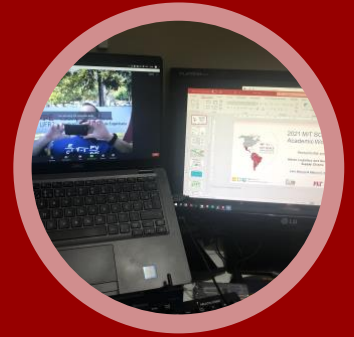




MIT SCALE Latin America Conference



PROCEEDINGS of the 2021 MIT SCALE Conference for Latin America & the Caribbean

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Foreword

“The difference between stumbling blocks and stepping stones is how you use them.” – Unknown

In early 2020, the MIT SCALE conference for Latin America and the Caribbean (LAC) organizing and scientific committees were ready to have our in-person conference in March. However, the news about a virus stopping our everyday lives emerged. We were paused for several months, dealing with uncertainty and observing how the virus caused significant health and economic issues and even changed our lives forever due to our invaluable losses! Despite the immense effort and time invested months before, we were forced to dismantle our event.

Based on these facts, we sought to reinvent ourselves and learn how to deliver the same value to conference attendees and participants while migrating to a completely different format. This big challenge offered us the great opportunity to discover the essence of the conference and the network: Our people!

After discovering the relevance of designing a 100%-virtual experience, our team worked day and night to make everyone feel it had the same quality as an in-person conference. We convened together to plan everything from prestigious keynote plenary speakers to an ambitious but well-balanced schedule with high-impact research and aimed to keep disciplined control of each session.

Thanks to the arduous work of the MIT Center for Transportation & Logistics staff, all our program committee members at the MIT SCALE network in LAC, and most importantly, our attendees—we hosted our first virtual conference with a record attendance of over 450 people from around 45 countries. The six-day event held three keynote plenary sessions, two discussion panels, five research chat series, and the presentation of 110 research works in 28 parallel sessions.

The representativeness that the academic partners in LAC bring to the MIT SCALE network has grown from 25 to 35 universities in the last three years. This partnership that these highly recognized institutions possess with the Center for Latin-American for logistics Innovation at LOGYCA allows for creating research and educational agendas to face and embrace the most difficult challenges in the region.

Researchers presented in 13 research tracks (in order of papers accepted per track): 1) *SCM for Food and Agri-Business*, 2) *Urban Logistics and Last-Mile Delivery*, 3) *Retail Operations for Nanostores in Emerging Markets*, 4) *Student Competition*, 5) *Humanitarian Logistics and Disaster Relief*, 6) *Data-Driven and Emerging Technologies in SCM*, 7) *Sustainable Supply Chains*, 8) *Freight Transportation and Public Policy in Logistics*, 9) *Educational Innovation in SCM*, 10) *OR Applications in SCM*, 11) *Logistics 4.0 and Digital Transformation*, 12) *Port Logistics* and 13) *SCM for Micro and Small Firms*.

This document is a compendium of the 110 abstracts presented at the 2021 conference. We hope that by disseminating the summaries of each work, readers will be able to find helpful information for their research, for solving industry problems, or just for motivating your curiosity and waking up your awareness about these critical topics for the future of emerging markets.

We sincerely hope you enjoy reading the abstracts as much as we did while preparing this document.

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In 2008, the MIT Center for Transportation & Logistics (CTL) and LOGYCA, a GS1 firm in Colombia, signed a multi-year agreement to create the Center for Latin-American Logistics Innovation (CLI) as part of the MIT Global Supply Chain and Logistics Excellence (SCALE) Network. This partnership brings together over 35 top academic partners who perform research and educational activities in Latin America, putting CLI-LOGYCA as the nucleus of this network in the region.

The vision of the CLI-LOGYCA is to lead innovation for value networks in the region. In this role, CLI has facilitated access to industry across the academic partners of the MIT SCALE network in Latin America and the Caribbean. It also offers online courses through LOGYCAx and the Undergraduate Certificate in Logistics (UCLOG), the first challenge-based-learning certificate created for undergraduate programs from the region in Bogota, Colombia.

During the 2021 conference, we had the opportunity of sharing emerging and applied multi-disciplinary research in all aspects related to logistics and SCM relevant to Latin America. We had the pleasure to co-organize the event together with MIT CTL, participate and have an update on the current works each researcher in the region is developing. Novelty ideas in last-mile distribution, circular economy, data-driven in emerging technologies, and collaboration, among other topics, were presented and discussed.

From the CLI, we want to extend the invitation to participate in the 2022 conference organized in a hybrid model to show new advances in the different research tracks. The conference will be relevant to exploring collaboration opportunities to strengthen the research capabilities in the region. We consider it is time to make an effort to work together in developing solutions to create sustainable value networks in Latin America and the Caribbean.

It's an honor to see Latin-American students and researchers transform value networks through collaborative research with academia and industry. Congratulations!

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Data-Driven and Emerging Technologies in SCM



Data-Driven & Emerging Technologies in Latin American Supply Chain Management Research

Jens Bürger

ABSTRACT

Though technologies have led to increases in wealth creation, they also have advanced international inequalities. It was argued that countries that adopt autonomous growth strategies are more likely to break with existing structures that sustain inequality. It is then interesting to investigate research activities related to data-driven & emerging technologies (DD&ET) in Latin American (LATAM) countries as one aspect of growth strategies and how it compares to the rest of the world. In this article, we are performing a bibliometric analysis of recent scientific literature at the intersection of DD&ET and supply chain management (SCM) in LATAM. We identify corresponding publications with authors from LATAM institutions and compare them with global publication data. Our results show that LATAM researchers achieve comparable numbers of citations for their work but depend strongly on international collaborations. Furthermore, relevant literature is not limited to traditional SCM journals anymore but finds a significant presence in journals aligned with DD&ET themselves. The results highlight the need for two types of collaborations: (1) international collaboration, connecting researchers from different countries, and (2) disciplinary collaboration, bringing together researchers from SCM and DD&ET fields.

Benefits of the RFID technology in a healthcare three - echelon supply chain

Hugo Herrera, Juana Valderrama, Juan Suarez, Agustina Calatayud, Jackeline Narvaez and Cesar Becerra

ABSTRACT

This research has been developed to evidence the importance of the automatic process of traceability through RFID technology (Radio Frequency Identification) in a health care three-echelon supply chain in Colombia assembled by one laboratory, one distributor, and two hospitals, respectively. First, the methodology was divided into three phases; (1) gathering of information, (2) RFID hardware implementation, and (3) a pilot that would be able to measure the advantages of the RFID technology. As a consequence, several benefits of RFID technology in the health supply chain were identified. One of them was the successful process of traceability that allowed to identify 2% of lost medicaments through the supply chain, another was the 90% reduction of the time used to register of the delivery order in the hospital, and finally could able to optimize OTIF (On Time- In Full) indicator of the distributor with incrementing of 36%. In summary, the fact of generating real-time data through the platform increased the competitiveness and quality of the information within the health three-echelon supply chain.

Beyond the Seaport: Assessing the Impact of Policies & Investments on the Transport Chain

Mamoun Toukan, Hoi Ling Chan, Dr Christopher Mejia Argueta and Dr Nima Kazemi

ABSTRACT

The growing importance of seaports in global trade makes it indispensable to operate efficiently. The movement of cargo internationally requires several interactions between different parties, turning the transport chain into a complex system. Thus, seaports' performances are affected not only by their internal operations but also by other stakeholders. Any intervention by stakeholders, whether policies or investments, in one part of the system will impact other parts. A holistic approach needs to be taken when assessing outcomes to ensure these policies and investments create values on a system-wide level. This study develops a System Dynamics (SD) framework that assesses the impact of policy and investment decisions on the container transport chain. Using Jordan's containerized transport chain as a case study, we build a model that supports decision-makers in considering the wider implications of different policies on the transport chain. The model helps to select better policies that could reduce the time to move containers from the terminal to the destination, which improves the transport chain's efficiency and ultimately increases value for stakeholders.

Traffic Count Prediction Based on Weather Information for Urban Logistics in Megacities

Valeria Laynes, Edgar Gutierrez and Luis Rabelo

ABSTRACT

E-commerce has been in a constant boom: it is easier to buy something online and have it delivered to the front door than to go to the store. As more people engage in online shopping, e-commerce platforms' challenges are more complicated and need to be attended to more quickly to prevent a decrease in customer satisfaction. However, these challenges escape the company's scope when external factors, such as weather and traffic, influence the process. This research aims to investigate the current state of the art done in traffic prediction with weather variables and identify which weather factors impact traffic count by using deep learning techniques. The methodology used includes Multi-Layer Perceptron (MLP) Neural Network for the deep learning phase. Results show that, by using weather factors, traffic count can be predicted with increased accuracy of 9.7%. Using single weather variables gives little significance to the model, and the interaction between variables is significant. Future work should concentrate on including this type of model in Vehicle Routing Problems with different constraints (time windows, multiple depots, pick-ups, deliveries, capacitated vehicles, etc.)

The relevance of data integration and IT to enable Postponement strategies in the context of Supply Chain Design: an empirical study

Carlos Panitz and Ricardo Cassel

ABSTRACT

This paper presents empirical research developed from a case study that describes how a Diesel Engine Manufacturer located in Brazil implemented a Postponement operation in Mexico to deliver more than 300 different configuration line sets sequenced. Applying a postponement strategy over long lead-time supply chains is a well-known approach to dealing with the trade-off between agility and cumulative lead times. Although, understanding the role of IT systems and data integration to drive the Supply Chain for this particular approach is still rare. This research aims to provide clarity

by empirically eliciting this construct from a supply chain design perspective. The first part of this paper presents the relevance of the Postponement strategy in the context of Supply Chain Design and Supply Chain Risk Management. The rest of the paper develops as follows: Literature review, methods and procedures, description of the case study, results and discussion, and finally, the conclusion and directions for future research.

Contractool: Scalable Contract Lifecycle Management Solution - Dell Case Study

Martin Razus, Peter Horny, Peter Banda and Jens Bürger

ABSTRACT

Supply chain risk management is increasingly concerned with complexities arising from dynamically changing, and sometimes even conflicting, interdependencies among different partners and vendors. The goal of alleviating disruption risks and building resilient supply chains relies heavily on contractual relations among the partners. Sadly, most companies' contracts and implications come under scrutiny only during disruptive events, which might be too late to formulate adequate action. To manage and structure (often) large quantities of contracts, avoid and reduce contractual risk, and identify supply redundancies, contract lifecycle management (CLM) tools were proposed and successfully deployed across the industry. This paper presents a novel solution called Contractool, which overcomes many deficiencies of current CLM tools by combining customizable workflow management and reactive presentation layer with visual analytics and natural language processing. Further, we showcase its functionality by providing the flagship success story of Contractool, in particular its integration in Dell Corporation, where it helped to reduce costs and bring governance and oversight, and consequently increased contractual commitments by 50%.

Data-driven and Model-driven Methods for Supply Chain Risk Management

Jens Bürger and Peter Banda

ABSTRACT

Supply chain risk management (SCRM) comprises various practices aiming to alleviate and mitigate disruption risks and economic losses. The complexities of modern supply chains pose challenges to the sole application of expert knowledge and encourage the use of computational methods. Based on an analysis of SCRM practices and emerging methodologies, this paper defines data-driven (DD) and model-driven (MD) methods relevant for SCRM. DD methods (statistics & machine learning, network analytics) allow the analysis of existing SC structures and processes for risk-aware decision-making and predicting specific future supply chain dynamics. MD methods (search & optimization, system modeling) are required to study supply chain behavior in case of potential disruptions, prepare contingency plans and supply chain configurations, and allow supply chain partners to improve collaborations. The definition of DD&MD methods contributes to the complex intersection of comprehensive SCRM and available computational methodologies. It enhances the possibilities of SC(R)M practitioners and academics by complementing traditional approaches to SCRM.

Demand forecasting using Machine learning in a pharma retail chain

Nestor Moreno, Mariana Sousa, Waldo Flores, Christopher Mejía and Nima Kazemi

ABSTRACT

Demand planning is the connection between marketing, finance, and operations. In an industry like pharma retail, products do not always behave according to a regular stable baseline. In addition, marketing enrichment like promotions or price fluctuations and the impact of government regulations and patient base characteristics increase operational complexity. Moreover, changes of more than thirty percent in the forecast from one cycle to another can either be overstock or out of stock due to the high production and delivery lead times. This project aims to find a proper demand forecasting model for a selected group of stock-keeping units to improve the supply processes of the most important stores of the sponsoring company, leading to further benefits such as budget purposes as a top-down analysis. Proper data analysis is needed to search for trends, seasonality, stockouts, and demand stability. Followed by the application of various forecasting models, including Machine Learning algorithms, this project provides a comparison of models to define the best baseline as a tool for the planning area to enrich to improve operational KPIs.

Urban Logistics and Last-Mile Operations



Framework development for fulfillment models in e-commerce

Renata Cabrini, Dominique Gomez De la Luz, Juan Manuel Bellido, Eva Ponce and Christopher Mejía

ABSTRACT

E-commerce relevance is increasing, and companies should be prepared to fulfill customers' expectations and ensure an optimal shopping experience. Online worldwide retail sales generated 70 billion U.S. dollars in 2019, being Mexico and Brazil the foremost leaders for this type of channel in LATAM (Chevalier, 2020). Companies need to have a consistent and aligned supply chain that follows their business strategy to be more efficient and differentiate from competitors. This study aims to generate a framework decision matrix, enabling companies to support decisions of introducing fresh, dry, refrigerated, and frozen product categories based on five major warehousing trends: distribution center, fulfillment center, dark-store, micro-fulfillment center, and crowdsourced warehousing solutions. We used a systematic literature review combining case studies, papers, research articles, and experts' validation. This paper aims to establish a framework that businesses can use to ensure strategies for e-commerce retailers that meet customer expectations regarding product quality, optimal price, and delivery time.

