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THE CONCEPTUAL FRAMEWORK OF HORIZONTAL COLLABORATIVE TRANSPORTATION MANAGEMENT IN INDONESIAN TRUCKING INDUSTRY

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Abstract: *Collaborative Transportation Management (CTM) aims to reduce inefficiency, avoid logistics bottlenecks and provide a mutual outcome to all parties through sharing of information and resources such as common transportation mode between two carriers on the same level. Collaboration between carriers or Horizontal CTM between truck carriers in Indonesia currently hasn't much been discussed or developed. Thus this paper proposed a conceptual framework for horizontal collaboration among truck freight carriers based on two case studies. This model will help to improve understanding of the behavioral aspect study of carriers' decision to collaborate with other carriers on the same level in the trucking industry. The behavioral aspects are limited to critical enablers to the human side of CTM, and operational aspects are limited to the hierarchical decision-making levels (strategic, tactical, and operational). The conceptual framework presented in this paper proposed that critical enablers in the human side of CTM will assist the carrier in selecting other carriers as a collaboration partner on the horizontal CTM level. The collaboration outcome resulted in the form of an increase or decrease of trust which is relevant for the continual of the horizontal collaboration.*

Keywords: *Collaborative Transportation Management (CTM), Horizontal Collaboration, Behavioral Approach.*

Introduction

The advent of globalization created both challenges and opportunities for different parties in the supply chain, notably in the transportation area (Okdinawati, Simatupang & Sunitiyoso, 2014). One of the challenges is the rising cost of operation along with the rise of competition

in the market among rivaling logistics companies (CTM White Paper, 2004). The approach of either competitive strategy or collaboration strategy can be used to resolve this predicament (Jagoda, 2013). However competitive strategy is short-termed, has little value and breeds mistrust amongst competing companies, while collaborative strategy can result in long-term, high value and high trust (Jagoda, 2013).

Through collaboration, each party can complement the capabilities of its partner, adding flexibility and giving a competitive edge to the whole business network (Prakash and Deshmukh, 2010). Collaboration strategy helps to ensure efficiency in logistics through the objective optimization of all the involved parties (Mason, Lalwani & Boughton, 2007) with the goal of "win-win-win" outcomes to all collaborative parties (CTM White Paper, 2004).

According to Sutherland (2006), the collaboration among truckload transportation is called Collaborative Transportation Management (CTM). CTM White Paper (2004) defined that interaction and collaboration enhancement between shipper, carrier, and shipper is the focus of CTM. Simatupang and Sridharan (2002) differentiated collaboration structure into three forms: vertical collaboration (Shipper-Carrier-Receiver), horizontal collaboration (Carrier-Carrier) and lateral collaboration (combination of Vertical and Horizontal collaboration). Horizontal collaboration is a collaboration between competing carriers within the same level of supply chain or horizontal collaboration (Asawasakulsorn, 2009). Participants in the CTM collaborate through information sharing and resources to improve the performance of the overall transport planning (CTM White Paper, 2004).

Liu, Wu, and Xu (2010) stated that horizontal collaboration is a viable choice for small or medium-sized less-than-truckload (LTL) carriers with potential cost savings around 5% to 15% through backhaul reduction and lane/request exchange. The logistic scenario of horizontal collaboration in the Canadian furniture transportation coordination by Audy, D'Amours, and Rousseau (2008) shows the gains obtained from collaboration in the reduction of cost and delivery time as well gain in the geographic market coverage. Cruijssen, Cools, Dullaert, and Fleuren (2007) surveys on the Logistics Service Providers in Flanders discovered that horizontal collaboration is believed to increase profitability and improve service quality.

Despite the benefits of horizontal CTM model, a collaboration between unrelated or rivaling carriers will not be easy. The difficulty of the application of the operation model in practice arises partly due to the lack of understanding of human behavior (Bendoly, Donohue & Schultz, 2005). Lack of trust between supply chain partners is one of the behavioral issues that can negatively impact operational success (Bendoly, Donohue & Schultz, 2005). Successful collaboration is when collaboration partners can work together to achieve their objectives, resulting in a collective win (Sutherland, 2006). According to *Supply Chain Management Review* (Supply Chain Management Review, 2000, cited in Sutherland, 2006, p. 6), critical enablers to concerning the human side of CTM are essential to ensure successful and long-term CTM operation.

As one of the biggest economies in Southeast Asia, we choose Indonesia case studies as the subject of our research. According to the Indonesia Logistics Association, Indonesia's logistics costs are known as one of the highest amongst Southeast Asia countries at 24% of total GDP. High logistics costs can significantly undermine the competitiveness of the company. Indonesia was affected as well by globalization, with the dissolving of traditional trade barriers and global competition from abroad. The increasing competition among truck logistic services and no

substantial differentiation on the services offered pushed Indonesian trucking companies to compete through the price war.

Indonesian truck logistic service companies may either adopted a competitive strategy or collaborative strategy to survive in the competitive market. There's an opportunity to implement horizontal collaboration between Indonesian truck logistic service companies by utilizing and complementing different capabilities of each truck carriers, therefore giving a competitive edge to the collaborative parties.

Maintaining a long-term collaboration between rivalling or unrelated truck carrier companies is still a challenge in Indonesia due to low trust. Trust is essential to maintain a long-term secure collaboration in uncertain market demand and the competitive market environment in Indonesia. The highly fragmented market with no clear differentiation in the shipping service creates an intense pricing competition in the market. To ensure that collaboration works and reap full benefit, it requires openness, cooperation, and disclosure of confidential information such as internal operational procedure, routing, scheduling, pricing, and customer information. Unfortunately, as more confidential information disclosed, there is a higher risk of opportunism (Pomponi, Fratocchi, & Tafuri, 2015). Not every truck freight company have the capability to orchestrate collaboration. Thus the collaboration needs a neutral to help coordinate collaboration process amongst truck freight carriers. For the case in Indonesia, truck companies often APTRINDO as the neutral party which helps to facilitate and coordinate collaboration.

