# SUPPLY CHAIN MANAGEMENT AND LOGISTICS IN LATIN AMERICA: A MULTI-COUNTRY PERSPECTIVE

Selected Papers from the 2016 MIT SCALE Latin American Conference on Logistics and Supply Chain Management – 21–22 March 2016, Cambridge, MA

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Chapter 1

# Introduction to Supply Chain Management and Logistics in Latin America

*Josué C. Velázquez Martínez,*
*Hugo Tsugunobu Yoshida Yoshizaki and*
*Christopher Mejía Argueta*

## How Relevant Is Latin America? Challenges and Opportunities

Within a variety of countries considered emerging economies, Latin America has received special attention in the last years. The region accounts for more than 625 million people with approximately 5% of the total world Gross Domestic Product (GDP; ECLAC Report Latin America, 2016). The Inter-American Development Bank (IDB) has labeled Latin America as a region with large market potential (Marczak, Engelke, Bohl, & Saldarriaga, 2016), specifically for the high potential for significant investments. In addition, in the last 20 years, the region has moved from a low-cost market to being a significant player in the world economy (Ruiz-Torres, Mahmoodi, & Ayala-Cruz, 2012), with five of its countries ranked among the world's fiftieth largest by GDP.

Unfortunately, Latin America faces most difficult challenges, such as poor infrastructure, expensive and inefficient logistics networks, and multiple social concerns (Carneiro & Brenes, 2014; Ruiz-Torres et al., 2012; Tanco, Jurburg, & Escuder, 2015). In addition, and since approximately 80% of the population lives in cities (Blanco & Paiva, 2014), the transportation intensity for both passengers and cargo is expected to grow in the next years, and thus, we foresee an increase of complexity in managing delivery operations in urban areas. For example, some studies indicate that by 2030, there will be more vehicles in developing countries than in developed nations (Wright & Fulton, 2005). These figures also suggest that the environmental impacts and pollution due to transportation will increase as well, probably as the largest contributor to emissions. Furthermore, Latin America has still more challenges, for example, income inequality, that is

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the region remains the most unequal in the world (Barcena & Byanyima, 2016). This situation mostly affects the low-income class who does not have access to basic services like potable water, electricity, and internet, as well as nutritious food.

While all these challenges are not exclusively for the field of supply chain management and logistics, the negative effects of companies, organizations, and consumers related to logistics operations in Latin America are evident. Some key questions are as follows: How to bring efficiently products and resources to the population? How to minimize environmental impacts in last-mile delivery operations? How to balance operational efficiency and financial performance?

To properly answer these questions, we must align the research agenda for the region with the challenges and opportunities of Latin America.

## Defining a Research Agenda for Latin America

In 2008, the MIT Center for Transportation and Logistics and GS1 firm LOGYCA signed a multiyear 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 more than 20 academic partners from top universities in Latin America, to work on knowledge transfer and research synergies. The vision of the MIT SCALE Latin America network is to lead innovative research initiatives with the purpose of creating and applying knowledge for the betterment of the region.

As a key initiative of this regional alliance, the MIT SCALE Latin America and CLI organize every other year an academic conference with researchers, students, and practitioners from supply chain management and logistics, coming from all over Latin America. In this book, we present a selection of 11 chapters (one per chapter) from the 2016 MIT SCALE Latin America conference held at the MIT campus on March 21–22, 2016. We organize the content in three parts: Section I – General methods in Supply Chain Management, Section II – Applied research in Latin America, and Section III – Case studies in Latin America.

While conducting applied research in supply chain management in Latin America is the main goal of our book, the literature presents different approaches to conduct this type of research, mainly based on empirical analysis and quantitative methods. Since we identify the relevance of both approaches, we present, in Section I, two chapters that discuss general methods in supply chain management and logistics. In Chapter 2, Perez-Franco (2018) presents a new approach to evaluate the supply chain strategy of an organization. This study focuses on scholars interested in assessing a specific supply chain strategy. The research method proposed in this chapter is based on qualitative analysis, that is, the author presents insights derived from empirical research. In contrast, in Chapter 3, Louzada Ribeiro et al. (2018) describe a hybrid heuristic method that combines a metaheuristic with an exact algorithm to solve a two-stage version of the facility location

problem. While no practical application was conducted, the authors present a new mathematical approach to the problem that is able to provide good solutions.