The Geo-Prescriptive Inventory Routing Problem

Daniela Cassandro-De La Hoz, Carlos Daniel Paternina-Arboleda and Jorge Iván Vélez

ABSTRACT

Inventory routing problems are commonly resolved with a reactive purchase order or dispatch information to provide solutions that contribute to efficient inventory management and vehicle routing. This research proposes a method for conducting prescriptive analysis of geographically collected demand patterns in retail companies before they are formally delivered to a supplier in order to propose priority routes for planned inventory. This is a work in progress where Machine Learning tools are used to predict the behavior of inventory levels in retail companies, followed by geospatial analysis, in order to build a route for the proactive distribution of products in a defined period of time. For the vehicle routing, it was used an approximate method that solves the problem of multiple suppliers, customers with time windows, and delivery of multiple products.

Investigating the operational effects of uncertainty on delivery times for off-hours deliveries in the megacity of São Paulo, Brazil

Claudio Cunha, Hugo Yoshizaki and Daniel Mota

ABSTRACT

Using data and real-life results from a pilot project in the city of São Paulo, Brazil, in this paper, we evaluate the operational impacts (in terms of required fleet and the total distance traveled) of distinct patterns of uncertainty on delivery times for Off-Hours Deliveries (OHD). Based on delivery densities, drop sizes, and distances to distribution centers obtained from a sample survey, we incorporate different levels and patterns of uncertainty in delivery times that vary according to the time period (day or night) to derive a trade-off for time-constrained last-mile distribution systems. Three probability distributions are considered: normal, exponential, and Weibull. A Monte Carlo simulation is developed to measure the benefits of shifting deliveries to off-hours. The results show that, for time-constrained distribution systems, moving partially or all deliveries to the off-hours period is advantageous from a carrier/shipper perspective; in addition, the level of uncertainty has an impact on the additional fleet required, and total distance traveled.

Design of a two-echelon last-mile delivery model

Juan Carlos Piña, Matheo Moreno, Miguel Barros, Alexandre Faria, Milena Janjevic and Matthias Winkenbach

ABSTRACT

Due to high congestion in cities and growing demand for last-mile delivery services, companies have been implementing two-echelon distribution strategies over the past few years. Notably, the installation of urban transshipment points has gained increasing attention, used by logistics operators to transfer goods from large freight trucks to smaller and more agile vehicles for last-mile delivery. Nevertheless, the main challenge is how to decide the number and location of these facilities under the presence of demand uncertainty. In this paper, we develop a two-stage stochastic program to design two-echelon last-mile delivery networks under demand uncertainty. This approach decomposes the problem into strategic decisions (facility location) and operational decisions (daily distribution of goods). We solve the model through the sample average approximation technique and estimate the optimal routing costs using continuous approximation methods to address large-scale instances. Using a real-world case study with more than 1,300 customers from New York City, our results provide several managerial insights regarding the mix of transportation modes, facility location, and the impact of allowing the outsourcing of customer demand. We validate the results using a simulation-based approach that employs a deterministic Mixed-Integer Linear Program.

A simulation-optimization model to evaluate the operational and cost impacts of pick-up points on e-commerce urban last-mile distribution

Rhandal Masteguim, Claudio Cunha and Eva Ponce

ABSTRACT

Online sales have been steadily increasing in recent years. Unlike the traditional retail shopping model, e-commerce retailers must deliver custom orders to highly dispersed locations in relatively narrow time windows. Consequently, adverse effects have been observed in large urban and densely populated areas, such as congestion and pollution. While online shoppers prefer home deliveries, researchers have shown the development of alternatives that satisfy consumer demand for flexibility and the need for companies to optimize order distribution through consolidated shipments. Pickup Points (PP) which may be either Automated Parcel Stations (APS) or brick-and-mortar locations are fast-growing solutions that provide parcel delivery and picking services at diverse locations throughout major city centers. These consumer delivery options play a decisive role in reorganizing logistics and business activities in companies. They are becoming the key features of e-commerce and transportation strategy globally. In this context, this paper describes a quantitative modeling approach aimed to investigate how a network of pickup points can be more efficient than home deliveries from both the operational and economic points of view in the context of urban last-mile distribution. We also describe some results of its application in the context of the megacity of São Paulo, Brazil, using real data obtained from a large online shopping retailer.

Districting of urban areas considering the road network for last-mile deliveries

Talyta Abichabki, Claudio Cunha, Fábio Boaventura and Lei Zhao

ABSTRACT

Motivated by the increasing population living in cities and the explosion of B2C e-commerce deliveries to homes, we analyze how delivery districting is affected by the road network. For this, we apply a traditional clustering algorithm, the K-means method, considering both Euclidean and road network distances and comparing the results in segmenting a central area of the city into subregions with similar characteristics. Using the city of São Paulo, Brazil, as an example, our results may be seen as somehow contra-intuitive; concerning the total distance traveled, the clusters obtained considering Euclidean distances yielded lower distances than clusters obtained using real distances.

Bottom of the Pyramid Urban Logistics: Case Study of Goods Distribution in Slums

Orlando Lima Jr, Selma Isa, Ana Hirakawa, Henrique Oliveira and Giulliane Fioravanti

ABSTRACT

In Latin America and the Caribbean region, 21% of the urban population lives in slums. Access to goods and services is commonly hindered by the topography, lack of transportation infrastructure, and safety. This paper evaluates the goods distribution in the slum Comuna 13, in Colombia, considering the dimensions of the analysis that interfere in the buying pattern: geography, resistance, adjacency, neighborhood, isolation, topography, and individual. Interviews and field observation were conducted, and spatial analysis confirmed that mobility is a huge problem faced by the slum population and affects the potential of delivering products. Several types of products are not found in these areas, and the prices are not competitive, but also there is a relevant level of resilience and a strong sense of community by the slum residents where it was identified low level of complaints regarding goods distribution and a high level of sales between close neighborhoods and acquaintances.

Interpretive Structural Modeling of Food Warehousing and Transportation Risks

Laura Garcia, Paulo Benitez-Fuentes, Hector Bernal and Juan Pedro Sepúlveda Rojas

ABSTRACT

This research intends to understand the risks involved in the warehousing and transportation of cold and frozen packed food at the last mile. The risks were analyzed using interpretive structural modeling (ISM), a widely accepted and applied methodology. As a result, we obtained a hierarchy model with 7 clusters of risks distributed in 4 levels. The model allows us to conclude that the clusters with the strongest driving power are strategic and demand; this means that the management of this cluster of risks will allow alleviating the negative impact of the rest of the clusters of risks. The various types of risks that compose the clusters were identified using a bow-tie methodology and after an exhaustive review of the literature and the help of experts in the food logistics industry who were consulted during the research process. The resultant model was finally validated through a case study in a 2PL food logistics operator (last mile) located in Santiago, Chile.

How to Do Deliveries in a Latin-American Megacity? Digital Twin for Last-Mile Operations in Bogota, Colombia

Edgar Gutierrez-Franco, Christopher Mejia-Argueta, Luis Rabelo and Mario Marin

ABSTRACT

This digital twin aims to predict future scenarios and plan strategies for the most likely situations for dispatchers of vehicles in delivery urban business contexts. The system supports the calculation of performance indicators of goods delivery and the near-real-time decisions for dispatchers and transportation managers. Decisions are taken under behavioral patterns from drivers, customers, locations, and traffic congestion. The case study is applied to one of the most difficult congested cities in the world: Bogota, Colombia. With a total area of 613 square miles, Bogota is the third-highest capital in South America with around 12 million inhabitants. It is characterized by the diversity in population density, irregular road infrastructure, and economic diversity conditions. The data is based on a real retail organization that operates in the city. This research provides guidelines and implications for the last mile delivery operations, where a network of stakeholders during the distribution process is simulated and analyzed, showing the potential benefits of the proposed solution methodology, especially in metropolitan areas offering diverse, hybrid, and complementary techniques like optimization, simulation, machine learning, and geographic information systems to understand the execution through data-driven decision-making. The system assesses the dynamic and learning process of the solution using agent-based simulation.

The vehicle routing problem with compatibility constraints

Claudio Cunha, Christopher Mejia-Argueta, Mauricio Gamez and Cassiano Isler

ABSTRACT

In this paper, we address the vehicle routing problem (VRP) with compatibility constraints, a variant of the VRP that arises in the last-mile distribution to small stores and nanostores in developing countries, particularly in Latin America. We proposed a mixed-integer linear programming (MILP) model for the VRP with compatibility constraints. The exact approach is solved using a modified column generation algorithm to solve large instances, and a metaheuristic based on GRASP, savings, and ALNS algorithms is introduced to find high-quality solutions. Both approaches are tested for a set of standard instances from Augerat, which are adapted for our approach (i.e., adding compatibility issues among the products) to validate the model, and one case study to prove the usefulness of our approach. Results show promising results and confirm the importance of considering compatibility constraints in the traditional VRP.

Urban travel demand estimation and forecasting: a mixed logit application to the Villa Carlos Paz city (Córdoba, Argentina)

Walter Javier Romano, Juan José Pompilio Sartori and Gerardo Heckmann

ABSTRACT

Stated choice models have been extensively applied in urban transport planning for estimating demand and the subjective values of levels of services and policy instruments. The paper presents discrete choice models estimated based on a stated choice survey applied to commuters in Villa Carlos Paz city (Argentina), contributing to widening the few existent empirical results in Argentina. We have estimated mixed multinomial logit models with random parameters and panel data for the commuting urban transport mode choice. The paper reports the estimation results, market share forecasts for the available transport modes, the subjective valuation of travel time savings, waiting time savings, and walking distance savings in origin and destination for accessing urban bus services. Also, we have estimated the demand elasticities derived from the application of

policies associated with changes in the level of services variables: bus travel time, car parking cost, bus waiting time, and bus travel cost.

Data-Driven Framework to Support Last Mile Operations in a Megacity

Edgar Gutierrez-Franco, Christopher Mejia Argueta and Luis Rabelo

ABSTRACT

With digital technologies for last-mile operations, extraordinary amounts of data are continuously generated. This information can be analyzed to include more details about system/stakeholders' needs, including consumer requirements, which would be difficult to obtain with traditional methods. This paper proposes a conceptual framework that supports decision-making for the execution of daily last-mile operations using predictive analytics tools. It depicts how to implement them considering factors of emerging markets such as sociodemographic diversity, fragmentation, congestion, and dense commercial areas. A reinforcement learning approach is also proposed to understand and anticipate logistics operations via a centralized platform through existing data. This allows decision-makers to plan actions, consumer activity-based scheduling, driver behavior, and traffic patterns to improve performance. As a result, our proposal iteratively tests and adjusts the gaps between the expected and real performance. The use of predictive tools supports the analysis of stakeholders during the distribution process, showing the benefits of these methodologies, especially in understudied metropolitan areas from emerging markets. A new perspective to solve the last-mile delivery problems is proposed. It shows that optimization, simulation, and Machine Learning methods can be used to build last-mile distribution policies.

In megacities: trends and realities

Luz Plazas, Julio Castillo, Mario Chong and Helmer Paz

ABSTRACT

This research aims to characterize a km² area of Popayán, Colombia, analyzing the type of stores that exist there. Likewise, the research makes a comparison with Lince, Peru, to analyze the commercial behavior of the two areas and their impact using the last mile / Km²-MIT methodology forms. The information obtained was compared with the data of Lince, an Inmegacity, using a statistical analysis to identify concordance and differences that help generate proposals in Popayán facing Industry 4.0. Both commune 4 of Popayán and the Lince district of Lima are characterized by having a large percentage of small businesses where the absence of cargo areas is notorious. However, the distribution of store types varies significantly between the two areas. This study aims to contribute basic information to make decisions in public policies that improve the efficiency of logistics operations in the center of Popayán based on experience in an Inmegacity such as Lince. The comparison between the two cities is aimed at Popayán having a guide to propose public policies in the face of the logistics challenges of the fourth industrial revolution. Additionally, public policies proposed to improve the logistics of Lince could be adapted to Popayán, but further research is required to have a more solid information base.

Customer preferences in last-mile logistics

Luiz Barreto, Agatha Clarice da Silva Ovando, Milena Janjevic and Matthias Winkenbach

ABSTRACT

Designing an efficient delivery service is one of the critical challenges for companies, particularly in countries that lack robust literature about customer preferences in last-mile logistics. This study applied the conjoint based-choice analysis (CBCA) to investigate consumer preferences in emerging markets to understand and fill this gap. The findings showed that income, safety level where the respondent works, and age are relevant for Brazilian consumers, while gender, type of residence,

and work situation are for Chinese consumers for all scenarios presented. Additionally, product type plays a relevant role in the Brazilian, Chinese, and Bolivian consumer mindsets. As a limitation of this research, the sample size of the three countries investigated was small (Brazil, 964 respondents; China, 122 respondents; Bolivia, 106 respondents). Companies need to understand and match customer expectations regarding the last-mile delivery. The results presented that consumers prefer different services for different types of products and scenarios tested. Additionally, some consumer characteristics drive their behavior towards the frequency of purchasing, varying across the four countries surveyed.

Pricing strategies for the retail industry in emerging markets

Marina Afonso Weil, Fausto Araujo, Roberto Ivo and Christopher Mejia

ABSTRACT

This study aims to propose a pricing strategy for a cash-and-carry company located on a Caribbean Island using machine learning, data processing, econometrics, and statistics tools. The methodology is based on Principal Component Analysis (PCA) and multiple regression modeling to find relevant variables, such as price elasticities, used to build demand equations. These demand equations were then used to construct an optimization model and propose a pricing strategy. The findings of this study showed the incredible power of the framework and methodology applied and how much these techniques can be impactful for a cash-and-carry company in an emerging market. This project suggested a better pricing strategy that could significantly increase financial performance. Moreover, inventory management recommendations were made based on demand variability and the relevance of the products in terms of value. This study has a paramount contribution since the results revealed that significant improvements can be achieved with the application of econometrics and optimization tools that don't require the use of sophisticated or expensive software, or high computational processing.