Horizontal model of collaboration transportation model between truck carriers in Indonesia and the understanding of behavioral aspect which arises from the collaboration currently hasn't much been discussed or developed. Based on several case studies in Indonesia truck carrier industry, this study will propose a conceptual framework of horizontal collaboration transportation management (CTM). This model will help to improve understanding of the behavioral aspect study of carriers' decision to collaborate with other carriers on the same level in the trucking industry. The behavioral aspects are limited to critical enablers to the human side of CTM (Supply Chain Management Review, 2000, cited in Sutherland, 2006, p. 6), and the operational aspects are limited to the CTM internal planning stage levels (strategic, tactical, and operational) (Okdinawati, Simatupang & Sunitiyoso, 2014). The conceptual framework presented in this paper proposed that critical enablers in the human side of CTM will assist logistic truck companies (carrier) in selecting other truck logistic companies (carrier) as collaboration partner on the horizontal CTM level. Next, the collaboration moved onto the operational aspect of CTM internal planning level (strategic, tactical, and operational) in which will be seen if the collaboration resulted into an increase or decrease of trust which is relevant for the continual of the collaboration.

The arrangement of this paper is as follows. The first part of this paper is the introduction, followed by the literature review on the second part. Part three elaborate the research methodology used to develop a conceptual framework for this research. Part four will elaborate the problem situation in the case studies. Part five will present the conceptual framework for behavioral aspect and hierarchical decision-making levels of horizontal collaboration. The limitation of this paper is the contribution of horizontal collaboration from a conceptual point of view and the exclusion of practical application.

Literature Review

In this section, the coordination of the literature review is according to two level of analysis. First, the relevant study of CTM and horizontal CTM are reviewed and categorized based on

their primary objectives and industry application. Second, the relevant study of behavioral aspects of CTM will be analyzed to understand the linkage and contribution to the application to horizontal CTM. Finally, based on the two case studies in Indonesia we will develop and present the framework, where we will discuss implication.

Transport Management in Indonesia

According to World Bank Logistics Performance Index (2018), Indonesia's logistic performance is under the other four largest ASEAN economies, namely Singapore (7th), Malaysia (41th), Thailand (32th) and Vietnam (39th). While against 160 economies in LPI, Indonesia ranks 46th. Logistics service competence, the efficiency of customs clearance and infrastructure are some of the lower performing aspects of Indonesia's logistics, while Indonesia performs comparatively better in the timeliness, tracking and trace shipments (LPI, 2010). In order to increase the competence of the logistics sector, the Indonesian government has been placing customs and infrastructure on high priority for major reforms (Soeriaatmadja, 2018).

The logistics sector in Indonesia has been growing steadily since 2007 in part due to the trend of local business outsourcing their distribution and logistics to third-party logistics providers (Global Business Guide, 2013). These third-party logistics providers are made up of a combination of courier provider (mainly land transportation) and total logistics service providers (multimodal transport model). In Indonesia, around 70% of freight distribution was done mainly using truck transport (Herliana & Parsons, 2010). The truck armada sizes are around 1,300 trucks for large companies and 1 to 2 trucks armada for small freight companies in Indonesia. This highly fragmented market with no clear differentiation in the shipping service creates an intense pricing competition.

Collaborative Transportation Management (CTM)

Sutherland (2006) defined collaborative Transportation Management (CTM) as the collaboration in the transportation area, notably among truckload transportation. The goal of the CTM is the "win-win-win" outcomes to all the parties involved in the collaboration (CTM White Paper, 2004; Sutherland, 2006). CTM aimed to reduce inefficiency, avoid logistics bottlenecks as well as to provide mutual benefits to all parties (Browning and White, 2000; Sutherland, 2006; Esper and Williams, 2003; Bishop, 2002). CTM was initially developed to complement CPFR (Collaborative Planning, Forecasting, and Replenishment) since CPFR was limited to collaboration on sales order forecast and the following replenishment orders, CTM complements by ensuring accurate fulfillment through shipment forecast as well as collaborative transportation and distribution management (CTM White Paper, 2004).

CTM White Paper (2004) defined that interaction and collaboration enhancement between shipper, carrier, and shipper is the focus of CTM. Simatupang and Sridharan (2002) differentiated collaboration structure into three forms: *vertical collaboration* (Shipper-Carrier-Receiver), *horizontal collaboration* (Carrier-Carrier) and *lateral collaboration* (combination of Vertical and Horizontal collaboration). Participants in the CTM collaborate through information sharing and resources to improve the performance of the overall transport planning (CTM White Paper, 2004).

Based on the time horizon, Okdinawati, Simatupang, and Sunitiyoso (2015) classified three level of collaborative planning: strategic level, tactical level, and operational level. Strategic level is the foundation of the supply chain process collaboration to identify the benefit, risk, commitment sharing and limitations in the strategic partnership model through front-end

agreement and network planning to establish collaboration relationship. Tactical level focuses on the improvement of transportation utilization to increase efficiency through shipment forecasting and order assignment which helps to map various carriers used in the logistic process. Operational level focus on the daily operation process flow of fulfilling customers' orders through scheduling, routing, & order processing. Each function of the collaborative planning level is interconnected. Scheduling model is developed based on the order assignment in the tactical planning level. Meanwhile, the routing model is developed based on the network model at the strategic level.

Horizontal CTM

In this paper, we will put boundaries on our literature review to our research focus on *horizontal collaborative transportation management structure*. Horizontal collaboration is a collaboration between competing carriers within the same level of supply chain or horizontal collaboration (Asawasakulsorn, 2009). Meanwhile, according to Okdinawati, Simatupang, and Sunitiyoso, (2015) horizontal collaborative structure in CTM, is a collaboration between independent or competing organizations through resources and information sharing.

