

## **Determinants of Logistics Transportation System in Thai Automotive Service Parts Industry**

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— *Review of* —  
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### **ABSTRACT**

The purpose of this paper is to study factors that impact on determinants of logistics transportation system in Thai automotive service parts industry. The study identified contexts where sourcing is made based on transaction cost economics theory (TCE), the resource-based view (RBV), core competency (CC), and customer requirement (CR) to examine a better theory for an organization's sourcing decision. In this paper, we reviewed the literature of logistics, supply chain management and performed multiple case studies by difference of supplier firm size in Thai Automotive Service Parts Industry. The observed results showed that the firm size, demand volume, bargaining power, distance of delivery, customer requirement, uncertainty of delivery, firm capability, frequency of delivery, and transportation cost are major drives of sourcing decision to in-house logistics provider or outsource logistics provider. This result provides a new perspective of the implementation of determinants of logistics transportation system under different levels of supplier firm size. This paper concludes with implementations for academics and practitioners, also the direction of future research in this area.

Keywords: Logistics transportation, Thai automotive service parts industry, case study.

### **1. INTRODUCTION**

The organizations' effectiveness and efficient utilization of the existing resources and capital has become extremely important recently (Yilmaz and Bedük, 2014). With the presence of the modern logistics concept, one of the core competitiveness of organization which is paying more and more attention to logistics management considering logistics is a new profit source. To reduce the logistics cost, the organization begins to inspect logistics organization modes (Wei and Ou, 2011).

Thailand has been pursuing the role of "Asian Detroit" for long. Its automotive market growth attracts enormous foreign investment to automotive service parts, especially the investment from Japanese companies which enters the market mostly as the joint venture. Currently, Thailand automotive industry is constituted by carmakers, and Tier 1 & 2 parts suppliers. Its suppliers are mainly invested by multinational companies. In addition, Thai Automotive Service Parts Industry is one of the value-added industries to drive the economics growth in Thailand (Thailand Automotive Institute: TAI, 2007). In 2014, the export value of automotive service parts was 252 Billion Baht. Component parts had the highest portion 61% of service parts export (The Federation of Thai industries, 2014). Benefits of determinants of logistics transportation system have been confirmed by a lot of researches, including transaction cost reduction and improving performance (Maia et al., 2010) and (Boysen and Bock, 2011), Outsourcing can improve the firm's cost-efficiency (Jiang et al., 2006). While

In-house logistics provider allow a firm to maintain management competencies to make more effective sourcing decisions (Williamson, 1989).

There is another stream of research attempting to discover factors that may impact on the determinants of logistics transportation system in Thai Automotive Service Parts Industry.

Transaction Characteristics has been identified as one of these factors based on logistics, supply change management literature. As explain by the transaction is made the basic unit of analysis and procurement decision (Williamson, 2008). The decision is first explained, thanks to the direct influence of three features of transaction: assets specificity, uncertainty and frequency (Ivanaj and Franzil, 2006).

Customer requirement is an empirical investigation done by in-depth interview with both supplier and customer who impact to the decision on determinants of logistics transportation system including delivery time, quality of delivery, and responsiveness.

Transportation cost plays a significant role in the overall costs of logistics operation (Beamon,1998; Aktas et al., 2011). The transportation cost here includes the means of fuel cost, maintenance cost, driver salary.

Core competency is essential to outsourcing decisions to consider logistics provider as a core business of the firm. If it is a core competitive activity, the better choice is to keep it in-house as it is more important. If it is a non-core activity, the effects of sunk cost may be comparatively low, thus implementing outsourcing may be possible in such a situation (Yushan Xu, 2009).

Firm capability is another factor which impacts to determinants of logistics transportation system according to the resource-based view of the firm theory (RBV) (McIvor, 2009). The RBV is the important theory to the study of outsourcing, as superior performance achieved in organizational activities which is relative to competitors would explain why such activities are performed internally (Rahman, 2011).

