

Resilience of Logistics Service Providers Facing a Port Strike: A Case Study

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Abstract

The purpose of this paper is to study the impact of a stevedores' port strike on logistics service providers. It aims to analyze the negative effects caused by this disruption, and the strategies logistics service providers may implement to sustain their performance levels and quickly recover from disruption. With this objective, a case study comprising three logistics service providers is developed. There are evidence that "Handling and management cargo delay", "Delay in deliver of orders" and "Incapacity to fulfill orders" are the stevedores' port strike negative effects with high impact and frequency. Because of these negative effects the logistics service providers' key performance indicators related to reputation, loss of capacity and operation stoppage are diminished.

Keywords

Resilience, Port Operations, Logistics Service Providers, Supply Chain

1. Introduction

The worldwide container shipping industry is one of the most critical links in the expansion of trade and global supply chains (SCs) (Notteboom and Rodrigue, 2008). An evidence of this fact is referred by Da Cruz et al. (2013): every year, over 35×10^8 tons of cargo pass through European ports. Ports are complex and multipart organizations in which institutions (e.g., customs authorities) and logistics service providers companies (e.g., port operators and freight forwarders) often intersect at various levels, collaborating to create and distribute value, while also pursuing their interests and objectives (Bichou and Gray, 2004).

In maritime commerce, there are numerous entities operating, and SCs can be extremely complex, with a lot of echelons (Carbone and De Martino, 2003; Lam and Song, 2013). In this context, a simple disruption can widely propagate its negative effects along the SC. This paper focuses on one specific disruption: the stevedores' strike. The resilience of a SC is its ability to deal with unforeseen events, to respond to disruptions they might cause, and to recover while maintaining the supply chain performance at the desired level (Ponomarov and Holcomb, 2009). Nowadays, ports are considered as integrated logistics hubs (Carbone et al., 2003), and thus ports malfunctions can have huge impacts on logistics service providers, which in turn can spread negative effects all over the SC. To prevent it, ports should be functional and must be aligned to excellence: failures in their operations would affect logistics service providers and respective SCs. It is therefore of great importance for companies that rely on logistics service providers be resilient and implement measures to minimize the impact of those disruptions.

The main objective of this paper is to understand the role of logistics service providers in assuring the resilience of a SC under a port disruption caused by stevedores' port strike, that is, their ability to return to the original state or to a new one, more desirable, after experiencing a stevedores' port strike. The following research questions will serve as guidelines for this study: i) What are the negative effects of a stevedores' port strike on logistics service providers? ii) What are the key performance indicators mostly impacted by a stevedores' port strike occurrence? To answer these questions, a case study methodology comprising three companies that perform services as logistics service providers in the SC is used. The companies' behavior during the 2012 and 2013 stevedores' strike in the port of Lisbon is the case study focus.

2. Theoretical background

A logistics service provider is an external company which manages, controls, and delivers logistics activities for their customers (Carbone and Stone, 2005). It may also manage and develop features such as information systems and inventory, provide customer-order fulfillment services and value-added activities such as secondary assembly of products (Laarhoven et al., 2000). Pallis and Veggelas (2010) provide examples of partnerships among port authorities and port operators. Also, Carbone and De Martino (2003) refer the existence of strategic alliances within the port environment. An example is CMA-CGM, a liner shipping company that has a concession on the port of Le Havre, which supplies value-added logistics services to the Renault automaker through the completely knock-down transportation. Le Havre port also offers other advantages to Renault automaker: a vehicle preparation center is sited in Le Havre port allowing decentralized storage with benefits in minimizing stock levels and related costs. In this method, the vehicle parts are built in factories/distribution centers and later on exported to be assembled at the destination point; in this case, at the vehicle preparation center in Le Havre.