Through in-depth content analysis of the existing academic papers on horizontal CTM, we analyzed a total of thirteen academic papers which covers horizontal CTM. **Table 1** summarises the papers main objectives and industry application of the existing horizontal CTM research. The table is limited to the relevant contribution available. Previous research on collaboration among less-than-truckload (LTL) is the most prevalent with a total of four papers (Taherian, 2013; Peeta & Hernandez, 2011; Liu, Wu & Xu, 2010; Nadarajah, 2008). These papers mostly cover collaborative planning level on the strategic level (Nadarajah, 2008; Frisk, Gothe-Lundgren, Jornsten & Ronnqvist, 2010; Liu, Wu & Xu, 2010; Audy, D'Amours & Rousseau, 2008; Peeta & Hernandez, 2011; Taherian, 2013).

Table 1: List of Horizontal CTM Previous Literature Review

Horizontal Collaborative Transportation Management			
Author	**Main Objectives of the Paper**	**Industry Application**	**Solution Method**
Chabot, Bouchard, Legault-Michaud, Renaud & Coelho (2018)	Proposing four less-than-truckload (LTL) horizontal collaborative schemes with different cost reduction objectives: 1) shipper's shipping cost; 2) carrier cost; 3) environmental cost; 4) combination of all three.	Canadian manufacturing companies with LTL shipments to the USA	Mathematical programming & Local Research
Defryn, C. & Sorensen, K., (2018)	Application of two different approaches to logistics optimization model to horizontal logistic cooperation and comparing the advantage and disadvantage of both approaches.	Truckload industry	Multi-objective traveling salesman problem with soft time windows
Defryn, Sorensen &	Decision optimization model in horizontal logistics collaboration which	Logistics optimization joint-route	Clustered vehicle routing problem

Dullaert (2017)	distinguishes between a group and individual partner in the collaboration.	planning for e-commerce.	
Pomponi, Fratocchi & Tafuri (2015)	The theory-based framework in logistics horizontal collaboration based on mutual trust among collaborative parties and the extent of cooperation.	The framework for collaboration based on organizational theories.	Theoretical framework
Liu, Wu & Xu (2010)	Develop LTL collaboration game and fair profit/savings distribution allocation method among collaborating participants.	Less-than-Truckload	Weighted Relative Savings Model
Asawasakulsorn (2009)	Formation stage partner selection criteria development based on economic, social perspectives and inter-organizational (IOS) design factor regarding trust.	Shipper and carrier companies in Thailand	Simple & Multi Regression
Audy, D'Amours & Rousseau (2008)	Different coordination mechanisms scenarios evaluation to ensure a reduction in cost and delivery time and gain in geographic market coverage.	Canadian furniture industry	Game Theory - Equal Profit Method
Nadarajah (2008)	Less-than-Truckload collaboration to reduce cost and improve customer service	Less-than-Truckload	Tabu Search & Guided Local Search
Cruijssen, Cools, Dullaert, Fleuren (2007)	Large-scale survey on potential benefits and impediments of horizontal collaboration between respondents who are currently collaborating and respondents who are not.	Logistics Service Providers in Flanders	Empirical Research
Song & Regan (2003)	Auction-based carrier collaboration mechanism examination and development.	US trucking industry	Quasi-Linear

Source: (Okdinawati, Simatupang, & Sunitiyoso, 2015)

Several of the present paper on horizontal CTM used case studies in the US (Taherian, 2013; Song & Reagan, 2003), Thailand (Asawasakulsorn, 2012), and Flanders (Cruijssen, Cools, Dullaert & Fleuren, 2007) as shown in **Table 1**. While most of the present paper uses the case study of horizontal CTM in Canada (Chabot, Bouchard, Legault-Michaud, Renaud & Coelho, 2018; Audy, D'Amours and Rousseau, 2008), the existing research on horizontal CTM has been done mostly on the issue of cost savings (Taherian, 2013; Peeta & Hernandez, 2011; Liu, Wu & Xu, 2010; Audy, D'Amours and Rousseau, 2008; Frisk, Gothe-Lundgren, Jornsten & Ronnqvist, 2010; Nadarajah, 2008; Song & Regan, 2003). The issues of logistics optimization (Defryn, C. & Sorensen, K., 2018; Defryn, Sorensen & Dullaert, 2017) and profit or savings distribution (Liu, Wu & Xu, 2010) for the collaborating parties are solved using mathematical

modeling and computer simulation. Therefore there is a gap to explore the behavioral aspect of horizontal CTM among parties involved in the collaboration, particularly in the Indonesia industry application.

Behavioral Aspect of CTM

Horizontal model of collaboration transportation model between truck carriers in Indonesia and the understanding of behavioral aspect which arises from the collaboration currently hasn't much been discussed or developed. According to Okdinawati, Simatupang, and Sunitiyoso (2017), the behavioral aspect in CTM is crucial to synchronize the structure decision process in CTM based on different perspectives of the collaboration parties which affect decision-making. Okdinawati, Simatupang, and Sunitiyoso (2017) used a study case on the behavioral aspects of vertical CTM in Indonesia in which shippers, carriers, and receivers have different objectives and perspectives. Meanwhile, for this paper, the focus was on the behavioral aspect of horizontal CTM in which both the collaborating parties (Carrier - Carrier) has similar objectives and perspectives which are to provide excellent transportation service, reduce transportation cost and to conduct efficient operational processes.

Table 2: Critical Enablers to the human side of CTM

Key Enabler	Description
Common interest	To ensure ongoing commitment, all parties involved in the collaboration needs to have interest in the collaboration outcome.
Openness	Collaborating parties must openly share their practice, resources as well as other proprietary information for the relationship to work. Adhere to anti-trust guidelines for collaboration among competitors remains prerequisite.
Recognizing who and what is essential (Prioritization)	Not all are eligible as a potential collaboration partner. Choose only the prospective collaborators and supply chain activities with the most significant benefits.
Clear expectations	All collaborating partners have to clear on what their contribution expectation in the relationship.
Leadership	Nothing significant will be accomplished without a dominant party to lead the collaboration forward.
Cooperation, not punishment	Should there be a problem in the relationship, the right action is to solve the problem jointly instead of giving out punitive actions.
Trust	At every management level and functional area in the organization, this primary human quality must be evident.

