco*, by HUERTA-RAMÍREZ, Alex Iván, MOREJÓN-SÁNCHEZ, Juana María, LOPEZ-VALDIVIESO, Leticia and ROSADO-LUNA, Juan Luis, with ascription in the Tecnológico Nacional de México - Instituto Tecnológico de Villahermosa, as following article we present, *Design and development of preventive, corrective and predictive maintenance manager software*, by CORDOVA-LOPEZ, José Miguel, MIGUEL-MARTINEZ, Janet, HERRERA-AGUILAR, Miguel Ángel and RUIZ-HERNANDEZ, Diana Laura, with affiliation at the Universidad Tecnológica de Oriental, as last article we present, *Assessment of quality defects in a production area of an SME*, by PORTILLO-CASTILLO, Víctor Manuel, MENDOZA-GINER, Lorena, ROJO-SIMENTAL, Erick Octavio and BATISTA-VEGA, Ma del Socorro, with secondment in the Universidad Tecnológica de Ciudad Juárez.

Content

Article **Journal-Industrial Organization**
June 2023, Vol.7 No.12 1-9

Strategy for staff rotation in a Department Store from the perspective of organizational psychology

Estrategia para la rotación de personal en una Tienda Departamental desde la perspectiva de la psicología organizacional

MÁRQUEZ-AMARO, Raymundo†, DE LOS SANTOS-DE DIOS, Raquel Olivia, SÁNCHEZ-TRINIDAD, Rosa del Carmen* and NAHUATT-VALENZUELA, María Isabel

Universidad Popular de la Chontalpa, División de Ciencias Económico-Administrativas. México.

ID 1st Author: *Raymundo, Márquez-Amaro* / **ORC ID:** 0000-0001-8822-5973

ID 1st Co-author: *Raquel Olivia, De los Santos-De Dios* / **ORC ID:** 0000-0002-1341-657X,

ID 2nd Co-author: *Rosa del Carmen, Sánchez-Trinidad* / **ORC ID:** 0000-0002-6614-0685

ID 3rd Co-author: *María Isabel, Nahuatt-Valenzuela*

DOI: 10.35429/JIO.2023.12.7.1.9 Received January 10, 2023; Accepted June 30, 2023

Abstract

Since the existence of organized groups to develop paid work, there is staff turnover, considered as the action of the collaborator to leave the organization during a determined period that requires a replacement; This absence in the work environment has significantly influenced the development, operation and functioning of organizations. Currently, the private initiative pays more attention to this organizational phenomenon with a view to achieving roots, stability or retention of personnel to create safe and reliable environments with favorable results in the medium and long term. In this sense, the research, based on the case study methodology, provides the results of the implementation of an intervention strategy from the perspective of organizational psychology, to study the rotation of the sales position of a commercial store and indicate its impact. on retention and organizational commitment. For this purpose, a theoretical journey on the topics under study is presented, the situational characteristics of the position are described, the methodological strategy applied, the results and the conclusion on the case under study that allow to make evident the participation of organizational psychology and its contribution to social welfare in the organization.

Rotation, Retention, Environments

Resumen

Desde la existencia de los grupos organizados para desarrollar un trabajo remunerado hay rotación de personal, considerada como la acción del colaborador de abandonar la organización durante un período determinado que requiere un reemplazo; esta ausencia en el entorno laboral ha influido de manera significativa en el desarrollo, la operatividad y el funcionamiento de las organizaciones. Actualmente, la iniciativa privada, presta más atención a este fenómeno organizacional con miras a lograr arraigo, estabilidad o retención del personal para conformar ambientes seguros y confiables con resultados favorables a mediano y largo plazo. En este sentido, la investigación, sustentada en la metodología del estudio de caso, brinda los resultados de la implementación de una estrategia de intervención con perspectiva de la psicología organizacional, para estudiar la rotación del puesto de vendedor de una tienda comercial e indicar su impacto en la retención y el compromiso organizacional. Para tal fin, se presenta un recorrido teórico sobre los tópicos en estudio, se describen las características situacionales del puesto, la estrategia metodológica aplicada, los resultados y la conclusión sobre el caso en estudio que permiten hacer evidente la participación de la psicología organizacional y su contribución en el bienestar social en la organización.

Rotación, Retención, Ambientes

Citation: MÁRQUEZ-AMARO, Raymundo, DE LOS SANTOS-DE DIOS, Raquel Olivia, SÁNCHEZ-TRINIDAD, Rosa del Carmen and NAHUATT-VALENZUELA, María Isabel. Strategy for staff rotation in a Department Store from the perspective of organizational psychology. Journal-Industrial Organization. 2023. 7-12:1-9.

*Correspondence to Author (E-mail: rosa.sanchez@upch.mx)
† Researcher contributing first author.

Introduction

Organisational psychology can be defined as the discipline that studies the elements of people's behaviour in one of its social spheres, which is also representative of contemporary society: the organisation (Zepeda, 2017). The most important functions or tasks performed by a psychologist within an organisation, in accordance with the topic of research interest, are: personnel selection, job analysis and staff retention, since turnover requires a recruitment process to cover vacancies caused by the abandonment of the job, analysing the elements and conditions of the vacant position and seeking new ways, in the personnel selection process, to reduce the behaviour of abandonment of the responsibilities and commitment established by the collaborator in the working relationship with the organisation.

Undoubtedly, the staff or human capital is the great engine of the organisation, and an effective selection of collaborators is decisive to achieve the objectives and goals set, therefore, the organisational psychologist can recommend policies and actions to compensate the work of the collaborators, as well as to ensure their well-being, safety and occupational health as part of a motivational or incentive programme; in the same way, he can contribute to the continuous improvement of the working environment with retention strategies that provide stability in the workforce. In this sense, one of the main challenges faced by the organisation is staff turnover, which is defined as the voluntary or involuntary permanent withdrawal from an organisation that can be a problem due to the increased costs of recruitment, selection and training (Robbins, 2017).

One of the focuses of interest for the Human Resources department is to keep employees in the organisation for a considerable time in order to gain stability and provide job security, staff retention according to Chiavenato (2020), for which it is of utmost importance to know the satisfaction of the staff in their stay and participation in the organisation. On the other hand, staff turnover is involved with primary and secondary costs; primary costs are the investments made by the organisation to hire staff and fill vacancies; secondary costs are the costs incurred by the organisation during the time in which the vacancy is filled (Chiavenato, 2020).

In this sense, human resource replacement costs or staff turnover refer to the costs of recruitment, selection, hiring, training, education and separation (Chiavenato, 2020).

There are many causes that can generate staff turnover, one of the main causes is related to the content of the job; that is, the activities of the position and the salaries, when in this relationship there is no correspondence, the collaborator will try to seek a solution to this situation of non-conformity by taking actions or behavioural positions both inside and outside the organisation (Arias, 1990). Another cause of staff turnover is absenteeism, i.e. the employee's action of being absent from some act or function in the organisation, which implies delays in the working day; however, it is not only related to unjustified absences and delays, it also refers to justified absences, i.e. when the employee communicates with the organisation and apologises or argues for his or her delay or absence. However, when the number of absences is high, not only the organisation's revenue may be compromised, but the whole team may be affected. Therefore, it is important to know the possible causes of the behaviour of the employee or group of employees in relation to absenteeism, both internally and externally.

Similarly, working conditions are important in this issue, when the working environment where the employee works does not meet the minimum expectations or requirements of the job, it generates low levels of satisfaction and, in specific cases, leads to staff turnover.

The most frequent personal reasons for staff turnover are housing problems, lack of childcare facilities, care for sick family members, leaving the country, distance from the workplace and transport problems.

The Department Store under study is an organisation that sells clothes and other articles of clothing; it has an organisational philosophy based on the mission described as "to offer customers products and services of the highest quality, at the right price, in the right environment, seeking their fullest satisfaction through a careful personalised service, where the customer is the reason for its work". In addition to the vision described as "consolidate and maintain the leadership of the business in the competitive market, integrating the objectives of its customers, staff, suppliers and shareholders".

ISSN-2524-2105

Finally, there are the values: Work, Growth, Social Responsibility and Efficiency.

Regarding the research interest, in 2019, the Department Store had a staff of 230 employees, where it presented a turnover of 40.4% with a total of 137 employees who left the organisation, of which 70 were women and 64 men, with a high school level, single marital status, with a seniority of 1 to 3 months, average age between 24 and 26 years and the three main reasons for leaving were: the search for better income, leaving the job and termination of contract. It is worth noting that, according to Schultz (1994), most of the dissatisfied employees are young single people without family and financial obligations, as they have more freedom to leave their jobs than employees in their 50s with debts and mortgages.

In this sense, in order to be truly motivated and to satisfy their diverse needs, subordinates ask for recognition of their work, constructive and unbiased criticism, personal interest in their daily practices, spaces to present ideas, information about changes before they are implemented, confidence in performance and use of communications (Fernández, 2009). In addition, depending on the employee's performance, incentives can be offered such as: participation in the organisation's profits, earnings and capital, creating an environment that is perceived as rewarding and motivating, treating them as partners and paying good salaries (Garfield, 1992 in Flores et al, 2008).

Finally, for the purposes of the research, organisational commitment is a key element for the social well-being of the organisation and, therefore, for structuring the organisational strategy to deal with staff turnover since, according to Meyer and Allen's (1991) model, organisational commitment has three components: the affective component, which refers to the employee's emotional attachment to the organisation and makes him/her feel proud to be part of it; the permanence component, which refers to the material component, i.e., he/she continues in the organisation because he/she expects to be rewarded and recognised for his/her work; and the normative component, which refers to the feeling of remaining in the organisation because of all the benefits he/she has obtained throughout his/her work.

On the other hand, according to Robbins (1996), organisational commitment is the employee's personal identification with the organisation, with its goals and desires. According to Jericho (2001), commitment should be understood as the motivation to remain and contribute to an organisation, and he emphasises the difference between satisfaction and commitment, since a satisfied employee is not necessarily committed, and when he/she grows in the workplace, he/she can achieve a high level of organisational commitment.

Finally, in the study conducted by Hewitt, Aon in 2012, they found that committed employees have a tendency to speak up, express themselves positively about the organisation in which they participate; to stay, have a desire to be part of the organisation, and to contribute, are motivated and strive for success in their work and the organisation. Therefore, the main purpose of this research is to identify the possible risks of turnover in the floor salesperson position in the Department Store under study; subsequently, the aim is to demonstrate, through the implementation of an organisational strategy, the retention of staff in the position in question, as well as the organisational commitment established in the employee-organisation relationship that influences job stability in the sales area.

Development

The research is of a mixed nature; on the qualitative side, a focused interview was carried out, according to Fiske and collaborators (2002), to find out the personal elements of abandonment or absenteeism and, on the quantitative side, a measurement scale was applied to find out the organisational commitment of the collaborators under study. Subsequently, by processing the data, a comparative analysis of the results was carried out in order to reach concrete conclusions about the causes of turnover in the sales area of the Department Store and, finally, an organisational strategy was designed to reduce turnover and establish a favourable organisational commitment to the objectives of the operational area.

ISSN-2524-2105

Methodological procedure

Composed of three phases and adjusted to the work dynamics of the definitive entry of the salesperson position, since the selected applicants go through a trial period where they are trained and evaluated practically with three indicators: attendance, customer complaints and performance in terms of mastery of the position, to make the decision to hire for a specific time; the trial period lasts 5 weeks so a sequence of weekly interviews was established to know the impression, expectations, interests and, to a certain extent, the satisfaction of the collaborator in the position and in the organisation. The phases of the methodological procedure were:

a) Organisation

The five interviews with four employees who were selected during the research period as applicants for the position of salesperson were monitored by means of an interview booklet (appendix 1). In addition, the interview guide (appendix 2) and the scheduling of the employees under study were defined in accordance with a timetable established in agreement with the human resources and sales area of the department stores'; it was also determined that in the fourth interview the scale of organisational commitment would be applied (appendix 3).

b) Implementation

The organisational strategy consisted of the development of the interviews and the application of the measurement scale, where the interviews were conducted with the four employees under study in the human resources office, with the necessary privacy measures and respecting the criteria of confidentiality and protection of information, as well as the consent of the interviewee. The maximum duration of the interviews was 20 minutes. In the fourth interview, the organisational commitment survey was applied to the four employees under study during the time established for the interview and respecting the application criteria to guarantee the reliability of the results.

c) Results

A comparative analysis of the data obtained through the interview was carried out in order to find points of convergence as evidence of the possible causes of absenteeism of the previous employees that contributed to the turnover rate or the behavioural tendency of current probationary employees to leave the company. With the findings identified in the comparative analysis, both from the interviews and the measurement scale, suggestions were made to the human resources area of the Department Store to follow up on the research results.

Measuring instruments

Two instruments were used to measure the employees' responses regarding their feelings about their work experience during the trial period:

Focused interview, a guide based on the working conditions of the position under study, made up of four sections of research interest: impression, expectations, interests and satisfaction, where each section has an average of 6 questions to enable the employee to express, based on their experience acquired in each of the weeks of the trial period, their feelings regarding the possibility of staying or leaving the job.

Utrecht Work Engagement Scale (UWES). Organisational engagement is assumed to be the sense of energetic and affective connection to work activities and the perception of themselves as being able to cope with the demands or requirements of their work activity and the organisational environment. This scale is a Likert-type scale with seven response options from 0 (never) to 6 (always); it consists of 17 items distributed in three factors: Vigour (6 items), Dedication (6 items) and Absorption (5 items) according to Schaufeli and Bakker (2003).

This scale takes an important value in the field of organisations because it considers three elements as pillars of organisational commitment: the first is vigour, conceived as the willingness to devote effort to work; the second is dedication, considered as the action of being strongly involved with the work; and the third is absorption, understood as being completely focused on what one is doing (Schaufeli, Salanova, González-Romá and Bakker, 2002).

ISSN-2524-2105

Vigour assesses energy levels and resilience, dedication assesses the sense or meaning of the work, feeling enthusiastic and proud of one's work, and finally, absorption assesses being immersed in the work, so that time passes quickly and one forgets everything that is going on around (Schaufeli and Bakker, 2003). The organisational commitment scale allows us to quantitatively assess the attitude or behaviour of employees towards the organisation based on the three main factors mentioned above.