Physical distribution is an activity vulnerable to many external factors (such as fuel price volatility or extreme weather conditions) that may cause negative impacts jeopardizing the companies' performance, leading to a rising uncertainty in the SC (Andreoli et al., 2010). According to Carbone and De Martino (2003), the ability of logistics service providers to contribute to value creation in the port context depends on the following attributes: reliability, punctuality, frequency, available information, and security. Lam and Song (2013) propose a hierarchical structure of a port's network performance evaluation considering three categories of Key Performance Indicators (KPIs): i) quality (the standard of the assets, service, process, planning, staff, shipment, documentation, safety, security, management, and control in connection to a port's networks); ii) timeless (time-related performance in terms of transit time, frequency, responsiveness, reliability and agility); and iii) cost (covering direct cost, indirect cost, logistics cost, shipment cost, ordering cost, fluctuation of cost and cost reduction performance). Bichou and Gray (2004) consider three categories of performance indicators to measure port efficiency: i) physical indicators (e.g., ship turnaround time, ship waiting time, berth occupancy rate, working time at berth, cargo dwell time or the time elapsed between cargo being unloaded from a ship until it leaves the port); ii) productivity indicators (e.g., labor and capital required to load or unload products from a ship); and economic/financial indicators (e.g. operating surplus or

total income, expenditure related to gross registered tonnes (GRT) or net registered tonnes (NRT), or charge per twenty-foot equivalent unit (TEU)).

Currently, factors such as global economic performance, market and competitors' expansion and high expectancies in quality services from customers, lead to the necessity for SC to be resilient, i.e., to have the ability to recovery quickly in case of a disruption. The correct implementation of the resilience paradigm allows companies and their SCs to handle with the inevitable disruptions in a more efficient way. According to Carvalho (2012), there are certain SC "characteristics" that provides the ability to "absorb" the potential damages and to minimize the failure severity. The characteristics are related to the SC capabilities, and they are interconnected to SC mitigation and contingency strategies, which should be able to help a company to reduce cost and/or to improve customer satisfaction under ordinary circumstances. These strategies also should enable a company to sustain its operations during and after a major disruption.

The maritime transportation system is composed of several processes encompassing open sea operations (such as vessel processes) and land operations (such as port infrastructures). Øyvind et al. (2011) define SC failure mode as the loss of the key functions and capabilities of the SC reducing or removing the ability of the SC to perform its mission. Thus, these authors propose the following typology for the failure modes in a maritime transportation system: i) internal operations interrupted (e.g., power failure or machine breakdown); ii) communication failures with vendors, customers or other sites (e.g., internet down); iii) loss of supply materials quality (e.g., supplier failure); iv) shipping unavailability (e.g., ports closed); v) work staff not available (e.g., due to a strike occurrence); vi) financial cuts (e.g., customer payments late); and vii) low customer demand (e.g., new competition).

Gurning and Cahoon (2011) consider that causal factors may trigger maritime disruptions (e.g., security threats, strikes or severe weather conditions) which in turn will provoke a set of negative effects as cargo rerouting, poor business reputation, higher logistics costs, loss of profit and/or higher prices of commodities handled. Colicchia et al. (2010) analyze the impact and likelihood of occurrence of disruptions in the port activities. According to these authors, a strike of port workers is a disruption with a high impact on port activities. So, it is of great significance to implement an appropriate set of management strategies to prevent the negative effects that can be generated by this disruption.

The literature contains few studies related to disruption management in port operations. In a study made by Gurning et al. (2011) and Gurning et al. (2013), the authors identify two types of strategies used to manage a maritime SC, during and after a disruptive event. They conclude that the most common strategies used to manage a maritime SC during a disruptive event are: i) to adjust new routes on the maritime leg, ii) to use strategic inventory (when there is no alternative source available), iii) to use backup systems, and/or iv) to implement business continuity actions. Other strategies, such as i) inventory pooling at ports, ii) changes in working practices, iii) applying other SC links, iv) postponement delays, v) formal assessment of risk, vi) determining the maximum allowable interruption, vii) risk impact monitoring, and viii) re-evaluating contingency plans are considered as post-disruption strategies. Colicchia et al. (2010) study considers the following set of strategies: i) pre-booking containers; ii) bonded warehouse; iii) shifting the customs inspections from the port of destination directly to the final destination; iv) service level agreements with shipping companies or freight forwarders on loading priorities at ports; v) use of multi-port calling; vi) use of hub and spoke system; vii) use of a combination of sea/air service; and viii) use of air freight. So, logistics service providers play a critical role in the deployment of the resilience strategies. They are the SC entities responsible for the material flows continuity within the port.