Operations, technology, and marketing system for e-commerce fulfillment

Andres Archila

ABSTRACT

E-commerce growth and last-mile operational complexities threaten B2C grocery and retail segment businesses. The pandemic accelerated technology and e-commerce adoption among households and retailers. A potential solution is an "open source" back-end technology platform that connects shippers to customers through vertical and horizontal scaling. The platform should offer microservices architecture and cloud technologies to help managers make decisions around demand planning, personnel scheduling, and distribution for many items and customers. The platform has decreased fulfillment costs by 25% and supports several operations for multiple companies to integrate transport operators.

Retail Operations for Nanostores



Supply and demand contrast between different types of nanostores in Lima

Rodrigo Villegas, Geraldine Garcia, Carmen Rodríguez and Miguel Santa Cruz

ABSTRACT

The paper aims to propose recommendations for the different types of nanostores present in Lima (Grocery stores and handcarts) to promote their survival against the growing competition from supermarkets, convenience stores, and possible new future competitors. We studied different families and their consumption preferences through online and personal surveys; purchases were also monitored for each group member's families to build a demand panel. On the other hand, we did interviews with the owners or workers of the nanostores to study their business model and supply. We also rely on observation and photography to extract data and contrast results. With the results, we analyzed the SWOT matrix and business model canvas of each type of nanostore to compare them, recognize improvement opportunities and provide suggestions to each. Project planning ended in 16 days. Forty-eight online surveys were answered, ten nanostores were analyzed, and the demand panel had 272 data entries. This comparison focuses on the nanostores supply of Jesús María and Lince, representative districts of Lima. To analyze the consumer's demand and preferences, the surveys were applied to socioeconomic level B families.

Geo-spatial analysis about the effect of population density and income level in nanostore's location

Dominique Gomez De la Luz and Christopher Mejía Argueta

ABSTRACT

Mexico City is one of the most populated cities globally with a high retail density. In this study, we analyzed how the population density and socioeconomic status impact the location strategy of diverse retail establishments, such as nanostores, convenience stores, specialty stores, local markets, and supermarkets. The research area was targeted in three main municipalities of Mexico City, which are Iztapalapa, Gustavo A. Madero, and Miguel Hidalgo, as they have distinct socioeconomic and demographic features. The results suggest that a greater population density stimulates a higher density of nanostores. Meanwhile, convenience stores and supermarkets are often located in main roads that connect different municipalities in the city or in places that have higher parking availability. Moreover, Iztapalapa was the municipality with the lowest socioeconomic status and greater nanostores concentration. In contrast, we found that Miguel Hidalgo has a reduced amount of nanostores, and a higher density of convenience stores and supermarkets, since the socioeconomic status is higher.

The coexistence of nanostores within the retail landscape. A spatial statistical study for Mexico City

Camilo Andrés Mora-Quiñones, Leopoldo Eduardo Cárdenas-Barrón, Josué C. Velázquez-Martínez and Karla Gámez Pérez

Abstract

The fast growth of chain convenience stores in the past ten years and the financial stability of modern channel stores have triggered speculation regarding whether nanostores will disappear or if they will endure. Previous studies suggest that nanostores are more likely to be attached to middle- and low-class income consumers in emerging markets. We conduct a comprehensive spatial statistical analysis to validate hypotheses from the literature. We used data from more than 3 million records for Mexico City, including Zip Codes, characterization of the stores, business name, number of employees, type of settlement, population per socioeconomic level, and geolocation. Our

results show that some of the hypotheses hold under specific conditions. However, we extended the value of the literature by showing evidence that high and medium-high-class income consumers are also attached to nanostores. We also present evidence of the proximity of nanostores to consumers regardless of their socioeconomic level. Finally, the study details the logistics and managerial implications of the findings.

Business practices in nanostores. A study in Piura, Perú

Brenda Silupú, Sergio Reyes, José Amorós and Fabiola Alcas

ABSTRACT

This research aims to identify the business practices used by nanostores compared to other businesses of similar size. Specifically, it is intended to define the profile of these types of businesses through the activities they carry out. Using the methodology of the Leveraging Supply Chain Management and Business Practices in Micro and Small Firms applied to 88 businesses located in Piura, of which 28 are neighborhood stores, there is evidence that these do not apply marketing practices frequently and do not maintain records of their operations, making it difficult to make decisions in the management of inventories and to quantify the real profit of the business because they do not consider the loss of merchandise of the fresh products they sell daily. An essential factor in this type of business is money management because they buy and sell cash, although sometimes they grant loans to their neighbors, and there is a high probability of not recovering it. The traditional business that exists in this type of company requires the design of supply chain tools capable of ordering and improving the management of these businesses.

Dynamic supply chain network design for a Brazilian retailer

Magali Aquino, Paulo Fernandes, Christopher Mejía-Argueta and Néstor Moreno

ABSTRACT

The retail industry is growing at a considerable rate in Brazil. To succeed in this fiercely competitive environment, companies such as bulk food retailers require a supply chain that is faster, more profitable, and more flexible under diverse circumstances. This, in turn, will transform into a high-performance supply chain network design that will be robust to address the needs of increasing capacity, demand uncertainty, and others. We propose an optimization model that helps the company deal with its expansion plan during the following years to deal with items like demand variability in the stores and the capacity of the current distribution center (DC). Moreover, we determine if an expansion of the current DC or locating a new DC is needed to serve all new demand to keep a proper cost structure and level of service. As the results show, there is no silver bullet for the 72 different scenarios run but it is clear that DC2 located in São Cristovão is the most preferred DC to be opened as the only option or mixed with another DC.

Improving access to healthy food in vulnerable populations through nanostores and small businesses

Gonzalo Mejía, Jairo Jarrín and Daniela Granados

ABSTRACT

Corner stores or nanostores are small businesses that are ever-present in the landscape of Latin America cities and towns. These small businesses are associated with informality, processed, and other highly unhealthy foods. Their role and potential in terms of food security has been always neglected. In this preliminary work, we investigate the dynamics of these businesses in peri-urban areas of central Colombia, specifically in terms of sourcing of fruits and vegetables. For this purpose, we surveyed over 80 store owners in the Sabana Centro region of Colombia about their

sourcing and sales habits. The results show that the inefficiencies of the logistics processes discourage store owners from selling these products. The results also suggest that having nearby and reliable sources of fruits and vegetables can motivate store owners to increase the availability of such products.

Demand Dynamics in Non-Alcoholic Beverages Market in Brazil

Roberto Ivo Rocha Lima Filho and Christopher Mejia

ABSTRACT

This paper aims to understand the dynamics of the non-alcoholic beverages (NAB) market in Brazil by measuring price demand elasticities from distinct categories and how they interact in modern (by definition, five or more checkouts) traditional trades. We analyze customers' decision-making using an econometric approach: an almost ideal demand system to deep dive into the trajectory of categories available on the shelves of multiple retailers and a set of efficient logistics operations that guarantee a long-term sustainable model. We also compute cannibalization rates by using a closed and analytical methodology driven into practice that contributes to closing some methodological gaps in the literature.

The future of nanostores. Current situation and buying patterns analysis in the city of Quito

Jonathan Acaro, Carlos Suárez and Ximena Córdova

ABSTRACT

The world population keeps growing every year, and Ecuador's situation does not differ. The nano store format makes up the majority of economic establishments in the country, and a considerable part of the budget Ecuadorians have, is used in this store format. The presence of bigger retail formats such as supermarkets has increased as well. This situation brings up the following question: What will happen in the future with the nano- store retail format? The sectors of the city of Quito, defined as a km², were classified according to the abundance and characteristics of the retail formats. Population socioeconomic characteristics were evaluated to determine if they related to the retail format they preferred. It is essential to understand the current situation in order to assess the bigger question leading this research.

Retail Execution Quality Analysis in Traditional Channel of Nanostores

Diego Valenzuela, Jose Larco and Claudia Antonini

ABSTRACT

Significant post-sales activities are invested regularly at nanostores by Consumer-Packaged Goods (CPG) manufacturers. The execution and visibility quality are routinely monitored by CPGs related to sales. Despite this, the relationship between post-sales activities and nanostore execution visibility remains unknown. This study characterizes the relationship between commercial sales and post-sales activities efforts and execution quality. The results have implications for redesigning agent sales routes and enhancing their impact on execution quality.

Logistics characterization of discounter's suppliers in Colombia

Nury Rodriguez, Sneyder Castro, Daniel Prato and César Becerra

ABSTRACT

Considering the growth that discounters have shown worldwide, its characterization from different perspectives has become of interest. Eight out of ten Colombian customers buy in discounters in 2018, given the facilities in terms of price and accessibility. This model has created particular interest in the academy to understand the logistics strategies used in its supply chain and how do they deal with the suppliers. The purpose of this study is to shed light on these issues by formally investigating i) How do they deal with the data quality, ii) logistics processes such as manufacturing, inventory replenishment, inventory management, storage, transportation and distribution, and returns, and, finally, iii) a preliminary approach is developed in terms of the percentage of products out of stock in discounter's formats by comparing the main players of the sector. The findings suggest the incorporation of reverse logistics in the discounter's operation, the stockout management, and the identification and physical characterization of their products for traceability purposes to reduce the product returns.

Collaborative economy logistics solution in urban environments from emerging markets

Diana Lopez, Debora Grassetti, Rodrigo Bilicki, Christopher Mejía, David Salinas and Daniel Prato

ABSTRACT

The exponential growth of cities in emerging countries changed the urban freight pattern flows and vehicle traffic in the cities. These changes have consequences in the traditional retail in these cities, impacting nanostores service and environmental and social aspects. It is essential to highlight that adopting good practices in the last mile distribution can positively influence society, mainly in the urban concentration areas where the nanostores are located. Simulation is a valuable technology to compare scenarios and find solutions based on real inputs such as probability distributions. In the model presented here of CGG goods distribution for nanostores in Medellín, Colombia, it was possible to verify the impacts on cost and carbon emission for a real demand with travel times and network definition, comparing different types of vehicle in the last mile seeking the best service level as per customer requirement: daily deliveries for small quantity orders to supply the nanostores. Network design with regional cross-docking points optimizes the speed in this activity, regardless of the type of vehicle used in the distribution, given the LTL in small vehicles characteristic of the last mile.

Closing the food access gap in underserved communities

Luiz Barreto, Jamal Taylor and Christopher Mejía

ABSTRACT

Neighborhood markets seem to be well-positioned to fulfill the need for fresh produce in their communities. The stores' proximity to their customer base is a strategic advantage over other means for consumers to get fruits and vegetables. Also, since many individuals in this demographic already purchase their groceries at convenience stores, sourcing these neighborhood markets with fresh produce allows customers to maintain their same shopping habits. Otherwise, customers might have to travel outside their neighborhood to purchase fresh produce. Advanced statistical modeling was applied to determine significant factors and differences and rank food access models depending on customer profiles. First, a principal component analysis was taken, resulting in 29 components to be used for analysis. Then a preliminary cross-analysis was conducted to spot any trends in the data.

Interestingly, the cross-analysis found that, among car owners, the higher the education level of those surveyed, the more they preferred the ride-sharing model. Results show that the veggie box was the preferred option among Somerville residents. It found six factors that lead to the preference for the veggie box model. Lastly, interviews with wholesalers/distributors and farmers/farmer associations showed that the veggie box model is feasible for providing food deserts with fresh produce. Moreover, over 70 percent of survey respondents indicated that they prefer the veggie box model, and our logit model was able to describe 89.5 percent of this data.

Defining an inventory policy for a CPG distributor in Puerto Rico

Gabriel Alcantara, Pablo Segura, Vinicius Rizzardi, Lars Meyer Sanchez and Christopher Mejia

ABSTRACT

Inventory management is key to achieving a high service level, dealing with uncertainties, and meeting economic goals. Despite its importance, many companies in emerging markets do not apply those well-known techniques properly. The sponsoring company, a CPG distribution company, situated in Puerto Rico, is trying to improve its supply chain management practices. Currently, the sponsoring company estimates lost sales is around 30%. This project reviewed the company's operating models and inventory policies to propose the most suitable policies for the company, aiming to reduce stock-out events without increasing working capital. This project aims to answer two key questions: what is the most appropriate inventory policy for this company? And what characteristics, constraints, and opportunities must be considered when defining and implementing an inventory policy? The study proposes a new inventory policy for the sponsoring company to reduce lost sales due to stock-out events and recommendations for future works. The policies analyzed show that it is possible to decrease stock-outs simultaneously with an inventory reduction. On average, inventories were reduced by 21% and stockouts by up to 95%.

Nanostores and Supply chains: A current outlook and future perspectives of technological and managerial practices

Ortega-Jimenez, C.H., Amador-Matute, A., Zavala-Fuentes, D., Zorto-Aguilera, F., Parada-López, J. and Alvarado-Sevilla, S.

ABSTRACT

Nanostore retailing is a universal term throughout company and university websites or in scientific journals. One objective of nanostores is to achieve a process of convenience by reducing waiting time to respond to demand and improving logistics in the sales process to end customers. Although the understanding of nanostore concepts has been sharpened in the last years, it is still challenging for academics, practitioners, supply chain manufacturers, and nanostore owners to establish a concrete roadmap within the jungle of different terminologies, ideas, and concepts. The theoretical and empirical study of the formal adoption of the nanostore in supply chain management (SCM) is a new and critical topic that requires further investigation. Since some studies have begun to review the work on nanostores, our goal is to map the evidence available about the requirements practices adopted and challenges faced by SCMs to understand how requirements issues are resolved using technological and managerial practices. Our study identifies three dimensions from six categories of paper content, discussing current shortcomings, challenges, and future research directions. Research in this developing field, with heterogeneous studies, benefits significantly from this first review, aimed at understanding and reorganizing available knowledge, as well as an important methodological contribution by applying elements of systematic literature review (SLR), originally from health sciences to SCM and nanostores studies, where there is no SLR, and the concepts are

often poorly operationalized, thus not providing sufficient assistance to organizations in their efforts to implement SCM practices in nanostores.