Source: (Supply Chain Management Review, 2000, cited in Sutherland, 2006, p. 6)

Despite the benefits of horizontal CTM model and similar objectives among collaborating carriers, the collaboration between unrelated or rivaling carriers will not be easy. The difficulty of the application of the operation model in practice arises partly due to the lack of understanding of human behavior (Bendoly, Donohue & Schultz, 2005). Additionally, not every truck carriers are eligible as a potential collaboration partner. Based on the study by Asawasakulsorn (2009), to determine collaboration success among competitors we can use five

selection criteria to choose potential collaborative partners (perceived cost reduction, transportation complementary, direct prior alliance experience, trust, and commitment). Taherian (2013) propose the use of outsourcing to a neutral party such as 3PL in their semi-automated DIY model. In this model the neutral party (3PL) manages the whole coordination process, removing the headache of establishing collaboration relationship between collaborating parties. According to *Supply Chain Management Review* (Supply Chain Management Review, 2000, cited in Sutherland, 2006, p. 6), critical enablers to about the human side of CTM are essential to ensure successful and long-term CTM operation as shown in **Table 2**.

There are only a few papers which delved into trust in the horizontal collaboration (Pomponi, Fratocchi & Tafuri, 2015; Asawasakulsorn, 2012) and partner selection criteria for the collaboration (Taherian, 2013; Asawasakulsorn, 2012). Lack of trust between supply chain partners is one of the behavioral issues that can negatively impact operational success (Bendoly, Donohue & Schultz, 2005). Empirical research by Asawasakulsorn (2012) shown a positive relationship between prior direct collaboration experience and some elements of trust, commitment and trusting intention in a potential collaboration partner.

Methodology

The proposed conceptual framework of horizontal collaborative transportation management uses a qualitative approach by using observation, and semi-structured interviews. The qualitative data are collected from October 2017 to March 2018 due to the informant availability for data collection. For this paper, we use two case studies of Dutatrans and Lookman Djaja.

The objective of the interview is to define the problem situation and structure the problematic situation. Two truck freight companies chosen for our case study are Lookman Djaja and Dutatrans. The justification is due to their truck armada size where both companies owned around 200 armada trucks. In Indonesia, for large truck freight companies, the truck armada sizes are around 1,300 trucks, while for small companies around 1 to 2 trucks armada. Both Lookman Djaja and Dutatrans falls in the middle range. Sometimes too big a company with tremendous bargaining power can hamper collaboration. We interviewed one senior executive from each company as well from APTRINDO. The justification for this data collection is due to the current limited available access to relevant informants. The informants from each case studies are selected based on their position as the senior executives of each organization with more than fifteen years of experience in the truck freight industry.

Dutatrans and Lookman Djaja are two truck freight member companies in APTRINDO (Indonesian Association of Trucking Freight Industry) DKI Jakarta and West Java respectively. DKI Jakarta province has the highest GRP (Gross Regional Product) in Indonesia in 2017 amounting to Rp2,410 trillion, while West Java province ranked the third province in Indonesia with the highest total GRP amounting to Rp1,783 trillion (Badan Pusat Statistik, 2016). The combined GRP of DKI Jakarta and West Java provinces amounting to Rp13,824 trillion or equal to 30% of the total GRP from all the provinces in Indonesia. The second highest GRP province in Indonesia in 2017 is East Java at Rp 2,019.2 trillion. However, we did not include East Java in our case study. The decision to focus only on the case studies in DKI Jakarta and West Java is due to the high amount of the combined GRP from both provinces as well as due to the currently limited access to the industrial data and contact person to the relevant truck freight companies in the other high GRP generated provinces.

Using the case study from two major truck freight companies in two provinces with high GRP will offer us more in-depth and more detailed insights into the collaboration process between truck companies in two economy powerhouse provinces in Indonesia. Another justification is due to the current limited available access to relevant informants. The informants from each case studies are selected based on their position as the senior executives of each organization with more than fifteen years of experience in the truck freight industry.

Case Studies Illustration

To understand the condition of the transportation industry in Indonesia and to develop a collaborative model among truck carrier companies, this research is done based on two case examples.

Case Study of Dutatrans

This case study shows the applicability of the horizontal CTM model in the real world. Dutatrans is a transportation company providing a broad range of transportation services which included inland transportation, sea freight, air cargo, and multimodal services. Dutatrans employed various truck types, from CDD truck (5-ton capacity), Engkle truck (10-ton capacity), Tronton truck (12-ton capacity), Tronton Wing Box (20-ton capacity), Trailers with containers measuring to 20' feet and 40' feet.

Based on our interview, Dutatrans usually caters shipping service for FMCG (fast moving consumer products), using their existing truck armadas. Dutatrans collaborate with other smaller truck freight companies usually due to insufficient availability of trucking armada, unreachable route or to lower empty truck problem or backhauling. By collaborating between carriers, Dutatrans and its partners can reduce transportation cost, increasing efficiency by minimizing backhauling and complementing the capabilities of different truck companies routing and resources.

However, some truck carriers in Indonesia are reluctant to collaborate due to lack of trust and lack the ability to orchestrate collaboration. This situation requires Dutatrans and other small truck companies to develop a partnership with APTRINDO. APTRINDO is an Indonesian Association of Trucking Freight Industry which aims to foster and develop members' capabilities as well as establish a strategic partnership relationship to create and develop conductive climate especially in the field of goods transportation. APTRINDO was established in August 2014 by 48 truck company owners with current memberships amounting around 44,000 units of truck owners and companies. Based on the interview with the senior secretary of APTRINDO West Java (Personal communication, March 2018) APTRINDO helps to facilitate communication and collaboration between members of the association. Collaboration among truck carriers was made possible usually due to insufficient availability of trucking armada, unreachable route or when the company does not have the adequate truck carrier to deliver specific cargo such as the liquid or refrigerated cargo. As the neutral party, APTRINDO will help to facilitate communication and later coordinate the collaboration process amongst truck freight carriers. In return truck, freight companies paid 2.5% of total freight service to the association, 2.5% to the truck owner and 5% to the company which the customers' orders.

