

A Collaborative Supply Chain Management System for a Maritime Port Logistics Chain

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ABSTRACT

In this article we propose a collaborative logistics framework for a Port Logistics Chain (PLC) based on the principles of Supply Chain Management (SCM) that rely on stakeholders integration and collaboration, providing a reference model for the inland coordination of the PLC. A comprehensive literature review was conducted, analyzing several cases in which SCM practices have been implemented as well as studies related to port development, governance, coordination and best practices associated. This background information was used to identify current gaps in logistics management practices and potential scopes of intervention within the PLC to suggest a redesign process and configure new structures under a collaborative scheme, following the guidelines of SCM.

Keywords: Port Logistics Chain, Supply Chain Management, Demand Management, Orders Management, Vehicle Management.

RESUMEN

Entender las disrupciones y su propagación a lo largo de las cadenas de suministro se ha vuelto crítico para el diseño de cadenas de suministro globales operando en economías emergentes. Esto no solo implican pérdidas económicas a cualquier organización involucrada en una cadena de suministro, sino que además disminuye la competitividad logística nacional. Este trabajo provee elementos numéricos de la importancia de la seguridad en América Latina y al mismo tiempo, propone un modelo de evaluación desde la metodología de dinámica de sistemas con base en información real, capaz de establecer escenarios para medir los impactos relacionados de la propagación de interrupciones en la cadena de suministro causados por actos criminales. Finalmente, se presentan conclusiones para el diseño de cadenas de suministro más resilientes, así como propuestas de investigación futura.

1. Introduction

A port logistics chain (PLC) embraces all the global logistics chains that operate through a seaport, including different stakeholders involved in the international trade processes, such as the importers and exporters, the Port Authority, the terminal operators, customs, customs agents, transport companies (ground and maritime), freight forwarders, empty container parks, etc. The PLC faces important challenges for the integration of those supply chains processes and the huge

number of public and private stakeholders. Another challenge faced by the PLC is the existence of several sources of variability that affect the import and export flows.

This could be either from the maritime perspective with variability in the arrival time of ships to the port, or from the inland perspective with uncertainty regarding the exact arrival time of external trucks to the port terminal, as well as

service times at each echelon of the logistic chain. These factors strongly impact the resource and capacity utilization of the different stakeholders. Hence, the PLC should focus on the reduction of variability through a better coordination among the physical and documental flows, based on the well-known inter-enterprise concepts of Supply Chain Management (SCM).

Chilean foreign trade has experienced a sustained growth in the last decades, as it can be observed in the reports of international commerce provided by the Chilean Customs and related gremial associations. Due to free trade agreements with several countries and the trade globalization process, this trend is expected to continue in the future. As a consequence, port infrastructure has been improved and increased.

However, after performing in site visits to Chilean Ports and interviews with key stakeholders such as transport operators and stevedore's managers, those investments in port infrastructure lack of modifications and improvements in logistics processes. Previous issue is also supported by the current position of Chile (or any Latin American country) at international benchmark measures such as the Logistic Performance Index (LPI), in which Chile occupied the first place in LATAM in 2012 report, but the position number 39 with respect to developed economies. Hence, it is clear that there is room for logistics improvements that may enhance the competitiveness of international trade of the nation.

Previous issues and the fact that international trade has significantly increased, has led to high logistics costs, congestion at port facilities, and document based processes prone to mistakes and duplications, among other problems. As a solution to the above problem, we present a proposal for the design and implementation of a collaborative logistics framework as a reference model for the coordination of the inland operations of the PLC. The proposed framework includes three main components:

(1) Management of Port Logistics Governance. This is based on the existence of a Port Community with a well-defined organizational structure that facilitates dialogue and communication among the public and private

stakeholders involved in the port logistics chain, fostering the analysis and continuous improvement of the international trade procedures.

(2) Port Logistics Operations Model. This considers the relationship between the main infrastructure of the port and the logistics processes associated, which could be centralized, decentralized or hybrid, according to the existence or not of a pre-terminal or a facility that is used as an extension of the port where total or partial flows should be directed;

(3) Logistics Management Platform System. This includes a conceptualization of the planning, scheduling, and control activities cycles of physical and information flows and the technological systems that support them through the entire port logistics chain.

The remainder of the paper is organized as follows. A literature review on SCM and other studies related to Port Operations and Development is addressed in Section 2. Section 3 presents the proposed framework and its main components and Section 4 provides details related to the Logistics Management Platform System and the subsystems Demand Management System (4.1), Vehicles Management System (4.2) and Order Management System (4.3). Section 5 presents a brief description of the case of a Chilean PLC. Conclusions, managerial insights and further research are provided in section 6.

2. Literature Review

Due to the globalization, e-commerce, and mass customization trends, global logistics management in business operations has become more important than ever. In this regard, transportation is becoming a more strategic business function because transport costs are accounting for a larger percentage of the cost of goods sold [1]. In addition, delays in transit time can undermine enterprise performance, affecting the organization's competitiveness [2]. Consequently, ports are now seriously exploring the potential of the supply chain management (SCM) concept. Effective SCM is an essential strategy for enterprise success in global and e-markets to get products to market faster and at a minimal total cost [3-5].

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