In Section II, we present an interesting set of applied research that focuses on solving specific challenges in Latin America. One key element in sustainable logistics is waste management. Depending on the type of waste, it is possible to determine proper supply chain management strategies. In Chapter 4, Rojas-Trejos and González-Velasco (2018) present a practical case for waste management for the context of Valle del Cauca, in Colombia, which is the third region that generates more waste in the country. The authors discuss a location model for solid waste disposal centers by using a multicriteria setting that considers multiple objectives, such as costs, taxes, and environment. Following the topic of green transportation for last-mile operations, in Chapter 6, Machado de Oliveira et al. (2018) describe a comprehensive methodology that assesses last-mile distribution strategies in terms of environmental and economic aspects. The authors present a practical application for the distribution of a postal company that operates in Rio de Janeiro, Brazil.

Improving last-mile operations might be extremely challenging, specifically due to the complexity of big cities and their transportation intensity; many of the large cities in Latin America are struggling with extreme traffic congestion, specifically in rush hours. In Chapter 7, Chicaiza-Vaca and Hidalgo-Carvajal (2018) present a set of indicators to characterize delivery areas based on a variety of qualitative data collected throughout observation, such as the amount of vehicles, fuel consumption, and traffic disruptions. The empirical study is conducted in the city of Bogota, Colombia.

In addition, one of most relevant countries from the logistics perspective is Panama, specifically because of the Panama "Canal." The Panama Canal moves hundreds of millions of tons per year, and the expansion project has been on the agenda of Latin America in the last few years. In Chapter 5, Castillo et al. (2018) discuss an empirical study to assess Value-Added Logistics-Services (VALS) after the Panama expansion. The study identifies services that seem to be more valuable by the customers.

Finally, in Section III, we present case studies applied in the context of Latin America. In these chapters, there is less focus on methodological contributions, and there is a strong emphasis on real-case applications that have high impact in solving real problems for companies and the society. A nice example is discussed in Chapter 8 by Fierro et al. (2018). The authors describe a difficult social problem of accessibility of potable water for the community of Pamplona Alta, Peru. By using a mixed-integer linear program, the authors present a new distribution network that provides a practical solution to efficiently satisfy water demand in that community.

Another main player in logistics is the government authorities, who, besides providing the transport infrastructure of a city, are also in charge of defining public policy for freight operations. In Chapter 9, Yoshizaki et al. (2018) describe a pilot to test off-hour delivery in the city of São Paulo, Brazil. The pilot was conducted with major stakeholders for urban logistics, including local authorities. The study helps to determine the opportunities and threats for

establishing a successful public policy related to shifting deliveries to late night in order to mitigate traffic congestion.

Another application for the context of urban logistics is discussed in Chapter 10 by López et al. (2018). The authors describe the logistics activities related to loading and unloading goods in two zones of the city of Quito, Ecuador. Using actual commercial activity data, they present a solution based on the optimal number and location of loading and unloading bays in each zone.

Finally, in Chapter 11, Manotas-Duque et al. (2018) present an inventory management problem applied to a company in the aluminum industry in Colombia, with focus on a key Chinese supplier. The authors analyze the financial impact of the raw material contract proposed by this supplier and discuss different indicators to assess risk. With this last chapter, we complete the description of the content of the book.

To conclude this Chapter 1, we would like to invite the reader to enjoy this set of selected chapters that are the result of many years of work conducting applied research in Latin America. We hope that this book will contribute to educating researchers and practitioners about the opportunities of Latin America and motivate them to continue looking for more impactful research in the region.

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