In the first stage, Dutatrans selects collaboration partners through group communication platform provided by APTRINDO. In this forming stage, each carrier interested in collaboration reveal specific information about themselves and their objectives. Since the collaborating parties (Carrier - Carrier) has similar objectives and perspectives, there's an opportunity to implement horizontal collaboration by utilizing and complementing different

capabilities of each truck carriers. For example, the objectives of Dutatrans is to provide excellent transportation service and increasing profit by reducing transportation cost and conducting efficient operational processes. Depending on the number of demand from customers, Dutatrans may decide to collaborate with other truck carriers with sufficient vital enablers to collaboration to fulfill customer's demand.

Dutatrans and its collaborating parties later develop a hierarchical decision-making structure in the strategic, tactical and operational level. In the strategic level, carriers will agree on developing front-end agreement based on the following information: pricing, the products shipped, information about the receivers such as delivery location and available resources. The front-end agreement will detail the duties and responsibilities of each collaborating parties as well as detail on the compensation distribution. The agreement can give assurance to the collaborating parties on the amount of delivered volume of goods to be delivered. Collaborating carriers can then formed network planning to establish distribution strategy and visibility of information in regards to the delivery operation and profit distribution.

On the tactical level, Dutatrans and the other collaborating carriers will match customer demand and forecasted order volume with the capacity and the availability of truck resources. This information can be filed and use to forecast the next shipment based on the timing of the order and its location. The shipment forecast will enable carriers to better prepare for the next incoming shipment from customers as well as to plan its transportation capacity. Next, the collaboration will assign the company responsible for which deliveries. Through the process, the information will be made visible through updated reports, including the position of the truck vehicle to ensure on-time delivery, excellent customer service and reduction of transportation cost.

Afterward, Dutatrans and its partner will conduct scheduling and route at the operational level. Scheduling will be done to ensure customer orders are delivered on time, while routing will assist in the distribution of goods to reach its destination. Finally is the last step is the order processing to make the necessary information on the whole process visible for all collaborating partners and the operation process run efficiently.

Dutatrans and other collaborating carriers will evaluate the result of the collaboration. This evaluation stage will measure the benefits and performance of the collaboration against the risks of collaboration. The results of the evaluation will be considered by each collaborating parties whether to develop a long-term commitment to collaboration or to disband the collaboration due to the perceived risk or inequality from the result that is felt by one of the parties.

Case Study of Lookman Djaja

Lookman Djaja is a transportation company located in DKI Jakarta which provides truck freight transportation services. Lookman Djaja currently employed various truck types, from Fuso truck (6-ton capacity), Tronton truck (12-ton capacity), Super Tronton Wing Box (15-ton capacity), and Big Mama Wing Box (32-ton capacity). Based on our interview, Lookman Djaja usually caters shipping service for FMCG (fast moving consumer products), using their existing truck armadas. Sometimes they are contracted to deliver cargo with special handling requirements, such as liquid products and temperature sensitive products. However, Lookman Djaja does not have the necessary type of truck to deliver specific cargo such as the liquid or refrigerated cargo. Therefore, the truck company needs to collaborate with other truck

companies which own shipping vehicles that can deliver these specific cargoes, such as bulk tankers and icebox.

In the first stage, Lookman Djaja looks for collaboration partners through group communication platform provided by APTRINDO. In this forming stage, each carrier interested in collaboration will look at collaborating partners with similar objectives and perspectives. To complement the different capabilities of each truck company, the potential collaborating partner will reveal specific information about themselves such as their truck resources. Lookman Djaja will look for collaborating truck partners with specific resources, such as tank truck for liquid cargo and refrigerated truck for refrigerated cargo. Depending on the number of demand from customers, Lookman Djaja may decide to collaborate with other truck carriers with sufficient vital enablers to collaboration to fulfill customer's demand.

Based on the interview, all collaborating parties should be willing to trust and open about their operational information in order to conduct a successful collaboration. However Indonesian truckload companies have to be careful on the content of the information they disclosed to their partner since the rivaling company in collaboration may take this confidential information in order to steal market share by providing lower pricing and faster shipment service to the client.

Lookman Djaja and its collaborating parties later develop a hierarchical decision-making structure in the strategic, tactical and operational level. The flow of the strategic level, tactical and operational level will be similar to that of Dutatrans case study. However, based on the interview, the extent of horizontal collaboration in Indonesia are most commonly done only at the operational level.

At the final stage, Lookman Djaja and other collaborating carriers will evaluate the result of the collaboration. This evaluation stage will measure the benefits and performance of the collaboration against the risks of collaboration. The results of the evaluation will be considered by each collaborating parties whether to develop a long-term commitment to collaboration or to disband the collaboration due to the perceived risk or inequality from the result that is felt by one of the parties.

Illustration Analysis and Discussion

Based on the interview, the following are the condition of Indonesia trucking industry as well as the analysis and proposed conceptual framework.

Discussion of Indonesia Trucking Industry

Indonesia was affected as well by globalization, with the dissolving of traditional trade barriers and global competition from abroad. According to Head of APTRINDO (Indonesian Association of Trucking Freight Industry) of DKI Jakarta (Personal communication, October 2017), most of the trucking firms main goals are on how to best response uncertainty in the rapidly changing demand for the competition coming globally and reducing total cost, especially for the truck logistic service industry. Truck backhauling issues, uncertainty in delivery due to congestion and bad roads are some of the significant logistics challenges in Indonesia (Sandee, H., 2016). Truck freight companies are limited in its resources and capacity, thereby limiting its ability to fulfil customer demand in an uncertain market. Since trucking carrier service industry is a commodity product with no substantial differentiation on their service, therefore compelling most trucking courier service companies to compete through the price war. Indonesian companies may either adopted the competitive strategy or collaborative strategy to survive in the competitive market.

