

Literature Review of Multimodal Transportation Risk Management System

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Abstract: This paper offers a literature review on supply chain and multimodal transportation risk management system with the aim of to provide a comprehensive concept for the management of multimodal transport risk and to assess multimodal transportation risk management from risk identification, evaluation and control perspective. The findings indicate that supply chain risk management is not only loosely described by multimodal transport risk management, but that there are different fragmented supply chain risk enablers and that there is a strong need for a consistent terminology for its construction enablers. Moreover, the review points to a lack of empirical confirmation regarding the correlation between supply chain and multimodal transport risk management results. This paper offers an analysis of 52 peer-reviewed journal papers on risk management in logistics from 2000 to the start of 2019. We have an overarching Risk management description, synthesis and assembly of the various enablers into preventive and sensitive meanings.as the analysis shows that risk identification, risk evaluation and risk control affects the multimodal transportation service. The challenge in the management of multimodal transportation operations in the supply chain is to increase their efficiency; therefore researchers have to focus on the area associated with multimodal risk management.

Key words: Multimodal; Risk; Risk Management; Supply Chain; Transportation

1. INTRODUCTION

Various industrial developments have increased firm exposure to supply chain risks (SCRs), including outsourcing, supply base contraction, just-in-time, and shorter product life cycles [1]. These threats can arise from man-made problems or natural disasters, which can have substantial implications for companies, including financial and operational issues, leading potentially to company discontinuity [2]. main area of focus has been multimodal transportation risk management within supply chain risk management the literature.p SCRM is planned to evolve multimodal transportation risk detection, evaluation, treatment, and tracking techniques [3], but Several knowledge gaps exist.

Researchers have yet to agree on a description of supply chain risk management from a conceptual viewpoint, with the literature emphasizing its multifaceted and dynamic existence [4]. From a theoretical viewpoint, it is unclear how hypotheses have been used to advance our interpretation of SCRM in the current literature. And in order to advance multimodal transportation risk management research and establish a cohesive information structure, knowledge gathered along narrow functional disciplines (such as buying and logistics) needs to be consolidated from an integrative perspective.

In the last decade, for instance, there have been 'conventional' (non-systematic) literature reviews (e.g. Tang and Musa, 2011; Ho et al., 2015). Although useful, these studies were either based on a small number of papers, articles in Rao and Goldsby (2009) and articles in Tang and Musa (2011), or focused specifically on quantitative models (Tang, 2006; Heckmann et al., 2015). The exception is the Ho et al. (2015) study of SCRM research from 2003 to 2013. Yet the field of SCRM is rising so rapidly that 138 papers have been published since 2013. Five systemic literature reviews (SLRs) have also been conducted a sort of systematic approach to conducting a literature review (Denyer and Tranfield 2009; Saenz and Koufteros, 2015) on SCR. Yet for these SLRs, which have either been focused on a small number of papers, similar conclusions regarding size and scope apply. Again, none of these reviews have paid specific attention to the theory. Therefore, it is argued that a on SCRM is needed.

The objectives of this review are to:

- To provide a comprehensive concept for the management of multimodal transport risk
- To assess multimodal transportation risk management from risk identification, evaluation and control perspective)
- To assess the use of theory in multimodal and supply chain risk management research

Research questions:

- 1) What is the concept of multimodal transport risk management?

- 2) What are the theoretical and empirical perspectives of supply chain risk management?
- 3) What will the process and stage of supply chain and multimodal transportation risk management look like in the future?

2. METHODOLOGY

This paper takes the form of a literature review of relevant studies related to multimodal transportation risk management system. According to [5] the methodology of literature review papers should at least contain the themes informing the review, databases used, keywords, and some of the primary sources consulted. In this work, risk management has been the most relevant theme. The major significant of those studies that attempt to link the concepts, perspectives to multimodal transportation risk management setting. In this paper, the Harvard system, the author-date-page format used for referencing all utilized literature sources. The study used a secondary source of data collection. Moreover, Journals related supply chain risk management and multimodal transport risk management particularly supply chain risk management academic, Management science, business-economics, International business and commerce Studies journals, and relevant books used.