Participants

The collaborators participating in the research were the four selected for the testing process during the development of the research, the collaborators were determined in common agreement with the human resources area of the Department Store and the researchers; it should be noted that the time was determined by the school period of the student researcher who collaborated directly with the work. The socio-demographic data of the employees under study of interest for the research were: gender, age, marital status, schooling, time of entry, distance from home and the organisation, number of children, which were determined after knowing the salient aspects taken into account by the human resources area for the selection of employees who start the trial period and are shown in table 1.

Results

After integrating the data obtained through the interviews and the measurement scale into analysis tables, a comparison was made to detect the outstanding findings according to the elements of interest for the research, which are presented in two tables, one for the socio-demographic characteristics as possible deciding elements, on the part of the employee, to opt for permanence or absenteeism; and another table to identify the recurring findings in the way of feeling and thinking of the employee under study, as well as the level of organisational commitment.

Socio-economic data Demographics	Contributor-Participant 1	2	3	4
Gender	Female	Male	Female	Female
Age	48	23	25	45
Marital status	Single (divorced)	Single	Single	Single
Date of entry	02/10/2021	13/10/2021	12/10/2021	12/10/2021
Schooling	Bachelor's Degree in Communication	Truncated degree in Administration	Degree in Biology	Completed baccalaureate
Experience in the position	Yes	Yes	Yes	Yes
Children	2 (11 and 18 years)	0	0	1 (10 years)
Home-work distance	Fence	Away	Fence	Fence

Table 1 Socio-demographic data of the employees in the job under study
Source: Own elaboration.

As Table 1 shows, the predominant gender is female, being single, and the proximity between home and the workplace; the average age is 35 years old in a wide range of ages with a minimum of 23 and a maximum of 48 years old. On the other hand, 2 of the 4 have completed a bachelor's degree, only 2 employees have children, one of them has 2 children. Finally, all of them have experience in a similar position, they have been accepted for the probationary period with approximately 10 days difference between the first employee and the rest.

This indicates that, for the Department Store, the experience in the position, the proximity to the workplace and, relatively speaking, the role of mother are important, the latter being relevant in the decision to leave the employee-participant A, which can be seen in the following table 2.

	Contributors-Participants A	B	C	D	Findings
1	The working group she joined received her in a good way, they explained to her the way of working, they solved any doubts she had, the courses they gave her were pleasant, she mentions that at one point she felt oversaturated with information..	He mentions that the working group he joined received him in a good way, his colleagues solved any doubts that arose during the first days, the courses he was given were pleasant and he had no problems in understanding the subjects.	She mentions that she was well received by the working group she joined, her colleagues resolved her doubts she had in the first few days, the courses she was given were pleasant; however, she mentions that she lacked training focused on cash handling.	She mentions that the working group she joined received her in a pleasant way, her colleagues solved her doubts that arose in the first days and in the first activities, the courses she was given were pleasant She had no problems in understanding the subjects.	The introduction to the team is pleasant. Colleagues in the team are friendly to newcomers. Not everyone is given the same training. There is a level of commitment of 80%.
2	On the other hand, he says that his work group became indifferent because he had a misunderstanding with one of his colleagues; however, he likes the activities he does.	His discourse was the same, the relationship with his area manager is good as well as the relationship with his colleagues, he mentions that he likes the tasks he performs and learns things in practice.	He mentions that he has already received the training he was missing, he likes his job and the tasks he performs, the relationship with his area manager is good.	When asked about his feelings on the departures that have taken place in the shop, he mentions that it is a difficult situation, because everyone needs the work, but the organisation has to have stability to be able to offer it to its collaborators.	Misunderstandings can lead to problems in living together. Missing training is provided. There is a 70% commitment level.

ISSN-2524-2105

3	El However, she mentioned that the relationship is no longer the same as it was at the beginning, the relationship with her area manager is good, the salary is variable, but she is happy with what she receives, she feels committed to the organisation and to the work she does.	His speech does not vary, he is happy with his salary, he met the shop manager and mentions that he was nice..	Her speech does not vary, she mentions that her salary is good and meets her expectations, she feels committed to her job..	Her speech has not changed, her relationship with her co-workers and her boss is very good, her salary has increased and she feels satisfied.	Problems are dealt with through daily co-existence. The working environment in most of the work areas is pleasant. The benefits offered are acceptable to people. There is a level of commitment of 80%.
4	It was no longer presented due to the dismissal due to personnel adjustment in response to an instruction from the corporate human resources area; the decision was taken taking into account the age of the employees.	His speech was unchanged, he mentions that his salary has been high for the season and he likes that, the relationship with his colleagues is getting better and better and he has even formed friendships. He was asked how he felt about the departures that have taken place in the shop, and he mentioned that there is a bit of uncertainty and insecurity around his job, but he also understands that these are decisions that the organisation has to take in view of the current situation.	The discourse does not vary, the relationship with her area manager and co-workers is getting better and better, she feels at ease in the work area, she does not consider that there are reasons for her to leave the organisation. She was questioned about her feelings regarding the movements that have taken place in the shop, and she mentioned that sometimes she has felt paranoid that she might leave the organisation, which is why her commitment to the organisation is greater and she carries out her tasks in the best way possible so as not to leave.	Her speech is favourable, she has not presented any discomfort with her work area, at the moment she has no reason to leave the organisation, she likes what she does, the relationship with her area manager is good. She was questioned about her feelings about the movements that have taken place in the shop, she mentions that it is difficult to know that the organisation is making movements and it is alarming but these actions cannot be prevented, she can only carry out her tasks in the best way possible.	The working environment is pleasant and suitable for work. Changes in work organisation cause uncertainty and job insecurity. There is a level of commitment of 75%.
5	Idem	His discourse does not vary, he feels committed to the organisation, he mentions that he feels satisfied with the benefits he is offered, he likes the work he does, the relationship with his colleagues, area manager and shop manager is good, he has no problems that would prevent him from continuing to work in the organisation..	Her speech does not vary, she feels committed to the activities she carries out and to the organisation, she feels satisfied with the salary, the relationship with her colleagues, the head of the area and the shop manager is pleasant, she mentions that she has no problems to leave the organisation.	Her speech does not vary, she mentions that she feels committed to the organisation because she likes the treatment she has received, she is satisfied with the benefits she is offered, she likes the work she does, the relationship with her colleagues, the area manager and the shop manager is good, she has no problems that prevent her from continuing to work in the organisation.	The working environment is pleasant, the assigned tasks are performed correctly, the benefits are pleasant for the people. There is a commitment level of 90%.
Result of the measurement scale	Vigour:	High	High	Average	A high level of energy prevails
	Dedication:	Average	Average	High	A common level of dedication prevails
	Absorption:	Average	High	Average	A common level of investment of personal resources prevails.
	Organisational commitment	Average	High	Average	There is a favourable level of established commitment to the organisation.

Table 2 Findings from the results of the interviews and the scale of measurement
Source: Own elaboration

The findings shown in table 2 allow us to identify, from the perception of the employees under study, aspects that increase the possibility of absenteeism or job instability in the salesperson position and aspects that favour job stability or staff retention, these aspects are included in table 3 and are called potentialising aspects of job retention and absenteeism.

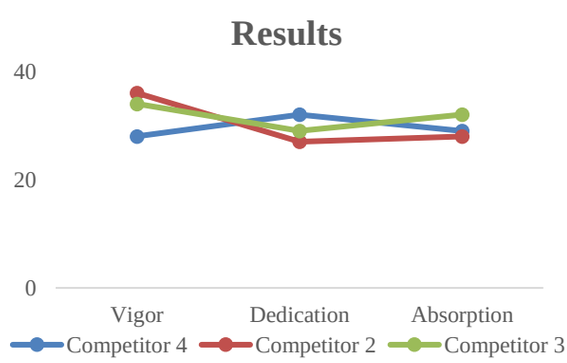
For the retention Staff retention	For absenteeism Of staff
The introduction to the team is pleasant, there is acceptance.	Not everyone is given the same training.
Colleagues in the team are friendly to newcomers.	Problems are dealt with on a day-to-day basis.
There is a commitment level of 80% on average.	Changes in work organisation cause uncertainty and job insecurity.
For the most part, the working atmosphere is pleasant.	Misunderstandings can lead to problems in coexistence.
A high level of energy, common level of dedication and concentration at work prevails.	

Table 3 Potentiating aspects of retention and absenteeism for the Department Store salesperson position
Source: Own elaboration

Table 3 shows that there is a balance between the aspects that can increase both absenteeism and retention of staff in the sales position, i.e., there is a 50-50 probability that the employee's behaviour or attitude will be towards permanence or separation from the organisation.

Finally, the results of the organisational commitment scale in terms of the factor analysis show that Table 3 shows that there is a balance between the aspects that can increase both absenteeism and retention of staff in the sales position, i.e., there is a 50-50 probability that the employee's behaviour or attitude will be towards permanence or separation from the organisation.

Finally, the results of the organisational commitment scale in terms of the factor analysis show that:



Graphic 1 Factor analysis of the organisational commitment scale
Source: Own elaboration

ISSN-2524-2105

Graphic 1 shows the widest gap in the vigour factor, between the results of each participant, which indicates that the employee feels energised with the execution of their daily activities in the workplace, referring to perceiving positive energy in the fulfilment of their tasks, objectives or goals; the smallest gap is located in the absorption factor, which expresses that the feeling of the employees is similar and refers to the concentration used in daily practices regardless of the time spent on the job.

Conclusion

Staff turnover is an important issue within an organisation, it contributes to the instability of the workforce, the results reflect a favourable level of commitment but slightly above the average level, this situation requires immediate attention to the potential aspects of retention identified in the analysis, as well as the implementation of strategies that contribute to the improvement of social welfare within the sales area and the organisation in general.

Similarly, the results allow us to identify the attitudinal tendency of the employees in the sales position who are in the trial period, which indicates a probability of 66.6% towards a balance in terms of job permanence, i.e. of the 3 employees who conclude the study, 2 will decide to continue in the job and 1 will decide to leave the organisation.

Based on the research experience and the specific conditions of the organisational phenomenon under study, the following suggestions are proposed for the continuous improvement of the Department Store in terms of turnover, retention and organisational commitment:

- Know the turnover rate in the sales area.
- Update the salesperson job profile to socialise specific responsibilities with current and new employees.
- Apply the staff retention interviews on an ongoing basis in the sales area.
- Apply the organisational commitment scale to all staff in the sales area, in this way we will have a broad perception of the employees' feelings.
- Analyse the results of the scale and the interviews in order to implement strategies focused on concrete situations according to real needs.
- Periodically evaluate the work environment in the sales areas to identify the elements that influence the decision to leave or the presence of turnover in the sales position.

Annexes

Annex 1. Interview control card

	New collaborators				
	A	**B**	**C**	**D**	**E**
Name					
Date of entry					
Departmental division					
Interview 1					
Date					
Interview 2					
Date					
Interview 3					
Date					
Interview 4					
Date					
Interview 5					
Date					

Annex 2. Focused interview guide for the personnel under study.

Interview	**Week**	**Questions**
First	1	How have you felt working these days? How do you feel about the training given previously? Do you think you need to reinforce any of them? Why? Are there any problems that prevent you from performing your tasks? Mention which one Did the salary meet your expectations? Can you do anything to improve it?
Second	2	How do you feel about your job? Do you think you can do better? How is the working relationship with your co-workers? Are there any problems that prevent you from performing your tasks? Mention which one Are there any risks that prevent you from continuing to work in the organization? Which ones?

ISSN-2524-2105

Third	3	How do you feel about your job? Do you think you can do better? Are there any problems that prevent you from performing your tasks? Mention which one Have you had a problem with a colleague? Mention which one Did the salary meet your expectations? Can you do anything to improve it?
Fourth	4	How do you feel about your job? Do you think you can do better? Are there any problems that prevent you from performing your tasks? Mention which one How has the support from your sales manager been? Have you had a problem with a colleague? Mention which one Did the salary meet your expectations? Can you do anything to improve it? Are there any risks that prevent you from continuing to work in the organization? Which ones? Application of the Utrecht Work Engagement Scale Survey
Fifth	5	How do you feel about your job? Do you think you can do better? How is your working relationship with your co-workers? Have you had a problem with a colleague? Mention which one How has the support been from your sales manager? How has the support been from the store manager? Did the salary meet your expectations? Can you do anything to improve it? Are there any problems that prevent you from performing your duties? Mention which Are there any risks that prevent you from continuing to work in the organization? Which ones?

Annex 3. Items of the organizational commitment scale

1. New challenges arise in my work.
2. In my work I feel full of energy.
3. I am immersed and focused in my work.
4. I am persistent in my work.
5. I am enthusiastic about my work.
6. I can continue to work for long periods of time.
7. When I get up in the morning, I look forward to going to work.
8. Even when things are not going well, I continue to work.
9. I am strong and energetic in my work.
10. I learn new and interesting things at work.
11. My work is meaningful.
12. When I am working I forget everything that is going on around me.
13. I "get carried away" by my work.
14. My work is stimulating and inspiring.
15. I am proud of the work I do.
16. When I am absorbed in my work, I feel good.
17. I am dedicated to and in my work.

References

1. Arias, F. (1990). Administración de Recursos Humanos.Trillas.
2. Chiavenato, I. (2020) Gestión del talento humano, nuevo papel de los recursos humanos en las organizaciones, McGraw-Hill, México.
3. Davis, K. y Newstrom, J. (2000) Comportamiento Humano en el Trabajo. McGraw-Hill.
4. Díaz, D. y Blanco, A. (2005) El bienestar social: su concepto y medición. Psicotema;17(4). ISSN: 0214-9915. Disponible en: https://www.redalyc.org/articulo.oa?id=72717407
5. Fernández, C. (2009). La comunicación en las organizaciones. México: Trillas.