To extend the understanding of their roles, this study is based on a multiple case studies of sixteen automotive companies in Thailand. This paper is further divided into three sections: the first section literature reviews and development of a framework which are related to determinants of logistics transportation system; the second section explains the research methodology in detail; and the final section provides empirical evidences from the sixteen case studies and discusses the major discover and their implications in understanding Determinants of Logistics Transportation System in Thai Automotive Service Parts Industry.

## **II. LITERATURE REVIEW**

This section reviews current literatures on logistics and supply chain management. This study is viewed based on logistics mode of service parts, related theories, affecting factors, and theoretical framework.

### **2.1 Logistics Mode of Service Parts Industry.**

Logistics mode refers to the basic philosophy in the process of firm's service parts industry in Thailand. Typically, the main logistics mode can be divided into two logistics modes; i) In-house logistics provider, ii) Outsourcing logistics provider (3PLs).

- i) In-House Logistics Provider refers to the establishing logistics system of the firm which is suitable for its own characteristic management depending on its own resource. The firm finishes all works by doing the purchase of raw material to the production, the storage, the process, the packing and the owned transportation such as 6-wheel truck or 4-wheel truck to deliver service parts to customer by themselves (Xu and Xia, 2008).

- ii) Outsourcing logistics provider (3PLs) means that the firm focused on the principle of outsource logistics work which was done by itself originally. Firm can manage and control all the logistics processes efficiently by communicating with logistics service enterprise (The-third party logistics, 3PLs), through the information system, this type of logistics activities undertaken by the third party may contain the entire logistics flow which arranges their own transportation to pick the parts at the firm plant and deliver to customer warehouse (Xu and Xia ,2008).

## **2.2 Transaction Cost Economics Theory (TCE)**

The original theory was developed by Ronald Coase at the end of the 1930s and Oliver Williamson contributed to development of it with his book titled “Market and Hierachies”, published in 1975 (Williamson, 1975; Yilmaz and Bedük, 2014). TCE specifies the conditions under the assumption of which organization should manage an internal economic exchange within its boundaries, and what conditions which are suitable for managing an economic exchange externally, i.e. outsourcing (Williamson 1975, 1985). TCE argues that organization should consider the lever of transaction specifically in the investment of the economic exchange as the principal determinants whether the economic exchange is internally managed within the organization or not (McIvor, 2009). Although TCE mainly focuses on transactions costs, the basic criterion for organizing transactions is to economize the sum of both production expenses and transaction cost. If the total cost of using a market is too high, other structures such as hierarchical production in a firm are merely appropriate (Adela, 2007; Bigelow and Argyres, 2008; Hafeez, Malak, and Zhang, 2007; McIvor, 2009; Dekkers, 2011). TCE argues that transactions have distinct characteristics that, in combination with the attributes of alternated governance structures, produce different production and transaction cost. The three keys of transaction characteristics are (1) asset specificity, (2) uncertainty, and frequency of transactions (Williamson, 1985; Adela, 2007). Most of literatures consider the transaction characteristics, mentioned above, as the key attributes affecting to the transaction cost of economic exchange (Adela, 2007). Therefore, asset specificity, uncertainty, and frequency of transactions become the key components of transaction characteristics for this research.

## **2.3 Resource-Based View Theory (RBV)**

Resource-based view is a unique bundle of assets and resources that, if employed in distinctive way, can create competitive advantage (Barney, 1991; McIvor, 2009). According to (Barney, 1991) a resource with the potential to create the competitive advance must meet a number of criteria including value, rarity, imitability, and organization. The RBV is important to the study of outsourcing as superior performance achieved in the organization activities relative to competitors would explain why such activities are performed internally. A major concern of the RBV is how an organization’s capabilities develop and affect its competitive position and performance (McIvor, 2009). Therefore, the RBV has extremely influenced in the study of this research to explain the complexities of outsourcing by each service parts organization.