3. Case study

3.1 Research methodology

The case study focuses on logistics service providers operating in the port of Lisbon. This port suffered from stevedores' long strikes in the 2012 and 2013 last trimester. Three logistics service providers were selected to cover different logistics activities in a SC context: a freight forwarder, a ship-owner, and a port operator. The logistics service providers offer international services, and they rely heavily on the proper functioning of ports. The research is focused on the impact of port strikes in logistics service providers and their resilience. The multiple-case design allows the analysis of a particular phenomenon in diverse settings, through cross-case analysis and comparison. Multiple cases are also used to predict similar results or to produce contradictory results for predictable reasons (Yin, 2002).

Empirical data were collected from primary sources (structured interviews with the director of operations, general manager and the president of the board of administration) and secondary sources (e.g., television news, websites, and conferences). The interviewees held positions related to the company's daily operations (operations manager, general manager and the president of the administration board) and also are highly aware of the phenomenon in the study having a thorough knowledge of it.

3.2 Case study description

The port of Lisbon's strike main cause was a law implemented in 2012 regulating labor in ports. The strike started in the last trimester of 2012, lasted for several months. A new strike began in the last trimester of 2013 and persisted until a settlement was made between port operators and the stevedore's unions in February of 2014. The case study involves three logistics service providers companies: Company 1 a freight forwarder, Company 2 a ship-owner and Company 3 a port operator.

To understand what are the port strike negative effects, in a structured interview the interviewees were asked to indicate the frequency of negative effects occurrence and their impacts in the operation activities on a 5-point Likert-type scale (1- "Never occurs/Has no effect", 2- "Rarely occurs/Rarely affects", 3- "Usually occurs/It affects operations in 50%", 4- "Often occurs/Often affects operations 5- "Always occurs/It affects all operations") (Figure 1). To support a cross-case analysis, the average value for the port strike frequency of negative effects occurrence and its impact was computed. The risk associated with a strike was computed (Figure 2). "Handling and management cargo delay" and "Orders delivery delay" are the major risks associated with port strikes (whose score is higher than 20 out of 25, considering the 5-point Likert-type scale).