ISSN-2524-2105

6. Flores, R., Abreu, J., y Badii, M. (2008). Factores que originan la rotación de personal en las empresas mexicanas. Revista Daena (International Journal of Good Conscience), 3(1). ISSN 1870-557X www.daenajournal.org

7. Jericó, P. (2001): Gestión del Talento. Del profesional con talento al talento organizativo. Prentice-Hall, Madrid, España. ISBN: 84-205-3109-X https://dialnet.unirioja.es/servlet/libro?codigo=107969

8. Fiske, M., Kendall, P. L., & Merton, R. K. (2002). Propósitos y criterios de la entrevista focalizada (traducción de Consuelo del Val y Javier Callejo). Empiria. Revista De metodología De Ciencias Sociales, (1). https://doi.org/10.5944/empiria.1.1998.740Meyer, J. y Allen, N. (1991). A three component conceptualization of organizational commitment. Human Resource Management Review.

9. Pérez-Fuentes, Dewin Iván, & Castillo-Loaiza, Jorge Leonardo. (2016). Capital humano, teorías y métodos: importancia de la variable salud. Economía, sociedad y territorio, 16(52), 651-673. Retrieved February 14, 2023, from: http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1405-84212016000300651&lng=es&tlng=es.

10. Robbins, S. (1996). Compromiso Organizacional. Prentice-Hall, México.

11. Robbins, S. (2017). comportamiento organizacional. edición 17. editorial pearson.

12. Schaufeli, W., y Bakker, A. (2003). UWES Utrecht Work Engagement Scale. Escala Utrecht de engagement en el trabajo. preliminary manual. Occupational Health Psychology Unit, Utrecht University. https://www.wilmarschaufeli.nl/publications/Schaufeli/Test%20Manuals/Test_manual_UWES_Espanol.pdf

13. Schaufeli, W., Salanova, M., Gonzalez-Roma, V. and Bakker, A. (2002) The Measurement of Engagement and Burnout: A Two Sample Confirmatory Factor Analytic Approach. Journal of Happiness Stadies, 3, 71-92. https://doi.org/10.1023/A:1015630930326

14. Schultz, D. (1994) Psicología Industrial. Florida. McGraw Hill.

15. Zepeda, F. (2017) Psicología organizacional, Pearson, México.

Article **Journal-Industrial Organization**
June 2023, Vol.7 No.12 10-13

Marketing plan: radio station in Villahermosa Tabasco

Plan de mercadotecnia: estación de radio en Villahermosa Tabasco

HUERTA-RAMÍREZ, Alex Iván†*, MOREJÓN-SÁNCHEZ, Juana María, LOPEZ-VALDIVIESO, Leticia and ROSADO-LUNA, Juan Luis

Tecnológico Nacional de México - Instituto Tecnológico de Villahermosa, México.

ID 1st Author: *Alex Iván, Huerta-Ramírez* / **ORC ID:** 0000-0003-1110-6612, **Researcher ID Thomson:** HCK-7629-2022, **CVU CONAHCYT ID:** 1244104

ID 1st Co-author: *Juana, Maria Morejón-Sánchez* / **ORC ID:** 0000-0002-9930-181X, **Researcher ID Thomson:** ABE-2879-2020, **CVU CONAHCYT ID:** 362413

ID 2nd Co-author: *Leticia, Lopez-Valdivieso* / **ORC ID:** 0000-0001-6288-3636, **Researcher ID Thomson:** G-5753-2018, **CVU CONAHCYT ID:** 67839

ID 3rd Co-author: *Juan Luis, Rosado-Luna* / **ORC ID:** 0000-0001-9698-8532, **Researcher ID Thomson:** GPP-4253-2022, **CVU CONAHCYT ID:** 1226425

DOI: 10.35429/JIO.2023.12.7.10.13 Received January 15, 2023; Accepted June 30, 2023

Abstract

Objective: Analyze the different variables that impact the development of a radio station in Tabasco, Mexico, for which an internal and external analysis was carried out in order to be able to offer comprehensive responses to the problems detected both inside and outside the station. company with the ultimate goal of being able to increase sales by 30% within the next 10 months, making sure to generate profits and profits in the established time.

Methodology: An analysis of the current situation of the company is carried out, to objectively identify where work must be done to achieve the objectives and goals, using the SWOT tool, which allows a general diagnosis of the current conditions, with the results we can Carry out different market segment strategies with an adequate design of the marketing variables (product, price, promotion, place) to design a marketing plan that brings us closer to our objectives.

Contribution: The possibility was found that the line of action to follow is to exploit the new technologies that are available in order to achieve the established objectives.

Plan, Marketing, Radio

Resumen

Objetivo: Analizar las diferentes variables que impactan el desarrollo de una estación de radio en Tabasco, México, para el cual se realizó un análisis tanto interno como externo con la finalidad de poder ofrecer respuestas integrales a los problemas detectados tanto el interior como exterior de la empresa con el objetivo final de poder aumentar las ventas en un 30% en el plazo de los próximos 10 meses, asegurándonos de generar ganancias y utilidades en el tiempo establecido.

Metodología: Se realiza un análisis de la situación actual de la empresa, para identificar de manera objetiva donde se deberá trabajar para alcanzar los objetivos y metas, utilizando la herramienta FODA, que permite tener un diagnóstico general de las condiciones actuales, con los resultados podemos realizar diferentes estrategias de segmento de mercado con un diseño adecuado de las variables de marketing (producto, precio, promoción, plaza) para diseñar un plan de mercadotecnia que nos acerque a nuestros objetivos.

Contribución: Se encontró la posibilidad de que la lía de acción a seguir es explotar las nuevas tecnologías con la que se cuentan para poder lograr los objetivos establecidos.

Plan, Mercadotecnia, Radio

Citation: HUERTA-RAMÍREZ, Alex Iván, MOREJÓN-SÁNCHEZ, Juana María, LOPEZ-VALDIVIESO, Leticia and ROSADO-LUNA, Juan Luis. Marketing plan: radio station in Villahermosa Tabasco. Journal-Industrial Organization. 2023. 7-13:10-13.

*Correspondence to Author (E-mail: alexhuerta360@hotmail.com)
† Researcher contributing first author.

Introduction

This is a marketing project in which the aim is to which seeks the planning of marketing strategies for a strategy for a given period, including objectives, indicators, analysis, among other important other important information to guide the company.

This is particularly designed for a radio station in Villahermosa Tabasco, for which both an internal and external analysis was carried out in order to be able to offer integral answers to the problems detected both inside and outside the company with the final objective of increasing sales by 30% within the next 10 months, making sure to generate profits and profits in the established time.

The following information was obtained after conducting a series of interviews with the management of the radio station, both with the different departments and their respective managers, as well as speaking with the general manager of the company, who kindly provided the information presented below.

Mission

To satisfy the information needs of our audience, while meeting our profitability requirements by providing the highest quality, creative, socially responsible service.

Vision

To be the state leader in the production and distribution of information in the next 10 months.

Methodology to be developed

A SWOT analysis was carried out to get to know the company in a comprehensive way, from the internal, which is where we can find the strengths and weaknesses, to the external, which is where we see the opportunities and threats.

In order to have a detailed analysis, interviews were carried out with the managers of the sales, network and editorial departments and with the general director of the company, with the aim of identifying the points required for this analysis and to be able to carry out the diagnosis of the company.

Strengths	Opportunities
- Positioned Brand. - Young talent is promoted. - Content can be viewed through social media and website. - High ability to adapt to changing context. - Pricing (volume). - Real estate assets.	- Increasing the market at the national level. - Use of telecommunications (internet). - Diversification of audiences. - Implementation of technology. - Strategic alliances with local media.
Weaknesses	**Threats**
- Low profitability - Local frequency (AM) - Low staffing - Staff commitment - Lack of variety in programmes - Low prices	- Streaming services. - Existence of other newscasts or programmes at state and federal level. - Other formats in relation to the media. - Political editorial changes. - Excessive competition at the state level.

Table 1 SWOT analysis
Source: Own contribution, 2023

Results

Marketing plan (Strategy and actions)

The following strategies will be the path of action that the company has to achieve the established objective, these are sought to be well defined to seek to achieve a better positioning in the market and against the competition, this to achieve greater profitability and generate more income with the commercial resources that the company already has.

These strategies are formulated based on the strengths and taking into account the weaknesses of the company, as well as the opportunities and threats of the market, without neglecting the nature of the organisation.

ISSN: 2524-2105

Strategies:

- Achieve better positioning in customer service.
- Limit less profitable services.
- Promoting the sale of the most profitable ones.
- Offer personalised customer service.
- Strengthen existing target market.
- Diversifying sales channels through advertising media.

The proposed strategies are the result of the SWOT analysis conducted for the radio station in Tabasco.

Action plan:

Actions to be carried out to fulfil the previously established strategies:

- Implementation of advertising campaigns both in traditional media (radio, billboards, flyers, etc.) and social networks (Facebook, tiktok, Instagram, Twitter, etc.) to achieve greater market penetration.
- Customer satisfaction surveys on the service provided and the results obtained.
- Targeting the services that generate the least revenue for us and limiting them to customers who indicate repurchase of the service
- Forming alliances with key players that can provide us with greater audience acquisition according to segmentation when carrying out campaigns
- Target loyalty campaigns such as personalised service to customers who use the service the most in order to consolidate them.
- Diversify sales channels through advertising media, social media promotions and using existing customer databases.
- Recruit external sellers of the service who will work on a commission basis.

Budget

Once it is known what needs to be done, the only thing missing is the necessary means to carry out the actions previously defined. This is materialised in a budget, whose sequence of expenditure is made according to the work and time schedules applied. All the numbers will be managed on an assumption.

Media	Description	Total cost	Time
Radio spot	Radio advertisement.	$4,000	12 months
Influencers	Someone in your niche or industry who has influence over your target audience.	$3,000	12 months
Perifoneo	Broadcast over loudspeakers in the city.	$2,000	12 meses
Social media	This consists of displaying ads paid for by brands to users of a social network, either interspersed in the content or in the form of a display.	$5,000	12 meses
Spectacular	Placed at strategic points in a city for greater visibility.	$15,000	12 meses
Flyers	Distribution of propaganda leaflets, usually in public places.	$2,000	12 meses

Table 2 Breakdown of budgets by service
Source: Own contribution, 2023

Control methods

The control method will be used to measure the degree of success of the previously established objectives, through which it is expected to detect possible failures or leaks in time and form in order to be able to intervene promptly and be able to apply the appropriate corrective or adjustment with the maximum immediacy.

ISSN: 2524-2105

These methods are established according to the strategies set out above:

- Through statistical measurement surveys that measure positioning according to customer perception.
- Measuring the results of the different advertising campaigns (reach, reactions, interactions, etc.) through the analytics of the different social networks.
- Results of sales of services (by service provided, by salesperson, recurrence of contracting, etc.)
- Monitoring of salespersons' activity through periodically established reports
- Ratios of revenue obtained for each service provided
- Cost/benefit analysis of services in stock with financial statements for the last few months
- Periodic evaluations of vendors to measure results.

Once we have observed and investigated the control methods, we are left to analyse the different existing deviations in order to get useful feedback and be able to decide whether we should and want to continue with the previously established route or whether it is time to take control and apply other strategies to achieve our goals and objectives.

Such monitoring methods should be applied at least once a month in direct meetings with the marketing, sales and management team in order to present the report and if necessary make modifications.

Acknowledgement

A big thank you to the company that allowed us to carry out this marketing plan by giving us access to their facilities, interviewing the staff and providing us with the information with the aim and purpose of achieving a work that will help them to meet their objectives.

Conclusions

After carrying out this marketing project, we realise the different challenges and areas of opportunity that the radio station has to face, starting with the large number of competitors in the area, here what we can highlight is the differentiation that the group has due to the frequency with which it has which helps to reach more potential listeners, in addition to having a multiplatform media (radio, social networks, website, etc.) which can reach a greater reach.

We also have the fact that being a media that relies on technology allows it to provide comprehensive and quick solutions to the different problems that may arise, such as having the ability to cover any news with immediacy to maintain the validity of the medium, without neglecting the editorial quality and content that is handled and characterises it, which is what differentiates it from other media and allows it to have the preference of the public.

This translates into being able to achieve economic stability, since by attracting a larger audience, brands increase the number of advertisements placed and contracted by the company.

References

Banco de información de telecomunicaciones. (2020). IFT. https://bit.ift.org.mx/BitWebApp/descargaDatos.xhtml

Phillip Koetler. (2008). *Fundamentos de marketing*. Retrieved April 1, 2023. https://frrq.cvg.utn.edu.ar/pluginfile.php/14584/mod_resource/content/1/Fundamentos%20del%20Marketing-Kotler.pdf

Sampieri, R. H. (2022). *Metodología De La Investigación*. Editorial Mc. Graw Hill. México.

Article **Journal-Industrial Organization**
June 2023, Vol.7 No.12 14-25

Design and development of preventive, corrective and predictive maintenance manager software

Diseño y desarrollo de software gestor de mantenimiento preventivo, correctivo y predictivo

CORDOVA-LOPEZ, José Miguel†*, MIGUEL-MARTINEZ, Janet, HERRERA-AGUILAR, Miguel Ángel and RUIZ-HERNANDEZ, Diana Laura

Universidad Tecnológica de Oriental, México.

ID 1st Author: *José Miguel, Córdova-López* / **ORC ID:** 0000-0003-0504-6780

ID 1st Co-author: *Janet, Miguel-Martínez* / **ORC ID:** 0009-0003-4749-6605

ID 2nd Co-author: *Miguel Ángel, Herrera-Aguilar* / **ORC ID:** 0000-0002-0699-1488, **CVU CONAHCYT ID:** 632390

ID 3rd Co-author: *Diana Laura, Ruiz-Hernández* / **ORC ID:** 0009-0000-3487-5604

DOI: 10.35429/JIO.2023.12.7.14.25 Received January 20, 2023; Accepted June 30, 2023

Abstract

Due to the need to have adequate and affordable software for maintenance management, at the Universidad Tecnológica de Oriental, a preventive, corrective and predictive maintenance management software was designed and developed, the needs of organizations have been analyzed and considered. in terms of maintenance management, designing a conceptual architecture that integrates the maintenance modalities and ensures the modularity and scalability of the software. In addition, key functionalities were validated and early feedback from users was obtained, allowing continuous improvements in successive iterations. The software offers efficiency, productivity, economic gains, production improvements and loss reduction. Thus, the development of maintenance management software meets the needs of organizations, improves maintenance management, reduces costs and promotes a culture of continuous improvement.