## **2.4 Core Competency Theory (CC)**

The original theory was developed by Gary Hamel and C.K. Prahalad in the book titled “Competing for The Future”, published in 1994 (C.K. Prahalad and Gary Hamel, 1994). They pointed out the concept core competency as an assembly of technology, skill and know-how to bring the specific benefit to customers. Kotler also explains that the core competency is the “Marketing Management”. And it has three features: (1) it is a source of competitive

advantage, (2) it has a wide potential application and availability for applying to various markets, and (3) it is difficult for competitors to imitate. Core competency is summarized as follows: core competency is the competitive strength established by the combination of own technology, skill and know-how, and it is difficult for competitors to imitate (Nakazato and Introduction, 2009). Therefore, management of each firm in automotive service parts industry can consider whether Logistics Activity is a core competency of business or not based on the core competency theory.

**2.5 Customer Requirement (CR)**

The customer requirement is the fact information of empirical investigation obtained from in-depth interviewed with both suppliers and customer. The degree of customer requirement would impact to the determinants for decision of logistics transportation system; including on-time delivery, quality of delivery, and responsiveness or other factors. To achieve highest customer satisfaction, a special attention must be given to the interactions between supplier and customer. Therefore, customer requirement would be considered as an important factor for this research.

**2.6 Theoretical framework**

Overall the literature review indicates that transaction characteristics, customer requirement, core competency, transportation cost, and firm capability do potentially affect the determinations of logistics transportation system in Thai automotive service parts industry.

Fig. 1 shows proposed theoretical framework which is based on five tenants. The determinants of logistics transportation system is directly influenced by i) transportation cost, ii) firm capability, and iii) core competency whereas transportation cost acts as the mediating to the determinants of logistics transportation system by iv) transportation characteristics, and v) customer requirement.

