



# SUSTAINABLE DEVELOPMENT GOALS

**9** INDUSTRY,  
INNOVATION, AND  
INFRASTRUCTURE



# Educational Intranet with virtual classroom in rural schools



Students and faculty from the Electronic Engineering and Networks and Communications Engineering programs (EPE) at UPC conducted the project “Educational Intranet with virtual classroom,” an initiative that originated during the pandemic. This project was developed at the school in the Human Settlement Brisas de California, located in Chosica, and at the early childhood education center José María Escrivá, located in the rural annex San Juan de Roldan, Cañete, due to the poor conditions in which students received their virtual classes. WiFi equipment was recycled and configured to optimally transmit the internet to the students’ homes.



The objective of the initiative was to install an intranet with a virtual classroom in a school without internet connection to improve the conditions of the teaching and learning process for children. To achieve this, an alliance with the company IPT (Internet for Everyone) was established in 2022, and in 2023 the technical design for the Cañete school was carried out. The site was visited in November, and the UPC Social Responsibility Office provided funds to acquire the radio link equipment necessary for the connection with IPT. The installation and details of the Virtual Classroom were planned with the school administration.

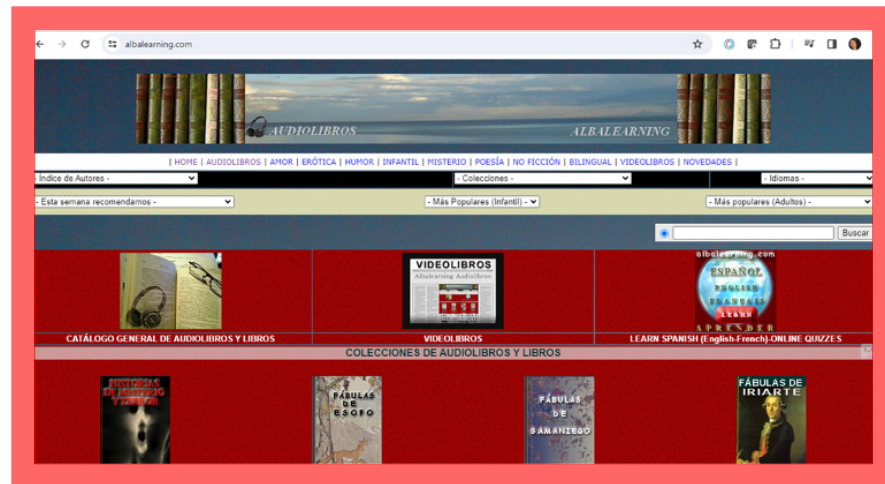


# Research Resources Portal



The Knowledge Management Directorate of UPC managed the “Research Resources Portal” platform, aimed at providing access to information resources (ebooks, journals, theses, multimedia resources, websites, among others) organized alphabetically, thematically, and by academic program. The platform offered resources subscribed to by the university and others that were open access for the general public.

No new electronic resources were subscribed for academic programs during this period. However, 2 open access resources with relevant content, such as Zotero and F1000Research, were incorporated. This initiative provided the educational community with organized information resources for the elaboration of academic and research work.

