

Port Logistics Integration: Challenges and Approaches

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ABSTRACT

Introduction: Recent competitive market in the port sector highly depend on logistics practices, functions and activities and seaports play a key role in port logistics chains. Despite the well-articulated importance of ports and terminals in integrated logistics, the role of success factors in port logistics integration has been rarely mentioned. The objective of this paper is to fill this gap in the literature and provide an insight into how seaports and terminals may improve their logistics integration. **Design/methodology/approach:** First, a literature review of studies on logistics integration in seaports and terminals is conducted. Second, a new conceptual framework for port logistics integration is proposed to incorporate the role of the new variables emerging from the recent developments in the global business environment. **Findings:** The literature review has found the logistics process and operations, information integration, value-added services, and logistics practices being influential to logistics integration. However, most studies are relatively dated and have not considered the nature of seaport and terminal operations. A new conceptual framework is developed to extend the existing framework and incorporates the new variables namely organisational activities, resource sharing and institutional support. **Research limitations/implications:** The framework could be more detailed on each factor and consider actors perspective. Further testing and examination of the framework is needed for the validity of the results. **Originality/value:** This is one of the first studies provide a new approach to analyse the port logistics integration and highlight the actor's role in the port logistics chain.

Keywords: Maritime Logistics, Port Integration, Logistics Integration

1. INTRODUCTION

Recent changes in the service industry have led to increasing complexity of supply chains and underpin the point that logistics activities and practices are important parts of business strategy (Stock, Greis & Kasarda 2000). Growing competition has motivated companies to not only expand their internal operations but also focus on integrating their suppliers into the whole value chain practice (Prajogo, DI et al. 2015). Port logistics with the antiquity of thousands of years has developed along the development of international trade. It has been expected that around 90 percent of the world's merchandise and commodity trade is transported by ship and it is predicted to encompass 45 percent liquid bulks, 23 percent dry bulks and 32 per cent general cargo. This percentage has remained constant over the last century, yet the volumes have increased enormously in the last two decades (Jacobs 2012; Lam & Zhang 2014; Mangan, Lalwani & Fynes 2008). Although some similarities can be found between previous studies, it is necessary to take one-step backward and define logistics integration based on its critical factors. The current study aims at identify critical factors in port logistics integration (PLI) and propose a conceptual framework to measure PLI.

This article is structured as follows: section 2 presents the methodology and process of conducting the study including finding related journals and papers. In section 3, related literature will reviewed. Section 4 is related to main part of this study, which is proposing the conceptual framework. Section 5 describes the research propositions, implications and contributions of the current study. Finally, section 6 presents conclusions, limitations and future research opportunities.