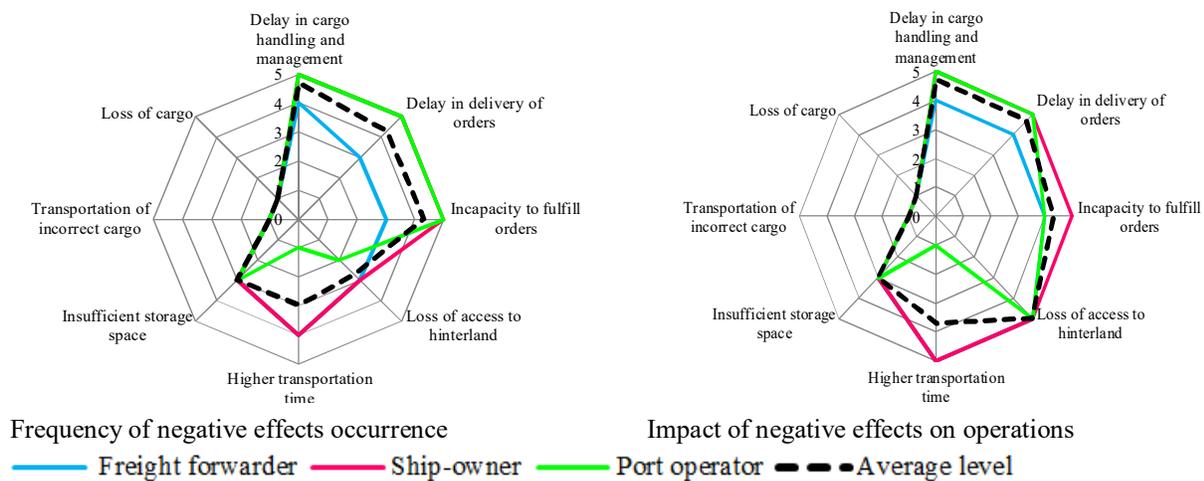


Figure 1 - Port strike negative effects: frequency of occurrence and impact

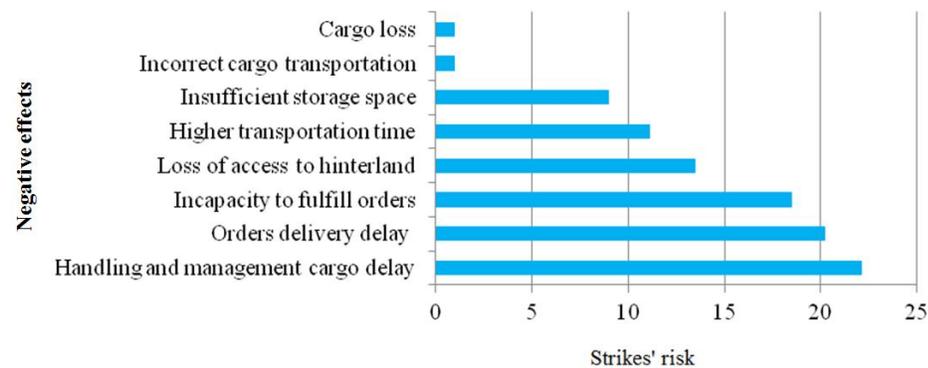


Figure 2 - Port strikes' risks

Figure 3 shows the strike severity through the size of each bubble (obtained by the product of the frequency and impact) highlighting the existence of three clusters of negative effects according to their severity.

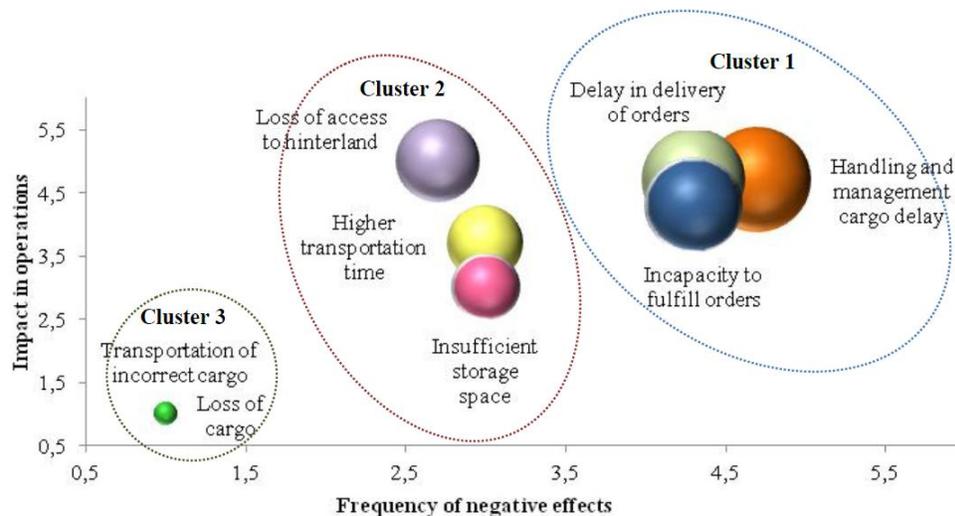


Figure 3 - Impact versus frequency of negative effects

In the first cluster "Handling and management cargo delay" is the negative effect with the highest severity (22.1). For the freight forwarder, a long port strike affects the maritime services leading to incapacity to containerize all cargo, slowing the handling activity and management of cargo; this can result in the stoppage of secondary operations or even the refusal of new services. The ship-owner is also severely affected since this effect disturbs its schedule planning. For the port operator, this effect always occurs during a strike as there are no stevedores to handle the cargo. "Delay in delivery of orders" is the second negative effect with the highest rate (20.2). For the freight forwarder, this effect depends on the type of container being transported. In the case of less-than-container loads (LCL), this effect is more severe than with a full container load, as the negotiation with several customers usually takes a long time, which may provoke a big delay. For the ship-owner and the port operator, LCL affects all the operations since during a strike the ship cannot load/unload their cargo in the scheduled period, impairing pre-schedule services. "Incapacity to fulfill orders" is the third most relevant negative effect (18.5). The logistics service providers considered that their lack of capacity to fulfill orders leads to the refuse of services originating opportunity costs and a negative company image.