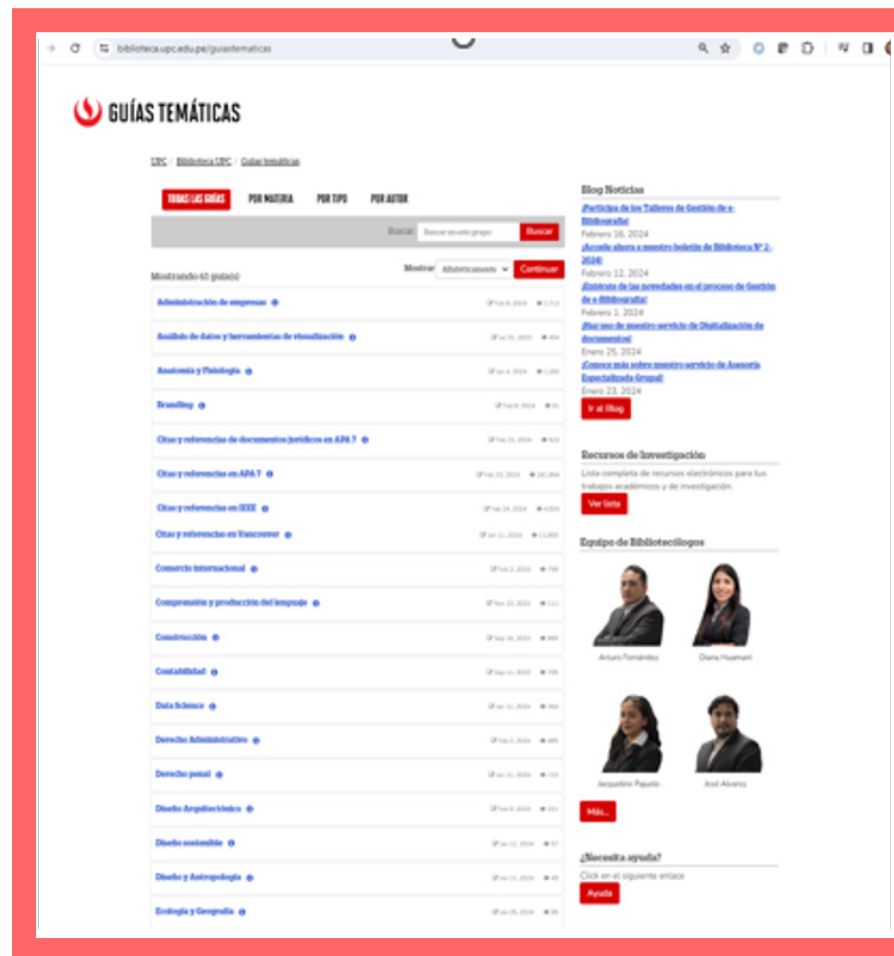


# UPC Subject Guides



The Knowledge Management Directorate of UPC managed the “UPC Subject Guides” platform with the aim of providing access to scientific and academic research through a selection of information resources (ebooks, journals, theses, multimedia resources, web-sites, among others) organized by topics of interest and research lines to contribute to the creation of academic knowledge. The platform offered resources subscribed to by the university and others that were open access for the general public.

Two new transversal subject guides were created in the 2023-1 semester. Additionally, the 51 guides created in 2021 and 2022 were updated monthly.



# Tourism Week “Inversiones Verdes”



The School of Hospitality and Tourism Management at UPC organized Tourism “Inversiones Verdes” (Green Investments) from September 20 to 27, 2023 a virtual format. Three presentations were held with international experts linked to the tourism, accommodation, and restaurant sectors. These experts presented international cases related to green investments in each sector. Additionally, a discussion panel was held with representatives from the business sector and three discussion panels with representatives from each of the three programs of the school and CETT students from the Universidad de Barcelona, Universidad del Valle de México and Universidad ANAHUAC.

The objective of the activity was to reflect on green investments in the tourism sector, accommodation businesses, and restaurants. Additionally, good environmental and sustainable practices were shared through the presentation of success stories.



# Training Workshop “Protagonists for the SDGs”



On June 21, 2023, the Directorate of the Business Initiative Unit conducted the online training workshop Protagonists of Change for the Sustainable Development Goals. This two-day workshop aimed to familiarize social and environmental entrepreneurs with the Sustainable Development Goals (SDGs) and the 2030 Agenda.

The objective was to invite the community of social and environmental entrepreneurs, students, and the general public.



# Design sprint for PDC



On September 22, 2023, the Directorate of the Business Initiative Unit conducted the online Design Sprint workshop for Protagonists of Change for the Sustainable Development Goals, an event where the winners of Protagonists of Change 2023 received training and advice that allowed them to improve their business model.

The objective of the activity was to collaborate with the winners to solve a big challenge based on the design sprint methodology. For this purpose, the Google Adventures methodology was used, which involved solving a big challenge through the collaborative work of student volunteers.

The beneficiaries improved their digital competencies and the use of agile methodologies to collaboratively solve a challenge of the organization with volunteers from other countries.



# Students from the Mining Management Engineering program successfully participated in congresses and workshops



Students from the Mining Management Engineering program took part in the following activities and training workshops during the first semester of 2023-1:

- National Congress of Mining Engineering Students (CONEI-MIN).
- Solid Waste Management Mining encounter.
- Solid Waste Management workshop by UPC Amautas Group.
- Training for outstanding students.

All these activities aimed to strengthen theoretical and practical knowledge in responsible and sustainable mining. In addition, to update knowledge on mining projects to strengthen skills on solid waste in the mining industry.