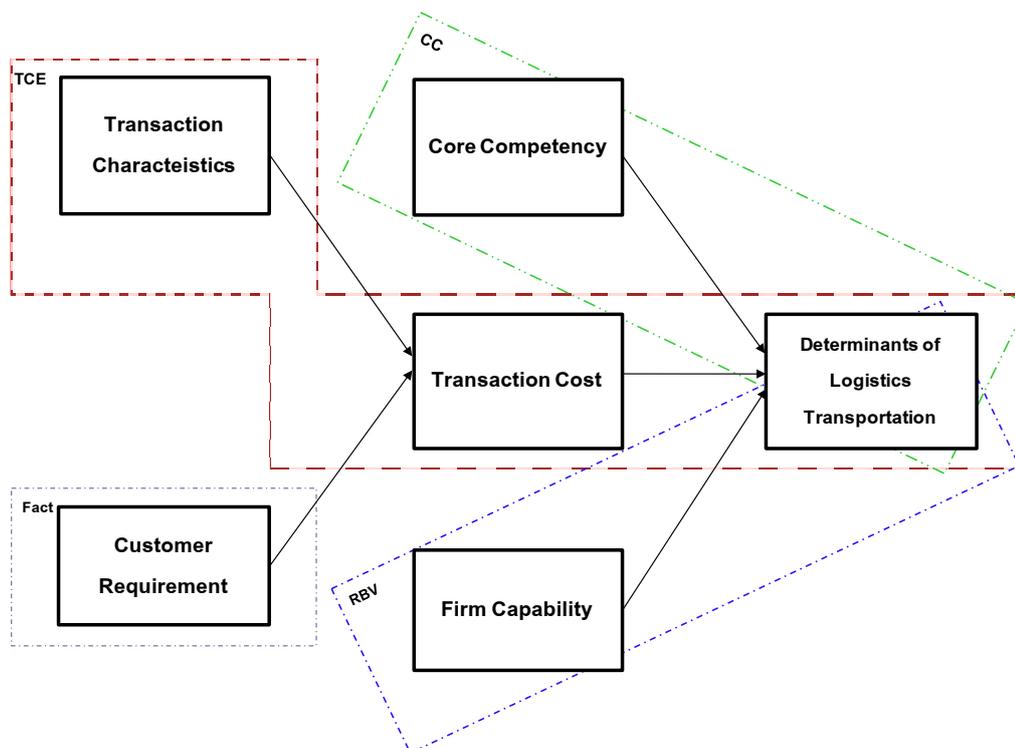


Fig. 1 Theoretical framework

### III. METHODOLOGY

A case study approach of qualitative method of analysis was chosen to undertake the research. Use of the case study approach allows an increase in the quality of data obtained. The case study approach allows the researcher to analyze the relationships, affecting factors, and social processes that is not possible in quantitative approach alone (McIvor, 2009).

While case study research has been frequently criticized for the lack of rigor, we have followed suggestions from the previous studies to increase the validity and reliability of the research. The first challenge was to identify the appropriate number of cases with respect to the desired level of validity, reliability, and generalization (Wong and Boon-itt, 2008; Eisenhardt, 1989) suggested about seven cases as being ideal for theory-building purposed. Less number of the study case might lead to a generalizability problem (Eisenhardt, 1989).

#### 3.2 Data collection

In Thailand, there are approximately 1,624 second-tier suppliers and third-tier suppliers providing raw material, component parts and equipment to first-tier suppliers. All are local suppliers and are identified as replacement equipment manufacturer (REM) suppliers. [28] This case study research was investigated sixteen manufacturing companies by in-depth interview within the Thai automotive suppliers. (See in Table 1)

According to the criteria of capital intensive by the department of industrial works, Ministry of Industry, we can classify the sixteen suppliers by firm size into 3 categories:-

1. High capital intensive (labelled as HC), capital investment over than 200 million baht.
2. Medium capital intensive (labelled as MC), capital investment 50-200 million baht.
3. Small capital intensive (labelled as LC), capital investment less than 50 million baht.

Table 1 Profile of the sixteen case company

Supplier	Product commodity	Product Lines	Capital (THB)	Capital Intensive
A	Interior	Ceiling Top	750,000,000	High
B	Chassis	Wheel Disc (Steel)	417,000,000	High
C	Exterior/Plastic	Bumper Plastic with paint	370,000,000	High
D	Exterior	Head lamp, Lamp-Front foglamp	365,200,000	High
E	Stamping	Steel floor parts and Bracket-Assy Part	282,360,000	High
F	Interior	Air bag, Side Airbag, Curtain Airbag and Passenger Airbag	200,000,000	High
G	Powertrain	Transmission Belt	177,000,000	Medium
H	Chassis	Power steering pump and Pulley	150,000,000	Medium
I	Engine& Powertrain	Brake & Fuel, EGR Pipe Assy	123,000,000	Medium
J	Electrical	Switch Power	80,000,000	Medium
K	Chassis	Steering Wheel	50,000,000	Medium
L	Rubber Part	Cabin mounting, Rubber bush, and Rubber stopper	45,000,000	Small
M	Engine& Powertrain	Piston	30,000,000	Small
N	Exterior/plastic	Rear view mirror	16,000,000	Small
O	Electrical/ Powertrain	Rubber Parts, Gasket/Insulator	14,000,000	Small
P	Exterior	Checker Door	6,000,000	Small

Remark: In all cases, company names are withheld in accordance with the general request for the company confidentiality.

#### 3.2 Data Analysis

Data analysis for this research is carried out through the in-depth interviews of sixteen suppliers in Thai automotive industry. In order to increase the reliability of this study, the in-

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depth interview questions are also created (see Appendix A) based on the definitions and components of the relevant constructs and theoretical framework (Fig. 1) established at the literature review.

In-depth interview questions are appropriate because we wanted to focus on the theories and the real information by interview of supplier. Since everyone was asked the same questions, we were able to compare three supplier groups as Large Capital Intensive, Medium Capital Intensive, and Small Capital Intensive. The interview questions were reviewed and pre-tested by advisors and practitioners in the automotive industry. A pilot study, used to review the interview questions, helped to improve the conceptual understanding of this research issue.