Humanitarian Logistics and Relief Operations



Maturity Model for Disaster Response Operations

Hingred Ferraz Pereira, Patricia Alcantara Cardoso and Adriana Leiras

ABSTRACT

The logistical costs of humanitarian supply networks account for most disaster operations expenses. In this scenario, better disaster operations management is needed. Thus, this paper aims to present a Maturity Model to analyze the responsiveness of organizations, identifying weaknesses and strengths to seek improvements. We conducted a structured literature review that retrieved 8 Maturity Models for Disaster Management in the Scopus and Web of Science databases. Based on the analysis of these models, and considering together with a process model, we propose a Disaster Response Process Maturity Model (DRPMM). The DRPMM is structured in five maturity stages in which an organization may position itself and plan a strategy to evolve to higher maturity stages.

Humanitarian Operations in Latin America: a taxonomy and a research agenda

Brenda Cardoso, Ludmylla Moreira, Adriana Leiras, William Guerrero and Jorge Vargas-Florez

ABSTRACT

Humanitarian operations have the primary purpose of saving lives and providing relief to the people affected by disasters. Due to the high number of disasters worldwide, the research in humanitarian logistics has increased. However, when it comes to Latin America, the number of studies reduces significantly in the Scopus and Web of Science databases. Latin America has a history of disasters and humanitarian operations that may provide significant lessons for future disaster management worldwide. Thus, the present paper aims to review the existing literature related to humanitarian operations in Latin America to identify key challenges facing humanitarian operations and the main research gaps. A review of 72 published papers provides a taxonomy of several dimensions such as country, disaster life cycle, model type, and identification of key challenges. The results show eight challenges that include stakeholder coordination, use of technology, and risk assessment. This study still offers a research agenda summarizing the suggestions for future researches avenues.

Risk generation in an Inmegacity

Isabel Bastidas, Yndira Guevara, Yereth Romero, Julio Castillo and Mario Chong

ABSTRACT

Magdalena del Mar is one of the most active districts in Lima (Peru). Despite having a low population, in the last years, the investment has increased because of tourist offers, varied cultural offers, and a diverse commercial zone. For this reason, house offers have grown exponentially, offering 20% more households (houses, apartments, and lands) than in the previous seven years (INEI, 2018). Nevertheless, the peak of the commercial movement has generated many problems that affect society. For instance, traffic congestion, excess breach of laws, attempts on public health, etc. These troubles impact the commercial areas and create risk zones. This study aims to find the urban risk commercial blocks in Magdalena del Mar. We used the methodology of the Last Mile (Km%) and the pedestrian methodology. Furthermore, we will offer a description of the urban logistics inside the commercial area of Magdalena del Mar and present solutions for the benefit of the society. Its importance lies in the nonexistence of a study that characterizes and evaluates the risks in the zone of Magdalena del Mar from the commercial density and using an analysis of speed pedestrians. Moreover, a plan of possible solutions to reduce the risks and inform authorities and

the population about the latest threats. This will serve to generate initiatives for a normative diagram to make responsible decisions in the urban development.

Landslide aftermath simulation in Paime: a dynamic system approach

Nicolás Giedelmann Lasprilla, Elyn L. Solano Charris and Carlos L. Quintero Araujo

ABSTRACT

Humanitarian logistics can be defined as the set of processes for delivering disaster relief supplies, e.g., inventory management, facility location, resource management, and decision making. The disaster management cycle considers four main activities, i.e., mitigation, preparedness, response, and rebuilding. In this paper, we study the rebuild phase, which is focused on providing assistance to the damaged populations once a disaster has happened. For this study, a case study on Paime, Cundinamarca is presented. Paime is characterized by an inherent risk of flooding and landslides, which presents a threat to the town's population. Then, a Dynamic System model is proposed to analyze the population's impact on mortality rates during the aftermath of a landslide. Results suggest a strong relationship between the reaction time in a landslide crisis and the growth in the expected mortality rates and the importance of local goods delivery time as a mitigation strategy.

PREFECT – Development and Evaluation of a prediction model for the probability of famine catastrophes using data analytics techniques

Roberto Ivo Da Rocha Lima Filho, Gernot Heisenberg, Regina Wirtz, Lisa Koeritz, Lars Carspensen and Sven Woehler

ABSTRACT

Starvation disasters occur in most cases due to different indicators, such as bad environmental conditions, crop failures, or man-made influences such as corruption or armed conflict. When various factors collide over a given time, the resources of a country are attacked, and famine can occur. Different indicators may arrive simultaneously, different factors favor other factors, and a sequence of events happens, and finally, a famine situation occurs. When a famine has come, it is usually too late. The biggest problem for aid organizations in fighting famines is the lack of time to establish sustainable help and care. The study aims to develop a prototype of a mathematical forecasting model that calculates the likelihood of famine so that adequate disaster relief can be ensured as far as possible before an emergency situation occurs. This predictive model will be created using data analysis methods and trained on the basis of historical data on the respective countries. Subsequently, the prediction accuracy of the model is to be validated. Once the accuracy of the model allows a good prediction of the training data sets, real predictions of the probability of famine can be calculated.

Distribution of donations for areas affected by frosts in the south of Peruvian Sierra

Franco Pérez-Saavedra San Román and Diego García Garay

ABSTRACT

Donations have always been a way to help the most vulnerable populations. However, sometimes donations are not distributed most efficiently. This analysis proposes a more efficient and more equitable way to distribute donations to the regions in the south of the Peruvian Sierra most affected by frosts, considering relevant criteria such as degree of vulnerability, population, and poverty level. Two methodologies that contribute to decision-making are proposed to carry out this

distribution. The first is the multi-criteria methodology AHP (analytical hierarchy process) to obtain the degree of vulnerability of the regions which are analyzed. The second is the fuzzy logic to calculate our final result (number of donations for each region). The criteria used by fuzzy logic are described above, adding the degree of vulnerability obtained in the AHP methodology. Finally, the regions analyzed are Apurimac, Arequipa, Cusco, Moquegua, Puno, and Tacna; because they are the most affected by frosts in the south of Peruvian Sierra.

An interactive decision support system to locate CEPDEC-SP warehouses

Márcia Frazão, Daniel Okane, Irineu Brito Jr and Hugo Yoshizaki

ABSTRACT

Every year during the rainy season, floods and landslides damage the life of thousands of people in São Paulo State (Brazil). The Protection and Civil Defense organism (CEPDEC-SP) help the people impacted by these events by providing them with essential supplies for eating, cleaning, and sleeping. The CEPDEC needs to store all these items in warehouses that should be able to provide the needs of these items after registering occurrences in the entire State. Thus, the positioning and capacity of these warehouses become critical aspects so that the service to people in need can be carried out efficiently. Previous work has sought to help the planning team to study new configurations to improve the responsiveness and reduce the total costs of the operation of warehouses where these supplies are located. However, after the delivery of these results, there was resistance to their implementation. The main objective of this research was to prepare an interactive system that friendly shows location decisions to the final users. Besides, the system enables users to manipulate the models and test alternatives, which helps in the reliability of the results.

Multi-criteria analysis to coordinate the relocation of flood victims in Colombia

Luis Gustavo Tavares, Alejo Sanchez, Chelsey Graham, Tim Russell and Jarrod Goentzel

ABSTRACT

Floods are the natural disaster with the most significant impact in Latin America. This study concerns the logistics of disaster response operations, focusing on the shelter strategy for victims of flood disasters in Colombia. The purpose is to investigate the relevant criteria for transportation planning and shelter allocation for victims and identify a methodology to select a strategy to serve decision-making in the field. Therefore, the criteria to assess sheltering strategies and the sheltering strategy alternatives adopted in the Operational Research models are identified through the content analysis of the relevant publications. Subject matter experts (SME) from Government Agencies, non-governmental organizations (NGOs), and Universities have assessed and weighted the strategies accordingly. A multi-criteria decision analysis model is employed based on the SME's responses. It is concluded that the adopted method is useful for defining the criteria and for developing strategies that result in improvements in the shelter allocation of victims. Thus, it is highlighted that this work contributes to the Humanitarian Logistics area with the investigation of the objectives related to the strategy, as well as to the field of Operational Research with the practical application of multi-criteria decision analysis.

SCM for Micro and Small Firms



Hey Small Firms, Do You Need Cash? Forget About Sales!

Analiz Cabrera Hernandez and Trevor Nathan Thompson

ABSTRACT

In Latin America, Small and Medium Enterprises (SMEs) represent about 99% of businesses and more than 70% of employment. These firms make a large contribution to their local economies and provide most of the employment opportunities for those most in need. Unfortunately, these firms face a low survival rate: 20% fail within the first year, with 50% closing within five years. As identified by small firm owners, lack of cash availability is the primary driver behind this low failure rate and is an area in critical need of assistance. This capstone project will define an optimized inventory model that can be utilized by micro and small firms to reduce inventory and increase cash availability. The research is focused on Colombia and included shadowing and conference presentations, a live data collection process in partnership with small and micro firm owners, and an upcoming pilot period to assess the validity of the optimized model. The ultimate contribution of this research is an app called "ANNA" that will be free to use for micro and small businesses. The app is currently in the prototype phase.

Micro business research in Piura, Peru

José Luis Calderón Lama

ABSTRACT

The majority of companies in Peru are microenterprises (99.5%), and the highest percentage of the PEA (economically active population) works in microenterprises. Still, microenterprises have very low productivity (under 30% of the productivity level of the USA), and the survival rate is also low. The research carried out by the University of Piura in 2019 covered 29 small neighborhood corner stores to find out what management practices they carry out and how the company manager distributes his time. The methodology used was the survey, through 144 questions and the shadowing to determine what the company manager does. It was found that in all areas of management, the average of the micro-business of Piura is below the average of the microenterprises of all Latin-American countries.

Sustainability in Supply Chains



The Greening of a Large Urban Distribution Network

Jerry Bendiner, Orlando Torres, Luiggy Rueda and Mario Valadez

ABSTRACT

Alquería (Productos Naturales de la Sabana S.A.S.) is one of the most influential business organizations in the Colombian dairy market. Founded in 1959, it manufactures and distributes dairy products and beverages through a supply chain network composed of 6 processing plants and 15 distribution centers. Competitive pressures and the need to reduce costs led to a review of the company's distribution network in Bogotá, Colombia's capital city, plagued by traffic congestion and environmental challenges. Motivated by Alquerías's strong corporate commitment to sustainability, balancing fiscal and environmental objectives became the driving force of the study and the evaluation of alternative network options. A mathematical programming-based model was implemented to optimize and compare the various network configurations, and minimizing total CO2 emissions replaced total costs as the model's optimization objective. In this paper, we describe the methodology applied to formulate the network model and derive its coefficients. The results have been very rewarding. A redesigned configuration that combines a brand-new distribution center and a pair of cross docks will have a very positive impact on overall network profitability while at the same time reducing total CO2 emissions by over 30%.

The repositioning of empty containers can improve Brazilian soybean grains exports through Manaus Ports (State of Amazonas, Brazil)

Bruno Oliveira and Augusto Rocha

ABSTRACT

Soybean is the most positive influencing commodity of Brazil's trade balance. However, bottlenecks in transport infrastructure impose extra costs on the logistics chain, lowering Brazilian soybean competitiveness. Possible solutions to this problem come from North Brazil, where 90% of containers reaching Manaus port (state of Amazonas), loaded with imported components destined to Manaus Free Trade Zone, are kept empty after unloading operations. The use of these empty containers in Brazilian soybean exports is claimed here based on the methods of Cost-based Activities and Cost-benefit Analysis. Results point to the feasibility of this proposal in the specific case of the top one soybean production achieved in Mid-West Brazil, leading to the conclusion that soybean logistics and transport can be significantly more competitive and, also, a decrease in the carbon footprint in soybean logistics can be achieved through the reduction of highway transport by truck.

Inclusion of remanufacturing in an office furniture manufacturing company in Santiago de Chile

Juan Pedro Sepúlveda Rojas, Rodrigo Ternero and Pedro Palominos

ABSTRACT

In this work, we studied the inclusion of remanufacturing activities in an office furniture manufacturer in Santiago de Chile. There are no companies of this type that have embarked on this type of activity in Chile and Latin America. The case study methodology was used to conduct this investigation. The main challenges and the main problems encountered when starting this transformation process towards a hybrid plant were raised. The profit margins and the increase in sales were also determined, finding that, despite the problems presented, the inclusion of remanufacturing represents a real potential for increasing profits and margins in Latin American companies.

Implementing CLSC for Plastic Bottles Reuse

Rafael del Rio, Adele Magalhães, Raissa Sosa and Christopher Mejía-Argueta

ABSTRACT

This paper will focus on identifying the main success factors for a hair care manufacturer in Latin America to develop a closed-loop supply chain (CLSC) model for their hair care products. The CLSC model will be developed through discrete event simulation, focusing on Sao Paulo and the southern regions. The simulation model will allow the company to understand how the critical variables affect the most relevant output KPIs, including the return on investment (ROI), percentage of reusable plastic improvement, and time to market. This will be achieved through a five-step process that includes performing a literature review of CLSC and discrete event simulation, mapping the critical processes and stakeholders, and analyzing their interactions through a system dynamics causal loop diagram. Thirdly, the required information will be collected and analyzed. Fourthly, the simulation model based on the information analyzed and the mapped processes and stakeholders will be created to finally build different scenarios and analyze the effect of changing the input variables and attributes of these on the critical output KPIs. These scenarios will find the best scenario for increasing the ROI and maximizing the percentage of reusable plastic.

Fast Shipping and Inbound Logistics Sustainability

Ana Luiza Ferrer, Perla Jazmin Haro Ruiz and Roger Mariño

ABSTRACT

Consumer demand for short delivery windows has driven companies to compete for faster shipping to clients. Recently, Amazon and Walmart, along with other major companies, have started offering same-day delivery. In this paper, we analyze the environmental impact of inbound logistics caused by fast shipping. We create a discrete-event simulation model to understand and compare the effect that certain parameters (i.e., delivery windows, inventory management policies, truck type) have on sustainability inbound logistics. We validate this model with the largest retailer in Mexico in order to analyze how sustainable fast shipping actually is and how to reduce its environmental impact. Results from the simulation model show that fast shipping produces significantly higher CO₂ emissions since it imposes a challenge for cargo consolidation.