Software. Management, Maintenance

Resumen

Debido a la necesidad de contar con un Software adecuado y asequible para la gestión del mantenimiento, en la Universidad Tecnológica de Oriental, se diseñó y desarrolló un software gestor de mantenimiento preventivo, correctivo y predictivo, se analizó y consideró las necesidades de las organizaciones en cuanto a la gestión de mantenimiento, diseñando una arquitectura conceptual que integra las modalidades de mantenimiento y asegura la modularidad y escalabilidad del software. Además, se validaron las funcionalidades clave y se obtuvo retroalimentación temprana de los usuarios, permitiendo mejoras continuas en iteraciones sucesivas. El software ofrece eficiencia, productividad, ganancias económicas, mejoras en la producción y reducción de siniestralidad. Asi, el desarrollo del software gestor de mantenimiento satisface las necesidades de las organizaciones, mejora la gestión del mantenimiento, reduce costos y promueve una cultura de mejora continua.

Software, Gestión, Mantenimiento

Citation: CORDOVA-LOPEZ, José Miguel, MIGUEL-MARTINEZ, Janet, HERRERA-AGUILAR, Miguel Ángel and RUIZ-HERNANDEZ, Diana Laura. Design and development of preventive, corrective and predictive maintenance manager software. Journal-Industrial Organization. 2023. 7-12:14-25.

*Correspondence to Author (E-mail: janet.miguel@utdeoriental.edu.mx)
† Researcher contributing first author.

Introduction

Effective maintenance of equipment and systems is essential to ensure optimal and reliable operation in various organizations. In this sense, the design and development of preventive, corrective and predictive maintenance management software has become a vital solution to optimize these activities. This article focuses on the creation of a software with differentiating features that addresses the problem of the high costs associated with specialized software.

One of the main obstacles to implementing specialized software solutions has been the high cost associated with them; many organizations, especially smaller ones, have been limited in their ability to acquire and use these softwares. Therefore, the development of an accessible and cost-effective maintenance management software becomes a solution to this problem, allowing a wide range of organizations to benefit from its functionalities without incurring excessive costs.

The added value of this software lies not only in its ability to integrate maintenance modalities, but also in its affordability. By developing maintenance management software that offers full functionality at a reasonable cost, access to effective maintenance management tools is democratized. This allows even organizations with limited resources to improve their efficiency and optimize their maintenance activities.

Each of the features of the maintenance management software will be clearly and precisely focused, highlighting its relevance and its contribution to overcoming the problem of high costs. The specific functionalities of the software will be described in relation to the planning and scheduling of preventive tasks, the follow-up and management of corrective work orders, and the implementation of monitoring and data analysis techniques for predictive maintenance.

General

Problem Statement: A common problem in small industry is the dependence on expensive specialized software that is beyond the economic reach of many organizations, especially those with limited resources.

This software often has high licensing and maintenance costs, which prevents its acquisition and effective use.

In addition, the lack of an efficient maintenance management tool makes it difficult to schedule preventive tasks, track work orders, and collect and analyze relevant data so many organizations rely on manual methods and fragmented systems that make it difficult to make informed decisions and optimize resources.

Justification: The development of a software that integrates the three maintenance modalities, that is accessible in terms of costs and that allows efficient planning, monitoring and analysis of maintenance activities, will make up for the lack of efficiency, the lack of comprehensive management and in addition to the economic inaccessibility of existing solutions.

General objective

To design and develop a preventive, corrective and predictive maintenance management software that integrates the three maintenance modalities in a unique and accessible platform, in order to improve the efficiency and management of maintenance in organizations.

Specific objectives

– To analyze the requirements of maintenance manager software, considering the needs of organizations in terms of maintenance management.

– Design a conceptual architecture that allows the integration of preventive, corrective and predictive maintenance modalities, ensuring modularity and scalability of the software.

– Develop functional prototypes of the software to validate key functionalities and obtain early feedback from users.

– Gradually add new functionalities in successive iterations, considering user feedback and needs identified during the development process.

ISSN-Online: 2524-2105

– Perform functionality, performance, security and usability testing of the software to ensure its quality.

Methodology

The methodology used in the development of the preventive, corrective and predictive maintenance manager software was based on an iterative and incremental approach, which allowed continuous adaptation as adjustments were made according to the requirements and feedback received.

The development process was divided into the following stages:

Opinion survey: In order to identify current problems in the industrial sector related to the use of specialized software, an opinion survey was conducted among companies from different sectors and industrial lines of business.

Analysis of maintenance software: Before starting the design, five softwares focused on maintenance management were compared to identify their characteristics and how they manage maintenance.

Requirements analysis: In this stage, a software requirements analysis was performed. Information was gathered on the needs of the organizations in terms of maintenance management. The key functionalities that the software should include were identified.

Conceptual design: Based on the requirements gathered, a conceptual architecture for the software was designed. The different modules and components were defined, as well as the interactions between them. Modularity and scalability were taken into account to allow future expansions and upgrades.

Software development: Functional prototypes were implemented to validate the key ideas and concepts of the software. These prototypes allowed obtaining early feedback from users and making adjustments to the design and functionality according to their needs and preferences. Appropriate technologies and programming languages were used to ensure software efficiency and usability.

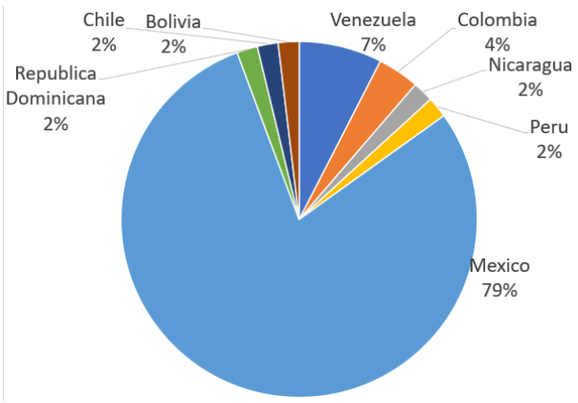
Incremental development: An incremental approach to software development was adopted. Basic functionalities were implemented and tested to ensure proper operation. In addition, new functionalities were gradually added in successive iterations.

Testing and quality control: Testing was performed at all stages of development to ensure the quality of the software. Functionality tests, performance tests, security tests and usability tests were carried out. Bugs were corrected and adjustments were made based on test results.

Results

Opinion survey:

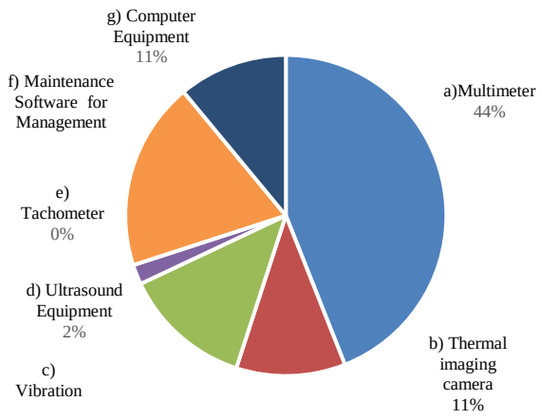
Interviews were conducted with a total of 53 companies belonging to various industrial sectors. Of these companies, 79% are of Mexican origin, while the remaining 21% correspond to foreign companies from Venezuela, Colombia, Nicaragua, Peru, Dominican Republic, Chile and Bolivia, as shown in Graph 1.



Graphic 1 Nationality of the surveyed companies
Source: Own elaboration

During the interviews, the companies were asked about the specialized equipment they have to carry out maintenance tasks. It was found that 19% of the companies mentioned having specialized software for maintenance management, as detailed in Graph 2.

ISSN-Online: 2524-2105



Graphic 2 Equipment used for the execution of maintenance
Source: Own elaboration

Those companies that indicated that they do not use software for maintenance management were asked the following question: Would it be desirable to implement such a software? In response, 60% said definitely yes, 25% said it would probably help in maintenance management, and only 15% said it was not necessary due to various reasons.

These indicators reveal that in most of the surveyed companies there is a desire to use maintenance management software, suggesting the need and demand for technological tools to optimize maintenance processes in the industrial environment.

Analysis of maintenance software

A comparison of some software available on the market for maintenance management was performed. In order to provide an overview and facilitate the choice of the most appropriate solution, a comparative table was prepared highlighting the characteristics of five best existing softwares. In Table 1, "the key aspects of these softwares are compared and the features and functions of each are analyzed and contrasted, providing a more complete view of the capabilities and costs associated with each solution." (Perez, 2021). [1]

SOFTWARE	FEATURES AND FUNCTIONS	PRICING MODEL
Fracttal One	Mobile Access Calibration Management Password management History tracking Inventory management. Predictive maintenance Preventive maintenance.	Free trial. Monthly payment Annual payment.
CMMS MP version 10	Documents in the MP General data Maintenance plans Spare parts used by the equipment Supplier data Images, notes and attachments Drawings and exploded parts diagrams Location: Real-time GPS location	Free trial. Monthly payment Annual payment.
IBM Maximum	Mobile Access Calibration Management Password Management Technician Management Programming History tracking	Free trial Annual fee.
Inno Maint	Mobile Access Calibration Management Technician management Programming History tracking Work order management Predictive maintenance	Free trial Annual fee.
EasyMaint	Mobile Access Calibration Management Technician management Scheduling History tracking Work order management.	Free trial One-time payment Annual fee

Table 1 Comparison of Maintenance Management Software
Source: Own elaboration

This comparative evaluation of maintenance management software was very useful to take into account both the functional aspects when designing a software solution for maintenance management

Requirements analysis

Studies were conducted to identify the key functionalities that the software should include in order to meet these needs.

It is important to highlight that, within the scope of the T.S.U. Maintenance Career, there were already some formats in physical format to carry out maintenance tasks. However, in this project a complete redesign process of these formats was carried out, seeking to optimize their structure and functionality.

ISSN-Online: 2524-2105

In addition, software programs must comply with a series of general parameters, including portability, accessibility, connectivity, modularity, flexibility, availability of utilities, update capacity, security and confidentiality, user management and connectivity, as well as the capacity to operate in multiple periods and exercises (Carvajal, Rios Gavira, & Montilla M., 2008). [2]

In some cases, a complete redesign of the existing formats was necessary, while in others it was only required to make modifications in their design to adapt them to the functionalities and features of the new maintenance manager software. In this section, a general description of the format redesign process is given, addressing the changes made and highlighting the benefits obtained.

With the redesign of the formats, greater efficiency in maintenance management was achieved, simplifying processes and improving data collection and analysis. This will allow organizations to optimize their maintenance activities, make informed decisions and improve task planning since managers will be able to focus their attention on selecting a system that truly meets their needs, instead of relying solely on the demonstrations presented by suppliers (Augusto Tavares, 1996) [3] [3].

A detailed description of the redesign of the formats will be presented below, highlighting the improvements and adjustments made to adapt them to the new maintenance manager software.

Check List: Check lists play a fundamental role in allowing the industrial maintenance personnel to visualize quickly and completely all the tasks to be carried out. By using checklists for the maintenance and repair of equipment, it is ensured that all necessary aspects are validated and that the equipment is functioning properly.

In this context, the format used to carry out these checklists is presented in Figure 1. However, some changes and improvements have been made to its design, as shown in Figure 2. In this figure, changes can be seen that have been incorporated to reflect the identity and specific context of the institution.

NOMBRE DEL EMPRESA: TRANPORTES DEL FUTURO

Check list:

Actividad que hace el equipo:

Área de ubicación del equipo:

Fecha de aplicación: Turno: 1 2 3 Mix

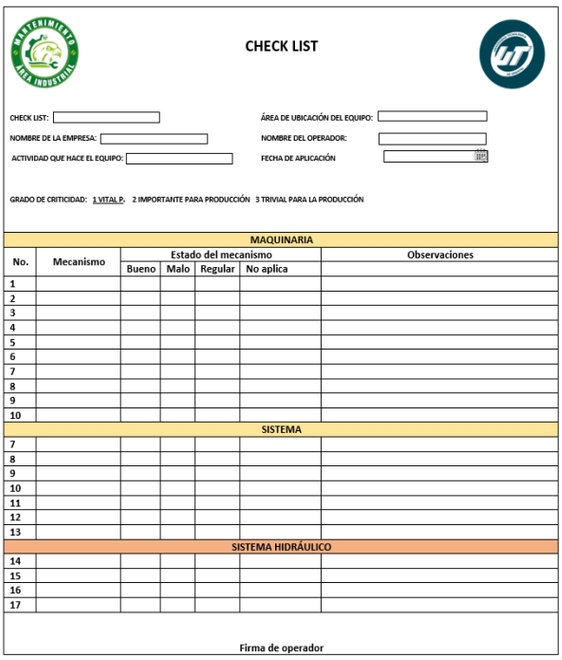
Nombre del Operador

Grado de Criticidad: 1 vital P. 2 importante para producción 3 trivial para la producción

Nun.	Mecanismo	Estado del mecanismo				Observaciones
		Bueno	Malo	Regular	No aplica	
Carrocería						
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
Sistema de Mecánico (Motor)						
7						
8						
9						
10						
11						
12						
13						
Sistema hidráulico						
14						
15						
16						
17						

Figure 1 Previous check list design
Source: Own elaboration

Through these changes and adjustments to the format, we seek to improve the experience of using the checklists, allowing technicians to carry out maintenance tasks more effectively and ensuring that all equipment is inspected thoroughly and systematically.



CHECK LIST

CHECK LIST:

ÁREA DE UBICACIÓN DEL EQUIPO:

NOMBRE DE LA EMPRESA:

NOMBRE DEL OPERADOR:

ACTIVIDAD QUE HACE EL EQUIPO:

FECHA DE APLICACIÓN

GRADO DE CRITICIDAD: 1 VITAL P. 2 IMPORTANTE PARA PRODUCCIÓN 3 TRIVIAL PARA LA PRODUCCIÓN

No.	Mecanismo	Estado del mecanismo				Observaciones
		Bueno	Malo	Regular	No aplica	
MAQUINARIA						
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
SISTEMA						
7						
8						
9						
10						
11						
12						
13						
SISTEMA HIDRÁULICO						
14						
15						
16						
17						

Firma de operador

Figure 2 Final checklist design
Source: Own elaboration

ISSN-Online: 2524-2105

These changes in the format of the checklists contribute to greater visual consistency and a better representation of the institution. In addition, they facilitate quick and accurate identification of equipment and tasks to be performed, which optimizes efficiency and accuracy in maintenance management.