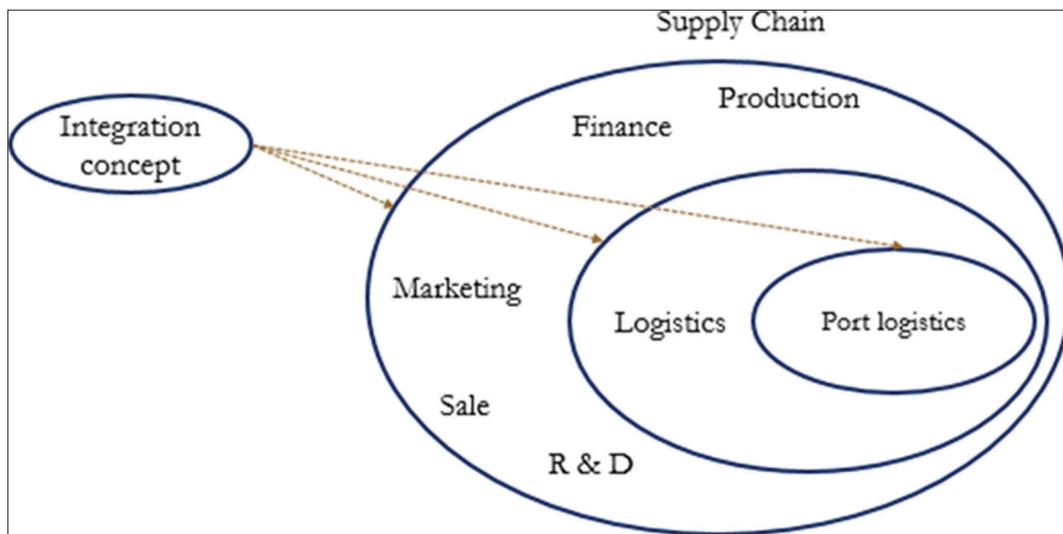
2. METHODOLOGY

The process of literature review is followed by Keele (2007) method which includes: Planning the review (recognize rational for review, starting the review, set the research question, develop and evaluate the review protocol), conducting the review (research identification, primary studies selection, quality assessment, data extraction and monitoring, synthesising the findings)

and reporting the review (identify dissemination process, set a proper format, evaluate the final report). According to this aim, the main research question defined as follows:

Main research question: what are the critical factors of port logistics integration?

As mentioned above the literature review process begins with recognising rationale for review. The rationale can be identified through problem formulation which is about what field is being examined and what is exactly its components or issues? So, due to the research problems and research questions, the keywords are divided into four main area: integration concept, logistics management, logistics/supply chain integration and port logistics integration. Various resources selected to find suitable databases and articles in this area.



The most popular databases such as Taylor and Francis, Elsevier, Emerald, Scopus, Thompson Reuters, google scholar and endnote search engine (web of Science) used to collect papers. Most of selected articles are extracted from highly cited journals such as Journal of operations management, The International Journal of Logistics Management, Journal of Business Logistics, International Journal of Physical Distribution & Logistics Management, Supply Chain Management: An International Journal, Maritime Policy & Management, Journal of Transport Economics and Policy, Transportation Journal, The Asian Journal of Shipping and Logistics.

After finalising searching articles, all the papers conveyed to endnote software and categorised by keyword. The total number of papers was 1809 papers. Selection criteria were determined to decide to include or exclude the papers. A large number of papers excluded from reading the title, keywords and date of published. Because new insight into maritime logistics is started since 2000, this paper filtered the articles based on their date of publish which is after 2000 except The other criteria for excluding papers were abstract reading, the source of publication, abstract reading, type of study, the main focus, study design, implication, publish date and finally reading the full text of the paper. Totally, approximately 178 highly related papers were selected out of 1809 papers. In order to decrease the risk of bias, types of extrading of data were planned before defing the project (Ghaderi, Fei & Cahoon 2015). Then, the details of the main studies summarised in form of Microsoft word. Two tables designed to extract the study details: the first one was on logistics integration as a general concept without any focus to specialised industry, the second one was related to port logistics integration, which is limited to the papers belonging to the seaport and maritime sector. Table 1 is extracted from two main tables.

3. LITERATURE REVIEW ON PORT LOGISTICS INTEGRATION

Traditionally, ports have played a central role in cooperating-port logistics partners (providing infrastructure, setting the strategic plan and loading/unloading cargo). Nowadays, ports are considered clusters of organisations that aim at creating value for the supply chain (Song & Panayides 2008). It has been assumed that an active port can increase profitability and productivity of its key items in production such as capital and human resources (Talley 1988). Logistic integration in the port sector has rarely been studied in research papers (Song & Panayides 2008). According to Tseng and Liao (2015) port logistics integration is important for two reasons. Firstly, the focus of the supply chain in manufacturing companies is on supplier integration, while, in service supply chain or specifically in port logistics the role of partner integration (like ports and container shipping firms) is

much more important. Secondly, the port supply chain is more complex than the manufacturing supply chain due to its global service features and the uncertainty in market and customer demands. Wilmsmeier and Notteboom (2011) believe that supply chains in ports are becoming more market driven due to the need to respond to increasing demands of customers in this sector.