Simulation of Reduction of Carbon Dioxide Issued in the Cellulose Industry: The Impact on Costs

Stephanny Pereira, Gisele Chaves and Sandra Rocha

ABSTRACT

The paper and cellulose supply chain is responsible for greenhouse gases emitted mainly by burning fossil fuels to generate energy in its industrial area. The expansion of production has caused increasingly environmental, economic, and social impacts. In this context, this paper investigates the potential of reducing carbon dioxide emission, a greenhouse gas, in the Brazilian large-scale cellulose industry. A proposed model was simulated to assess a combination of fuels that guarantee the heating value required by the process and that minimize cost and emission. The system dynamics method was used. The results demonstrated that the combination of LSFO, HFO, Diesel, Turpentine, Hydrogen, and Methanol could reduce emissions by 44.4% compared to the current use in the studied company. This paper evidenced that the change in fuel consumption looking for minimization of kiln polluting impact, could achieve the goal of carbon dioxide (CO₂) emissions decline without affecting the operation and performance of the equipment.

Northern Arc export corridors: better competitiveness in logistics costs and lower environmental impacts for Brazilian soybeans exports from Mato Grosso

Ramesh Thadani, Fabiana Oliveira and Augusto Rocha

ABSTRACT

The state of Mato Grosso (MT) is Brazil's largest producer and exporter of soybeans and is located on average 2,000 km inland from the traditional grain exporting ports in the south and southeast of the country, resulting in high "farm to port" logistics costs, mostly using road transportation. As a result, recent projects to use inland waterways to reach ports in northern Brazil, known as the Northern Arc ports, have provided a new choice of export corridors. This case study evaluated the benefits of using the Northern Arc to export soybeans from MT, determining the competitive advantages by focusing on the farm-to-port logistics based on costs and environmental impacts of the transport mode choices. We first modeled the transport costs from farm to port for the different microregions of MT. We then performed a Sensitivity Analysis (SA) evaluating the impact of changes in transport costs on the model's corridors from farm to port, determining which regions should prefer the Northern Arc. The results indicate that using the Northern Arc corridors positively impacts the competitiveness and ecological footprint, as transport costs on inland waterways are 67.7% lower than road transportation and emit 89.9% less carbon dioxide.

SCM for Food and Agri-Business



Rethinking Fresh Food Supply Chains for Low-Income Consumers in Brazil

Lars Meyer Sanches, Cristiano Flores E Silva, Christopher Mejía Argueta, André Moura Duarte, Ricardo Cassel and Alexandre Ávila Lerípio

ABSTRACT

Health problems related to obesity and undernourishment are a major global issue, especially among a lower-income population where the obesity rates are even higher. The lack of adequate health systems and a large percentage of poor people amplify these issues in Brazil. A significant cause of malnutrition is the high intake of ultra-processed food items combined with a low intake of fruits and vegetables. Previous efforts to tackle the problem have failed or were not able to become sustainable in the long run. Previous research showed that low-income consumers are price sensitive and that a reduction in the demand for healthier food options decreased its accessibility creating the so-called Food Deserts. Our main goal is to build a financially sustainable fresh food access model linked to the low-income population. Results of a survey were applied to 300 consumers in Brazil to evaluate the willingness to adopt an access model based on a subscription to a basket of fresh food. We implemented a series of statistical tests and concluded that consumers are willing to adopt a subscription model, especially if pre-selected products come directly from the farmers to a location of easy access to them with lower prices than other alternatives.

Improving food security with farmers' markets in Bogotá, Colombia: A logistics perspective

Daniela Granados and Gonzalo Mejía

ABSTRACT

Food insecurity affects 1.3 billion people in the world. Farmers' markets are a strategy to bring fruits and vegetables (F&V) to locations with limited access, connecting farmers directly with consumers. These markets use a short supply chain. In the case of Bogotá (Colombia), this strategy was implemented by the Office of Economic Development of the Bogotá District. Nevertheless, this program has had a limited impact due to its short outreach. This study will evaluate the strategies to increase the percentage of F&V demand covered by farmers' markets through their strategic location within five UPZ (territorial units of the town) of Bogotá. To do so, we propose a mathematical model of the facility location problem (FLP) to select the most appropriate locations for each market and establish their capacities. The results showed that in order to cover 30% of the weekly F&V demand of Bogotá, 12 farmers' markets should be located throughout Bogotá.

First mile food losses destination and quantification in Colombia

Andrés Cárdenas, Diego Gutiérrez, Vivian Rangel, Julieth Ricardo, Agustina Calatayud and Catalina

Silva-Plata

ABSTRACT

Several organizations have studied food losses along the supply chain in different regions. However, food losses in the first-mile stage have been little detailed and even less in Latin-American countries. This study aims to find the quantification, destination, and reasons for food losses of mango, tomato, and avocados in Colombia. Direct interaction with growers was held, which differentiates this study from others with a more theoretical methodology. We define a discarded product as all those harvested products that are not sold to any customer. Food loss refers to those

discarded products that are finally not consumed by humans. Results show that product selection is the stage within the first mile that accounts for the principal reason for discarded products. Of the total discarded product, 72% is destined for human consumption (growers' internal consumption, food industry, or food banks donations), and the other 28% is considered as food loss (non-human consumption such as animal feed, compost, and trash). Then, the annual percentage of loss in the first agricultural mile for avocado is on average 0.5%, 4.2% for mango, and 12.6% for tomatoes.

Considering temperatures in wine shipping decisions: model, risk indices, and applications

Alejandro Mac Cawley and Max Garafulic

ABSTRACT

Chile is currently the fourth largest wine exporting country in the world. Most of the wine is transported in dry containers, exposing it to the prevailing temperature conditions during its maritime transport, affecting its quality. Transport decisions are mostly based on costs, with the least cost route being preferred usually, without considering the potential temperature risks. In this study, we develop a decision support model for the shipping route selection problem, taking into account the temperature risk during maritime transport. To achieve this, we construct a model that considers the internal container temperature information obtained from 167 shipments of wine and determines the correlation with the external temperature. Because the external temperature is available through the global NCEP-NCAR database, we can determine the internal container temperature of any shipping route. We also present a set of temperature risk indices, which allows us to assess the risk to the wine shipment for a specific route. The results indicate a good forecasting performance for our model, with low mean accumulated deviation and root mean squared error values. We validate this model by applying it to a group of routes and show that the lowest cost route can have the highest risk for wine quality. Hence, a more expensive and less risky alternative route should be considered.

Increasing consumer awareness of nutritious food at retailers in emerging markets

Patricia Naranjo, Ivo Ferreira, Patricio Crespo and Christopher Mejía

ABSTRACT

Nanostores play an important role in emerging markets because they account for the highest market share in the food and beverage industry. Retailers that are not specialized in organic and nutritious goods tend to offer processed products from global suppliers, which leads to limited accessibility to healthy food, especially in non-wealthy geographic areas where most of the population lives. This study performs field experiments to analyze drivers that are more relevant to triggering healthier purchasing decisions for different income levels in Quito, Ecuador, and Rio de Janeiro, Brazil. By applying experimental design and analysis, the effects of price variation and nutritional awareness on customers' decision-making are tested. Two neighborhoods have been chosen from each city, Bonsucesso, and Ipanema in Rio de Janeiro; Tumbaco and Cumbayá in Quito. These neighborhoods are low-medium income and high income, respectively, for each city. The methodology used in this research is a behavioral field experiment based on applying surveys to consumers' nearby retailers in transited streets of the selected neighborhoods. Surveys were performed on random pedestrians, and products selected as the foundation of the survey were regular white bread and whole wheat bread. Results are analyzed using advanced statistical modeling. The experiment tested affordability and awareness in a randomized block design approach, trying different combinations of exposures to the groups.

Analysis of the Global Value Chain of the Salvadoran coffee sector

Gilma Lizama

ABSTRACT

This article identifies the coffee chain in El Salvador based on a qualitative analysis of the situation experienced by Salvadoran producers, emphasizing the Global Value Chains approach to identify leaders in each of its links; In addition to relate the supply chain of agricultural supplies in the first link, which serves to identify weaknesses and propose improvement policies for the sector.

Can food be circular? An investigation of food supply chains through the lenses of circular economy and data-driven technologies

Vinicius Picanço Rodrigues and Jens Bürger

ABSTRACT

The current food production and consumption system pose significant challenges to planetary sustainability and human health, making it a ripe sector for a transition towards a circular economy. While several studies and organizations constantly claim that data-driven technologies are one of the most important enablers of this transition, this topic has neither been well exploited in the literature nor empirically assessed, especially from a Latin American perspective. To add initial evidence to this discussion, this paper (i) systematically reviews the literature on the key challenges for transitioning from linear to circular food supply chains and (ii) explores the potential relationships between those challenges and the application of relevant data-driven technologies. Key insights on the potential uses of technologies throughout different stages of the food supply chain are highlighted, and a major gap is identified, which relates to the unexplored uses and adaptations of network-based models and methods for understanding and improving circular food supply chains. Future research streams under this overarching theme are also explored.

Supply chain model to reduce meat degradation during exports

Hongli Xu and Christopher Mejia-Argueta

ABSTRACT

This paper aims to combine a food degradation model based on microorganism growth and a mathematical model to optimize multi-modal transportation to minimize cost and food waste. We used modified Gompertz models and Arrhenius equations to model microorganism growth under distinct temperatures and a MILP to optimize the controlled temperature food supply chain. We tested our approach based on rich data sets provided by the stakeholder of the meat industry (e.g., vendors, inspectors, carriers, and retailers) that contain information about temperature, lead times and expiration, and best before dates. We consider the case of exporting beef between Uruguay and the Netherlands by using diverse transportation modes. Results show that these food degradation models might drive the international transportation network and help reduce cost and food waste.

How far can the organic fairs go? The context of Belo Horizonte (MG)

Isabela Kopperschmidt De Oliveira, Leise Kelli Oliveira, Maria Rosa Amorim, Ellen C. N. Madalon,

Luiza V. Fleury and Augusto Cezar Peres Filho

ABSTRACT

Brazilians have increasingly searched to consume healthier products at more affordable prices, so the organic product market has grown in this country. Even though Brazil is one of the largest producers of organics in the world, it is not yet the main consumer market due to the high prices practiced in supermarkets, which are still its main distribution channel. Organic fairs are then a more affordable alternative to organic consumers. This study aims to analyze the spatial distribution of organic producers and consumers from four organic fairs in the city of Belo Horizonte. In addition, the profile of both was identified through descriptive statistics, and relations were obtained on fair accessibility, from the consumer's point of view, through the application of the chi-squared test. It was possible to observe that the producers are not located near their organic fairs, and 94% of the sellers are also producers. Customers are scattered throughout the city, showing that fairs with unique characteristics have the potential to attract more customers. It was also possible to observe that the organic customer values the quality of food, and a valid relationship was found between the price and location of the organic fair.

A mathematical model for minimizing waste in crop maintenance tasks

Nestor E. Caicedo Solano, Guisselle A. Garcia-Llinas, Jairo R. Montoya-Torres and Luis E. Ramirez-Polo

ABSTRACT

This paper shows a mathematical model as a decision support tool for crop maintenance planning problems. The model seeks the minimization of waste generated by the use of resources necessary for the task of crop maintenance. The wastes are based on seven wastes of Lean Manufacturing (LM), which include labor, machinery, agricultural supplies, movements, and operations. The model is a Mixed Integer Nonlinear Problem (MINLP), solved with a case study on banana farms in Colombia. To solve were used the Response Surface Methodology (RSM) for a sensibility analysis, obtaining a significant reduction in cost, resources optimization, wastes reduction, and the schedule of crop maintenance activities, obtaining a reduction of 59% on the total cost and a new approach for scheduling of activities and tasks. The proposed model can be adjusted and replicated in other crops and is useful for farmers, production managers, and decision-makers on agricultural production systems. The most innovative aspect of this work is the integration of mathematical modeling, the use of RSM, and the seven wastes of LM as a tool for managing wastes in agricultural production systems.

Bullwhip effect on the supply chain of perishable products: a research proposal

Julian Andres Duran Pena, Angel Ortiz Bas and Nydia Marcela Reyes Maldonado

ABSTRACT

According to the National Planning Department (DNP), the loss and waste of food in Colombia, specifically in 2016, according to the National Planning Department (DNP), was 9.76 million tons, of which 6.1 million correspond specifically to fruits and vegetables, which is 62% of the total. In this sense, the present investigation seeks to understand if the whip effect in the supply chain of perishable products could explain the loss of food, specifically bananas, attending to variables

related to the supply and demand presented along with the links of the chain. For the above, information on sales prices of the producer, wholesaler, and retail was taken during the years 2009 to 2017, showing greater variations in the prices of the wholesaler and lower variations in-retailer prices, although their price levels are higher than the other actors in the chain. On the other hand, banana production shows stability, although diminished yields per hectare. It is still pending to conduct semi-structured interviews with all the actors in the chain and to determine if the whip effect is affecting, crossing these results with the quantitative variables.

Market size and direct accessibility as mediators for explaining potato prices

Maria Noriega, Jose Larco, Claudia Antonini and Christopher Mejia

ABSTRACT

Improving the produce price for small farmers is paramount for reducing poverty and hunger. Traditional prices have been explained by a combination of market and production factors. However, access to the market may be the missing link between production factors and produce prices. In this paper, we study market access and direct connection to consumers as mediation factors between traditional productive factors and prices for the context of two main staples in Peru: white and yellow potatoes. We use data from The National Agricultural Survey 2017 collected by INEI (Instituto Nacional de Estadística e Informática). We apply Structural Equation Modelling (SEM) to assess the mediation effect of access to markets and direct connection to consumers. We find that, indeed, market access and direct connection to consumers mediates the effect of crop sold, zone production volume, good practices, point of sales, and farmer sale price.