3. REVIEW OF RELATED LITERATURE

3.1. Concept and theories of the multimodal transportation in supply chain and logistics

In international trade, transportation today is all about logistics, according to [6] Transportation, which deals with moving goods from one location to another, is the primary activity of logistics. International transport of finished goods from the site of the shipper to the destination of the customer is essential, as this relates to domestic production and domestic transportation. However, there is a substantial difference between the two activities, the goods could be out of the reach of the exporter for a more extended period of time, and more documentation is needed. Transportation, warehousing and inventories are the essential tasks involved in the movement of goods, all of which, as we have stressed, should be incorporated into the method of a system if the amount is increased in more places if the warehouse is increased. Additionally, if an effort is made to minimize inventory expenses by reducing the number of warehouse and inventory levels, transportation cost will be going up (1985 by Brown).

The definition of 'multimodal transport' was described in the United Nations Convention on Trade and Development [7] as: 'carriage of goods by at least two different modes of transport based on a multimodal contract of carriage from a place in a country in which a multimodal contract of carriage transports goods'. The multimodal transport operator takes goods to a distribution point located in another country. However, in many less developed countries, the inland transport system part of international freight transport impedes international trade [7]. Companies of transport engaged in foreign trade. For many years, new technologies have been introduced and introduced to allow more efficient delivery across multiple transport modes. Therefore, the idea of multimodal transport, promoting the operation of origin-to-destination freight transport under the responsibility of a single operator using more than one way of transportation, is a natural containerization extension [8].

Multimodal transport system it is not unusual to see the system's challenging situations. In most cases, these problems are more prominent in developing countries than in developed nations. [9] states that the fundamental challenge presented by various authors as factors influencing the regular operation of the system is the disparities in trade and investment policies and regulations, the legal and political climate, infrastructural facilities and the lack of skilled human capital. [10] noted that multimodal logistics brings many challenges, along with opportunities. Infrastructure, legislation and technology, which require quite a bit, are the areas sorted out by the author for the challenges.

Multimodal transport operations are carried out in different fields through the interconnected work of individuals and organizations, and this can again be another source of challenges for the system. In this regard, [11] emphasized the absence of international laws governing the successive carriage of goods as an issue of the scheme, leading to crucial problems in the field of carrier liability and liability for loss or damage to the goods transported under the multimodal system. The multimodal transport system also has an environmental effect on the means of transport used in multimodal transport operations, according to [12]. This study identified three sets of activities associated with transport vehicle operations, equipment maintenance, and facility operations that can have harmful impacts on the environment. The system contains chemicals that can easily pollute the natural environment.

Choosing the mode of transport in the world is not just a choice between the form of transport, but between the system and the transport mechanism. Transport companies should be able to meet and synchronize the business requirements to optimize the use of transport offered, which will then have a significant impact on the choice of mode of transportation [13]. A successful multimodal transport system would bring short-term benefits to local traders and transport operators, as well as longer-term implications for the country's systemic shifts in transport and the growth of international trade.

Multimodal transport was introduced by Ethiopia to minimize the difficulty of transit and auction of cargo. The Ethiopian Multi Multimodal Transport Act (Proclamation [14] was adopted. The main goals were to minimize the time and expense of transportation. The government claims that international multimodal transport is one of the Effective means of facilitation and cost-effective transit logistics operation. This led Ethiopia's government to use the multimodal transport law.

The logistics and supply chain reliability aspects of being landlocked were explored on the logistics issue of landlocked countries [15] and found that despite the enormous reduction in maritime transport costs and the development of logistics technology that reduces transport costs, the lack of direct sea access is a major challenge for transport costs Creation and

development of land-locked developed countries (LLDCs) Multimodal transport and logistics are increasingly becoming a vital component for companies to becoming competitive in international trade. Therefore, the need for operators to satisfy the demand for quicker, safer and more efficient deliveries to the market has increased. However; most developing and landlocked countries have been left behind in accessing this service [16].