Within the second cluster "Loss of access to hinterland" is the negative effect with a long-term impact in the SC. Losing the hinterland access due to a temporary loss of transport connections or orders (that were rerouted to other areas) results in a loss of potential service. If the access to the hinterland is undefined may occur permanent customers' loss. "Higher transportation time" is a consequence of the cargo rerouting strategy, which is not implemented by the port operator, since it does not transport cargo. The rerouting strategy is often used by the ship-owner and the freight forwarder, which leads to higher transportation duration. It affects all the operations because the ship(s)/truck(s) that transport the cargo to a different location spend extra time in the transport, which can interfere with the schedule services planning. "Insufficient storage space" is associated with the amount of workload and the strike duration. So, in average, it is a negative effect that will occur in a long strike, and that can lead to the refusal of other services due to lack of physical space to cargo storage. However, these situations are brief, since customers put all efforts in receiving their cargo as fast as possible, avoiding getting stalled along the SC. Logistics service providers under study considered that the negative effects "Transportation of incorrect cargo" and "Loss of cargo" are not enhanced by a port strike since they reached the lowest rates (both with a 1.0 value).

To identify the proper set of KPIs that could be used to measure the logistics service providers performance during a long port strike, the interviewees were asked to give the relevance of eleven KPIs using a 5-point Likert-type scale (1- Not relevant, 2- Few relevant, 3- Moderately relevant, 4- Relevant, and 5- Very relevant) (Figure 4).

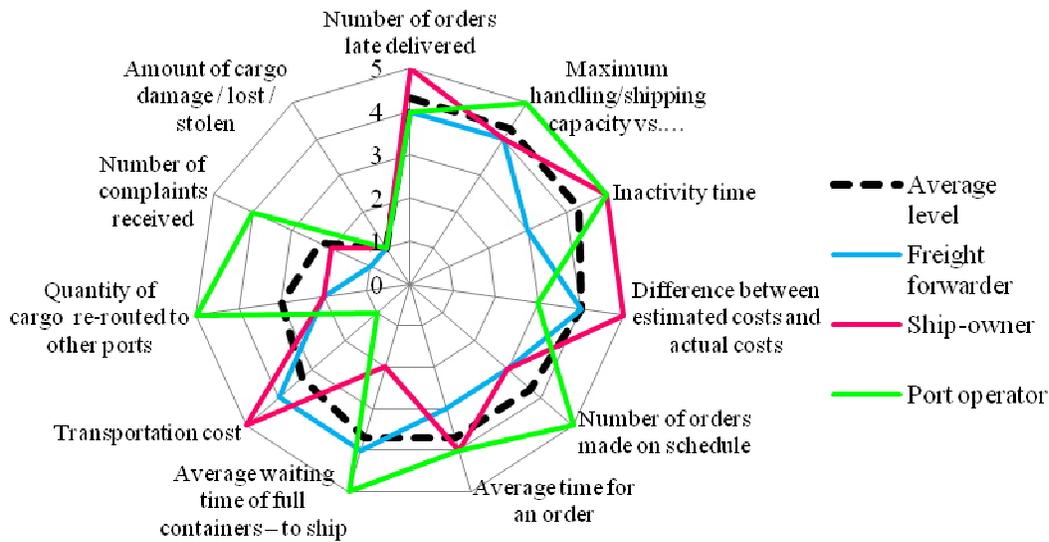


Figure 4 - Key performance indicators relevance in a port strike

The logistics service provider aims to deliver orders on-time to customers, which in a strike can be extremely hard. So, according to the three companies the "Number of orders late delivered" is the most important KPI as it can be used to evaluate, for example, the necessity to upgrade infrastructures to sustain a strike better. The "Maximum handling/shipping capacity vs. Containers effectively handled/shipped" is the next most important KPI as it allows analyzing resources utilization and efficiency during a strike. The KPI "Inactivity time" allows ascertaining the resources wastage, the decrease in work volume and the opportunity cost due to the strike. "Difference between estimated costs and actual costs" is very important for the ship-owner and the freight forwarder as it permits to analyze the transportation costs increase and gives a clue on the company profits/losses due to the strike.

In a strike "Number of orders made on schedule" is a KPI more relevant to port operator, once the cargo already on their premises has no possible to be rerouted. The KPI "Average time for fulfilling an order" takes into consideration the order's dimension and the number of customers relying on them. For the port operator, this KPI can be used to analyze the increase in the required time to fulfill an order according to the strike adherence level. "Average waiting time of full containers-to ship" is also more relevant to the port operator, since its main function is to handle cargo in the port's quay and the time consumed during this activity is crucial to his success.