A Multi-Echelon perspective for distribution of perishable foods to nanostores: The case of Lima, Peru

Diego Matuk and Andrés Regal

ABSTRACT

As the urban population grows, especially in emerging markets, managing the increasing demand for goods and services becomes a crucial challenge for the logistic activities within cities. In Latin America, small traditional retailers (nanostores) dominate the retail sector and present a highly atomized distribution channel. To assess the challenges that distribution to these small retailers presents, this paper proposes a distribution strategy based on multi-echelon vehicle routing where the demand is consolidated. This approach looks to reduce the total transportation cost assumed by each nanostore owner while providing a routing solution that will minimize the distance traveled by the vehicles serving them.

Understanding Urban Food Deserts from a Geo-data Driven Perspective

Claudio Ortega and Michelle Rodriguez

ABSTRACT

The concept of urban food deserts has been extensively analyzed and documented in developed countries, but in the Global South, it has not. Since developing countries have a distinct retail sector composition, it's necessary to analyze and rethink the way to understand this concept. In developing countries and, specifically, in Peru, 70% of the retail channel are from small traditional retailers called nanostores, which complicate the last-mile logistics. In this sense, this paper analyzes the case of Lima, Peru, regarding its fruit and vegetables logistics distribution system from a geodata-driven perspective by using 1) Geographical Information Systems (GIS) to theoretically identify urban food desert zones and 2) a clustering technique to obtain the different nanostores profiles and assess the validity of point 1. Furthermore, in this case of study, it was inferred that the healthy food supply is related to specific nanostores characteristics. Finally, the urban food desert conceptualization in current literature does not apply to urban areas in the case of Lima, Peru.

Adoption of Technology in Lima using the UTAUT model: How an app can improve fruits and vegetables distribution through nanostores

Ericka Vidal, Marcio Soto and Jhohao Mallma

ABSTRACT

In a context where malnutrition issues are growing sustainably worldwide and with a specific problem in emerging markets like Lima, it is necessary to identify possible opportunities to improve this situation. This paper will discuss the actual fruit and vegetable supply processes through nano stores in six districts in Lima. This will give a better understanding of how the actors involved think about the adoption of technology in this traditional channel. Using the UTAUT model, we have elaborated 178 surveys that will give us a better look at the causes and relationships between constructs.

Improving the Peruvian Food Bank Supply Chain

Angelo Vaghi, Jhon S. Niño, Hongli Xu, José Larco Martinelli, Claudia Antonini and Christopher Mejía

ABSTRACT

Nowadays, food banks face the challenges of a poor product portfolio (BAP, 2020) and an inefficient supply chain network (INEI, 2020). This paper focuses on the enhancement and improvement of the Peruvian Food Bank Supply Chain, especially in the balance and accessibility of nutritious product portfolios for the final consumers. The problem lies in economic and social factors which lead to food malnutrition¹. In this research, we focus on the Peruvian case, considering challenges including the fact that most donations are poorly nutritious, the fact that current beneficiary organizations have dissimilar logistical capabilities, and a growing need for nourishment support. At the same time, we analyze potential opportunities, including sourcing for beneficiaries at higher levels in the Wholesale Santa Anita's Farmers Market (GMML by its acronym in Spanish -Gran Mercado Mayorista de Lima-) which wastes 60 tons per day, of which 80% is organic. An in-depth data analysis and an optimization model are carried out, as well as the development of different scenarios based on the framework of the food bank in Peru, including variables such as changes in customer needs and logistical capabilities of charity organizations and donors. The results lead to a new product mix portfolio that allows Peru's Food Bank (BAP) to better serve charity organizations and provide healthier food supplies to those in need in Peru.

Characterization of fruits and vegetables at nanostores in Lima

Julio Castillo, Cecilia Villacorta, Mario Chong and Christopher Mejía Argueta

ABSTRACT

Accessibility and availability of produce items drive food security and nutrition worldwide. However, for the most vulnerable communities, fruits and vegetables are not available through grocery stores and retail chains but through nanostores. We collected over 400 surveys at diverse neighborhoods in Lima, Peru, to understand their proximity to wholesale markets, produce retailers, and farmer markets, as well their assortment, patronage, and challenges. We analyzed the data using geographical information systems and factorial analysis of correspondences (MFAC). We identified that the supply of fruits and vegetables is different all over Lima and that their procurement strategies vary depending on the type of nanostores and their patrons.

Logistics 4.0 and Digital Transformation



Are Workers from the Agricultural Industry Ready for the Arrival of Industry 4.0?

Daniel Jurburg, Álvaro Cabrera and Martín Tanco

ABSTRACT

In parallel with the technical challenges related to Industry 4.0, a more humanistic challenge arises about how to prepare current and future workers to adapt to future jobs, which will demand new requirements in terms of professional competencies. The main objective of this paper is to discuss the specific set of competencies needed within the agricultural sector, since this is one of the economic sectors with the greatest risk of job automation. An extensive literature review followed by in-depth interviews to relevant stakeholders in the agricultural sector in Uruguay was conducted. This study concludes with the creation of a framework of 31 competencies divided into four categories. Radar graphs are displayed to show the actual and expected level of development of these professional competencies. The competencies acknowledged by the stakeholders as most relevant for the future are: IT knowledge, Ability to interact with modern interfaces, Active Learning, Analytical and Logical Thinking, Oral expression, Teamwork, Trust in technology, and Flexibility. Also, some of the major gaps in terms of competencies are related to the ability to interact with modern interfaces, Active Learning, Teamwork, Trust in technology, and Flexibility.

Diagnosis of Supply Chain 4.0 maturity in Uruguay

Juan Topolansky, Agustín Rodríguez, Martín Tanco, Daniel Jurburg and Santiago Kraiselburd

ABSTRACT

The phenomenon of Supply Chain 4.0 has gained relevance in past years, together with the possibilities it brings for optimization and efficiency in logistics. Latin America faces the challenge of not falling behind in technological development, a risk that could compromise the efficiency of its supply chains and, therefore, the strength of its economies. In order to diagnose Supply Chain 4.0 maturity among Uruguayan companies along the supply chain, an online survey was carried out based on maturity models from literature and by international consulting groups. The survey covered a wide range of company sizes and types of activity. Preliminary results show that 70% of respondents predict increasing investment in technology and digitalization by their companies for the next three years.

Industry 4.0 thru Augmented Reality System for Load Yard Control in Industry

Eduardo Silva, Augusto Rocha and Sandro Santiago

ABSTRACT

One of the critical factors that allow the advancement of industry modernization concerns logistics, and these issues are directly linked to the advancement of industry 4.0 and its issues. Technologies such as Augmented Reality, the Internet of Things, and Robotics have been applied in many areas of these industries. The following study presents an application that uses Augmented Reality aligned with the logistics context to improve the process of controlling incoming and outgoing loads. After defining the requirements for the cargo yard control process case analysis system of an electronics factory located in the Manaus Industrial Pole, an application that integrates an Arduino microcontroller with a Reality application was designed and developed—increased to control the factory yard selected in the study. After development, an analysis of the proposed application for results consolidation was performed. The results show that the application easily recognizes the

defined targets and allows the handling of objects without viewing instability, and it is possible to observe a considered consumption when presenting an object in Augmented Reality.

Where have all the Cowboys gone?

Franco Alarcon, Omar Ramirez and Gabriel Carrasco

ABSTRACT

This document goes over a data set provided by a transportation company and analyses the driver's logs for one quarter. Driver's profiles are created using statistical data analysis with the objective to identify and characterize the drivers; these drivers will be called in our study 'Cowboys.' The Perfect Cowboy will be the driver that maximizes the weekly driving time, driving and being on-duty as much as allowed by the federal regulations. Using the dataset provided by the company, the question to solve is, how can we identify and describe the drivers that maximize the on-duty driving hours?

Applications of Artificial Intelligence in Supply Chain Management

Wendy Carvajal, Marcelo De Sousa Murta and Lucia Leal

ABSTRACT

The world is currently facing a transformational era. Since 2015, with the advance in cloud computing, new applications using Artificial Intelligence (AI) and Machine Learning (ML) have been successfully developed in many segments. In Supply Chain Management (SCM), this is no different. The use of AI is spreading in all the main processes, such as demand, planning, procurement, warehousing, and transportation. AI is taking operations from reactive to proactive and making key functions more predictable and accurate. Nevertheless, the current scenario suggests that despite these advances, a lack of knowledge of how to apply AI to SCM and doubts about the return on investment can lead to misconceptions regarding this technology. In this work, we present a compilation and classification of use cases in which companies are using AI and ML in supply chain processes were collected and analyzed. Then, we analyze the application of this technology in the SCM of Pregnant Subsidy in Bolivia. Finally, we conclude by showing the results and discussing the benefits and limitations of these technologies. The purpose of the project is to understand the concept, the maturity of the technology, and the risks involved in the implementation of emerging technologies in organizations.

Innovation in Education Related to SCM



Capacity building through e-learning in logistics for micro and small enterprises (mSEs)

Sindy Melo, Cristian Barragán, Juana Valderrama, Estefania Lasso and Catalina Silva-Plata

ABSTRACT

Micro and Small Enterprises (MSEs) face great challenges in achieving effective development in their value chain. This is the reason why, often, these organizations lack specialized personnel in the logistics and supply chain management area. In the era of the 4.0 industrial revolution, online learning offers an effective tool for bridging this gap due to its advantages in flexibility and low cost. This research aims to answer how MSEs can add value to their logistics processes through e-learning. In order to do this, case studies were carried out with 12 Colombian MSEs, where the need for receiving training in logistics and supply chain management was evidenced. Additionally, an Online Logistics Clinic (OLC) was developed where companies can ask specific questions related to their operations and are assigned experts who accompany them in the process. To date, the data gathered from four companies through the OLC with has evidenced that MSEs do their supply chain management in an empirical way and are seeking training that allows them to strengthen their knowledge in logistics. Moreover, an Online Professional Certificate in Logistics for MSEs was developed in edX. This program consists of four courses in the areas of Value Chain Design, Efficient Purchase Management, Inventory Management, and Portfolio and Distribution and Delivery of Products. The program has had more than 2000 registrations from countries such as Mexico, Colombia, Peru, Argentina, and Chile. Upon completion, students are asked a series of questions to evaluate the courses, and preliminary results show that through e-learning, companies can be effectively trained in supply chain matters and generate value in their logistics processes.

Innovation Semester: Challenge Based Learning Model for the Development of Competences in Industrial Engineering Students

Jaime Palma-Mendoza, Teresa Cotera-Rivera, Ivan Arana-Solares, Sandra Viscarra-Campos and Ernesto Pacheco-Velazquez

ABSTRACT

This paper describes a case study of a model developed in Tecnológico de Monterrey called Innovation semester (i-semester), applied to the development of competencies in industrial engineering students. This i-semester consisted of using Challenge Based Learning (CBL) in collaboration with associated training partners to develop disciplinary and cross-disciplinary competencies in industrial engineering students. This case study was implemented with the participation of three Tecnológico de Monterrey campuses located in Mexico City, 34 students, and ten professors. Additionally, six Small Medium Enterprises (SMEs) participated as associated training partners. Furthermore, two external High-Level Education Institutions (HLEI) were involved as evaluators and advisors. The results that were obtained show that students who participated in this experience performed better regarding disciplinary competencies than students who did not participate. With respect to cross-disciplinary competencies, results show the progressive development of these competencies in students during their involvement in the I semester. Finally, this article describes the positive impacts of strategic Key Performance Indicators (KPIs) on the SMEs supply chain as a result of the student's intervention.

Design of a challenge-based learning model for higher education, an application case in a beverage company in Bolivia

Agatha Da Silva, Oscar Olivares Quintana and David Salinas

ABSTRACT

As the profile of students and the industry's expectations modifies over time, universities must be able to advance learning methodologies to deliver more suitable graduates to the labor market. The Universidad Privada Boliviana (UPB) aims to develop experiential learning practices through the implementation of Challenge-based Learning (CBL) to enrich the curricula of undergraduate students. One example of this case refers to Taquiña Brewery, one of the five breweries of the Cervecería Boliviana Nacional (CBN), a beverage company part of ABInBev, in cooperation with the Industrial and Systems Engineering Department of the UPB, which developed two CBL experiences between 2018 and 2019. As a positive outcome for the university, the methodology was widely accepted by the students, and academics from all disciplinary areas were trained to replicate CBL experiences in their classrooms. On the other hand, CBN found in the experience the opportunity to hire new talent, receive a fresh perspective on recurrent issues in their operations, and find new ideas based on theoretical concepts that could be applied to improve the way they usually do things. This work contributes to the exemplification of innovative approaches to enhance the teaching and learning in the discipline of Supply Chain Management and Logistics.

Experiential learning as a methodology to engage educational initiatives to operational problematics in micro-companies

Patricia Huanca Cortez and Agatha Da Silva Ovando

ABSTRACT

One of the most significant complaints about the superior educational system in Bolivia, especially in private universities, has been that undergraduate students enter the job market unready to face the complex reality and dynamic environment that companies have to face. Traditional methodologies in the classroom establish roles where the professor gives the student specific content to be learned in the classroom and later applied in a real scenario. Therefore, it is important to implement new methodologies that bring students and teachers out of their comfort zone and forces them to analyze real companies' problems from different angles in order to offer better solutions and develop competencies that are relevant to reality. Companies, big and small, face different kinds of problems daily related to productivity, customer service, and logistics, among others, that could be solved by saving resources with the help of universities if they would assign some resources and attention to real problems. This paper gives special attention to micro companies, which are often beyond the scope of industrial and educational innovation activities due to a lack of interest, knowledge, or the preconception that having simple processes should not be given priority. Implementation of experiential learning methods, such as Challenge-based learning, is an important alternative for both universities and companies since it offers a win-win relationship between both main actors with direct and clear benefits and advantages for students, their performance, as well as both parties.