The infrastructural development in the transport and communication sectors in Ethiopia seem stagnated in the past decades, and its continued stagnation is manifested by the poor logistics facilities the country possesses. This poor infrastructural status cannot encourage transport service providers to invest in the sector and give time and cost-efficient services. Poor networks of road, poor telecom facilities, interrupted energy supply and unavailability of qualified experts and lack of commitment from government side all have played their role to worsen the quality of the logistics sector [12].

At the same time, multimodal transport service can generate practical benefits by saving goods transit time, reducing transportation and warehouse costs, minimizing the burden of documentation, security of goods, improving the competitiveness in the international market, increasing productivity, and enhancing the inward and outward freight transport effectiveness [17]. This gave birth to the multimodal transport service which was started by (ESLSE) in 2012. Following the commencement of the new service, unexpected situations happened in the daily operation of the enterprise and ultimately affected the effectiveness of the service. For instance, lack of coordination of goods transport which creates the imbalance between the port transit and inland transit, As a result, the ESLSE failed to bring shipments to dry ports within a reasonable period. This trend posed a strong challenge to the economy at large[12].

As described by the [18], the trade cost and transit times in Ethiopia are very high, compared to neighboring countries like Kenya, Tanzania, and others. For instance, the report stated that importing a container in Ethiopia required additional costs of \$1095 compared to Tanzania. On the other hand, the transit time takes to import and export is about twice as long as Kenya and other countries such as China and Vietnam [18]. Due to this fact, the importers were not getting their raw materials and merchandise goods in time, and a unimodal system was being used. As a result, the enterprise was forced to pay huge amounts of dollars to the container carriers such as Maersk Line (ML), Maritime Freight Company-General Maritime Company (CMA CGM), American President Lines Ltd (APL) and Djibouti port for demurrage and detention fees accrued for cargoes stayed for months at the discharging port [12].

Besides, the problems are created extended waiting time to get the transportation services, length of the documentation process and getting the goods long after schedule [19].According to the results from the World Bank Logistics Performance Index (LPI) of trade logistics comparisons between countries indicated that Ethiopia ranks 126 out of 160 countries in [20] Moreover, the chart of logistics competency of the World Bank in 2016 shows that after 2014 the Ethiopia logistics competencies continuously decline. These indicate that the logistics services in Ethiopia are not steadily improving over.

The multimodal system avoids several transport service providers and assists shippers to come to a single contractual agreement with the carrier and render a door to door cargo delivery service [21]. The ability to transport goods quickly, reliably, safely and economically is seen as vital to the international business success and multimodal transport service, which has significantly affected the current transport system, the trade with transport networks taking shape through a series of developments (Bhat, 2011). While most of the former research has been focusing on and evaluating the challenges of multimodal operation is related to customers but, not considered the effect of the shipping agents in the multimodal transport operation.

Moreover, most of the researcher's respondents are government officials. Hence, the result of those studies may not necessarily reflect the attitude of private companies, transistors and shipping agents[22]. ESLSE has taken responsibility to manage the multimodal transport system to improve inward and outward trading activities in terms of low cost, maximum customer convenience and become an international carrier [12]. However, the multimodal transport system did not have the expected effect on customer satisfaction and the operational efficiency is low due to low level of experience the new concept of the multimodal transport system for ESLSE [17].

The multimodal transport system is still lagging in achieving its starting aims; the gain from the operation is far less compared to the effort exerted starting from the first day of implementation (Maritime affairs Authority, 2013). It is obvious that efficient multimodal transport can generate practical benefits by saving goods transit time, reducing transportation and warehouse costs, minimizing burden of documentation, security of goods, improving the competitiveness in the international market, increasing productivity, and enhancing the inward and outward freight transport effectiveness since, effective multimodal transport service ensures the use of the most efficient mode of transport at each stage and ultimately reduces bottleneck, energy expenditure, and pollution dramatically[19].