Shippers in Indonesia most often utilize the multiple truck carriers to mitigate late delivery time and loading time, however, this, in turn, made the shippers can easily switch carriers. Some of the horizontal collaboration among carriers was made possible usually due to insufficient availability of trucking armada, or when the company does not have the adequate truck carrier to deliver specific cargo such as the liquid or refrigerated cargo. The collaborating parties (Carrier - Carrier) has similar objectives and perspectives which are to provide excellent transportation service, reduce transportation cost and to conduct efficient operational processes. Based on the above there's an opportunity to implement horizontal collaboration between trucking courier by utilizing and complementing different capabilities of each truck carriers. As stated by Prakash and Deshmukh (2010), collaboration can help each party to complement capabilities and adding flexibility, therefore giving a competitive edge to the whole business network.

However, despite the merits of horizontal CTM, the collaboration between unrelated or rivaling carriers will not be easy due to lack of trust. Besides, not every truck carriers are eligible as a potential collaboration partner. Each truck freight company has different truck resources with differing capacity, practice, and processes. Additionally not every truck freight company have the capability to orchestrate collaboration. Thus the collaboration needs a neutral party to help coordinate the collaboration process amongst truck freight carriers. For the case in Indonesia, truck companies refer to APTRINDO as the neutral party which helps to facilitate and coordinate collaboration.

Analysis and Conceptual Framework

Based on the problem situation, this paper proposed a conceptual framework for horizontal CTM as shown in Figure 2. The conceptual framework contains three agents: Carrier A, Carrier Band and Neutral Party. We will refer the truck logistic service companies as the carrier in this paper. Carrier's goals are to fulfill customers' demand, capture market share and maximize their profit by either increasing transportation rates or reducing transportation cost (Okdinawati, Simatupang & Sunitiyoso, 2014). Meanwhile APTRINDO is referred as the Neutral Party. This paper will apply critical enablers of the human side of CTM (Supply Chain Management Review, 2000, cited in Sutherland, 2006, p. 6) for collaborating partner selection to ensure successful and long-term CTM operation. Key enablers to the human side of CTM and its definitions are as depicted in **Table 2**. They are the common interest, openness, prioritization, clear expectation, leadership, cooperation not punishment and trust.

In the first stage, the agents' interaction is only limited to enhancing each other's attractiveness to join a collaboration. By revealing each agent's' carrier ability such as capacity and scope of resources as well as other CTM key enablers, it is used to position their attractiveness to collaborate. The agents can either decide to join collaboration or not join the collaboration. Similar role and activity were identified in each agent since both are carriers. Depending on the number of demand from customers, carriers may decide to collaborate to fulfill customer's demand due to each agent have different capacity and resources. Should the carrier A or carrier B does not have the necessary vital enablers to collaboration, the horizontal CTM will not take place.

Based on the problem situation above, some truck carriers in Indonesia are reluctant to collaborate be it due to lack of ability to orchestrate collaboration, or due to collaboration is outside the core capability or due to lack of trust. Therefore a neutral party, such as 3PL or APTRINDO, will be used as coordinator for collaboration between truck carriers with the

incentive payment for collaborating parties. The inclusion of a neutral party is optional and depends on the need for the collaborative parties.

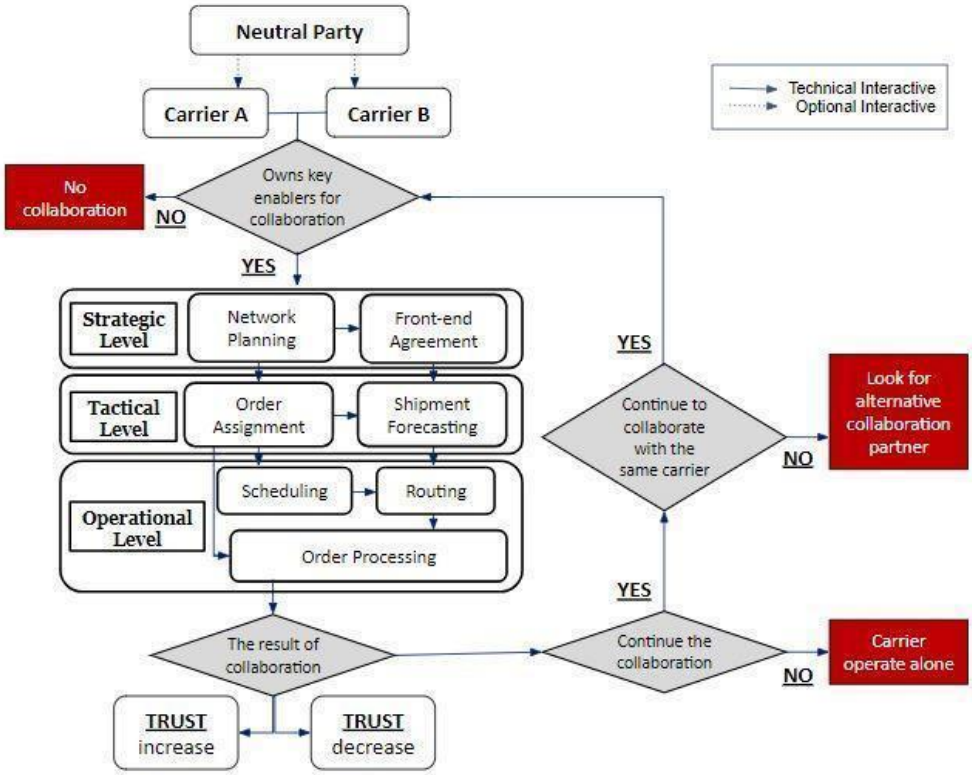

Figure 1: The Proposed Framework for Horizontal CTM of Agent's Decision-Making Processes (Author's Analysis)

The next stage is the CTM internal planning stage decision of the trucking company which moved hierarchically into the strategic level, tactical level, and operational level. The framework for the CTM planning stage level was adapted from Okdinawati, Simatupang, and Sunitiyoso (2015) as depicted in **Table 3**.