Activities format: The activity format is a detailed report that records all activities performed daily throughout the month. This format provides an overview of the activities performed, giving management a clear and concise picture of ongoing operations. By systematically recording and documenting activities, it facilitates monitoring, evaluation and informed decision making.

Figure 3 shows the format used for recording activities, which has been designed to include all relevant data in an organized and structured manner. This ensures the accuracy and completeness of the information collected, as well as providing the flexibility to adapt to the specific needs of each company.

Formato de actividades de mantenimiento preventivo

Sistema mecánico

Num.	Mecanismo	Actividad de mantenimiento preventivo	Materiales s	Herramienta	Tiempo de ejecución	Imagen
1						
2						
3						
4						
5						

Sistema Eléctrico

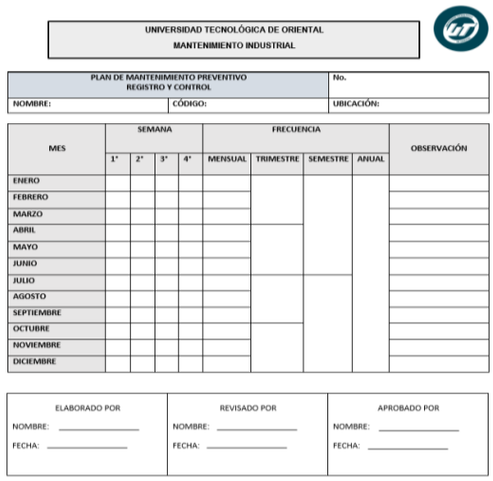
Num.	Mecanismo	Actividad de mantenimiento preventivo	Materiales s	Herramienta	Tiempo de ejecución	Imagen
6						

Figure 3 Design of the Activities Format
Source: Own elaboration

Maintenance plan: The maintenance plan consists of a set of preventive tasks to be carried out in a facility in order to meet the objectives of availability and reliability, thus prolonging the useful life of the facility as much as possible (Figure 4). To achieve this, a comprehensive format has been developed to keep a detailed record of the scheduled activities in a weekly, monthly, quarterly, semi-annual and annual schedule, and includes the documentation of specific observations for each activity.

The maintenance plan format has been created from scratch, taking into account the specific needs and requirements of the facility in question. Its design facilitates the scheduling and tracking of preventive tasks over time, allowing for efficient and systematic maintenance control. The schedule included in the format covers different time periods, ensuring complete coverage and proactive maintenance management.

With this comprehensive and systematic approach to maintenance, organizations can achieve greater reliability, availability and performance of their facilities, which in turn translates into greater operational efficiency and improved bottom line results.



UNIVERSIDAD TECNOLÓGICA DE ORIENTAL
MANTENIMIENTO INDUSTRIAL

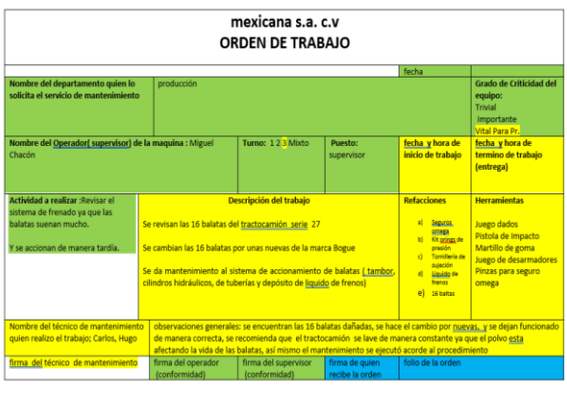
PLAN DE MANTENIMIENTO PREVENTIVO REGISTRO Y CONTROL		No.
NOMBRE:	CÓDIGO:	UBICACIÓN:

MES	SEMANA				FRECUENCIA				OBSERVACIÓN
	1°	2°	3°	4°	MENSUAL	TRIMESTRE	SEMESTRE	ANUAL	
ENERO									
FEBRERO									
MARZO									
ABRIL									
MAYO									
JUNIO									
JULIO									
AGOSTO									
SEPTIEMBRE									
OCTUBRE									
NOVIEMBRE									
DICIEMBRE									

ELABORADO POR	REVISADO POR	APROBADO POR
NOMBRE:	NOMBRE:	NOMBRE:
FECHA:	FECHA:	FECHA:

Figure 4 New Maintenance Plan Format
Source: Own elaboration

Work order: The work order plays a crucial role in the communication and execution of an intervention aimed at solving a problem detected in a machine or equipment (Figure 5).



mexicana s.a. c.v
ORDEN DE TRABAJO

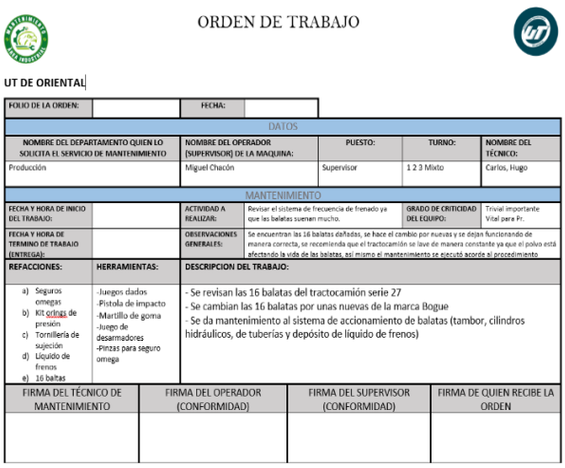
			fecha	
Nombre del departamento quien lo solicita el servicio de mantenimiento	producción			Grado de Criticidad del equipo: Trivial Importante Vital Para Pr.
Nombre del Operador(supervisor) de la maquina : Miguel Chacón	Turno: 1 2 3 Mixto	Puesto: supervisor	fecha y hora de inicio de trabajo	fecha y hora de termino de trabajo (entrega)
Actividad a realizar :Revisar el sistema de frenado ya que las balatas suenan mucho. Y se accionan de manera tardia.	Descripción del trabajo: Se revisan las 16 balatas del tractocamión serie 27. Se cambian las 16 balatas por unas nuevas de la marca Bogue. Se da mantenimiento al sistema de accionamiento de balatas (tambor, cilindros hidráulicos, de tuberias y depósito de liquido de frenos)		Refacciones: a) liquido, omega b) Kit omega de presión c) Tornillería de sujeción d) liquido de frenos e) 16 baltas	Herramientas: Juego dados Pistola de Impacto Martillo de goma Juego de desarmadores Pinzas para seguro omega
Nombre del técnico de mantenimiento quien realizo el trabajo; Carlos, Hugo	observaciones generales: se encuentran las 16 balatas dañadas, se hace el cambio por nuevas, y se dejan funcionado de manera correcta, se recomienda que el tractocamión se lave de manera constante ya que el polvo esta afectando la vida de las balatas, así mismo el mantenimiento se ejecutó acorde al procedimiento			
firma del técnico de mantenimiento	firma del operador (conformidad)	firma del supervisor (conformidad)	firma de quien recibe la orden	folio de la orden

Figure 5 Previous design of the work order
Source: Own elaboration

ISSN-Online: 2524-2105

In this context, a complete redesign of the format previously used for work orders has been carried out. Although the essential fields have been maintained, significant changes have been made, such as the incorporation of new colors and the inclusion of the logos of the Universidad Tecnológica de Oriental and the Industrial Maintenance Area (Figure 6).

By completely redesigning the format, the aim is to standardize and optimize the recording of activities performed during corrective maintenance. This facilitates effective communication between those responsible for the intervention and the personnel involved, ensuring that all necessary tasks are performed in an accurate and timely manner.



ORDEN DE TRABAJO

UT DE ORIENTAL

FOLIO DE LA ORDEN:		FECHA:			
DATOS					
NOMBRE DEL DEPARTAMENTO QUIEN LO SOLICITA EL SERVICIO DE MANTENIMIENTO		NOMBRE DEL OPERADOR [SUPERVISOR] DE LA MAQUINA:	PUESTO:	TURNO:	NOMBRE DEL TÉCNICO:
Producción		Miguel Chacón	Supervisor	1 2 3 Mixto	Carlos, Hugo
MANTENIMIENTO					
FECHA Y HORA DE INICIO DEL TRABAJO:		ACTIVIDAD A REALIZAR:	Revisar el sistema de frecuencia de frenado ya que las balatas suenan mucho.	GRADO DE CRITICIDAD DEL EQUIPO:	Trivial importante Vital para Pr.
FECHA Y HORA DE TERMINO DE TRABAJO (ENTREGA):		OBSERVACIONES GENERALES:	Se encuentran las 16 balatas dañadas, se hace el cambio por nuevas y se dejan funcionando de manera correcta, se recomienda que el tractocamión se lave de manera constante ya que el polvo está afectando la vida de las balatas, así mismo el mantenimiento se ejecutó acorde al procedimiento		
REFACCIONES:	HERRAMIENTAS:	DESCRIPCION DEL TRABAJO:			
a) Seguros omegas b) Kit cotas de presión c) Tornillería de sujeción d) Líquido de frenos e) 16 balas	-Juegos dados -Pistola de impacto -Martillo de goma -Juego de desarmadores -Pinzas para seguro omega	- Se revisan las 16 balatas del tractocamión serie 27 - Se cambian las 16 balatas por unas nuevas de la marca Bogue - Se da mantenimiento al sistema de accionamiento de balatas (tambor, cilindros hidráulicos, de tuberías y depósito de líquido de frenos)			
FIRMA DEL TÉCNICO DE MANTENIMIENTO	FIRMA DEL OPERADOR (CONFORMIDAD)	FIRMA DEL SUPERVISOR (CONFORMIDAD)	FIRMA DE QUIEN RECIBE LA ORDEN		

Figure 6 Final design of the Work Order
Source: Own elaboration

Conceptual design: The process of functionality of the maintenance software is shown according to the activity that the user wants to perform from the registration in case the user is not registered so that his data is saved, but if he is, he can log in without any problem and thus access any option either to access the machines or to print any of the maintenance forms. As shown in the flow chart (Figure 7).

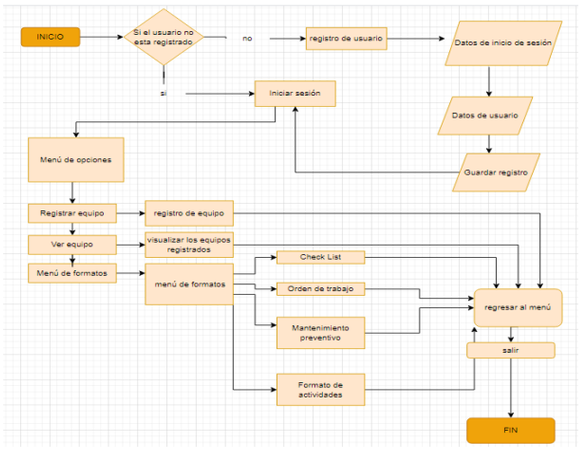


Figure 7 Flowchart of the Maintenance Management Software
Source: Own elaboration

Java

Java is an object-oriented programming language developed by Sun Microsystems in the early 1990's. "The language itself takes much of its syntax from C and C++ Programming Language, but has a simpler object model and eliminates low-level tools, which tend to induce many errors, such as direct manipulation of pointers or memory" (Gosling, 2005). To realize such software, the following programming tools are required for its elaboration. [4]

Java is a programming language used to create software compatible with a great diversity of operating systems. This language has the particularity of being compiled and interpreted at the same time; this means that it is a simplified language that automatically converts the code into machine instructions.

Traditional cascade methodology

Waterfall: it is a methodology in which the stages are organized from top to bottom, hence the name. The different functions are developed in differentiated stages and obeying a rigorous order. Before each stage, the product must be reviewed to see if it is ready to move on to the next stage. The initial requirements and specifications are not set to change, so the results cannot be seen until the project is well advanced.

ISSN-Online: 2524-2105

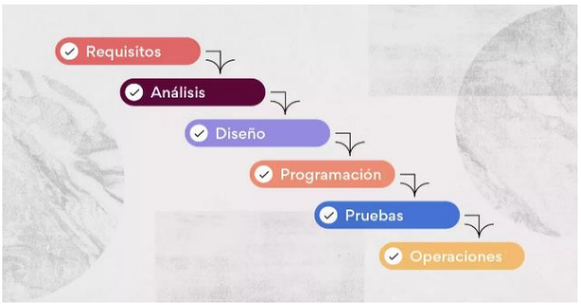


Figure 8 Stages of the cascade methodology
Source: Own elaboration

Apache NetBeans IDE

In this section we will talk about the Java work environment with the Apache NetBeans IDE, used for the design and development of this software, as well as the database management system. MySQL. [5]

NetBeans "is an IDE or integrated development environment, based on the Java language and executed in Swing" (E, 1995).

Next, a screen of the work environment is presented where the Login screen is developed as shown in the following figures. The design is made using the tools offered by NetBeans for the interface design and code for the execution of the buttons.

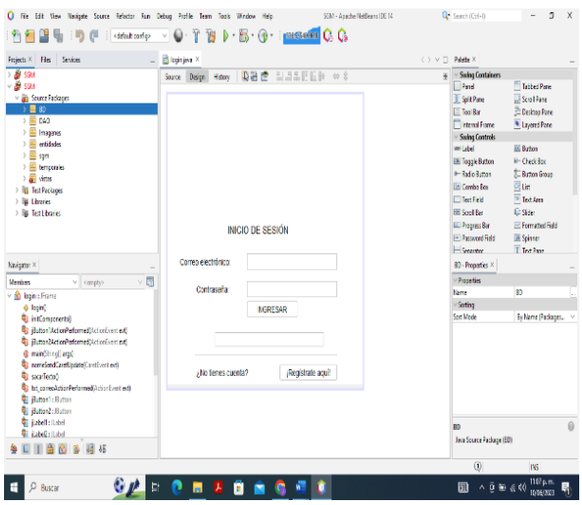


Figure 9 Design of the Login screen
Source: Own elaboration

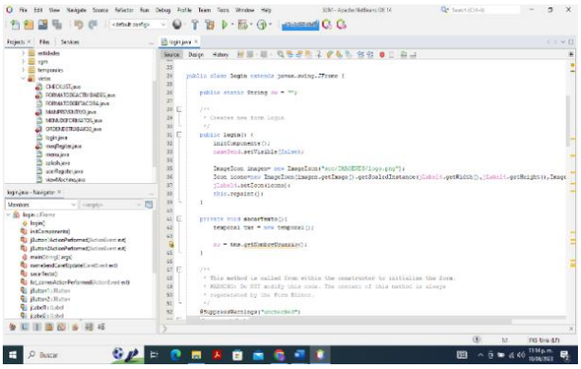


Figure 10 Login screen code
Source: Own elaboration

The following figure shows the interface design of the equipment registry, which will help to have an inventory of all the registered machinery with the following data to have a better control of these such as: Equipment name, model, serial number, description, among other data that will be necessary for the equipment information. And the source code of how each label and button to be used in this screen is programmed. See figure 11.