One of the key reasons that have been identified for declining international competitiveness is poor trade logistics. Several recent reports have drawn attention to the trade logistics sector in Ethiopia as being critical constraints to current trade flows and a bottleneck to further economic growth and development [23].

According to [9] and [12], the logistics services of Ethiopia Shipping and Logistics Service Enterprise in Europe as well as in other trade routes are categorized by a low level of development of logistics service. The studies stated that the logistics services of Ethiopian Shipping and Logistics Service Enterprise are characterized by a lack of coordination of cargo transportation, lack of delivery of cargo both in quality and quantity, inadequate fleet of vehicles from discharging port/Djibouti to dry ports, lack of coordination in ICT, absence of qualified experts in the logistics services, lack of logistics infrastructure, unavailability of enough

containers, poor logistics management, lengthy of the documentation process and monopolized the sea transport and logistics services. [24] noted that inefficient logistical operation would result in delivery delay, a high cost of logistics, loss of customers, poor quality of service and discrepancy on quantity delivered, production interruption and extension of lead time, length of documentation process, ineffective ICT and inadequate dry ports.

3.2. Risk management system in supply chain and logistics

Supply chain risk studies in foreign countries focus primarily on three aspects: identification of supply chain risk, evaluation of supply chain risk, and prevention and control of supply chain risk. Risk management is related to the planned and purposeful analysis, steering and control of the risk, resulting in minimizing possible losses or maximizing the benefits of the process, for 26 examples: transport process, being analyzed. [25].

In supply-chain risk management, uncertainty and disintegration are emerging as critical challenges. As supply chain processes have fallen into the hands of outside service providers and are thus less noticeable, it has become more difficult to detect risks. The risks, their detection and their effect depend on the role of the companies in the chain and the degree of analysis that they may conduct. [26].

A detailed review of SCRM's scholarly literature was carried out by [27]. According to this study, which looks at 120 papers published between 2000 and 2010; 54.16 % are qualitative, 36.66 % are quantitative, and 9.16 % are mixed in terms of research approach; 35.00 % are risk recognition, 14.33 % is risk evaluation, 5.83 % are risk mitigation/control and 44.16 % are holistic in terms of risk management process; 56.33 pp. are proactive, 23.33% are reactive, and 20.83% are holistic regarding the risk mitigation approach.

In global companies, modern port enterprises are essential nodes. Integration of the supply chain and have begun operating as integrated support centers for logistics. To suggest steps to enhance port business supply chain risk management, and improved AHP approach was used. In this supply chain, port service process risk, operational risk, port relationship process risk, and external environment-associated risk are too high. Improved port service quality, enhanced port functional capacity, strengthened membership management, and improved supply chain risk reduction mechanisms are needed to enhance supply chain risk control. [28]

3.3. Risk management process

A certain number of main elements or stages of the process determine the method of implementation of the risk management process. Depending on the authors and organizations referencing them [29], the number and meaning of these phases (steps) describing the risk management model depend. A large number of risk management models can be found in literature and practice, and similar elements are present in most of them, as described in [30], ranging from risk identification / analysis (or assessment) through risk assessment (or assessment) to different forms of risk management and control. It can therefore be assumed that, with respect to the basic processes they are made of, almost all models are similar, while only the names of those processes vary. Confirmations of such a conclusion and argument can be found in the paper [31], according to which three specific processes define each of the current risk management models: (1) risk identification; (2) risk analysis; and (3) risk control. A certain number of techniques and methods are used for the realization of each of these steps, some of which have found their application in the management of supply chain risk.



Figure.1. Three core steps in risk management, adapted from [31]

In supply chain risk identification research, scholars have identified risk factors from different perspectives. Some scholars considered the supply and demand perspective [32]; [33], and divided supply chain risk into demand and supply risk. Some scholars pointed to risk factor identification based on supply chain structure [27]; [34], and divided supply chain risk into capital risk, information flow risk, and logistics risk. This implies that supply chain risk mainly originates from supply chain demand uncertainty and imperfect supply chain organization.