The interviewees also made suggestions to improve the interview when the on-site interviews and observations were conducted. Each interview was conducted at supplier plant with logistics managers supply chain manager/warehouse manager because they have the most knowledge regarding to logistics and supply chain process. Each interview was completed within 1 hour on average. Most of the interviews were tape recorded and document supported.

#### IV. RESULTS

The findings from the research by in-depth interview of sixteen suppliers which can be classified by firm size into 3 categories; i) High capital intensive (HC), ii) Medium capital intensive (MC), and iii) Low capital intensive (LC). The results show that TCE, RBV, CC, CR are required to understand the complexities of the determinants of logistics transportation system decision. The factors associated with TCE, RBV, CC, and CR were presented in the supplier's decision into i) in-house or ii) outsourcing as the details below;-

##### a) Logistics Mode in Thai automotive service parts industry

Difference suppliers by firm size would have a different logistics mode.

Supplier in HC and MC group are using two types of logistics mode; i) in-house and ii) outsource to deliver service parts to customer warehouse. On the other hand, most of suppliers in group LC is using only 1 type of logistics mode of outsourcing due to limitation of transportation management, human resources, and maintenance cost of each month to keep truck in a good condition.

##### b) Factors affecting the determinants of logistics transportation system

Difference suppliers with firm size would have a different importance of their owned decision to select type of logistics mode.

Supplier in HC group focuses on transportation cost as the first priority. However, supplier in MC group focuses on transportation cost and customer requirement as priority, and supplier in LC group focuses on customer requirement as priority.

##### c) Factors affecting In-house logistics provider

In case of supplier who selects in-house logistics provider to deliver service parts to the customer warehouse, the important factors is to consider for their selection by difference suppliers by firm size.

Supplier in HC group considers the factor of transportation cost as the first priority. They compare transportation cost from distance between their factories to customer warehouse, frequency of delivery, demand volume before making of the decision. For example, if the distance close to customer warehouse, they will select their in-house logistics provider by using their owned truck to pick the parts and delivery to customer warehouse instead of outsourcing.

Supplier in MC group consider to use their owned truck to deliver parts for customer requirement as emergency order purpose.

Nonetheless, supplier in LC group considers outsourcing logistics provider rather than in-house logistics provider according to no company policy to purchase trucks for delivery parts and support for maintenance cost.

d) Factors affecting outsourcing

In case of supplier who selects outsourcing logistics provider (3PLs) to deliver service parts to customer warehouse, important factors is to consider for their selection by difference suppliers by firm size.

Supplier in HC group considers transportation cost and demand volume as the main priorities. Outsourcing to the third party logistics provider to avoid the maintenance cost and logistics operators can develop their skills to other main function areas. The logistics in transportation activity is not our core business for the time being, while supplier in group MC consider demand volume by customer as the priority factor. It would be a good benefit for price negotiation with transportation supplier to reduce the transportation cost if supplier get a high demand volume with consistency of order. Supplier in C group who has low capital investment to consider for outsourcing to the third logistics provider as a result of limitation of budget, prevention of maintenance cost.

e) Decision maker in type of logistics mode

All suppliers of each group have the same concept to review the process of determinants of logistics transportation system such as transportation cost between in-house and outsource, firm capability, human resource strategies of logistics before submission to the top management for final decision.

f) Factors affecting value added to customer satisfaction

All supplier of each group have the same direction of the factors affecting value added to customers which are (1) On-time delivery (2) Quality of delivery (3) Maintain transportation cost and (4) Quick responsiveness.

g) Transaction characteristics

Asset specificity of transaction cost economics theory such as capital investment, distance of delivery, experiences in the industry and employee skills might significantly affected the determinants of logistics transportation system to the different suppliers in firm size.