Table 3: CTM Internal Planning Stage Level

Level	Description
Strategic Level	**Front-end Agreement**: The process starts on the Front-end agreement stage, which is necessary for all the agents involved in the collaboration as an assurance of collaboration per the agreement to bring equal benefit. **Network Planning:** In this stage, the agents established pricing, distribution strategy and visibility of information to bring benefit to the collaboration.
Tactical Level	**Shipment Forecasting**: At this stage, the collaborating agents would forecast the volume of shipment based on customer demand and match them with the existing capacity and availability of trucking resources. **Order Assignment**: After the shipment forecasting, the collaborating agents will decide the assignment for the deliveries.
Operational Level	**Scheduling**: This stage is necessary to ensure the goods are available and ready to be delivered on time.

	Routing: The routing stage is developed to assist the distribution of goods from the shipper to the carrier.
	Order Processing: All agents are required to develop an order-processing procedure to make the necessary information visible for all collaborating agents and the operation process run efficiently.

Source: (Okdinawati, Simatupang & Sunitiyoso, 2015)

The result of the CTM internal planning stage decision of the trucking company will show the interaction and information sharing among all parties in the collaboration. The result of the collaboration will impact the level of trust in the collaboration. Changes in trust level are evident through the continuation or disbandment of the ongoing collaboration. Should trust increase, the collaborating carrier may continue the collaboration with the same courier which will bring it back to the formation of crucial enablers to collaboration stage. However, should the trust decrease, the collaborating carrier may decide to discontinue the collaboration and operate alone. On the other hand, should trust decrease, the collaborating carrier may continue the horizontal collaboration. However, they will look for alternative collaboration partner instead with the existing one.

Based on the two case studies in Indonesia, we found that the most relevant and applicable key enablers to the human side of CTM are the common interest, openness, and trust. Common interest means that all collaborating parties have similar objectives and perspectives for the collaborating outcome to secure participation in the collaboration. Openness is required to enable collaborating parties to share information and knowledge. Meanwhile, trust is essential to maintain a long-term secure collaboration in uncertain market demand and the competitive market environment in Indonesia.

Another finding is that the extent of horizontal collaboration in Indonesia is commonly at the operational level only. The limit of the extent of the collaboration in the operational level only was due to the collaboration mostly focusing on the daily operation for customer orders' fulfilment which requires a minimal amount of trust to initiate collaboration. Higher decision-making structure in the tactical and strategic level requires a higher level of trust and openness, which involve continuous open communication as well as the common interest in the long term between collaborating partners.

Lack of trust remains an issue for maintaining long-term horizontal collaboration between unrelated or rivalling carriers in Indonesia. Not every carrier are eligible and own differing capacity, resources and capability for collaboration. Besides, there is a concern of opportunism when collaborating party disclosed the company's internal information (such as routing, pricing, and customers' information) for the collaboration. The rivaling company in collaboration may take this confidential information in order to steal market share by providing lower pricing and faster shipment service to the customer. Therefore some collaboration in Indonesia requires a trusted, neutral party to coordinate the collaboration process among truck freight carriers. For the case in Indonesia, truck companies refer to APTRINDO as the neutral party which helps to facilitate and coordinate collaboration.

Conclusion

Through the above-proposed framework, the researcher hopefully may be able to forecast whether the horizontal collaboration between carriers will succeed and maintained in a long-term. Trust is essential to maintain a long-term secure collaboration in uncertain market

demand and the competitive market environment in Indonesia. Model validation is required to see if the model can capture the behavior similar to the real system. APTRINDO West Java and DKI Jakarta, as well as the owner of Lookman Djaja, have validated this model. The limitation of this paper is the contribution of horizontal collaboration from a conceptual point of view and the exclusion of practical application. Empirical research should be undertaken to apply the conceptual framework in real practice and refine the framework components. For future studies, ABM simulation can be used to subjectively validate and evaluate whether the proposed framework model system and its agents' behaviors are reasonable and capable of behaving similarly as the actual system in the real situation. The practical implications of this research using the conceptual framework are to see whether the horizontal collaboration between Indonesia truck freight companies is viable without the risk of investing much money in real collaboration. The managerial implications of this research are to enable truck freight managers to visualize the collaboration process.

References

Audy, J.F., D'Amours, S. & Ronnqvist, M. (2008). Cost Allocation in the Establishment of a Collaborative Transportation Agreement: An Application in the Furniture Industry. *The Journal of the Operational Research Society*, 62 (6), 960-970.

Asawasakulsorn, A. (2009). Transportation Collaboration: Partner Selection Criteria and Inter-Organizational System (IOS) Design Issues for Supporting Trust. *International Journal of Business and Information*, 4 (2), 199-220.

Badan Pusat Statistik. (2016). Statistik Indonesia 2016. https://www.bps.go.id/index.php/publikasi/4238 [Accessed on March 2018].

Bendoly, E., Donohue, K., and Schultz, K.L. (2005). Behavior in Operations Management: Assessing Recent Findings and Revisiting Old Assumptions, *Journal of Operations Management*, 24 (6), 737-752.

Bishop, S.B. (2002). Collaborative transportation management benefits. 2001. *Annual Conference Proceedings.*

Browning, B., & White, A. (2000). Collaborative Transportation Management. *Logility Inc*. http://www.vics.org (accessed October 10, 2017)

Chabot, T., Bouchard, F., Legault-Michaud, A., Renaud, J., Coelho, L.C. (2018) Service level, cost and environmental optimization of collaborative transportation. *Transportation Research Part E*, 110 (2018) 1-14.