A body of literature has examined the causes, patterns and implications of the integration of logistics in the port sector (Heaver et al. 2000; Notteboom & Winkelmanns 2001; Robinson 2002). Logistics integration and the changing role of port authorities in the new logistics-restructured environment is addressed by Heaver et al (2000) and Notteboom and Winkelmanns (2001). Robinson (2002) places the role of seaports within a new paradigm of ports as elements in value-driven chain systems. Bichou, Khalid and Gray (2004) study reveal that logistics integration in ports can be defined in two different ways. The first perspective is about intermodalism, which defines as inter-links between nodes and transport modes in the port logistics system. The second view is related to organisational integration and partnership, which is about logistics channel restructuring and considering the relationship between port logistics chain partners. Notteboom and Rodrigue (2005) added an important view of port regionalisation to port logistics integration literature. They propose the importance of inland terminals and relationship between different ports in a region to develop the level of port logistics integration. Panayides and Song (2009) limited port logistics integration definition to effective collaboration of four functions in logistics system of the port information and communication systems, value added services, multimodal systems and operations and supply chain integration practices. To sum up, port logistics integration means integration between functions and actors of the port.

3.1. Influential factors and issues in port logistics integration

Based on process and activities, which has been mentioned in the previous section, influential factors in logistics integration of port will be reviewed in this part. These factors divided into two major categories in port context, partners (actor) of the port logistics system and the relationship between them (Notteboom, T 2008) and activities and functions (Panayides & Song 2009, 2013; Song & Panayides 2008). As mentioned before in logistics integration context, there is a gap in partner integration approach specifically in port context. Next section will identify and explain port logistics chain actors and their relationships. The other influencing factors to port logistics integration are related to actors and activities in the port logistics chain. In activities and functions part, the study will focus on series of studies by Song and Panayides (2008) and the factors related to resources and infrastructures of logistics system which haven't been investigated before in port logistics integration studies.

4. CONCEPTUAL FRAMEWORK FOR PORT LOGISTICS INTEGRATION

This section is aimed at developing a conceptual framework for port logistics integration. The framework indicates key influential factors as well as current challenges in port logistics integration. Such a conceptual framework is needed for various reasons such as extend previous studies and fill the gap, develop logistics integration framework for seaport industry and identify challenges in port logistics.

This section explain the process of developing conceptual framework for this study. Literature review in logistics integration in general contexts shows the gap between mentioned factors. In this section, the key factors regarding port logistics integration are going to discuss briefly. Based on Tseng, Y-y, Yue and Taylor (2005) definition of a logistics system, it comprises three main sections: logistics information systems, operations and physical activities and logistics infrastructures and resources. Efficient collaboration between these main areas will lead to an integrated logistics system. Dominant studies in logistics integration in the port sector focused on operations and information parts of a logistics system and resources and infrastructures have not been studied as indicators of integrated logistics system in the port sector (Bae 2012; Notteboom 2008; Panayides & Song 2009, 2013; Song & Panayides 2008).

This section has covered this gap in logistics literature consider all the measures. Seven main factors have been recognised in the literature review:

- Information and communication integration,
- Value added services,
- Processes and operations,
- Logistics integration practices
 - Organisational activities,
 - Institutional support,
 - Resource sharing