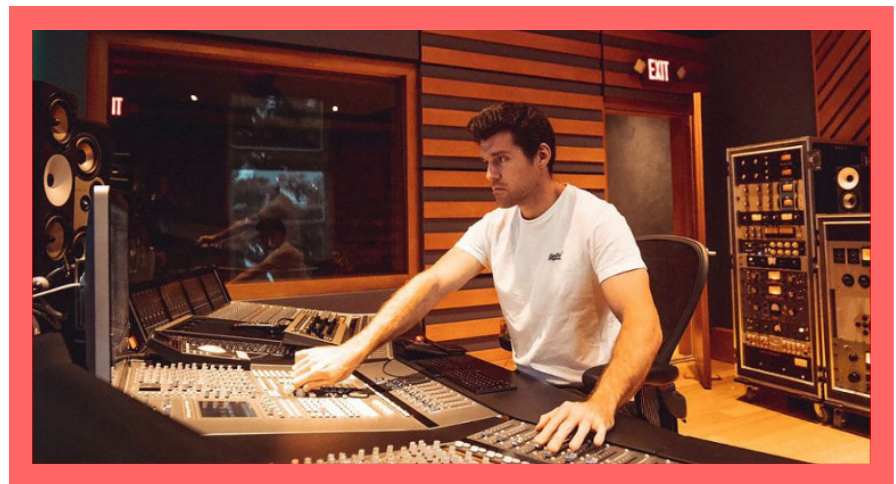


# Workshop and Discussion Panel with Lewis Pickett



The UPC Music program organized a workshop and discussion panel with Lewis Pickett, a mixing engineer, producer, and musician who has won four Grammy awards. The faculty interacted with the international speaker, a global reference in the audio industry, and together they developed topics on the benefits offered by technology in order to develop healthy habits. In this way, the various attendees were trained, who will in turn train others to spread these good practices and create a positive impact.

The goal of the event was to conduct free training workshops with national and international speakers, aimed at improving the quality of what is heard. Additionally, the workshop addressed the health issues related to auditory health, the responsible use of audio-related technology, which has a direct impact on people's auditory health. This workshop was held in partnership with and under an agreement with the company SONOTEC. The workshop was attended by educators from various educational institutions and ninth-cycle students from the Music program.



# UPC Business Creativity: Most Innovative Projects of 2023



During the event, the creation of products, services, processes, or strategies that generate a significant impact on their institutions and benefit various users was celebrated. The ceremony introduced a new category, “Purpose-Driven Management – ESG”.

The Universidad Peruana de Ciencias Aplicadas (UPC) Business Creativity award ceremony marked the most important moment for the finalist organizations. The 27th edition of UPC Business Creativity 2023 recognized the most innovative ideas and projects in the country.

Nearly 300 applications were received from various parts of Peru, across 20 available categories.



# A modular mechatronic gripper installed on the industrial robot KUKA KR 60-3 for boxing, unpacking and selecting of beverage bottles



**Authors:** Andrade, R.G.V.; Vinces, L.; Lau, K.

**Abstract:** Nowadays, bottling industries perform inefficient maintenance and transportation sub-processes, such as: boxing, unpacking, and selecting. These functions are performed by workers during long hours, which causes delays in the general production process, risks in the safety of personnel and integrity of the bottles, a tendency to a greater number of errors and especially, severe medical problems caused in the long term. In view of the advantages of industrial automation, it is known that it makes use of the union of engineering knowledge to facilitate procedures and guarantee reliability. This is the case of industrial robots that are increasingly required to optimize numerous systematic strategies in many fields; however, it is complex to develop an autonomous artifact that adapts to variable changes in different environments. Despite the existence of interesting projects for grippers or claws to lift objects, several of them lack adaptability regarding the type of element they handle and among other deficiencies. For these needs, a Modular Mechatronic Gripper was designed and installed on the Industrial Robot KUKA KR 60-3; having characteristics of versatility and dynamism to load and unload 12 glass or plastic bottles, personal or medium size; and all of them at the same time efficiently and safely. Likewise, the automatic machine can be used with different box layouts or different industrial robots, by means of simple component modifications. With the dexterity of the mechatronic system, the time required for the aforementioned sub-processes was reduced by 72% and it is expected to improve the health of the employees.

**Keywords:** Bottling industry, CAD, CAE, CAM, Industrial automation, Mechatronic system, Modular gripper, Robotics

International Journal on Interactive Design and Manufacturing; Volume 17 ; Pages 331-352

<https://doi.org/10.1007/s12008-022-00879-0>



# Lean Operations Management Model to Increase On-Time Project Delivery in a Construction Company



**Authors:** Quiroz-Flores, J.C.; Acuña-Cervantes, F.; Quicaña-Arbieto, A.; Nallusamy, S.

**Abstract:** The construction industry is exposed to more significant risks and unforeseen events than other industries, as projects are often developed under unpredictable circumstances due to different factors that must be taken into account during their execution. In addition, delays in the construction industry are considered one of the biggest problems faced by projects, as they can lead to cost overruns, disputes between parties, project abandonment and even lawsuits. The objective of the present study aims to increase the on-time delivery of construction projects by addressing the reasons and root causes identified in the study. The innovative proposal to avoid project delivery delays is introducing a Lean system based on the Last Planner System (LPS) methodology, designed to support production planning and control in construction projects. The proposed model was validated using a pilot plan in a project of tracks and greenways carried out in Lima, obtaining; as a result, a decrease of 8% in the time of project delays with respect to the initial deadline, an increase of 22% in the percentage of the completed plan and a decrease of 5% of the stoppages due to rework. The research confirms the success of the lean construction philosophy and its powerful tools, such as the LPS, which will serve as a reference for its application in other companies with similar characteristics.