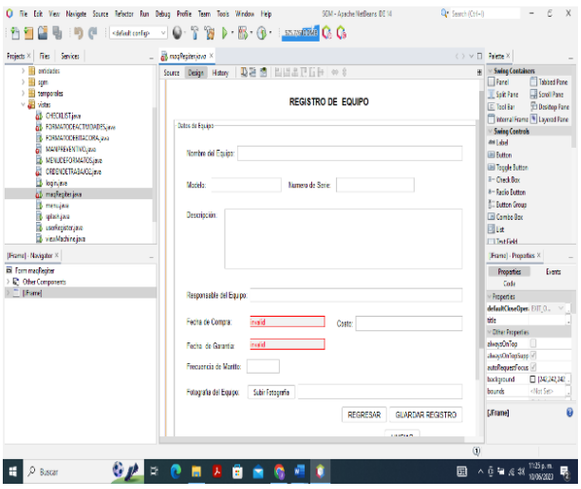


Figure 11 Machinery Register screen
Source: Own elaboration

ISSN-Online: 2524-2105

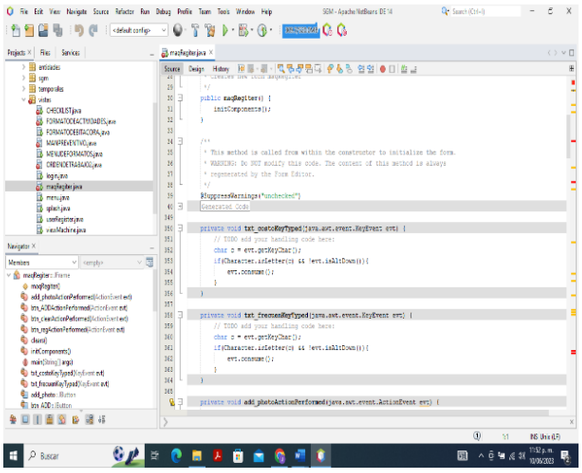


Figure 12 Source code of the Machinery Registration screen
Source: Own elaboration

DBMS

Database Management System. A Database Management System (DBMS: Data Base Management System) is a software system that allows the definition of databases; as well as the choice of the data structures necessary for the storage and search of data, either interactively or through a programming language. A relational DBMS is a data model that makes it easy for users to describe the data to be stored in the database along with a set of operations to handle the data.

Relational DBMSs are an effective tool that allows multiple users to access data at the same time. They provide efficient facilities and a set of functions with the objective of ensuring confidentiality, quality, security and integrity of the data they contain, as well as easy and efficient access to it.

XAMPP

XAMPP is an Apache distribution that includes several free software packages. The name is an acronym composed of the initials of its constituent programs: the Apache web server, the relational database management systems MySQL and MariaDB, "as well as the programming languages Perl and PHP", (COBO, 2005, p. 99). [6] The initial X is used to represent Linux, Windows and Mac OS X operating systems.

– **Apache**: the open source web server is the most widely used application globally for web content delivery. The server applications are offered as free software by the Apache Software Foundation.

– **MySQL/MariaDB**: With MySQL, XAMPP has one of the world's most popular relational database management systems. In combination with the Apache web server and the PHP language, MySQL is used to store data for web services. In the current versions of XAMPP, this database has been replaced by MariaDB, a fork of the MySQL project.

An XAMPP server can be installed quickly and easily as a local test system under Linux, Windows and Mac OS X with a single executable file. The software package contains the same components that are used in any web server, so that developers can test projects locally and conveniently transfer them to real systems. However, XAMPP is not recommended as a public server because, in the interest of user-friendliness, there are certain limitations in terms of security. The following is the Installation screen as shown in Figure 13.

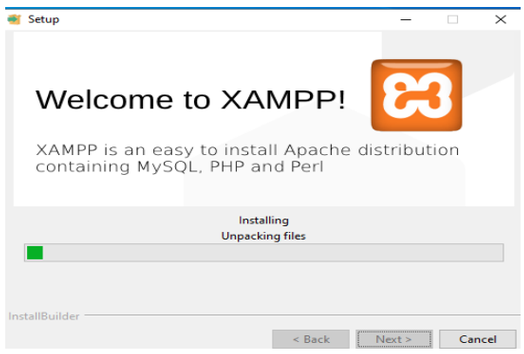


Figure 13 Xampp installation screen
Source: Own elaboration

MySQL

MySQL is an open source relational database management system (RDBMS) supported by Oracle and based on Structured Query Language (SQL). MySQL runs on virtually all platforms, including Linux, UNIX and Windows. Although it can be used in a wide range of applications, MySQL is most often associated with web applications and online publishing.

ISSN-Online: 2524-2105

The following figure shows the working environment of the database design and administration that will be used in the development of the maintenance software.

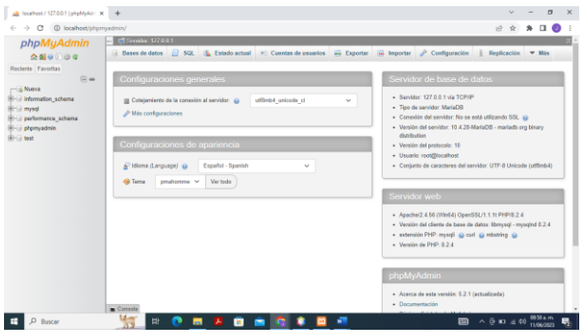


Figure 14 Work environment for the Database Design
Source: Own elaboration.

Incremental development: Following the flowchart, the user interfaces that were designed are described. Login to the platform, the user will be able to access through the e-mail with which he/she registered, in case the user is not registered he/she can do it by clicking on "Register here", once he/she has been registered he/she will be able to log in as shown in the following image (see figure 15).

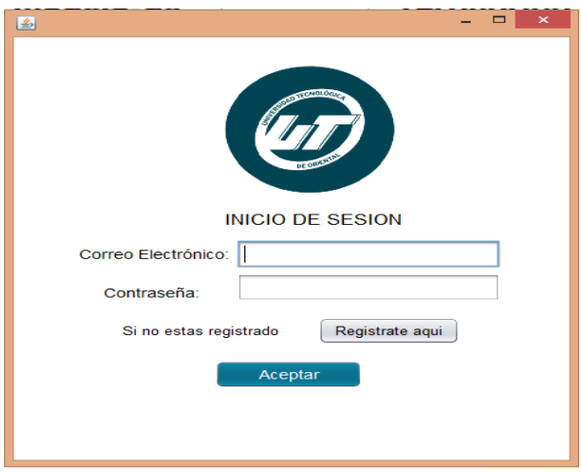


Figure 15 Login window
Source: Own elaboration

Equipment registration window in which each machine will be registered according to its characteristics so that they can be consulted later (Figure 16).

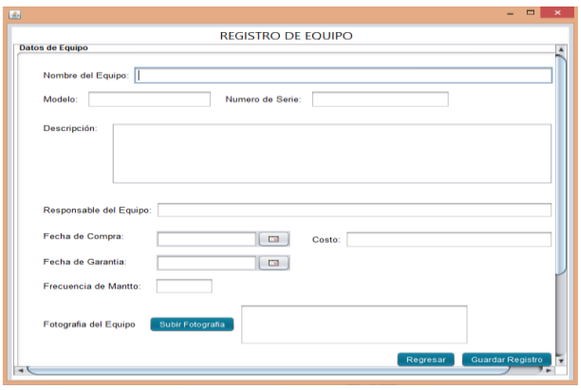


Figure 16 Equipment Registration Window
Source: Own elaboration.

The maintenance window has its respective drop-down box of No. so that the user only has to select and automatically fills the field as well as the date (Figure 17).

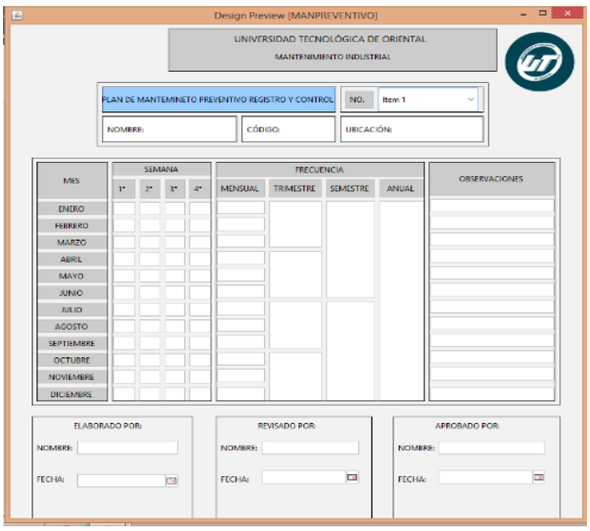


Figure 17 Result of Maintenance Plan
Source: Own elaboration.

The Check List window is filled only with drop-down lists, the only thing that the user fills by himself are the observations and data of the company and the equipment (Figure 18).

ISSN-Online: 2524-2105

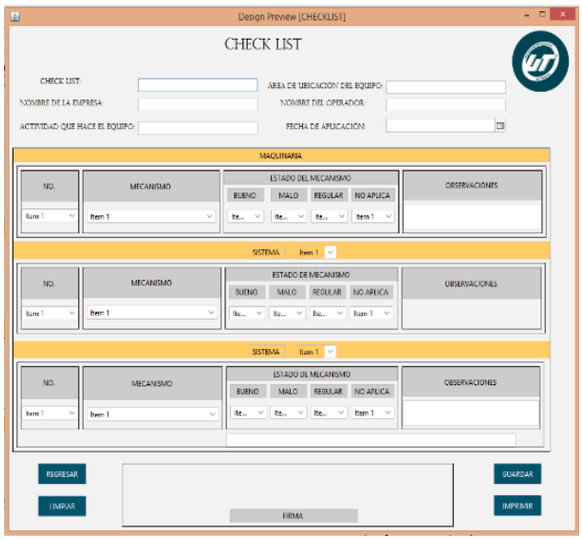


Figure 18 Result of Check List
Source: Own elaboration

The Work Order window has both drop-down lists and check boxes to fill in this format, where personnel data and maintenance data are filled in.

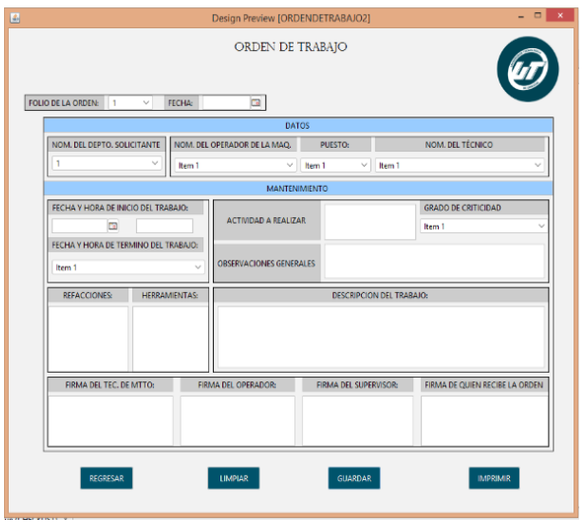


Figure 19 Result of Work Order
Source: Own elaboration

Conclusions

The development of the preventive, corrective and predictive maintenance manager software meets the objectives established in this article. The analysis of the software requirements has allowed to identify the specific needs of the organizations in terms of maintenance management, which has been fundamental for the design of a conceptual architecture that integrates in a modular and scalable way the maintenance modalities.

The implementation of functional prototypes of the software has been fundamental to validate key functionalities and obtain early feedback from users. This allowed for continuous adjustments and improvements, gradually adding new functionalities in successive iterations. In addition, extensive testing of functionality, performance, security and usability of the software has been carried out to ensure its quality and reliability.

However, a constant re-evaluation of preventive maintenance activities is necessary to avoid unnecessary costs. A continuous improvement system should be implemented and a success-oriented organizational culture should be promoted, integrating all management systems and establishing responsibilities for functions related to the work order, inventories, equipment coding, among other aspects.

References

[1] Pérez Valenzuela, Comparación de software para mantenimiento Industrial ComparaSoftware SPA 2021. https://www.comparasoftware.com/mantenimiento-industrial

[2] Carvajal, G., Rios Gavira, A., & Montilla M., C. (2008). Desarrollo de un software para mantenimiento preventivo, aplicable a los sectores de micro y pequeñas empresas colombianas. (U. T. Pereira, Ed.) Scientia et Technica, XIV(40), 89-94. ISSN 0122-1701

[3] Augusto Tavares, L. (1996). Criterios para seleccionar y evaluar un software de mantenimiento. Revista Mantenimiento - Chile(26). Obtenido de https://skat.ihmc.us/rid=1NQV1GJBN-13JY63L-HC/criterios.pdf

[4] Gosling James, Joy Bill, Steele Guy, y Bracha Gilad: *The Java language specification*, tercera edición (2005). Addison-Wesley, ISBN 0-321-24678-0.

[5] E. A. BERTINO, y MARTINO: Sistemas de bases de datos orientadas a objetos, ed. (1995). L. A. Ediciones Díaz de Santos, 1995.

ISSN-Online: 2524-2105

[6] GÓMEZ y ÁNGEL, PATRICIA: PHP y MySQL. Tecnologías para el desarrollo de aplicaciones web COBO, (2005) s.l.: Ediciones Díaz de Santos 2005. 847978706.