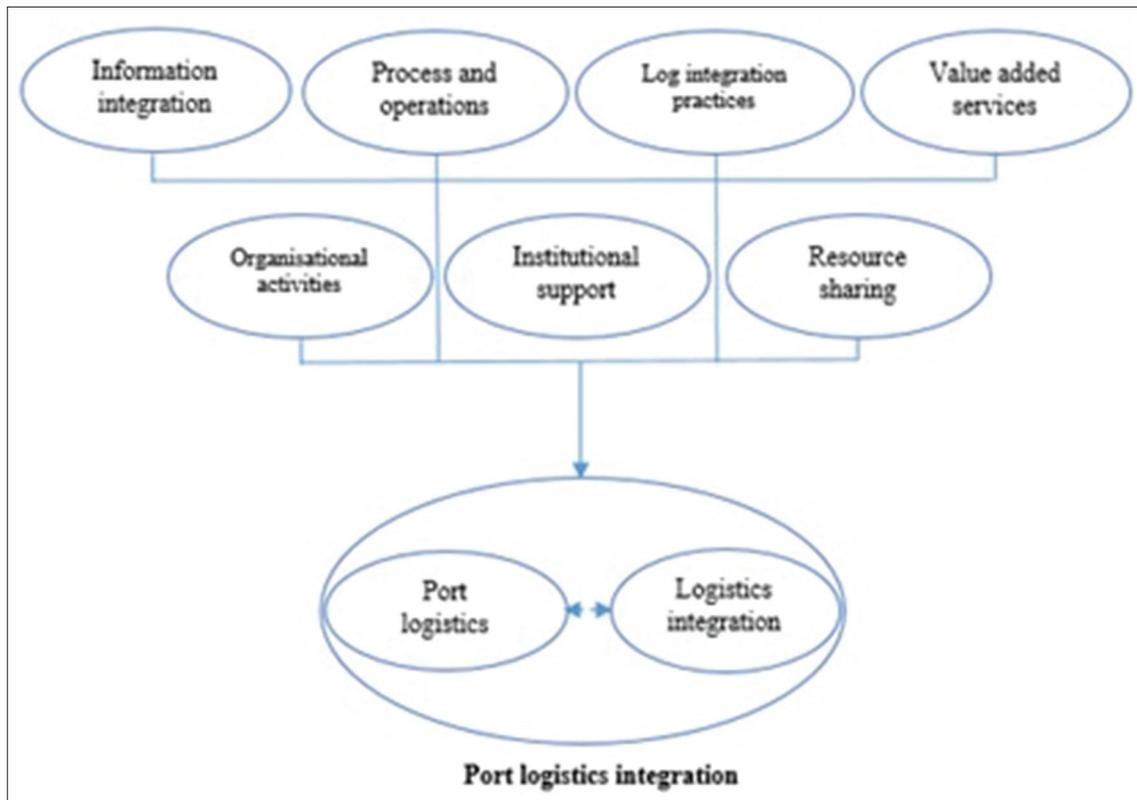


Figure 1: Conceptual framework of the study

5. CONCEPTUAL AND THEORETICAL BACKGROUND

The proposed conceptual framework is built upon key aspect of two extend theories: supply chain management and resource dependency theory (Pinmanee 2016). Supply chain management has been adopted by various fields such as quality revolution, materials management and integrated logistics networks structure, industrial marketing management, the notion of increased focus and industrial specific studies (Chen & Paulraj 2004). Logistics integration is an approach based on SCM, which is developed and applied with the purpose of utilising the supply chain in order to afford effective performance and respond to customer needs. Resource dependency theory (RDT) states that firms are dependent to interactions and relationships with other parties. Based on RDT theory, handling the external dependencies and resources (both in physical and skill-based) with supply chain partners can decrease uncertainty. Considering this theory in logistics and supply chain context, RDT suggests supply chain partners would be dependent and collaborate with each other, it can guarantee greater performance improvements in the long term period (Pinmanee 2016). According to this theory, resource-sharing activities would be one of crucial practices to achieve integrated logistics system.