**Keywords:** LPS, Construction projects, Lean construction, Planning, Lean management.

SSRG International Journal of Civil Engineering; Volume 10 ; Pages 22-28

<https://doi.org/10.14445/23488352/IJCE-V10I4P104>



# Application of Lean Manufacturing to Improve the Duct Production Process of an Air Conditioning Company in the Year 2021



**Authors:** Peralta, A.; Valverde, L.; Salvador, R.; Quispe, G.; Dominguez, F.; Raymundo, C.

**Abstract:** The article's objective was the implementation of the lean manufacturing methodology in the production process of an air conditioning metal processing plant. For this, the methodology of 2 phases was used. The company and its current operation, structure, products, and work plan are presented in the first phase, demonstrating its main deficiencies. In phase 2, an improvement plan was made with lean manufacturing tools applied to the deficit of phase 1. As a result of the implementation of these tools, 64%, 80%, 71% and 50% of space in the measuring, cutting, bending, and welding stations, respectively, and an improvement in production times were obtained. Based on the study results, it is concluded that the application of lean manufacturing benefited the company by drastically improving its production process and work environment.

**Keywords:** Value Stream Mapping, Kanban, Productivity, Process improvement, 5S.

International Journal of Engineering Trends and Technology; Volume 71 ; Pages 46-58

<https://doi.org/10.14445/22315381/IJETT-V71I3P206>



# A Proposed Lean Approach Model to Increase the Operational Efficiency of Natural Gas Connection Installations in Metropolitan Lima



**Authors:** Quiroz-Flores, J.C.; Cepeda-Zavala, C.; Terry-Alba, E.; Nallusamy, S.

**Abstract:** The construction sector is significant, contributing approximately 10% of industrialised countries' Gross Domestic Product (GDP). However, it is complex and associated with a high level of risk that leads to failures in terms of time, cost and quality. Thus, problems are evidenced in the execution of infrastructure projects, such as delays, cost overruns, poor quality of work and increased musculoskeletal disorders in workers. The present study seeks to increase operational efficiency by addressing the fundamental reasons and causes identified in the study, delays in the work plan, unproductive work time, and work stoppage time. Consequently, these causes have generated an economic impact of 8.62%. Given the above, a pilot validation was carried out where it was proposed to implement Lean tools (Standardized Work), an ergonomic analysis (Economy of Movements) and a Behavior Based Safety System (BBS) to the positions with the highest incidence of occupational hazards in order to solve the sub-causes that generate low efficiency. Finally, the proposal allowed for increasing the operating efficiency of the gas installations to 88.00%, reducing the cycle time by 45.00%, increasing the safe behaviour index by 45.16% and reducing the average dysergonomic risks by 54.84%.

**Keywords:** Efficiency, Standardized work, Lean construction, Ergonomics assessment, Behavior based safety.

SSRG International Journal of Civil Engineering; Volume 10 ; Pages 1-8

<https://doi.org/10.14445/23488352/IJCE-V10I6P101>



# A Production Process Efficiency Improvement Model at a MSME Peruvian Metalworking Company



**Authors:** Del Rosario-Malasquez, L.; Dulce-Meneses, E.; Viacava-Campos, G.; Cardenas, L.

**Abstract:** This research study seeks to improve the efficiency of the production processes at a MSME metalworking company operating under the Make to Order (MTO) strategy. For these purposes, the authors first assessed the previous problems reported by the company, detecting a low efficiency rate of 69.56% in its production process, which generated an economic impact at 14.6%. Then, the design of a custom model based on several Lean Manufacturing tools, such as Sort and Set in Order Focused on the 5S, Visual Management Board and Work Standardization, production process efficiency improved by 6.4%, reprocessing experienced a 12.63% reduction, and search times decreased by 24 minutes, which translated into a 5.83% savings for the company. In fact, the proposed model generated positive improvements for the research study.

**Keywords:** Production Process, Efficiency Improvement Model, Efficiency, Make to Order (MTO) strategy

AIP Conference Proceedings; Volume 2613

<https://doi.org/10.1063/5.0119648>



# Minimization of Personnel Absenteeism with the Application of Proposed Ergonomic Model in a Plastics Manufacturing Industry



**Authors:** Quiroz-Flores, J.C.; Abásolo-Núñez, B.; Suárez-Miñano, D.; Nallusamy, S.

**Abstract:** This research article focuses on the ergonomic design of the workstations for the plastics industry plant to reduce the postural load that improves the workers' productivity and the operators' absenteeism due to musculoskeletal disorders. This article develops an innovative solution to deal with one of the main problems of the plastic industry, namely, the high rate of worker absenteeism generated by musculoskeletal disorders due to the high postural load at the stations of work in this industry. The research is divided into four stages, namely the Determination of the objectives through the analysis of the problem and its root causes, the Redesign of the work methodologies in the productive area, the Improvement in the activities and tools used in the production chain, and Evaluations of the different impacts that the proposal entails. A proposed model validated with the Delmia V5 software and evaluation methods such as RULA, REBA, and OCRA, made possible a reduction in the level of risk of 50% and 66.7% in the different jobs analyzed and obtained 42,929 PEN in savings per year in respect to the total costs generated by the absenteeism presented. The result of the new workstations satisfies the ergonomic aspects and the needs of the workers. The study focuses on an analysis of risk levels that occurred in each of the high-density bag production activities, where non-conformity was found regarding the high risks presented, those leading causes with inappropriate postures by the staff, non-optimal working conditions, and absence of ergonomic furniture. This research serves as the basis for future lines of research and other companies with similar characteristics to implement the model.