Some scholars have used the analytical hierarchy framework (AHP) [35], [36], the fuzzy systematic evaluation system [37] and other conventional risk assessment approaches in the supply chain risk assessment research.. Some scholars adopted relatively novel evaluation methods; used frequency and net present value analysis methods to evaluate the cost-associated risk factors [38] assessed supply chain network risk using Monte Carlo simulation; they indicated that the combination of scenario analysis and Monte Carlo simulation could better evaluate the risk fluctuations associated with supply chain network demand.

In supply chain risk assessment study, many scholars used grey evaluation [39], [40] while some scholars used neural network evaluation [41]. Some scholars have introduced new methods for assessing the danger of the supply chain, such proposed a loss function to assess the risk of the supply chain; assessed the risk of the supply chain through a support vector machine algorithm; developed the shared risk factor risk relationship;

Some scholars have concentrated on internal supply chain risk management in supply chain risk prevention and control research [42] to examine the relationship between risk factors and detailed risk speech, beginning with the reasons for risk occurrence. Risk integration, that is, to identify all risk factors as components of comprehensive risk, was the focus of the study. Many scholars researched risk regulation from the establishment of risk reduction mechanisms and risk management enhancement [43], [44]

Globalization, e-trade, sophisticated innovations and evolving manufacturing methods have improved the productivity and added value of supply chains. However, these factors make supply chains more fragile and vulnerable to threats, despite numerous benefits. Businesses that conduct supply chain risk management gain a competitive advantage for this reason. Supply chain managers have concentrated predominantly on cost savings in the past. Still, recently, they have begun to give priority to continuity and resilience of the supply chain, which also has essential cost impacts. Hence, in supply chain risk management, traditional reactive planning has given way to constructive planning. In this research, the risk management mechanism of the supply chain is investigated, and a procedure is proposed in the phase of risk reduction. [45]

The influence of disruptions during transport on supply chain (SC) efficiency was examined by [46]. In short, the most significant adverse impact on the supply chain is the transport disturbance between the 1st tier supplier and the warehouse, resulting in a high rise in inventory levels and materials in transit, resulting in unfulfilled customer orders. A large-scale quantitative analysis investigating the influence of SCRs on SC success was carried out by [47]. They showed that 6% of the variation in supply chain output was due to the adverse effects of supply chain risks. They concluded that in balancing demand-and supply-side threats, SCRM was of vital importance. The impact of SCRs on SC performance is evaluated by four measures: order fill capability, delivery reliability, customer satisfaction, and delivery speed.

Empirically the continuing influence of the three critical phases of risk management are 1) risk identification, 2) risk evaluation, and 3) business performance risk mitigation or control have valid [48]. Their analysis shows that businesses with high experience in those three SCRM phases perform well in terms of the frequency and effect of supply chain risk mitigation. [49], revealed that when SC disruptions occur, increased exposure in SCs provides considerable cost savings. The findings showed that increased exposure is attractive because it generates efficiency in SC and decreases both risks and costs. [50] proved that a decentralized design framework is optimal when there is both supply and demand volatility, which balances out cost variance through the impact of risk adjustment.

In their empirical study in which survey data from 270 industrial firms were collected [51] found that SCRM is important for a company's robustness and agility to boost efficiency. While skill only has a significant positive effect on the value of the SC consumer, robustness has a significant positive impact on both performance measures. [52] analyzed the relationship between SCRs in both cases. Integration of the supply chain (SCI) and success of business their studies have shown that SCRs have a negative effect on SCI and on business results in turn. All in all, their results advocate that SCRs have an adverse impact on internal integration between suppliers and consumers, pointing out that the risks between supply chain management impair effective SCI.