6. DISCUSSION

Logistics integration is crucial element to the transportation and logistics sector especially seaports due to their nodal role in international transport and logistics. A higher level of integration also helps improve the operational efficiency as well as the competitiveness of freight and logistics providers. This further creates positive impacts on other elements of the supply chain and the economy. An efficient shipping system is influential in joining separate activities, as it includes one-third of the logistic costs and considerably affects logistics system performance (Tseng et al. 2005). Literature review revealed wide variety of factors and dimensions, which makes it difficult to compare findings and reach into a determined framework. There several examples of frameworks and research papers point out in this study in previous sections. Logistics integration in port sector is presented in different ways. Tseng, PH and Liao (2015) focus on information integration, process and operations factors. On the other hand, Song and Panayides (2008) create a framework with 7 constructs, namely information and communication technology, relationship with shipping line, value added service, integration of transport modes, relationship with inland transport operators and channel integration practices and performance. Later they focused their study to four factors: Information and communication systems, Value added services, Multimodal systems and operations and Supply chain integration practices (Panayides & Song 2008, 2009). However, Bae (2012) considered internal and external factors as dimensions of PLI. In

another study, Wilmsmeier, Monios and Rodrigue (2015) more specifically looked at port hinterland integration factors such as modal shift, custom clearance and dwell time, load centre, metropolitan accessibility, rail and road regulation, cargo security and land acquisition.

On the other hand, Resource sharing activities and coordination between resources between supply chain members was one of the main concerns in logistics/supply chain integration studies (Alfalla-Luque, Rafaela, Medina-Lopez & Dey 2013) (Xu, Huo & Sun 2014) (Adams et al. 2014) (Karia & Wong 2013) (Yao & Liu 2007) (Quesada, Gioconda et al. 2008). Furthermore, by looking from strategic perspective to logistics integration managing the relationships among supply chain partners can be classified as organisational integration activities (Alfalla-Luque, Medina-Lopez & Dey 2013; Pinmanee 2016; Swink, Narasimhan & Wang 2007). There are number of studies mentioning the impacts of different institutions (specifically governmental institutions) on logistics integration in literature (Rietveld & Stough 2005) (Legacy, Curtis & Sturup 2012). These scattered examples and lack of consensus on factors, leads the study to propose a conceptual framework to bring these ideas together and have comprehensive insight into port logistics integration (Alfalla-Luque, Medina-Lopez & Dey 2013; van der Vaart & van Donk 2008).

7. CONCLUSION

The main aim of the study is to identify influential factors in port logistics integration and contributes to a clarification of concept of integrated logistics and its factors. Besides, the other purpose of the paper is highlighting the role of internal (e.g. organisational activities, resource sharing) and external (e.g., Institutional support) actors on port logistics integration. This study has a number of theoretical and practical implications. In terms of theoretical implications, the current study proposes a new conceptual framework to analyse port logistics integration. This new framework will consider the drawbacks and limitations of previous frameworks such as focusing on port supply chain partners rather than functions to identify the level of integration with each partner. A close relationship between supply chain partners and the integration of their functions and activities make integration such an important topic and objective in every system (Allen, Browne & Woodburn 2010). Moreover, this study considers the developments in each function (such as information integration) in recent literature and proposes a comprehensive framework to fill the gaps.

The main limitation of this study is no primary research has been conducted to validate the conceptual framework. The other limitation is about large number of studies using concept of integration and differentiate between these studies and finding most relative study to logistics integration; specifically, the subtle difference between supply chain integration and logistic integration. For this, the study may not cover all studies out there. However, an organised process has been used to select related journals, papers, reports and books as explained in methodology section.

Research results and conceptual framework shed the lights on new research areas in terms of port logistics integration outputs. In this regard, several researchers have mentioned the importance of integrated logistics to improve overall efficiency and performance of the logistics chain. In other words, results of the logistics integration should be revealed in overall performance of the logistics chain. Researchers have agreed the relationship between logistics integration and its impact on different types of performance for instance: organisational performance (Stock, Greis & Kasarda 2000), logistics performance (Rodrigues, Stank & Lynch 2004), business performance (Robertson 2006), inbound supply performance (Prajogo, DI et al. 2015), operational performance (Prajogo, D & Olhager 2011), firm performance (Narayanan et al. 2011), financial and market performance (Mellat-Parast & Spillan 2014), supply chain performance (Alam et al. 2014).

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