**Keywords:** Ergonomics; RULA; REBA; facility layout design; Delmia V5; plastic industry

Applied Sciences (Switzerland); Volume 13

<https://doi.org/10.3390/app13137858>





# Enhancement of On-time Delivery Maintenance Services by Lean Manufacturing Tools in an Automotive Industry



**Authors:** Quiroz-Flores, J.C.; Pineda, J.P.; Anis, W.Q.; Nallusamy, S.

**Abstract:** In recent years, the automotive industry has continued to develop exponentially. However, this has led to an increase in the demand for maintenance services that automotive repair companies are unable to provide (representing significant losses for automotive companies). Thus, to maximize the number of maintenance services performed each day and reduced the costs associated with penalties, automotive repair companies try to optimize maintenance service hours. According to the current analysis, the main problem that causes the greatest financial loss in a Peruvian auto repair company is the high percentage of maintenance services that are not performed. The company considers the issue to be crucial not only for the economy but also for the connection it maintains with its customers, as they are very likely to choose to travel to other auto repair centers if there are delays in deliveries. The company's assistance and data collection made it possible to identify the main causes of these delays. As a result, it is proposed to create a model based on the Lean Manufacturing technique, using the 5S tool, ABC analysis and standardized work, with the aim of optimizing the delivery times of the company's existing vehicle repair service. In the end, the approach reduced delivery time violations by 19.94%. In conclusion, the company was able to satisfy its customers and avoid delays as a result of the improvement made.

**Keywords:** Automotive, Lean manufacturing, Maintenance Service Optimization, Standardized work, 5S.

International Journal of Engineering Trends and Technology; Volume 71; Pages 372-385

<https://doi.org/10.14445/22315381/IJETT-V71I5P238>



# CirCAT: PURRtention: a Litter Box that Monitors Feline Urine using Electrochemical Biosensors



**Authors:** Sun, S. | Vega, G. | Reagan, K. | Seker, E. | Vega, K.

**Abstract:** Feline urine provides valuable information on an animal's well-being, but professional veterinary collection and analysis of urine samples can be intrusive, costly, and infrequent. Electrochemical biosensors recognize biological elements such as pH, glucose and sodium, and have numerous applications, including in medical diagnosis, environmental monitoring, food quality control and drug discovery. This paper presents cirCAT: PURRtention, a litter box system that uses an electrochemical biosensor to monitor analytes in feline urine. We provide the implementation process of the system that consists of a DIY three-electrode biosensor, a potentiostat, a microcontroller, a ToF sensor and a mobile application. A rinsing mechanism is also included to extend the lifespan of the sensors. The system was tested using three separate electrochemistry tests to ensure accuracy, reliability, and applicability. We prepared and compared electrochemical biosensors with different conductive materials for Do-It-Yourself (DIY) electrodes. The second test compared PURRtention against an industry-grade potentiostat. The third test compared our system against current veterinary standards for chemical analysis using feline's urine samples. Additionally, we conducted a case study with a cat using PURRtention for 72 hours. Finally, with results from these research and another series of interviews we did with veterinarian experts, we provide implications and future directions of this technology. PURRtention presents an innovative and non-invasive means to consistently monitor chemistry elements in feline urine, potentially allowing for early detection and management of cat's health conditions.

**Keywords:** biosensor, electrochemistry, potentiostat, urinalysis

ACI '23: Proceedings of the Tenth International Conference on Animal-Computer Interaction December 2023-Article No.: 5 - Pages 1-13

<https://doi.org/10.1145/3637882.3637887>



# Improvement proposal to increase the production efficiency of garment with lean manufacturing tools for the textile sector in Lima



**Authors:** Quiroz-Cueva, Alejandra; Simbron-Guillen, Maria; Saenz-Moron, Martin

**Abstract:** In Peru, the textile and clothing sector is considered the third activity with the highest market share and with the greatest contribution to the national economy. Much of this industry is made up of small and medium-sized businesses, which generate the largest number of jobs. However, most of these companies present problems in factors such as quality, high production times and low availability of machinery, which hinder better performance in the market and undoubtedly affect competitiveness. The present research work aims to increase production efficiency in a garment line based on Lean Manufacturing tools. Which proposes a model based on the use of tools such as 6S, SLP, TPM (2 pillars), Study of methods, time, and motion study. The results of the application of the proposed model with each of the tools were taken periodically until an improvement of 13% was obtained in the indicator of Overall equipment efficiency (OEE).