ISSN-Online: 2524-2105

Article **Journal-Industrial Organization**
June 2023, Vol.7 No.12 26-33

Assessment of quality defects in a production area of an SME

Evaluación de los defectos de calidad en el área de producción de una PYME

PORTILLO-CASTILLO, Víctor Manuel†, MENDOZA-GINER, Lorena, ROJO-SIMENTAL, Erick Octavio and BATISTA-VEGA, Ma. del Socorro

Universidad Tecnológica de Ciudad Juárez, México.

ID 1st Author: *Victor Manuel, Portillo-Castillo* / **ORC ID:** 0000-00003-0026, **Researcher ID Thomson:** E-8100-2018, **arXiv ID Author:** q-fin.TR, **PubMed ID Author:** vmktor_17, **CVU CONAHCYT ID:** 897310

ID 1st Co-author: *Lorena, Mendoza-Giner* / **ORC ID:** 0000-0001-6024-8065, **Researcher ID Thomson:** D-9838-2018, **arXiv ID Author:** LoreMG, **PubMed ID Author:** lorena_mendoza@utcj.edu.mx, **CVU CONAHCYT ID:** 355972

ID 2nd Co-author: *Erick Octavio, Rojo-Simental* / **ORC ID:** 0000-0001-6786-9710, **Researcher ID Thomson:** S-8657-2018, **arXiv ID Author:** 4492539, **PubMed ID Author:** eors2610@gmail.com, **CVU CONAHCYT ID:** 319134

ID 3rd Co-author: *Ma del Socorro, Batista-Vega* / **ORC ID:** 0000-0003-2019-3017, **Researcher ID Thomson:** GQP-1572-2022, **arXiv ID Author:** 4476909, **PubMed ID Author:** marias.batistav@gmail.com, **CVU CONAHCYT ID:** 324229

DOI: 10.35429/JIO.2023.12.7.26.33 Received January 25, 2023; Accepted June 30, 2023

Abstract

The importance of this study lies in the support SMEs require in terms of the limitations of technologies and work methods for carrying out their daily activities in some manufacturing processes that businesses conducts. The objective was to measure the dependence of the quality defects found in fuses when considering using a new welding component in the production lines. Even with a quality management system, some defects were presented in the final product. Therefore, the methodological design was performed to identify variable defects in fuses, welding components, and production lines. Likewise, the chi-square statistical test was applied to determine the dependence between the variables that intervene in the process. The information obtained was analyzed through the SPSS 20 statistical program. The results showed dependence between the variables, allowing proposals to be established to correct the defects.

SMEs, Dependence, Manufacturing processes

Resumen

La importancia del presente estudio, radica en el apoyo que requieren las PYME´s en cuanto a las limitaciones de las tecnologías, métodos de trabajo para la realización de sus actividades diarias en algunos procesos de manufactura que llevan a cabo en su negocio, el objetivo planteado fue medir la dependencia de los defectos de calidad que presentaron los fusibles, considerando el uso de un nuevo componente de soldadura utilizado en las líneas de producción, aun con un sistema de gestión de calidad, se presentaron algunas defectos en el producto final; el diseño metodológico se realizó identificando las variables defectos en los fusibles, componente de soldadura y líneas de producción, así mismo se aplicó la prueba estadística chi cuadrado para determinar la dependencia entre las variables que intervienieron en el proceso. La información obtenida se analizó a través del programa estadístico SPSS 20. Los resultados presentaron dependencia entre las variables, permitiendo establecer propuestas para corregir los defectos.

Pymes, Dependencia, Procesos de manufactura

Citation: PORTILLO-CASTILLO, Víctor Manuel, MENDOZA-GINER, Lorena, ROJO-SIMENTAL, Erick Octavio and BATISTA-VEGA, Ma. del Socorro. Assessment of quality defects in a production area of an SME. The case of the bachelor's educational program in administration. Journal-Industrial Organization. 2023. 7-12:26-33.

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

Introduction

Support for small and medium-sized SMEs in different areas and activities generates a positive and decisive impact on activating the competitiveness of these businesses. Most of the time, these companies do not have the experience, preparation, equipment, technology, and personnel that allow them to solve problems quickly and efficiently during line production activities. Therefore, the external practical, theoretical contribution allows to support and solve situations that affect the company. Furthermore, methodological and statistical support provides conclusive results for identifying and resolving the effects of the causes mentioned above.

The previously proposed practice allows these businesses to make effective decisions and apply changes suggested in the problem raised providing certainty and security in the processes. Additionally, this allows application changes in implemented modifications and provides continuous growth and security in the search for a competitive advantage through all elements and processes that integrate the activities of SMEs.

Additionally, the company detected the problem in the middle of 2022 when integrating a new welding component for elaborating different types of fuses manufactured in the production lines. As a result, the quality department detected that the finished product did not meet with the requirements and resistance specifications that the clients requested, causing delays in the production and delivery of the orders. Furthermore, the quality department points out that the defects found in the fuses are not uniform in the production lines, which differ from the supervision area. Also, the quality department considers that the problem arises due to the human factor when carrying out the welding operation.

Therefore, it is established as a hypothesis that the new welding component is generating the quality defects of the fuses in the company's production lines.

Literature review

Small and medium-sized enterprises (SMEs) form a sector of great importance for the economic development of the region and the country. Although these businesses have been built through entrepreneurship, their contribution is the primary source of the generation of jobs, growth, productivity & innovation. In this context, an essential determinant of the development of the local economy lies in the support and monitoring of small and medium-sized companies, seeking to generate competition through the experience gained with their approach and participation in the business sector (Kruja, 2013).

Many countries have been seeking economic progress, most of the developing countries mainly recognize the SME sector. Considered as a promoter of growth and the labor force of a region, it contributes and provides economic growth and business resources as well as employment sources and opportunities.

On the other hand, the roles played by SMEs in the economic development of a nation have been empirically explored, finding a factor of ambiguity. It can be concluded concretely, when examining the economic progress by sector, the specialists in the economic areas, generally ignore the industrial structure of the economy and the impact of the advantage that it may have on the development of the country (Ming-Wen, 2010) .

It can be noted that quality is based on a concept that is very fashionable in these times in companies and throughout the business world. The dialogue between all organizations on this subject is typical. It has reference to receiving a bad service or due to a problem with a product. One key element of total quality management is competitiveness because companies without competitiveness could not achieve great success in today's market, thanks to using the quality tool to achieve their objectives. It could also be said that consumers are looking to satisfy their needs and find products, goods, and services that follow the client's needs (Guajardo, 2003).

ISSN-Online: 2524-2105

In the 1980s, researchers considered raising awareness about the importance of the strategic quality field and the critical aspects of their philosophy of integrated improvement and fulfilling immediate customer satisfaction. From publications generated in Japan and sufficient arguments on this subject, many businesses and organizations in the western world started with total quality management programs focused on taking strategic action to improve performance and competitiveness (Gutierrez, 2010).

The generation of competitiveness of companies is of crucial importance to generate a focus on their ability to maintain advantages that participate in that same competitiveness against other companies, generating a sustainable panorama with a greater impact on the region and society. It is of great importance to avoid and reduce losses and waste by increasing production efficiency, no organization should be exposed to waste and misuse of resources to develop its production process (Gonzalez, 2011).

Another author Cuatrasecas, (2009) established that a production process represents a central element made up of a series of coordinated activities for the development of physical operations.

In addition, there are activities in which a series of productive factors interfere to transform them into products. The integration of processes and quality generate wealth; that is, they add value to the raw material acquired by the company. The acquired materials represent valuable elements, increasing the potentiality of satisfying the client's needs with each activity of the production process. Therefore, it is important to identify the processes of raw materials and products being used to obtain the final product. Generally, these processes are executed through tasks, flows, and storage (Mayorga, Ruiz, Marcelo, & Moyolema, 2015)

On the other hand, Miranda & Toirac, (2010) pointed out that production generates a phase in the economic process. Some productive factors are transformed to make goods and services and meet needs. The neoclassical theory establishes the creation of wealth with a focus on increasing the well-being of a social group, demanding the efficient application of scarce resources to enhance the achievement of well-being; resources are generally directly related to the factors of production.

In the 1980s, researchers considered raising awareness about the importance of the strategic quality field and the critical aspects of their philosophy of integrated improvement and fulfilling immediate customer satisfaction. From publications generated in Japan and sufficient arguments on this subject, many businesses and organizations started with total quality management programs focused on taking strategic action to improve performance and competitiveness (Syamsul, Djabir, & Ria, 2012).

However, the standards published by ISO, considered as Quality Management standards, generated their first edition in 1987 by the ISO 9000 series, provided what is currently an example of quality worldwide, providing general well-being to manufacturers and consumers of goods and. Services with thousands of certified companies around the world, leading the European continent with more than 500,000 companies (Carrera, Ligña, Mortreno, & Morales, 2018).

Another aspect of total quality management focuses on preventing repetitive processes for an activity to eliminate problems that could arise at the end of each process and to have a balanced work environment in which the organization reacts quickly to customer needs and requirements. In this regard, the members of these businesses must be aware of the value and role they represent in this process. Other alternatives to manage growth and value must include the elements in which the company participates inside and outside, increasing the analysis and limits of the processes carried out (Carro & Gonzalez, 2010).

Lozano (1998) conducted a study in which he interpreted a completely close relationship in the quality field, a product quality symbol. The subject of quality means the quality of work. Another main point is the quality of service, as well as the quality of information. The study represents the product quality symbol, such as the quality industry process, medical field areas quality, and other aspects of quality, including engineers, managers, and executives who integrate the system's quality. Furthermore, it constitutes the quality contributions of the company in the planning process and the quality of the objectives. Its primary focus was to control the quality present in all manifestations.

ISSN-Online: 2524-2105

Moreover, Ramos, (2011) pointed out that quality management must be represented as a philosophy that is considered an approach to support companies to obtain excellent results, several advantages must be considered, by offering results in the development of processes and management a vision of quality. , generating a continuous improvement to define the strategic processes proposed by the organization.

Another author defines quality as a key element in survival; concretizing it allows turning it into a long-term competitive strategy focused on permanent execution. It is worth mentioning that it appears as a living standard of achievement in people, achievement of the company, its objectives, its processes, and in general of all the elements and activities of the organization. The company must have the commitment to improve products and services to gain an advantage over competitors in an approach to reduce errors and make things right the first time (Demuner & Mercado, 2011).

Quality is perceived and well received from the participation of all company members in their tasks to the effectiveness of preventive signs. In these cases, there should be no reason to neglect the order of the process, with a focus on achieving excellence. Quality allows the business to be profitable, productive, and participate in the market; it establishes a series of procedures that provide business success in a coordinated and categorical manner (Maldonado, 2018). Quality management systems must meet the following factors: improve internal operation, competitive advantages, and customer demand (Erazo, Acevedo, Guzman, & Rodriguez, 2010).

Every organization requires a great effort before, during and after having prepared and implemented a quality management system, the monitoring and control of the system through the evaluation of the system through quality audits carried out by third parties (Horovitz, 1991).

Consequently, quality is a factor that must be considered as a generator of a competitive advantage, by establishing a degree of cohesion in the inherent characteristics that provide the need or expectation, continuously implicit or obligatory, translating into terms of compliance with requirements, for which every system is obliged to perform measurements on its processes and critical attributes to determine their conformity. If a nonconformity is identified, it is defined as the absence of the quality (Santamaría, 2017).

Nevertheless, quality assurance is depicted through a series of mechanisms developed in Latin America and Europe; it emphasizes the relationship, needs, and characteristics that influence and emerge from manufacturing systems providing diverse responses. However, it is not complex to identify some common characteristics that have generated its appearance, development, and implementation. Although some differences are based on the purposes and functions assigned, in which they result in methodological analysis associated with their use, management, and application of the obtained results (Espinoza & Gonzalez, 2012).

Furthermore, quality assurance starts from the Conceptual phase of a project and concludes with a final product of great satisfaction to meet customer expectations. Finally, the quality system, represented by a technical department, intends to establish control mechanisms of the economic proposals through the implementation of key performance indicators; in these cases, they are decisive for a correct control carried out in the course of the elaboration of the calculations and the unit prices. (Chase, Jacobs, & Aquilano, 2012).

Methodology

The objective of this chapter is to explain the methodology used to collect and analyze the information used in this study. The approach or nature applied in this study was quantitative, of a non-experimental type with a cross-sectional design with a descriptive-correlational scope (Hernandez, Fernandez, & Baptista, 2014). It was applied for convenience to obtain the study information in a given time, apply the statistical tests and process the corresponding information to analyze the results (Anderson, Sweeney, & Williams, 2008).

ISSN-Online: 2524-2105

In conclusion this research was focused on determining if there is a dependency between the variables defects in the fuses, welding component and production line through the chi square test (Lind, Marchal, & Wathen, 2012).

Likewise, the research was carried out of the applied type since an attempt was made to solve a problem that arose in a manufacturing SME. The type of sampling selected was non-probabilistic for convenience and availability of schedules and manufacturing in the production lines (Levin & Rubin, 2010).

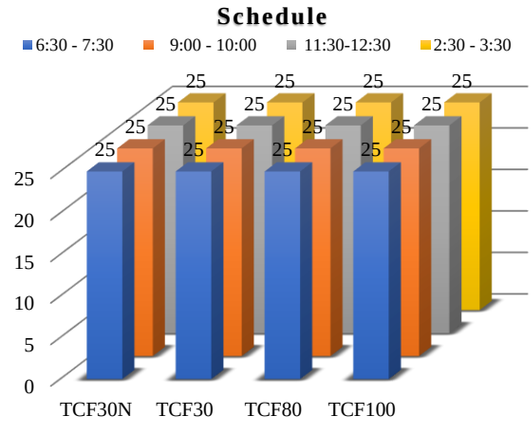
According to the production standard, 6,400 fuses must be produced daily from all production lines. For this work, a non-probabilistic sample was applied due to the easy acquisition of fuse samples and carrying out the measurement process by the quality department. The formula for finite samples was reviewed to determine the sample size (Bluman, 2007). The result demonstrated that at least 362 pieces were needed for a representative study population sample. To conclude the sample results, it was defined to apply it to 400 fuses according to the quality department's recommendations.