Student Paper Competition



An index proposal for sustainable supply chain benchmarking

Maria Florencia Kalemkerian, Martin Tanco, Javier Santos and Daniel Jurburg

ABSTRACT

Due to the adverse environmental effects caused by industrial activities, companies are pursuing to incorporate practices that reduce the environmental impact throughout the entire supply chain. In this context, the concept of a sustainable supply chain is growing attention, especially because there is a need for companies to improve their performance on these issues. The aim of this paper is to present a characterization of the companies in their supply chain operations and a set of indicators to evaluate their sustainable performance. To that end, a survey was carried out in Uruguay. The results of the survey show that the main drivers of incorporating sustainability are costs reductions, corporate image, and environmental concerns. Additionally, the most adopted sustainable practices in transportation and warehouse management are presented. Finally, an index proposal is presented to evaluate sustainable performance, which will be validated by the company's members of the Program of Sustainable Logistics led by the University of Montevideo.

The impact of credits on the efficiency in the distribution to the nanostores

Rafael Escamilla, Marcos Mogollon and Jan C. Fransoo

ABSTRACT

Granting credits to nanostores in emerging markets could lead to several operational benefits. Beyond the increased coordination that trade credits provide, which has been pointed out in the extant literature, these credits could lead to a number of logistics efficiency gains, such as a reduction of the number of rejected orders or of the total time spent on the route. We explore such potential savings through the econometric analysis of the effect of trade credits granted by a Latin American distributor and confirm that these lead to reduced time on the route (26.4% potential reduction) and reduced return rates due to order rejection (which could almost be entirely eliminated). Moreover, we discuss how this relates to the incentive structure of the firm and how this might differ in other operations with a return-based incentive structure, where the time savings could be even larger, and the distance savings could be significant as well.

Study of the factors related to the operational management of a return center considering the reverse logistics of the SMEs

Carolina Barea Espinoza, Fernando Amado López Gutiérrez and Renán Alberto Laguna Vargas

ABSTRACT

Statistics indicate that small and medium enterprises (SMEs) are the engine of the development of the world's economy. In Europe, they account for 66% of employment, and it is estimated that in Bolivia, it represents 90%. Reverse logistics is a process that is finally being adopted as a profitable part of a business. Implementing such a process can be quite difficult, especially given the country's culture. After the review, there are no direct articles or research papers on the impact of reverse logistics on the food sector SMEs. This document is a pilot study on the factors related to operational management of a return center with the starting point of reverse logistics of products from SMEs as a response to facing one of the country's challenges, such as malnutrition and waste in the food sector. This study was carried out in Bolivian companies with less than 50 employees belonging to the food sector. Additionally, the document includes comparisons with similar structures in Colombia and Mexico.

Rotating Rack System Learner (RRSL): a methodology to increase space usage by varying SKU locations

Alfredo Gimenez Zapiola and María Sánchez-Arriola

ABSTRACT

As warehouse operations become more complex with e-commerce and specific retail trends (fewer days of delivery, customer satisfaction focus, etc.), inventory management is bound to evolve. An example of such evolution is chaotic storage systems. Nevertheless, those goals tend to require big investments, which are not always feasible. We present the methodology to apply a new algorithm in warehouses that reduces the number of unused spaces in distribution centers: Rotating Rack System Learner. To test its efficacy, we performed a case study at a Mexican retail company and simulated its functioning with the corresponding data, leading to a mean increase of 6% in rack occupancy. Our work is useful for warehouses with fixed location systems looking to increase occupancy without radically changing the overall operation of a center and not wanting to incur a large WMS investment, particularly for distribution centers in megacities and developing countries.

Optimization strategies for last-mile delivery of CPG products to nanostores in the city center of Cochabamba

Daniel Santiago Lima Urquiola and Agatha da Silva

ABSTRACT

Given the growth of cities and urbanization, freight distribution in dense urban areas has become a challenge for manufacturers. The scarce investment in infrastructure suitable for transport, public policy constraints, traffic congestion, and other issues make retail operations for nanostores a complex task. This study takes place in Cochabamba, the third-largest city in Bolivia, where the traditional channel has the greater dominance, as traditional retailers have the 92% of the market share over the modern channel. We analyzed the data collected from almost 100 nanostores in the region defined for the study and from 2 main CPG manufacturers to study the behavior of distributors in the critical zone and the businesses operating in this area. We approach the problem with a system thinking perspective and define a profile for nanostores and their satisfaction with the current delivery model. In the literature review, we study strategies that were proposed or implemented in other cities worldwide and analyze their hypothetical impacts if applied in the City center of Cochabamba, Bolivia, to conclude with an optimal delivery strategy that responds to the characteristics studied.

Explaining Product Returns in a Nanostore Context: Implications for Marketing, Sales, and Logistics Functions

David Hernandez, Jose Larco, Claudia Antonini and Jan Fransoo

ABSTRACT

The cost of serving the nanostore channel is significant for Consumer-Packaged Goods (CPGs) Manufacturers. Product returns due to perishability and low demand levels are one important source of inefficiency. This study uses a large data set of 741,730 instances from a large CPG to explain product returns using multilevel logistic regression. We show that these returns can be explained by actions that depend on different functions of the organization: promotions from the marketing function, selling agent route size from the sales function, and case size from the logistics function. We discuss potential strategies to reduce product returns.

Distribution strategies to deliver yogurt and juice to underserved communities

Daynor Bautista-Conde, Miguel A. Jemio and Christopher Mejia-Argueta

ABSTRACT

This project emphasizes the availability of juice and yogurt for the vulnerable population. Socioeconomic factors and primary data collection at nanostores were used to understand availability with statistical analysis and logistic regression models. From this analysis, we obtained that the availability of juice and yogurt is related to the presence of refrigerators, credit, and the different socioeconomic levels of the city of La Paz and El Alto. Finally, distribution strategies and policies are proposed to increase the availability of both products in vulnerable areas.

Characterization of human behavior in the decision making of donation management in the event of a disaster

Raquel Ruiz, José Larco, Claudia Antonini, José Renom and Mario Chong

ABSTRACT

One of the main challenges in humanitarian logistics is managing an uneven coverage of private donations in terms of needs per location. In this study, we seek to gain an understanding of the donation generation process, in particular, the effect of media exposure on decisions of where to donate. Using an experimental study and a between-subjects design, we obtain evidence that disaster news frequency and positioning the number of affected by the disaster in the news headline have a positive effect on deciding on a given donation destination. We also show that under certain circumstances, donation decisions may deviate from a normative one based on frequency and headline exposure.

Implementation and adoption of a technological fruit and vegetable distribution platform for 'bodegas' or nanostores in Lima

Rodrigo Carrión, Jeysi Marcelo, Renata Vega, Miguel Alegre and Mario Chong

ABSTRACT

This study analyses a technological improvement proposal to facilitate the trade of fruits and vegetables in the traditional channel in Metropolitan Lima, Peru. This improvement proposal arises against a problem afflicting Peruvians regarding their diet by identifying that they do not consume the daily fruit and vegetable portions recommended by WHO. Different studies will be analyzed; among them will be used a study to identify the distribution channel that owns most of the market. In the Peruvian case, it is the traditional channel, or 'bodegas' (nanostores). Then, data collected will be analyzed regarding the offered products of this channel, as well as the use of technology that the channel possesses in its operations. This data will allow analyzing, through the UTAUT methodology, the factors that explain users' intent on the adoption of technological information systems, in addition to the behavior that they will present in the use of the technology.

Location of Urban Distribution Centers to Enhance the Competitiveness of Nanostores

Maria José Ibarra and David Ernesto Salinas-Navarro

ABSTRACT

This paper presents a method to locate Urban Distribution Centers (UDC) to enhance the competitiveness of nanostores in Mexico's City by means of analyzing consumers' preferences to conform to consumption profile clusters. The method is complemented with decision factors such as local traffic conditions, space availability at Urban Distribution Centers, shopping trends, and urban characteristics to customize UDC depending on the type of urban cluster where Nanostores are located. With the help of a free access Machine Learning Software, urban clusters are located according to observed consumption patterns across different zip codes in the city. Additionally, with the use of descriptive statistics, a clearer picture of clusters is depicted for their visualization in specific geographical areas to consider additional criteria for UDC location based on proximity and local conditions. The method can still be improved in robustness by adding additional variables about consumers' preferences. The main contribution of the paper is the elaboration of a method to locate Urban Distribution Centers for particular clusters in Mexico's City so it can be further implemented in any other city, offering valuable insights for decision making to support nanostores.

Including risk parameters in vehicle routing modeling

Jocabed Becerra and Agatha da Silva

ABSTRACT

The following article will present an in-depth analysis of the optimal routes that a vehicle may have when distributing a product, covering downtown areas that have a greater amount of movement through these vehicles, analyzing risk variables such as the probability of theft, the poor state of the streets and different conditions of the vehicle, which influence final cost, taking into account that these decisions will be evaluated and analyzed, observing the alternatives that were presented by great authors, in order to adapt a model to the reality that currently has the problem. The model will be divided into phases to achieve the objective: analysis of variables, route designs, and model tests. Within the first phase, we will cover the process of gathering information and analyzing information that will allow us to move on to the following phases with the use of said data for the construction of the model, based on a multi-purpose programming model, where we can analyze specific cases that can show the effectiveness of the algorithm for the selection of routes with risk variables, where it is observed that these variables have an effect within the choice of a route.

Forecasting the short-term calls for electric emergency repair

Marcelle Cordeiro, Lino Guimarães and Roberto Filho

ABSTRACT

The electrical system is subject to numerous failures that compromise the continuity of the power supply, such as weather conditions, flooding, inadequate maintenance of electrical components, and inadequate management of the power system. To deal with power system grid blackouts, the electric utilities usually have expert teams who are responsible for repairing a failure as soon as possible. However, in chaotic weather situations, such as heavy rain, wind, and flood, the number of emergencies can severely increase, hindering the work of the teams. In view of that, this research examines the emergency repair service in electrical systems, using the case study of the Rio de Janeiro Electric Utility, responsible for providing energy to over 10 million people in the state. The seasonal auto-regressive moving average exogenous (SARIMAX) model was used for forecasting electric emergency daily demand considering the influence of rain and weekend days in the call for electric emergency repair. Then, we used the forecasting calls to estimate the arrival rate in queuing theory approach to size the minimum number of teams necessary to keep the stability of the queuing of calls waiting to be executed.

Operations Research applications in logistics and SCM



Design of a resilient supply chain at Hospital de Clínicas in La Paz, Bolivia

Ana Palenque, Rosa Paye and Sergio Caballero

ABSTRACT

This research analyzes the supply chain (SC) of the Hospital de Clínicas (HC), located in La Paz - Bolivia, where the main point to evaluate is to identify the problem in the internal logistics management of the medical services of HC. For its development, the descriptive and exploratory method was used, having as the main findings that among the 139 pathologies that are treated most frequently in HC, 79 are high risk, 48 are medium risk, and 12 are low risk. And in the surveys carried out with health personnel, it was identified that the factors that would most affect the risk of loss of life of the patient for these pathologies are the lack of equipment in 37.5%, medicines in 27.1%, facilities in 27.1% and medical specialists in 8.3%. The problems identified in HC are the economic dependence of the state resources to carry out the purchase contracts. No indicators were found to assess CS performance within HC. The acquisition of medical equipment is made solely by donations. Social conflicts directly affect SC. Shortage of some supplies and medicines.

Human Capacitated Production Mix Decisions in Sales & Operations Planning Contexts

Alex Dyer, Jose Larco, Jan Fransoo, Maria Noriega and Jose Cabrera

ABSTRACT

Sales and Operations Planning is a standard planning framework for planning in supply chains. Even if algorithmic and heuristic decision support is available, humans take the final decisions. This paper consists of analyzing human decision-making in a specific Sales and Operations Planning context: a capacitated two product production system, where lot sizes per product are decided dynamically. Such decisions imply a trade-off between inventory holding costs and backorder costs, while both products compete for a single limited resource. We test whether changes in demand variation, the share of demand, and the critical factor may bias decisions away from a normative-rational perspective.

A GRASP-RVND Metaheuristic for the Data Mule Routing Problem with Limited Autonomy

Igor Moraes, Pablo Munhoz, Glaydston Mattos Ribeiro, Laura Assis, Eduardo Bezerra and Pedro Henrique González

ABSTRACT

Wireless sensor networks have been used in many applications due to their low cost and easy deployment; these sensors are used in many military and environmental applications. In sparse sensor networks, it is impossible for sensors to communicate only using multi-hop messages. For this type of problem, a particular sensor, called a data mule, is usually used to collect data from the sensors and return them to a base station. The present work analyzes the structure of the data mule routing problem and proposes a solution method based on the GRASP-RVND metaheuristic. Experiments are performed with the proposed approach, and the results show that the GRASP-RVND can be used for obtaining feasible solutions in an acceptable computational time.

Port Operations



Comparative case study between the logistic competitiveness of three industrial agglomeration models:

Shenzhen in China, Manaus in Brazil and Ciudad Del Este in Paraguay

Richards Veras and Fabiana Oliveira

ABSTRACT

Using Special Economic Zones (SEZs) to understand one of the strategies for attracting foreign investments in emerging economies. This is the case in the free trade area in Brazil, Paraguay, and China. Although they have specific goals, all of them aim for the development of industrial activity by encouraging the entry of large multinational companies. Several variables are companies when determining the location of their factories around logistics, industrial and labor costs, and economic stability. In this way, the research problem is: How competitive are Shenzhen, Manaus, and Ciudad Del Este free trade areas? This case study comparatively evaluates the three models of industrial agglomeration from variables such as advantage tax, industrial, logistic, and labor costs. The results obtained were: (1) Shenzhen has a comparative advantage by incentive policy which gives priority to the attraction of the high-tech industry and, considering that SEZ from Ciudad Del Este and Manaus compete in the same market, (2) the adoption of tax incentive policies by Manaus or Ciudad Del. These similar to Shenzhen would make it more competitive than the other.