**Keywords:** TPM, OEE, 6S methodology, SLP, Study of Methods

ACLeadership in Education and Innovation in Engineering in the Framework of Global Transformations: Integration and Alliances for Integral Development”, Hybrid Event, Buenos Aires - ARGENTINA, July 17 - 21, 2023

<http://dx.doi.org/10.18687/LACCEI2023.1.1.1045>



# Reduction of delivery times for orders in small and medium-sized paint businesses based on Standard Work and Raw Material Management



**Authors:** Macassi-Jáuregui, Iliana; Avalos-Torvisco, Martin; Montoya-Cochachin, Luis

**Abstract:** The paint industry at the level of Mypes, concentrates various critical processes in the production process. This is because they lack a planning and engineering support system, which trigger problems such as: low on-time delivery rate, defective products, stock breaks, among others. Based on this, the case study that is 24% below the standard regarding on-time deliveries is presented. To do this, a production model of Standard Work and Raw Material Management is proposed in a painting Mype in Peru. The diagnosis is given through an analysis of times and activities that includes the manufacture of paints, as well as the analysis of production stops regarding the shortage of raw material. The model will be applied under a hybrid model of implementation and simulation. Through this, it is possible to optimize the production cycle time by 33.6% (301.13 min to 225.39 min) and, therefore, increase production capacity by 13.51% (1377 gallons/shift to 1563 gallons/shift). Likewise, stock out decreases from 6.52% to 0.22% and on time deliveries (On Time Delivery indicator) present an improvement of 17.85%.

**Keywords:** standard work, lean manufacturing, on-time delivery, raw material management, paint manufacturing.

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<http://dx.doi.org/10.18687/LACCEI2023.1.1.1263>



# A development of a mechatronic system to stimulate cognitive skills in children



**Authors:** Sofia Roncalla; Ten Salinas; Leonardo Vincas; Jose Oliden

**Abstract:** Assisted robots for the treatment of learning for children are currently on the rise and this is thanks to the good potential that robots have to communicate and capture their attention. It is proposed to make a humanoid robot called Potts that will be developed in 3D printing and that can be developed in Peru to improve learning in children with autism spectrum disorder (ASD) in different parts of the country. The robot was manufactured in PLA material and has 8 degrees of freedom in addition to being able to have a graphical interface with the user using two touch screens of 3.5 and 7 inches. It will use a Raspberry Pi control and will have an audio system which can communicate various instructions to the children. An experiment was conducted to compare the efficiency of performing a dynamic practiced by a psychologist versus the proposed robot. As a result, it was obtained that the child obtained fewer wrong answers with the robot than with the psychologist (decrease of repetitions up to 50% less). In addition, the percentage of time that the child kept looking at the psychologist or the robot during the dynamic was calculated. A value of 85% was obtained for following the robot compared to 60% of the time that was spent with the psychologist.

**Keywords:** Autism, TEA, Robot, Human-robot interaction, Open CV, 3D print, Robotic, Denavit, Hartenberg

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<https://doi.org/10.1109/CONIITI61170.2023.10324067>



# Productive management proposal to increase the level of efficiency of the food sector through the application of Lean Manufacturing



**Authors:** Aguirre-Cueva, L.| Alcantara-Gloria, Y.| Cano-Lazarte, M.| Torres-Sifuentes, C.

**Abstract:** The food manufacturing sector in Peru is in constant growth and for 2019 it contemplated 25.20% according to the GDP by manufacturing activity, which represented 3.23% of the national GDP for that year. In our country, most manufacturing companies are classified as mypes, this is the case of the food sector, where more than 90% of the total industry are microenterprises. One of the main problems in these organizations is that the average efficiency level of a food industrial plant is 60%, however, according to studies it should not be less than 82%. In addition, as they are micro-enterprises, they do not have a very large budget to implement major changes or acquire technologically advanced machines that exceed their spending limit. That is why this research proposes the design of a productive management methodology to increase the level of efficiency of the production area of a Mype in the food industry through 5s and Poka Yoke tools. These Lean Manufacturing tools will contribute to the implementation of improvements at a low cost and quick understanding. The main purpose of this methodology is to increase the level of efficiency in the production area of organizations to improve the quality of the products and avoid waste that generates unnecessary expenses. In this way, it will contribute to increase the growth of GDP by manufacturing activity and therefore the national GDP. For the development of the methodology, Lean Manufacturing tools will be used, because the mypes seek to apply low-cost and easy-to-apply procedures

**Keywords:** Lean Manufacturing, Lean Tools, 5S, Poka Yoke, FMEA, Process Management, Continuous Improvement.

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# Proposal to improve the traceability in the common service process by applying of TPM a postal company



**Authors:** Juan Carlos Gaspar-Huamani; Joan Raquel Cabanillas-Umeres; Alberto Flores-Perez

**Abstract:** This article aims to improve the tracking of postal shipments, through lean manufacturing tools, including total productive maintenance (TPM), 5s and Standard Work. It allows us to identify possible problems, taking into account that there are many factors and causes that cause low traceability throughout the entire distribution chain of postal items. The monitoring processes of the common service require an optimal operation of the machines and equipment, there is 7% as a stop of machines, applying the TPM tool we will be able to reduce this percentage between the corresponding range (2% to 3.5%). With the TPM the conditions of the machines were identified and controlled, with the 5s better skills are developed between the operators and the machine. To finish this research, the causes of the low traceability of the common service will be found, where all the quantitative, qualitative variables and the ideal control measures for this model are defined, which aims to improve the traceability of the machines in the common service.