Whereby the information was collected through a checklist designed by the quality department, which includes the day, time of production, year, and model, assigning a consecutive number to each piece once an electrical test was conducted on the fuse. Although the collection was carried out in the first shift through the quality department, table 1 shows the schedules and fuses obtained as a sample.

Schedule	TCF30N	TCF30	TCF80	TCF100
6:30 - 7:30	25	25	25	25
9:00 - 10:00	25	25	25	25
11:30-12:30	25	25	25	25
2:30 - 3:30	25	25	25	25

Table 1 *Daily production sample by lines*
Source: Own elaboration.

Graph 1 represents the non-probabilistic sampling selected for convenience and availability of schedules and manufacturing in the production lines.



Graphic 1 Daily production sample by lines
Source: Own elaboration

Results

The results of the data obtained objectively and logically are presented below, accompanied by the respective statistical treatment. These results are shown through tables and analyzed based on the hypotheses raised, presenting the calculated values and the established probability levels.

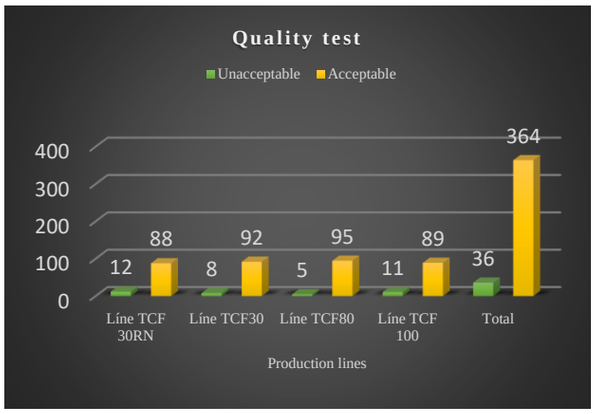
In addition, through the data analysis of the statistical program SPSS 20, the result was captured in the contingency table presented in table 2, showing 12% of resistance failures of the fuses extracted for the test in the TCF30RN line. The minimum result obtained in the TCF80 line was 5%. In general, 9% was obtained, equivalent to 36 pieces with quality problems of the 400 registered and analyzed as a sample.

		Production lines				
		Líne TCF 30RN	Líne TCF 30	Líne TCF80	Líne TCF 100	Total
Quality test	Unacceptable	12	8	5	11	36
	Acceptable	88	92	95	89	364
Total		100	100	100	100	400

Table 2 Contingency table & Quality test of production lines.
Source: Own elaboration

Graph 2 shows the results of the test in which the percentages of the fuses that do not meet the quality specifications can be seen, as well as the percentage of those that were accepted and the total sample analyzed.

ISSN-Online: 2524-2105



Graphic 2 Quality test of production by lines
Source: Own elaboration

Table 3 shows the chi-square test for the variable defects of the fuses (Anderson, Sweeney, & Williams, 2008), with the welding component verifying the hypotheses raised in the investigation. The quality defects of the fuses in the production lines are not derived from the integration of the new welding component. Since the calculated value of chi-squared (3.663) appears in the left region of 7.815, the null hypothesis is not rejectable at the 0.05 level of significance. Therefore, there is no evidence of a relationship between the welding component and the defects of the components' fuses.

	Value	gl	Sig. asymptotic (bilateral)
Pearson chi-square	3.663[a]	3	.300
likelihood ratio	3.885	3	.274
Linear by Linear Association	.219	1	.640
N of valid cases	400		

Table 3 Chi-square test
Source: Own elaboration

Gratitudes

We appreciate the support and facilities provided to the authorities of the Technological University of Ciudad Juarez.

Conclusions

In conclusion the results obtained through the statistical tests allowed us to define the methodological proposal raised at the beginning of the investigation. Furthermore, the rejection of the null hypotheses strengthened the security of great ideas remaining about the scope and effectiveness of its implementation and use.

Therefore, the breakdown of the results offered the identification of internal details of the quality department, which enhanced the opportunity for the investigation.

Consequently, the results made it possible to determine that the welding component was not presenting the problem. The sample did not yield convincing evidence to determine that it was one of the factors influencing the production process since the component was integrated at the beginning of the year. Therefore, the supervision department considered the problem generated due to the component's quality. However, the resistance tests yielded a non-significant percentage of a statistical sample that meets the requirements to determine if all the daily production generated in the production lines had to be reviewed to ensure that it was generating the quality problem.

As no problems were found in the welding component, it is essential to review the production processes of the operators since it may be one of the contributing factors influencing the defects, as well as review the calibration of the welding machines to ensure the quantity and amperage are correct, creating a new line of research.

References

Anderson, D., Sweeney, D., & Williams, T. (2008). *Estadistica para administracion y economia.* Mexico: CENAGE learning.

Bluman, A. (2007). *Elementary Statistics A step by step aproach.* New York: Mc Graw Hill.

Carrera, C., Ligña, C., Mortreno, G., & Morales, R. (2018). *SISTEMAS DE GESTION DE CALIDAD.* Guayaquil-Ecuador: Grupo Compás. Obtenido de http://142.93.18.15:8080/jspui/bitstream/123456789/466/3/SISTEMAS%20DE%20GESTI%C3%93N%20DE%20LA%20CALIDAD.pdf

Carro, R., & Gonzalez, D. (2010). *Administracion de la calidad total.* Argentina: Universidad Nacional del Mar de la Plata. Obtenido de https://nulan.mdp.edu.ar/id/eprint/1614/1/09_administracion_calidad.pdf

ISSN-Online: 2524-2105

Chase, R., Jacobs, F., & Aquilano, F. (2012). *Administracion de operaciones produccion y cadena de suministro.* Mexico: Mc Graw Hill.

Cuatrasecas, L. (2009). *Diseño avanzado de procesos y plantas de produccion flexible.* Barcelona: Profit Editorial.

Demuner, M., & Mercado, P. (2011). Gestión de calidad en PyMEs manufactureras certificadas con ISO 9001-2000. *Revista del Centro de Investigación*, vol. 9, núm. 35; 79-97. Obtenido de https://www.redalyc.org/pdf/342/34218346009.pdf

Erazo, L., Acevedo, J., Guzman, L., & Rodriguez, A. (2010). A GUIDE FOR THE IMPLEMENTATION OF A QUALITY MANAGEMENT SYSTEM IN SMALL AND MEDIUM-SIZED BUSINESS. *SIGNOS*, Vol. 2 / No. 1 pp. 107-115. Obtenido de https://www.redalyc.org/pdf/5604/560458732008.pdf

Espinoza, O., & Gonzalez, L. (2012). Estado actual del sistema de aseguramiento de la calidad y el regimen de acredtiacion en la educacion superior en Chile. *Revista de educacion superior*, 87-109. Obtenido de https://www.scielo.org.mx/pdf/resu/v41n162/v41n162a5.pdf

Gonzalez, N. (2011). CONTROL DE MERMAS Y DESPERDICIOS EN ALMACÉN DE CONDIMENTOS DE INDUSTRIA AVÍCOLA. *(Tesis de ingenieria induatrial).* UNIVERSIDAD DE SAN CARLOS DE GUATEMALA, Guatemala. Recuperado el 28 de Enero de 2023, de https://www.academia.edu/41885495/CONTROL_DE_MERMAS_Y_DESPERDICIOS_EN_ALMAC%C3%89N_DE_CONDIMENTOS_DE_INDUSTRIA_AGRICOLA

Guajardo, E. (2003). *Administracion de la calidad total.* Mexico: Pax.

Gutierrez, H. (2010). *Calidad total y productividad.* Mexico: Mc Graw Hill.

Hernandez, R., Fernandez, C., & Baptista, P. (2014). *Metodologia de la investigacion.* Mexico: Mc Graw Hill.

Horovitz, J. (1991). *La calidad del servicio a la conquista del cliente.* Barcelona: Mc Graw Hill.

Kruja, A. (2013). The Contribution of SMEs to the Economic Growth. *Euro Economica*, Vol 32, No 1, 55–67. Obtenido de https://scholar.google.com.mx/scholar?q=The+Contribution+of+SMEs+to+the+Economic+Growth&hl=en&as_sdt=0&as_vis=1&oi=scholart

Levin, R., & Rubin, D. (2010). *Estadistica para administracion y economia.* Mexico: Pearson.

Lind, D., Marchal, W., & Wathen, S. (2012). *Estadistica aplicada a los negocios y la economia.* Mexico: Mc Graw Hill.

Lozano, L. (1998). Que es la calidad total. *Revista Medica Herediana*, 9-28. doi:DOI: https://doi.org/10.20453/rmh.v9i1.566

Maldonado, J. (2018). *Fundamentos de Calidad Total.* Mexico: Mc Graw Hill. Obtenido de https://issuu.com/joseangelmaldonado8/docs/fundamentos_de_calidad_total

Mayorga, C., Ruiz, M., Marcelo, L., & Moyolema, M. (2015). PROCESOS DE PRODUCCIÓN Y PRODUCTIVIDAD EN LA INDUSTRIA DE CALZADO ECUATORIANA: CASO EMPRESA MABELYZ. *Revista ECA Sinergia*, 88-100. Obtenido de https://dialnet.unirioja.es/servlet/articulo?codigo=6197632

Ming-Wen, H. (2010). SMES AND ECONOMIC GROWTH: ENTREPRENEURSHIP OR EMPLOYMENT. *ICIC Express Letters*, Volume 4, Number 6(A), 2275-2280. Obtenido de https://mail.tku.edu.tw/humw/t2239.pdf

Miranda, J., & Toirac, L. (2010). Indicadores de productividad para la industria dominicana. *Ciencia y Sociedad*, Vol. XXXV, pp. 235-290. Obtenido de https://www.redalyc.org/pdf/870/87014563005.pdf

Ramos, J. (2018). Influencia del Sistema de Calidad e Innovación Tecnológica en los Resultados Enfocados en la Mejora Continua en la manufactura de Transformadores de Distribución y Potencia. *Industrial Data*, vol. 21, núm.1: 63-72. doi:DOI: http://dx.doi.org/10.15381/idata.v21i1.14912

ISSN-Online: 2524-2105

Santamaría, R. (2017). Factores críticos de la gestión de la calidad determinantes del éxito sostenido empresarial en las PYMES. *Ingeniería Industrial. Actualidad y Nuevas Tendencias*, Vol. 19, 105-118. Obtenido de https://www.redalyc.org/articulo.oa?id=215055006008

Syamsul, B., Djabir, H., & Ria, M. (2012). Implementation of Total Quality Management and Its Effect on Organizational Performance of Manufacturing Industries Through Organizational Culture in South Sulawesi, Indonesia. *IOSR Journal of Business and Management*, Volume 5, Issue 1, PP 10-24. Obtenido de https://www.iosrjournals.org/iosr-jbm/papers/Vol5-issue1/C0511024.pdf
.

ISSN-Online: 2524-2105

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

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

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

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

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

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

Abstract (In English, 150-200 words)

Objectives
Methodology
Contribution

Keywords (In English)

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

Abstract (In Spanish, 150-200 words)

Objectives
Methodology
Contribution

Keywords (In Spanish)

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

Citation: Surname (IN UPPERCASE), Name 1st Author†*, Surname (IN UPPERCASE), Name 1st Coauthor, Surname (IN UPPERCASE), Name 2nd Coauthor and Surname (IN UPPERCASE), Name 3rd Coauthor. Paper Title. Journal-Industrial Organization. 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

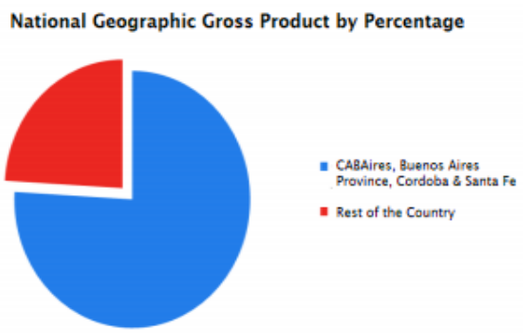
[Title No.12 in Times New Roman, single spaced and Bold]

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.

	n	%
Knowledge of the terms Mesh o DeCS	0	0.0
Operator knowledge AND (Y)	4	20.0
Operator knowledge OR (o)	2	10.0
Operator knowledge NOT (no)	2	10.0

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:

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

They 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 to indicate if they were funded by any institution, University or company.

Conclusions

Explain clearly the results and possibilities of improvement.

ISSN-On Line: 2524-2105

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-On Line: 2524-2105

Reservation to Editorial Policy

Journal-Industrial Organization 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. RINOE® 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 RINOE® 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 RINOE Journal-Industrial Organization 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 RINOE® in its Holding Peru 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 RINOE® in its Holding Peru for its Journal-Industrial Organization, 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 RINOE® 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)
V|LEX (Global Legal Intelligence Platform)
RESEARCH GATE (Germany)
GOOGLE SCHOLAR (Citation indices-Google)
MENDELEY (Bibliographic References Manager)

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
Article Translation
Article Publication
Certificate of Article
Service Billing

Editorial Policy and Management

1047 Avenida La Raza -Santa Ana, Cusco - Peru. Phones: +52 1 55 1260 0355, +52 1 55 6159 2296, +52 1 55 6034 9181; E-mail: contact@rinoe.org www.rinoe.org.

Journal-Industrial Organization

Advertising & Sponsorship

(RINOE® - Peru), sponsorships@rinoe.org

Site Licences

03-2010-032610094200-01-For printed material, 03-2010-031613323600-01-For Electronic material,03-2010-032610105200-01-For Photographic material,03-2010-032610115700-14-For the facts Compilation,04-2010-031613323600-01-For its Web page,19502-For the Iberoamerican and Caribbean Indexation,20-281 HB9-For its indexation in Latin-American in Social Sciences and Humanities,671-For its indexing in Electronic Scientific Journals Spanish and Latin-America,7045008-For its divulgation and edition in the Ministry of Education and Culture-Spain,25409-For its repository in the Biblioteca Universitaria-Madrid,16258-For its indexing in the Dialnet,20589-For its indexing in the edited Journals in the countries of Iberian-America and the Caribbean, 15048-For the international registration of Congress and Colloquiums. financingprograms@rinoe.org

Management Offices

1047 Avenida La Raza -Santa Ana, Cusco – Peru.

Journal-Industrial Organization

2524 2105
ISSN 2524 - 2105
www.rinoe.org