Supplier in HC group considers distance of delivery, capital investment, and experience in the industry to be no effect to the determinants of logistics transportation system in Thailand.

In contrast to supplier in MC and LC group, the distance of delivery is the most important factors that effect the determinants of logistics transportation system due to the saving of transportation cost when the distance of delivery (supplier plant location) is close to customer warehouse.

h) Uncertainty of delivery

All supplier of each group have the same direction of the factors affecting the uncertainty of delivery; including Fluctuation in demand volume, Material shortage, Machine breakdown in the production plant, Accident during transportation, Traffic condition, and no stock on hand for sales. High uncertainty of delivery might impact to supplier delivery performance, thus supplier might consider outsourcing to third party logistics provider instead of in-house logistics provider.

i) Bargaining power

Different firm-size supplier would have different bargaining power.

Supplier in HC, MC, and LC group use the demand volume to negotiate transportation cost with outsourcing supplier and frequency of delivery with customer. By different bargaining

power of each group, it would be affected directly to determinants of logistics transportation system, transportation cost, and frequency of delivery.

j) Frequency of delivery

Different firm-size suppliers would have different frequency of delivery.

Supplier in HC group has average delivery frequency of 5 trips a week according to high demand volume by fast moving parts, maintenance parts, e.g. air filters, oil filter, fuel filter, Engine oil and Lubricant, etc.

Supplier in MC group has average delivery frequency of 1 trip a week according to medium moving parts by collision replacement parts, accident parts, e.g. head lamp/rear lamp, bonnet, bumpers, glass windshield, front door/rear door, etc.

Supplier in LC group has average delivery frequency of 1 trip a month according to low demand volume from slow moving parts, e.g. nut, screw, bolt.

k) Transportation cost

Transportation cost is most significantly affect to determinants of logistics transportation system for suppliers. Comparison of transportation cost between outsource and in-house, if in-house cost is higher than outsource cost, suppliers in HC, MC, and LC group would select outsource for transportation arrangement instead of in-house.

The key component of transportation cost; including fuel cost, maintenance cost, driver salary.

l) Customer requirement

All suppliers of each group consider customer requirement as the important factor

for determinants of logistics transportation system; including on time delivery, quality of delivery, and responsiveness.

m) Firm capability

Difference suppliers in firm size would have different firm capability.

Supplier in HC group have higher capabilities in terms of capital investment, human resources than supplier in MC group. However, supplier in LC group has lowest firm capability in all suppliers group. Nonetheless, supplier in LC group have high flexibility, quick response to customer because of less complexity of organization management.

With all mentioned factors above, we can summarize a diagram of the determinants of logistics transportation system shown in Fig. 2.