**Keywords:** Companies; Maintenance engineering; Manufacturing; Proposals; Standards; Monitoring; TPM; 5S; Standard Work; Postal Service; Validation and Simulación; Pillars

2023 Congreso Internacional de Innovación y Tendencias en Ingeniería (CONIITI), Bogotá, Colombia, 2023, pp. 1-5

<https://doi.org/10.1109/CONIITI61170.2023.10324117>



# Micro and Nano-Silica Additions to Optimize the Compressive Strength of Shotcrete



**Authors:** Jonaiker Davila, Humberto Pehovaz, Luis Arauzo, Carlos Raymundo, Gianpierre Zapata, Francisco Dominguez

**Abstract:** The reinforcement of excavated tunnels is of utmost importance for worker safety and operational efficiency in underground mining. Shotcrete significantly helps with both, and while many additions with sustainable and pozzolanic properties have been evaluated, few studies have established the upper strength limits and guidelines for the practice. This study seeks to maximize the compressive strength of shotcrete through an optimized formula with micro and nano silica additions. Three dosage combinations across four different water-cement mixtures were tested, with results presenting a compressive strength at a .45 water-cement ratio of 64.9 MPa, a 72% increase over the control. The greatest strength result was found at a .30 water-cement ratio and measured 106.7 MPa. These results present some of the highest documented compressive strength values for their respective water-cement ratios. They contribute shotcrete formulas to help the mining industry improve their underground safety structures and maintain operational efficiency.

**Keywords:** Micro silica, Nano silica, Shotcrete, Compressive strength, Underground mining.

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<https://doi.org/10.14445/22315381/IJETT-V71I12P211>





# Improvement Proposal to Increase the Availability of Machines in The Thermoforming Line of a Plastic Industry Applying TPM, SMED And Standardized Work Tools



**Authors:** Jimenez-Ballumbrosio, A. | Rodriguez-Herran, D. | Castro-Rangel, P.

**Abstract:** Worldwide, the production of plastics has maintained remarkable growth in recent years. Since its emergence in the 1950s, it has maintained an exponential trend, due to the fact that products made from this material are adapted to different uses, such as containers, packaging, toiletries, etc. Thermoforming is one of the plastic forming techniques, this process is largely automated, so it is vitally important to keep the machines operational most of the time. There are studies that show that low machine availability can be caused by long setup times and downtime due to equipment breakdowns. In this sense, the purpose of this research is to identify, study and solve the main causes that generate the problem of low availability in the thermoforming line of a plastic industry in Peru, since they represent high expenses for the company due to penalties for delays in the delivery of orders and additional consumption. To solve this problem, the implementation of Lean Manufacturing tools such as Single-Minute Exchange of Die (SMED), Total Productive Maintenance (TPM; Autonomous Maintenance and Planned Maintenance) and Standardized Work is proposed to increase line availability by 10%. and stay competitive in the market. This model was validated through a simulation method in the Arena software



# Improvement Proposal to Increase the Availability of Machines in The Thermoforming Line of a Plastic Industry Applying TPM, SMED And Standardized Work Tools



where three solution scenarios were established. After validating the model, it is concluded that the availability of machines can be increased from 80% to 93% by implementing these tools and having an optimistic scenario. In addition, the setup time indicator decreased from 56.25 minutes to 22.3 minutes, the programming time by non-standardized parameters decreased to 13.99 minutes, the number of stops due to breakdowns per year was reduced by 40.7% and the MTBF (Mean Time Between breakdowns) increased to 158.5 hours. Finally, it was possible to demonstrate economically that the project is viable, since the IRR (Internal Rate of Return) is greater than the Opportunity Cost (COK) and the Net Present Value (VAN) is greater than zero.

**Keywords:** Autonomous Maintenance; Availability; Industry Plastics; Lean Manufacturing; Planned Maintenance; Single-Minute Exchange of Die (SMED); Work Standardized

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<https://doi.org/10.1145/3629378.3629393>



# Current research trends on smart ports in the last decade: A theoretical application for supply chain management



**Authors:** Aguilar Sumari, Claudia Elena; Alatrística Baldarrago, Luis Angel; Donayre Casas, Carla Alexandra; López Palomino, María Lucía; Poma Guerrero, Mariana Liset; Moscoso Cuaresma, Julio Ricardo

**Abstract:** The research identifies and analyzes the main academic trends developed on the use of smart ports in the last decade. The PRISMA bibliographic review of literature from journals indexed in Scopus and others anchored to the SJR is used as a methodology. Sustainability, information technologies and infrastructure on the use of smart ports for supply chain management were taken as variables. As a main result, it was identified that the three variables provide added value, competitiveness, and efficiency in the management of the microgrid system for the reinvention of the maritime supply chain, transforming it into a solid connection in the fourth industrial revolution.