Efficiency analysis of solid bulk terminals using DEA Method

Jully Anne Giacomini, Vanina Macowski Durski Silva and Beatriz Chow

ABSTRACT

The growth of the global market implies an increase in the flow of goods and, consequently, there is an increase in the demand for maritime transport services. Economies tend to invest in transport infrastructure and technology in order to remain competitive. Therefore, it becomes evident that studies are needed to increase the efficiency of the port sector. The current work presents a study of the relative efficiency of Brazilian dry bulk terminals using the Data Envelopment Analysis (DEA) method. For this purpose, 27 terminals were selected, eight of those import coals, nine export iron ore, and ten export soybeans, and it was adopted four inputs and two outputs for the analysis. The results showed a trend for higher efficiency of exporting terminals than importers.

Port City Interface: Transfer Time Variability Analysis of Freight Transport Vehicles Between the Albrook Free Zone and the Port of Balboa

Jose Ocando

ABSTRACT

The Port City Interface between the Port of Balboa and the Albrook Free Zone has many problems related to traffic congestion and errors in legal proceedings, which has generated a transfer time variability in freight transport, causing many actors involved to have difficulties planning their cargo and customer dissatisfaction. Therefore, data compilation from the Customs agency of Panama City was made through QR scans, but before that, paper-recorded data transferring to the main system was made, given the lack of technology and the inefficiency of human talent, which caused many outliers. Then these were eliminated through data validation, using descriptive statistics with Durán-Hormazábal's (2016) model, and extremely long values were found, such as 145.11 hours of standard deviation, 13.69 hours of mean, and 369.51 hours of kurtosis; then, the

data registered in customs system was exported to Excel and then to Tableau in order to produce and analyze several indicators that showed high variability and fluctuations between different hours of days, weekdays, months of the year and more. Keywords: variability, transfer time, traffic congestion, data validation, land cargo transport.

Evaluating the Efficiency of Brazilian Container Port Terminals using Data Envelopment Analysis (DEA)

Melina Nolasco Vargas, Vanina Macowski Durski Silva and Antonio Sergio Coelho

ABSTRACT

The globalization process is closely related to expanding the waterway modal since maritime transport is the main route in foreign trade. This research aims to measure the relative efficiency of the main Brazilian container port terminals using Data Envelopment Analysis (DEA). As input data, six inputs are pre-selected (number of cranes, terminal area, cradle length, number of cradles, number of employees, number of containers) and one output (annual movement in TEUs). The terminals of the largest Brazilian container ports (handling over 50,000 TEUs) are investigated, totaling nineteen organizations. For discussions on efficiency, the efficiency scores of the CRS, VRS, ESC, DRS, and IRS models were presented, as well as input contributions to the modeling. Results showed that three terminals of the Southeast region and one terminal of the South region presented maximum scale efficiency. The analysis contained in this study may serve as a reference for the construction of an efficiency model for management decision-making processes.

Port Productivity by Improving Shift Change Process

Stephanie Dueñas, Cristian Pérez, Pamela Suárez and Mario Chong

ABSTRACT

Nowadays, the increase in international trade is the fact that each maritime port must deal with, especially those used to exchange cargo containers. Without going so far, South Pier of Callao (Peru), one of the main container terminal ports, presents problems with a maritime service (Eurosas) in the time spent performing the loading and unloading processes. This document aims to provide an initiative to improve the productivity of the port, through a time and movements study, in order to increase the outputs of the process from a given set of inputs. To achieve an increase in productivity, we focus on the shift change process of Quayside Crane Operators, beginning with an observation of the current scenario and mapping the process. Subsequently, we identify stages and activities that can be simplified or reduced, and we define a to-be process. Finally, we measure the tentative impact of the initiative on metrics such as movements, time, and a tentative increase in revenue. Some of the relevant information about this document and the proposed initiative is the 12% reduction in the current work shift time, increasing container movements by 1.2% for the Eurosas service, and this represents a monthly income of 20 thousand USD.

Efficiency comparison between container terminals in Southern Brazil

Beatriz Murakami Chow, Vanina Macowski Durski Silva and July Giacomini

ABSTRACT

In 2009 containerized cargo represented over 90% of maritime trade, and about 80% of the world trade uses the waterway mode, and this demonstrates its importance. So, this research has the objective to analyze container terminals in southern Brazil, comparing the efficiency data from Pires (2016) and update to 2018. As inputs, it was used canal depth, carriers, storage area, quay length, cranes, and as output, annual throughput in TEUs. The discussion and analysis of relative

efficiency were based on DEA (data envelopment analysis) method, considering constant return (CCR) and variable return (BCC). As a result, it was shown that the Southern region increased the amount of TEUs handled since 2016, even though the Sao Francisco terminal stopped handling containers. Another result is the capacity to identify some possible improvements to each terminal. These results can be used to improve the terminal operation.

Smart and Sustainable Logistic Ecosystem of Panama: A Conceptual Model

Juan Marcos Castillo, Zoila Yadira Guerra de Castillo and Erick Jones

ABSTRACT

Greta Thunberg highlighted in her speech during the COP 2019 the lack of integrity about the goals of the countries in emission reduction when vessel and aircraft transportation has a great impact on pollution, and none of them were addressed. On the other hand, during the decade of the 2010s, the Panama Canal took the risk of expanding the canal to the third set of Locks, and a new type of vessel arrived, the Neo-Panamax, which increased the capacity per vessel from 8,000 TEUS to 15,000 TEUs. In other words, the Panama Canal expansion increased the efficiency of movements in global commerce while reducing the impact on emissions. Therefore, Panama is increasing the awareness about the logistics impact of the emissions, but there are still challenges because of the increment of 87.5% of the load movement into the Logistic hub of Panama. Consequently, there is a need to address real-time information about the performance of the Distribution Centers, the ports, and the interaction with the Logistic ecosystem in order to increase efficiency and reduce CO2 emissions. Thus, the Smart and Sustainable Logistic Ecosystem of Panama is the cornerstone of Latin-American international commerce to address the fourth industrial revolution, while Sustainable Development is a common need so the world reaches another century of peace.

Freight Transportation and Logistics Policy



Collaborative strategies for freight transportation using an ITS

Ana Maria Castañeda Velazquez, Juan David Suárez Moreno, Andres Polania, Maria Esperanza Riaño and Daniel Prato

ABSTRACT

Freight transportation is accounted for many negative externalities, such as congestion, emissions, noise, and accidentality, among others. However, goods movement is an important issue regarding the livability and competitiveness of a country. Having more efficient transportation systems can be the difference between the success or failure of economies, as reported in the LPI (Logistics performance index). Recent technology development such as information systems, the internet of things, and collaborative economies can be an answer for solving transport inefficiencies. Literature has reported the use of intelligent transport systems as a useful tool to improve the efficiency, safety, and environmental performance of vehicles and transport systems. Below novel system and its real application that is based on the concepts of supply chain collaboration is presented, resulting in important benefits for the companies involved, improving utilization rates, and diminishing costs. Finally, some practical implications are presented.

Truck Transportation in the Americas: A cross-comparison analysis

Andres Villena, Vivian Ruiz, Guilherme Mendonça and David Correll

ABSTRACT

The road freight mode is the backbone of the national transportation systems in the Americas. Each country has different characteristics that have a direct impact on how transportation is procured and managed in the region. This paper conducted a comparative cross-country analysis of the most significant road freight transport systems of Latin America (Brazil, Argentina, Colombia, and Mexico) and North America (United States) based on the newly proposed concept of the Truck Transport Performance Index (TTPI). The objective is to provide practitioners and researchers an extensive overview of the main transportation practices regarding procurement, truck drivers' labor market, innovation, cost management, environmental topics, and public policies. Semi-structured interviews with main transportation stakeholders such as carriers' companies, multinationals, and transportation agencies were conducted, and final results were presented based on qualitative coding methodology.

Observatory of Urban Transport of Cargo OTUC-QUITO

Bernardo Puente-Mejia, Carlos Suárez-Núñez and Clara Orellana-Rojas

ABSTRACT

Constant urbanization growth offers several benefits to citizens, such as access to education, services, and labor markets. However, logistics problems such as volume and frequency of deliveries, poor infrastructure, traffic congestion, and air pollution arise following the continued expansion of cities and the growing demand for goods and services on a larger scale. There is a lack of information regarding the dynamics of urban freight distribution in such complex systems, so there is an urgent need for technological and information platforms that allow analysis and help the decision-making process for both private companies and the government. In response to this need, rises the Observatory of Urban Transport of Cargo OTUC, a technological platform that focuses on the systematic and continuous process of data collection of the urban freight transportation system. This technological tool analyzes and converts GPS data of cargo vehicles into valuable information, generating the conditions that allow to monitor and validate their behavior and evolution over the years. Furthermore, the OTUC observatory promotes the participation of the main agents involved

in the urban freight transportation system, such as private companies, public policy makers, citizens, and academia, to collaborate in better decision-making processes.

Stakeholder Perceptions of Urban Freight Transport in Brazilian Historical Cities

Leise Kelli Oliveira, João Guilherme De Costa Braga França, Carla De Oliveira Leite Nascimento, Artur Diniz Rocha Macedo, Mylena Cristine Rodrigues Jesus, Gustavo Peixoto Silva, Leonardo Herszon Meira, Ligia Rabay and Francisco Gildemir Ferreira Silva

ABSTRACT

This paper presents retailers' perceptions of urban freight transport (UFT) in Brazilian historical cities. Retailers in the historic center of 7 cities were surveyed: Diamantina, Olinda, Ouro Preto, Recife, São João del Rey, Serro, and Tiradentes. Operations were characterized, and UFT problems were identified. Freight solutions were faced with the UFT problems. Results show similarities between operations and problems related to the historical centers. Therefore, the framework proposed could be useful in freight policies for these cities.

A big data model to enable better decision-making by public authorities on-road logistics corridors

Diego Gutierrez-Rubiano, Juan Carlos Martinez-Rodriguez, Andres Cardenas, Carlos Ramirez-Sandino and Catalina Silva-Plata

ABSTRACT

The information management of logistics operations is a necessary process to guarantee the correct value chains' performance. Colombia currently ranks 58 in the Logistics Performance Index, and despite the advances in Information and Communication Technologies in the country, the National Ministry of Transportation (the maximum organism conducting logistics public policy) still lacks a tool that can summarize operational information of freight flows within the country. Understanding that Big Data applications do not only encompass private interests but this study was also conducted to establish what kind of Big Data model was needed to build a visualization platform that would help the Colombian Ministry of Transportation to enact operational logistics' public policies more accurately and efficiently. The main result of the Project was a Big Data model containing separate panels for each family indicator contemplated (e.g., freight flows, vehicles capacity utilization analysis, CO2 emissions, operational costs, and incidents). Also, the platform allows any user to visualize information of liquid and solid mobilized merchandise separately and to organize it on a daily, weekly, monthly, quarterly, and annually basis. This technological development is expected to help the operational decision-making process in the Ministry but also in the private, academic, and community sectors.

Collaboration in urban freight distribution: Results of two pilot tests

Diego Gutiérrez-Rubiano, José Hincapié-Montes, Andres León-Villalba, Jackeline Narvaez and Cesar

Becerra

ABSTRACT

The urban freight distribution (UFD) processes represent externalities and inefficiencies to the community and the private actors involved. The collaborative enterprise approach has been

implemented during the last decades as a solution to the referred problems. The aim of this study is to present the results of two pilot tests for collaborative logistics strategies carried out in Bogotá, Colombia. The tests were conducted to assess the collaborative logistics strategies' efficacy in the reduction of congestion and contamination as well as their impact on companies' efficiency. The initiatives evaluated were: (a) freight consolidation and (b) unload scheduling at retailers. In both cases, benefits were evidenced for the companies (-26% on average freight and +83% on vehicles occupancy) as well as the community (-23.5% parked trucks on roads and -7% emissions). Nonetheless, the results do not possess statistical sufficiency. Further research could complement the factors and methodologies that facilitate organizational collaboration.

Traffic and Congestion Effects of Urban Last-Mile Deliveries. Measuring Impact and Assessing Policy Measures

Bernardo Puente-Mejia, Sofia Rivas, Rafael Leon, Matthias Winkenbach and Milena Janjevic

ABSTRACT

Urban logistics activities, such as transportation of goods, are critical to attend to the growing customer needs, especially in highly populated cities. Rising urbanization rates lead to higher demand rates, both for goods and services which must be served. Satisfying the needs created by this migration, among other factors, certainly adds complexity to the environment of urban delivery. In developing economies, such as Latin America, the problem is more critical due to outdated infrastructure and poorly designed public policies. This study analyzes traffic congestion generated by freight transportation within highly dense urban street segments from Quito, Ecuador, and Guadalajara, Mexico. Streets with high commercial density and heavy traffic congestion were selected and studied in-depth. Observational methods were used to understand the behavior of traffic in terms of vehicle inflows, outflows, and parking activities. In both cities, over a thousand disruptive parking events were collected to simulate and evaluate the best policies to leverage traffic in such streets.

Government measures for urban freight transport: Perceptions of Brazilian scenario

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ABSTRACT

There has been growing interest among municipal and academic administrators in assessing and implementing measures to mitigate the effects of Urban Freight Transport (UFT). Therefore, this paper seeks to identify, through a Systematic Review of Literature (SRL), the main UFT initiatives implemented by public Authorities in cities worldwide, identifying the impacts that the application of such measures has generated in terms of sustainability. Considering the lack of quantitative research on the impact of the implementation of these UFT initiatives by the public sector identified in the study, especially in the developing countries, a survey was carried out with professionals and academics on the subject, aiming to identify the initiatives that are most suitable to mitigate the negative impacts generated by the UFT considering the scenario of Brazilian cities, as well as to evaluate the main obstacles found in the implementation of such initiatives. Results obtained, contextualized according to the size of the cities where such measures were implemented, provide a primary guide to a public manager that considers not only the stakeholders in the UFT management but also the population context of the municipality, its capacities, and limitations, aiming to select measures with the best possible match between expected goals and results obtained.

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