Competition has spread from businesses to supplies in modern times. For supply chain administrators, chains and risk management have been one of the main challenges. Risks influence the efficiency of the supply chain, so the risk management of the supply chain requires further focus. [33]

Global supply chains that are effective and secure contribute to improving the competitiveness of goods traded on international markets by reducing their cost and delivery time, while improving reliability and safety. Without transport convergence, which is typically done in the form of multimodal transport system, global supply chains are impossible. Due to the number of stakeholders, including transport services, infrastructure and processes, multimodal transport networks are much more complicated than unimodal ones, which can lead to increased supply chain risk in the event of poor coordination in the planning, organization and implementation of transport chain logistic activities. The key challenge in the operation of intermodal transport operations in supply chains, therefore, is to improve their performance, taking into account the associated risk challenge [29].

In this supply chain, port service process risk, operational risk, port relationship process risk, and external environment-associated risk are too high. Improved port service quality, improved port operational capacity, strengthened membership management, and improved supply chain risk reduction mechanisms are needed to enhance supply chain risk control [28].

4. CONCLUSION AND RECOMMENDATIONS

The above-mentioned literature review indicates that domestic and foreign supply chain risk analysis focuses on the manufacturing industry and manufacturing enterprises for this specific case and industry. In addition, international and domestic risk analysis in the supply chain is not only conducted from an economic point of view, but also from a management perspective. There is room for further exploration as theoretical research on the risk management business service supply chain is limited.

A higher level of dissatisfaction was clearly shown in a current study conducted by [17], under the title 'Evaluation of the performance of the multimodal import-export freight transport system in the case of Ethiopia' using the five delivery factors, including documentation, liability and insurance, cost, convenience and facilitation. The multimodal service offered by the organization. In addition, Ethiopia ranks at the lower end of the surveyed countries on the basis of the World Bank Logistics Performance Index (LPI), which offers a comprehensive measure of the state of commercial logistics in a country and encourages comparisons between countries, and shows a relative deterioration between 2010 and 2016.

As a result, 123 and 141 out of a total of 155 countries were put in Ethiopia in 2010 and 2012, respectively. The nation was ranked 104 out of 160 member countries in the latest versions of 2014 and 2016 and 126 out of 160. The four-year LPI average is 123.5. The company's study has shown that the majority of multimodal shipments do not Loaded within the duration of grace granted. The average dwelling time of containers in 2014/2015 was 9 days, which is almost 53 percent of the shipments and was subject to storage costs.

- Due to the number of stakeholders, including transport resources, facilities and processes, multimodal transport systems are much more complex than unimodal systems, which can lead to increased supply chain risk in the event of poor coordination in the preparation, organization and implementation of transport chain logistics activities. The key challenge in the management of multimodal transportation operations in the supply chains, therefore, is to increase their efficiency, taking account of the risks associated.
- It offers a structure for comprehensive risk consideration in multimodal transport supply chains that can contribute to increased efficiency and competitiveness of the supply chains.
- Multimodal transport plays a very important role in global supply chains, any risk in the multimodal transportation system can adversely affect the flow of goods, information and finance through the supply chains in issue. Risk sources may be responsible for multiple risk events, and a single risk event may be the result of the influence of different sources of risk.[29]
- It is important to identify the cause-and-effect relationship between sources and risk events, as well as the relationship between risk events themselves (particularly the relationship between external and internal risk types), as this is the only way to achieve a high-quality multimodal risk management process in the supply chain.

In addition, the current work on risk in multimodal supply chains does not provide an adequate and complete image of all the possible risks in multimodal supply chains. The key outcome of this work is the proposal for a general structure for the holistic concept of multimodal supply chain risk management, which can provide policy makers with a broader understanding of the risks to which these chains are exposed, in addition to a strong basis for an initiative to improve the efficiency of supply chain and logistics.

Therefore, it is important to assess the actual practice, identify the challenges of multimodal transport service, and risk management systems contribute to solving these challenges and increasing the efficiency of multimodal transportation service.

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