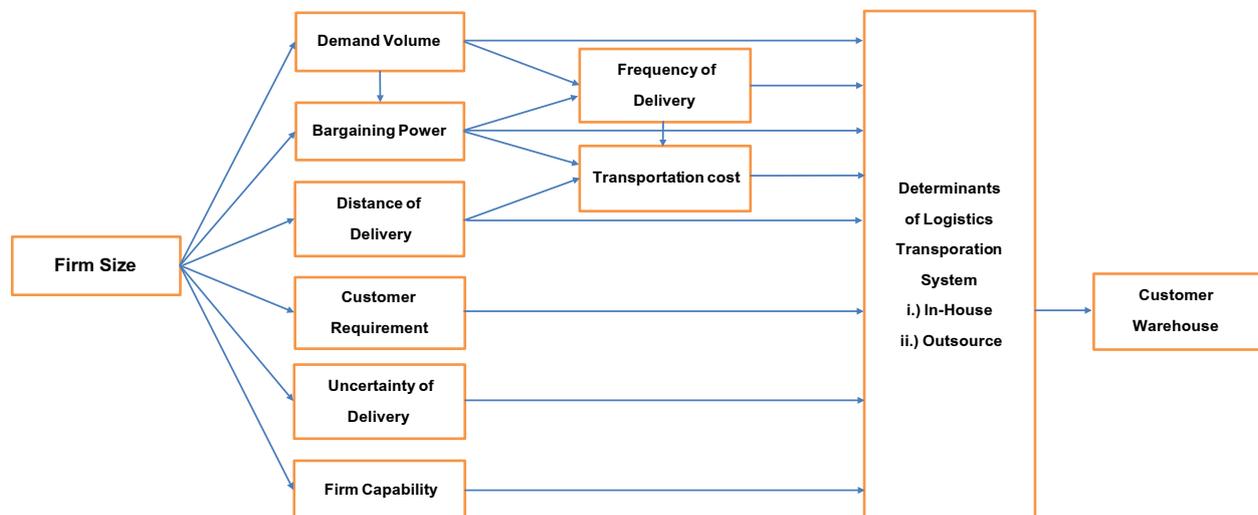


Fig. 2 Diagram of the Determinants of logistics transportation system.

## V. CONCLUSION

In this paper, we explore the relationships between the suppliers with different firm size and the determinants of logistics transportation system. Based on sixteen study cases of automotive companies in Thailand, the difference of supplier firm size is found to be associated with the outsourcing decision. The results showed that demand volume, bargaining power, distance of delivery, customer requirement, uncertainty of delivery, firm capability, frequency of delivery, and transportation cost are major drivers of sourcing decision to be in-house logistics provider or outsource logistics provider.

This research provides contributions to both theory and practice. First, the study highlights the importance of theories. Transaction Cost Economics theory (TCE), Resource-Based View theory (RBV), and Core Competency theory (CC) appear to have complementary influences on the determinants of logistics transportation system. TCE is the most significant contribution as a primary driver of firm size resulting to consider the benefits of the determinants of logistics transportation. RBV is a better predictor of supplier performance. CC influences the extent of logistics activities, e.g. outsource transportation or in-house transportation.

Second, the study is based on the practice. Although companies have tended to focus on outsourcing for some reasons, managers of the firm should have to give enough information in all aspects before the outsourcing. The degree of customer requirement (CR) would impact the determinants of logistics transportation system decision including; on-time delivery, quality of delivery, and responsiveness or other factors. To achieve higher customer satisfaction, a special attention must be given to the interactions between supplier and customer.

Future research could investigate whether different environments in other industries, and of other functions would be appreciated or not. In addition, it is likely to be examined in quantitative research methodology to confirm the factors affecting the determinants of logistics in transportation system for the completed paper of both qualitative and quantitative analysis.

### APPENDIX A. Interview Questions

The following issues are the key questions asked during the interviews of the sixteen automotive companies in Thailand.

1. Can you explain your current logistics transportation activities in service parts ?
2. Tell us about your type of logistics mode in service parts.
3. Tell us your criteria of determinants of logistics transportation
  - 3.1 Criteria of in-house logistics provider
  - 3.2 Criteria of outsourcing logistics provider
4. If your company apply outsource logistics provider, how to control the KPI (performance of delivery to customer) with your outsourcing supplier.
5. Tell us your warehouse location? Reason to select the stated location and how far to the customer warehouse (km.) ?

6. Tell us who make a decision for determinants of logistics transportation. (President, MD, plant manager, logistics manager, etc.)
7. If your company currently apply in-house logistics provider, will it have a potential to change to outsourcing in the next 1 year or 2 years ?
8. Tell us the value added factors affecting customer satisfaction on delivery to customer.
9. To what extent do you think if asset specificity, e.g. capital, plant location, experience in the industry, employee skill, are affecting the determinants of logistics transportation ?
10. To what extent do you think that the factors of uncertainty of delivery should be ?
11. Tell us how frequent of delivery affecting the determinants of logistics transportation ?
12. Tell us your transportation cost structure should be ?
13. Tell us how to manage the current issues in your logistics transportation ?

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