**Keywords:** Competitiveness, VUCA, smart ports, supply chain management, international logistics, sustainability, information technology, infrastructure.

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# International Business and the Development of Innovation through Corporate Culture



**Authors:** Lima, I.A.C.| Alvarado, J.A.Q.| Mantaro, J.E.A.| Cuaresma, J.R.M.

**Abstract:** Innovation and cultural differences are two topics frequently study for international business. However, the link between the three concepts has been unusual. Does culture affect the way international trade stimulates innovation? This descriptive study, based on a compilation of research published between 1980 and 2020, seeks to theoretically describe the relationship between international business and the development of innovation through national culture. As a pragmatic link, the Hofstede dimensions and the Doing Business and Global Innovation Index are presented. The results indicate that international business provides strong incentives for the development of innovation. Likewise, current academic trends identify four combinations of cultural archetypes that energize the ecosystem of international business and innovation. Thus, the study concludes that culture has a double impact on the relationship between international business and innovation. On the one hand, there are cultural archetypes that promote the advancement of foreign trade and that simultaneously stimulate the capacity for innovation. On the other hand, such archetypes can determine the degree to which the incentives provided by international trade are absorbed and produce innovation.

**Keywords:** International business, innovation, cultural profile, national innovation development.

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# Main research trends on reverse logistics published during the years 2013 and 2022



**Authors:** Josseph Fernando Alvis Reyna; Quiler Gerar Aranda Riquelme; Mirella Nicole Celi Campos; Saraí Julissa Martínez Portocarrero; Julio Ricardo Moscoso Cuaresma.

**Abstract:** The article identifies the main research trends published and indexed on reverse logistics during the years 2017 and 2022. The state of the art defines the concepts of reverse logistics, the environmental conditions of supply, as well as the main logistics business practices. established for this business model. The methodology uses the systematic literature review technique, under the PRISMA model. It is concluded that the literature shows a special concern for the standardized processes of reverse logistics to mitigate environmental damage, the effects of value creation, the level of efficiency, the general logistics costs of its implementation, as well as its impact on the transformation of the traditional supply chain.

**Keywords:** Reverse logistics, environmental impact, business practices, supply chain.

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# A design of a distillation column to produce an alcoholic beverage based on Blueberries



**Authors:** Susuki, Ken; Ipanaque, Andres; Vinces, Leonardo

**Abstract:** In various industries, the fruit is utilized to produce derivative products such as beverages, vitamin C masks, jam, ice cream, pastries, among others. This highlights an area that has not been thoroughly explored: its use as a raw material, once fermented, to produce a distilled beverage with a strong presence of antioxidant properties. Various mathematical calculations were performed to obtain a column capable of distilling the fermented product at a maximum temperature of  $98^{\circ}\text{C}$  without damaging the antioxidant compounds present in blueberries. Therefore, calculations were made for the number of stages required in the distillation column, the column diameter, the distance between stages, and the simulation of the distillation process for the fermented blueberry must. Therefore, a novel mechanical design of the distillation column was carried out using the rigorous FenskeUnderwood-Gilliland methodology. Additionally, electronic, and electrical equipment were carefully selected to ensure a robust system capable of withstanding unfavourable climates and environments. The designed system was validated through a temperature-induced mechanical stress analysis using ANSYS R2 2022, followed by numerical simulation. With this innovative mechanical design and temperature control system, a production ratio of 1:7 was achieved compared to the initial batch of 50 L of blueberry must for a blueberry-derived alcoholic beverage with a 40% alcohol content and the presence of antioxidants concentration such as resveratrol.

**Keywords:** Batch; Blueberries; Distillation; Ethanol; Perforated Plates; Resveratrol.

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# Improvement Model to Increase Productivity Based on the Application of SLP and Lean Manufacturing Tools in a Textile Company



**Authors:** J. Cabrera-Jeronimo, M. Serpa-Osores and A. Flores-Perez

**Abstract:** Currently, the textile industry worldwide is one of the most important for the development of emerging countries. However, like many industries, it is not exempt from the presence of various problems, the most frequent being the presence of low levels of productivity. Which influence the ability of organizations to satisfy the demanding current market. Therefore, in order to address this problem, a plant distribution improvement model was proposed based on the application of methodologies such as Lean Manufacturing and Systematic Layout Planning. From these, an increase in productivity rates was generated through the proper management of resources and processes under a continuous improvement approach.

**Keywords:** productivity; industries; systematics; layout; companies; manufacturing; planning

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