Cruijssen, F., Cools, M., Dullaert, W., Fleuren, H. (2007). Horizontal cooperation in logistics: opportunities and impediments. *Transportation Research Part E: Logistics and Transportation Review*, Vol. 43 No. 2, pp. 129-142.

Defryn, C., & Sorensen, K. (2018). Multi-objective optimization models for the traveling salesman problem with horizontal cooperation. *European Journal of Operational Research*, 267 (2018) 891-903.

Defryn, C., Sorensen, K., & Dullaert, W. (2017). Integrating partner objectives in horizontal logistics optimization models. *Omega*, 000 (2017) 1-12.

Esper, T.L., & Williams, L.R. (2003). The value of collaborative Transportation Management (CTM): its relationship to CPFR and information technology. *Transportation Journal*, 42 (4), 55-65.

Frisk, M., Gothe-Lundgren, M., Jornsten, K., & Roonqvist, M. (2010). Cost Allocation in Collaborative Forest Transportation. *European Journal of Operational Research*, 205 (2), 448-458.

Global Business Guide Indonesia (2013) Indonesia's Logistics Sector. http://www.gbgindonesia.com/en/services/article/2013/indonesia_s_logistics_sector.php [Accessed November 2018]

Herliana, L., & Parsons, D., (2010) Chapter 22 Logistics in Indonesia. https://www.apec.org/-/media/APEC/Publications/2011/1/The-Impacts-and-Benefits-of-Structural-Reforms-in-Transport-Energy-and-Telecommunications-Sectors/TOC/Logistics-in-Indonesia.pdf [Accessed November 2018]

Jagoda, P.A. (2013). Competitive and Collaborative Conflict Strategies. http://www.conflicttango.com/competitive-an-collaborative-conflict-strategies/. [Accessed November 2017].

Liu, P., Wu, Y., & Xu, N. (2010). Allocating Collaborative Profit in Less-Than-Truckload Carrier Alliance. *Journal of Service Science & Management*, 3(1), 143-149.

Mason, R., Lalwani, C., & Boughton, R. (2007). Combining Vertical and Horizontal Collaboration for Transport Optimization. *Supply Chain Management: An International Journal*, 12 (3), 187-199.

McKinsey & Co. (2010). Eye For Transport. www.eft.com [Accessed November 2017]

Nadarajah, S. (2008). Collaborative Logistics in Vehicle Routing. *The University of Waterloo*.

Okdinawati, L., Simatupang, T.M., and Sunitiyoso, Y. (2017). *A Behavioral Multi-agent Model for Collaborative Transportation Management*. Doctoral Dissertation, Institut Teknologi Bandung.

Okdinawati, L., Simatupang, T., M., & Sunitiyoso, Y. (2015). Modeling Collaborative Transportation Management: Current State and Opportunities for Future Research, *Journal of Operations and Supply Chain Management*, Volume 8 Number 2 p 96-119

Okdinawati, L., Simatupang, T., M., & Sunitiyoso, Y. (2014). A Behavioural Multi-agent Model for Collaborative Transportation Management (CTM). *Proceedings of T-LOG*, 2014.

Peeta, S., & Hernandez, S., H. (2011). Modeling of Collaborative Less-Than-Truckload Courier Freight Networks. *USDOT Region V Regional University Transportation Center Final Report*.

Pomponi, F., Fratocchi, L., Tafuri, S.R. (2015). Trust development and horizontal collaboration in logistics: a theory based evolutionary framework. *Supply Chain Management: An International Journal*, 20/1 (2015) 83-97.

Prakash, A., & Deshmukh, S.G. (2010). Horizontal Collaboration in Flexible Supply Chains: A Simulation Study. *Journal of Studies on Manufacturing*, (Vol. 1-2010/Iss. 1). Pp. 54-58.

Sandee, H. (2016). Logistic challenges in Indonesia. Media round-table talk. World Bank Indonesia Office. World Bank Group.

Simatupang, T.M., & Sridharan, R. (2002). The Collaborative Supply Chain. *The International Journal of Logistics Management*, 13 (1), 15-30

Simatupang, T.M., & Sridharan, R. (2002). The Collaborative Supply Chain: A Scheme for Information Sharing and Incentive Alignment. *The International Journal of Logistics Management*, 1 February 2002.

Soeriaatmadja, W., (2018). Infrastructure developments aim to unite Indonesia, says Jokowi in annual Parliament address. Straits Times. https://www.straitstimes.com/asia/se-asia/infrastructure-developments-aim-to-unite-indonesia-jokowi [Accessed November 2018]

Song, J., & Regan, A., C. (2003). An Auction-Based Collaborative Carrier Network. *Transport Research Part E: Logistics and Transportation Review*, 2.

Sutherland, J.L. (2006). Collaborative Transportation Management: A Solution to the Current Transportation Crisis. *CVCR White Paper 602*. Lehigh University, Pennsylvania, U.S.A.

Taherian, H. (2013). Outbound Transportation Collaboration Do-It-Yourself (DIY). *Thesis Engineering System Division*, MIT.

World Bank (2018) Global Ranking Logistics Performance Index 2018.

https://lpi.worldbank.org/international/global [Accessed November 2018]
World Bank (2010) Connecting to Compete in Indonesia. Paper associated with the release of the World Bank LPI Rankings 2010. http://siteresources.worldbank.org/INTINDONESIA/Resources/Publication/280016-1264668827141/LPI.indo.en.pdf [Accessed November 2018]
VICS (CTM sub-committee of the voluntary inter-industry commerce standard logistic committee). (2004). *Collaborative Transportation Management White Paper*. Version 1.0. http://www.vics.org [Accessed October 2017].