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Editorial

Risk management of logistics systems

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ABSTRACT

Nowadays, with the globalization of business operations, logistics systems are threatened by all kinds of uncertainties and disruptions. Almost every month, serious accidents in transportation and natural disasters all around the world are reported in the media. As a result, an effective and efficient risk management scheme is of a top most priority in the mind of all professionals in logistics management. This paper concisely explores risk management of logistics systems in several critical areas, namely disruption risk management, operational risk control, disaster and emergency management, and logistics service risk analysis. The papers featured in the special issue are also introduced and examined. This paper ends with a proposal of various future research directions for advancing risk management of logistics systems.

1. Introduction

According to the definition by The Council of Supply Chain Management Professionals, logistics is the "*process of planning, implementing, and controlling procedures for the efficient and effective transportation and storage of goods including services, and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements*".[1] Major activities in logistics include both inbound logistics and outbound logistics, and transportation and inventory control are two critical functional areas. A typical logistics system includes many members, from materials suppliers, manufacturers, distributors, wholesalers to retailers. It is rather natural that a logistics system, in most cases, operates efficiently and effectively only when all the corresponding members function properly. In other words, if any member fails to perform, the logistics system will easily collapse and fail to achieve its objectives. Nowadays, as logistics systems are more and more globalized, there are more and more members and hence the chance of having "logistics systems failure" is higher than ever!

It is a common belief that logistics systems, in the global business era, are vulnerable (Xanthopoulos et al., 2012) and open to many sources of threats (Sodhi et al., 2012). For example, the presence of accidents and political conflicts could create market disruptions which result in heavy loss to the involved supply chain members (Tang, 2006; Xanthopoulos et al., 2012). The high supply and demand uncertainties along the logistics system lead to a high level operational risk (Lewis, 2003; Cheong and Song, 2013). The occurrence of disasters, such as the Indian Ocean tsunami in 2004 (Altay and Green, 2006) and the Japan magnitude-9 earthquake in 2011, bring challenges to logistics systems and call for emergency supplies (Hu and Sheu, 2013; Sheu and Pan, 2014). The popular business measures such as logistics services outsourcing and strategic alliance also bring new dimensions of risk to logistics systems (Choi et al., 2016).

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[1] See https://cscmp.org/sites/default/files/user_uploads/resources/downloads/glossary-2013.pdf; retrieved on 9 March 2016.

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In the literature, logistics/supply chain risk management has been a popular topic over the past decade and many prior studies are devoted specifically to establishing systematic taxonomies and providing critical reviews on it (e.g., Juttner et al., 2003; Tang, 2006; Colicchia and Strozzi, 2012; Sodhi et al., 2012; Chiu and Choi, in press; Heckmann et al., 2015; Ho et al., 2015). In addition, a quick search in Google Scholar[2] with title words "risk" and either "logistics" or "supply chain" yields Table 1, which shows the number of related publications over the past few years. From Table 1, we can see that the number of publications over the past decade has increased significantly, and the number becomes rather stable and maintains at a high level over the past five years.

There is hence no doubt that risk management in logistics and supply chain systems, in both academia and industry, is a timely and important topic nowadays. As risk management in logistics and supply chain systems mainly include operational risk management and disruption risk management (Tang, 2006), and both disaster emergency management and logistics service risk management are emerging and critical research topics related to logistics risk management,[3] we divide our following discussions into the four respective areas: (i) disruption risk management, (ii) operational risk control, (iii) disaster and emergency management, and (iv) logistics service risk analysis. For each area, the related papers featured in this special issue are also introduced and discussed. After that, we conclude this paper by exploring future research directions on risk management of logistics systems.

2. Disruption risk management

In logistics systems, disruptions are brought by many factors which can be man-made or natural. For instance, the Hong Kong Chek Lap Kwok Airport stopped operations right after its formal opening in 1997 which led to serious disruptions of air-transport in Hong Kong and many other countries (as Hong Kong is a logistics hub in the region). Ericsson's operations were disrupted and it lost heavily after a fire accident happened in its supplier's factory in 2000. The shortage of cotton a few years ago, due to poor yields (brought by climate changes), resulted in supply disruptions and also severe financial loss to companies in the textiles and clothing supply chain. There is no doubt that disruptions bring huge problems.

To deal with disruptions risks, various measures have been proposed. For example, adopting proactive measures by making the structure of logistics and supply chain systems agile, and implementing the "sense and respond" strategy are effective schemes to handle disruptions. In this special issue, Ivanov, Pavlov, Dolgui, Pavlov and Sokolov study the scenarios in which a multi-echelon supply chain system can be re-planned in the presence of disruptions. The authors explore seven proactive structures for the supply chain and develop the recovery policies to re-organize the flows of materials in different disruption cases. They focus on how the proposed structures affect the service level and costs of the supply chain. Li, Zhang, Guan, and Zheng investigate how the decision sequence and channel leadership in the supply chain system affects logistics systems reliability. They consider a single-manufacturer single-supplier supply chain system which faces disruptions. The authors uncover that the logistics systems reliability is higher under the supplier–led case. However, the supplier–led case does not necessarily bring a higher profit for the supply chain system. Dunn and Wilkinson study the air transportation network problem in the presence of natural hazards and disruptions. The authors investigate both the adaptive reconfiguration strategy and the fixed re-routing strategy. They find that the adaptive reconfiguration strategy outperforms the fixed re-routing solution. In particular, they argue that the geographical location of airports would make the air transportation network vulnerable to disruption risks if the fixed re-routing strategy is adopted.

In addition to designing the proper contingency plan and the mechanism to proactively react to disruptions, the traditional financial risk management schemes such as insurance can also help. In this special issue, Zhen, Li, Cai and Shi examine whether the business interruption insurance can help to deal with disruptions for distribution center operations. The authors compare four strategies, namely the business interruption insurance strategy, the backup transportation strategy, the hybrid strategy which combines the business interruption insurance and the backup transportation strategies, and the basic strategy which does not include the business interruption insurance and the backup transportation. They find that the business interruption insurance and the backup transportation strategies are complementary and substitutable. The distribution center which aims to achieve the minimum profit loss will prefer the hybrid strategy most. However, adopting the hybrid strategy might lead to a longer transportation recovery time than the pure business interruption insurance strategy.

3. Operational risk control

In business, owing to the presence of uncertainties on supply, demand, market price, and cost, normal operations face a substantial level of risk (even in the absence of disruptions), and it is called the operational risk. Controlling operational risk requires proper understanding of the sources of risk and setting the right optimization objectives (Xiao and Choi, 2009; Heckmann et al., 2015). For example, Lewis (2003) proposes a theoretical framework to examine operational risk with the considerations of causes (inputs), consequences (outputs), and control. He argues that risk control is in fact an integrated process. Chiu and Choi (in press) review the use of classical mean–variance models from finance to conduct supply chain risk

[2] Based on the searching by the authors on 9 March 2016.
[3] See the recently published special issues in related areas (Starr and Van Wessenhove, 2014; Choi et al., 2016).

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