As the freight forwarder performs a cross-docking service, having the responsibility for the loading and unloading of cargo and the transport as well, this KPI is also taken into account by him. "Transportation cost" is an irrelevant KPI to the port operator since it does not perform the transportation. It is, however, of great importance to the ship-owner and the freight forwarder for the cost increase due to the upsurge of mileage and time spent when cargo is rerouted. Sometimes, the customer covers the extra cost, and these companies can increase their profit margin on transportation. "Cargo rerouted to other ports" indicates the potential loss of service during the striking port. It is a KPI relevant only to the port operator since it provides services within Lisbon port and the work volume decreases significantly in this situation. Moreover, there is also a high probability of customers abandoning the port. The research port operator performs about 16 000 cargo movements per month, which are reduced to approximately 4 000 cargo movements during the strike and even two or three months after the strike has ended. For the freight forwarder and the ship-owner, this is not very relevant, as they perform the cargo rerouting and does not lose service. "Number of complaints received" and "Amount of cargo damage/lost/stolen" KPIs has low usefulness to monitor the strike negative effects. "Number of complaints received" is not relevant to the ship-owner and the freight forwarder since in a strike the complaints will not be about their service. However, for the port operator it is of major importance to examine the complaints during a strike once it provides data about the decline of the number of customers; with no considerable strategies to overcome the strike, risking the loss of customers (ship-owners that may terminate service with the port). These complaints can be transmitted to the port authorities that can help taking measures to safeguard the proper functioning of the port. The "Amount of cargo damage/lost/stolen" KPI is not considered relevant since a port strike does not potentiate the variation of this KPI.

4. Conclusions

The purpose of this study was to understand better how logistics service providers can be more resilient when facing a port strike, using as a case study the recurrent strikes in the port of Lisbon from 2012 to 2014. Using the case study empirical data it is possible to conclude that a stevedores' strike triggers several negative effects in logistics service providers that will eventually severely impair the whole SC. The most critical negative effect, regarding impact, is the "Loss of access to Hinterland," since it leads to loss of service in the companies under study. However, this negative effect has a low occurrence frequency, which makes it more manageable by the logistics service providers. The analysis of the negative effects severity (impact versus frequency) allows to identify the "Delay in cargo handling and management," "Delay in deliver of orders," and "Incapacity to fulfill orders" as the ones that have aggravated consequence on the logistics service providers operations. These negative effects reflect the material flow disruption that occurs on the SC during the stevedore's strike. Therefore, a stevedores strike will have a high impact in port activities, and the worst case scenario can cause a port clogging. These results are in line with previous researchers where the stevedore's strike is identified as one of the disruption with high impact in all port operations.

The negative effects were spread along the SC; the logistics service providers role is to minimize or avoid the propagation of the material flow disruption along the SC; they act as "buffers" and deploy a set of resilient strategies to assure the cargo delivery on time or to reduce the delay. All the companies under study consider that the anticipated communication with the port authorities is essential to prevent the strike negative effects. The freight forwarders deploy resilient strategies such as reroute cargo to other ports, so their customers receive the product on time or resort to outsourcing. The shipping companies tend to analyze other options, especially if they have other ports nearby that can "replace" the one in question or adapt their partnership strategies in areas such as geographic positioning, possible alliances, level of integration in their customers' services, among others. The port operators rely mostly on the negotiations with the stevedores' unions, and if necessary it resorts to outsourcing since during the strike period the available resources are depleted.

This study contributes to highlight the necessity of the logistics service providers to work with contingency plans and be prepared to adopt a set of resilient strategies to mitigate the negative effects that come from a disruption, which can be motivated by for example a stevedores' port strike. It would be very interesting if, to better understand the magnitude of this problem, future research about port strikes could present more quantitative data, instead of mainly qualitative. In particular, studies analyzing the impact of resilience strategies on KPIs would be useful in assessing the effectiveness of these strategies. Also, future studies should take into account the end customer, who will bring a new perspective to this issue.

Acknowledgements

The authors are pleased to acknowledge financial support from Fundação para a Ciência e a Tecnologia (PEst-OE/EME/I0667/2014) and FEDER/COMPETE (grant UID/ECO/04007/2013).

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