



A Critical Study of Transportation Cost in Inland Road Transportation Business

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Abstract

This research aimed to study the Critical of Transportation Cost in Inland Road Transportation Business, which is considered one of the industries that are important to drive the country's economy with a relatively high proportion of transportation as well as the proportion of costs in Freight. Thus, managing the cost of transportation to be most efficient will help enhance the capacity of the economy in this industrial sector to have more growth. This research started with a review of the secondary data. Then, the researcher conducted survey research on critical transportation costs in Truck Operators Certified Q-Mark from the Department of Land Transport (2018). Then, it comprehensively analyzes and synthesizes the guidelines for using modern technology to manage the real cost of road transportation. The results of the study revealed that the companies have the highest proportion of fuel costs, up to 33.70 %, and found that most establishments have adopted GPS technology to manage transportation costs the most, along with incentive measures to encourage employees to be aware and take part in saving fuel rates. Although enterprises are used to track and review fuel usage, corruption is still encountered. Due to the consistency analysis of fuel cost and transportation activities, the test statistics at 0.10 level, it found that most establishments with fuel costs were inconsistent with transportation activities, indicating that there is a corruption in fuel costs.

Keywords: Logistics, Transportation Cost Structure, Fuel Cost Management, Q-Mark Standard, Road Transportation, Driver Behavior

Introduction

Transportation in Thailand is important to encourage domestic economy and industry because of the whole part of an industry has the transportation to connect shipping to respond customer requirements therefore, the industries are expanded and the domestic transport to have more growth.

Transportation in Thailand, there are 5 categories shipping services (Krungsri Research, 2018) such as 1) Road transport, which should be the large vehicles as trucks. 2) Rail transport, which is transferring goods on trains, there is a serve in Thailand as State Railway of Thailand (SRT). 3) Pipeline transport, whole of petroleum as fuel gas or chemical using a system of long-distance pipes. 4) Sea freight, the domestic shipping would ship the bulks or grains, the international shipping to import and export goods by using the feeder ship. 5) Air freight, the transport that must beware particularly. the cargo which is underweight, express transport, delicate goods including food, electronic device or accessories thus, these are the most expensive charge (Figure 1).

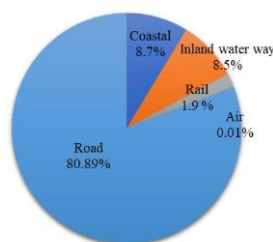


Figure 1 Ratio of transportation in Thailand in 2015

In 2015, the proportion of Road transport accounted for 80.9 percent that was the major of domestic transport. The government had developed the road network more than the other. Transport by using roads could enable door-to-door delivery of goods and connecting with all other transports. consequently, transportation business had an influence in domestic and cross-border transport.

According to the 80.9 percent of Thai's transportation was the Road transport, trucks were used 84 percent of them (Krungsri Research, 2018), those split into two groups as personal trucks for their own business and trucks hire for general cargo shipping. Business operators in Third party (Kasikorn Research, 2018) using technology to help inventory management and distribution center to connect the road transport. Inventory was applied by "Internet of thing" technology efficiently to manage transportation costs including enhance potential transport.

The costs of the road transport would be more expensive than the other transports because of the proportion of costs are high variation such as Fuel costs and prices accounted for 39 percent of the whole of variable costs were difficult to control but Drivers' wage, there was 24 percent increasing to modify on labor shortage (Figure 2).

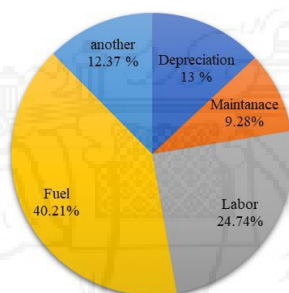


Figure 2 The variable costs on the road transport as trucks

The variable costs of transportation were spending mainly on Fuel (Figure 2). Thus, how were the costs measured that be used in shipment fully. In 2015, there was the corruption in Thailand (Shell, 2015), Shell said that there had been 92 percent of the manager who was vehicle supervisor had an opinion that Business operations was interrupted by the corruption accounted for 85 percent and 64 percent of the drivers had used to see the others had made mistakes as the behavior which was fuel theft so these the reason why the transportation costs was too high and losing. Thus, this research has intended on learning about how to improve the problems in industries. Therefore, this research has intended to learn about how to improve the problem as the fuel theft. to give information to other industries recognize the problem, which was widely impacted to transportation cost that would become to a state of loss. Including, to guide adapting technology method to suppress the corruption.

Methods and Materials

Population

This was a survey research, by taking a questionnaire to collect data about the corruption which was the fuel theft from the manager, 497 people of them who were assured of the Q-mark (Retrieved February 18, 2020). There were personal data, comments opinions and suggestions about the fuel theft which was able to be calculated on "Taro Yamane" method (Chancharoen, K., n.d.). This research defined 95% allowable error and 497 companies



$$\text{Where } n = \frac{N}{1+N(e)^2}$$

n= sample size required

N = number of people in the population

e = allowable error (%)

Therefore, the result was at least 222 companies.

Reviews

1. The information for analyze and learning.

Primary Data was used in this research as the questionnaire of the survey research. Secondary Data which split into two groups. Firstly, researching on internet which were Inventory and Distribution management (Thailand Development Research Institute, 2010), Fuel price structure, Transportation costs structure by using trucks (Department of Land Transport, 2018), Concept and theory of motivation. Secondary, researching on other research which were how to defend the fuel theft from PTT Public Company Limited (Yangthisarn, T and Prasertwong, P., 2012), Cost Analysis of Logistics System for Private Transport Entrepreneurs: A Case Study of Buriram Phanom Rung Transport Ltd. (Rossukhonsakul, S. and Rittirod, T., 2016).

2. Data Collection

This was a survey research, taking a questionnaire. Representative samples were used on data collection that was assured Q-mark and Measure of Quality by Twenty-two of Department of Land Transport (2018). Afterward, to analyze the results by statistic methods such as calculating the mean, variance, and Coefficient of variance of data.

3. Design the questionnaire

Taking a questionnaire was necessary for survey and collection data. Interviewers should be Managing director General manager or Supervisor etc. the questionnaire must be verified by experts. Analysis the index of data by calculating IOC (Worakitkasemsakul, S., 2011). To measure the representative group by testing Cronbach's alpha coefficient. The structure of the questionnaire split into 4 parts such as 1) the questionnaire of the personal data, to measure reliability. 2) the questionnaire of the establishment, to verify the fuel costs and transportation. 3) Strategy of resource management and Tracking information. 4) Suggestion.

Results

1. Assessment results the equipment in this research.

Index of Item – Objective Congruence (IOC), the questionnaire was estimated by the experts, there were the average of 19 assessment results, the IOC had more than 0.5 to show this questionnaire has appropriated content validity, the questionnaire was believable by using Cronbach's alpha coefficient (Table 1).

Table 1 The Cronbach's alpha has more than 0.6, to tester realized the question

Variable	Cronbach's Alpha
Level of opinion from establishments in the transportation business	0.810

From table1, there has more than 0.6 which mean the representative sample were understand well and gave the useful issues.

2. Results of the questionnaire

The road transport cost problem in this research, these have been collecting data by taking a questionnaire with 84 establishments, to survey the proportion of transport costs including their opinion and attitude. The establishments were assured Q-Mark (Service Quality Standard for Truck Operation), there was 90% of confidence levels.

2.1 Characteristic of the respondents.

The survey of road transport business, the people who were foremen, they could identify the corruption directly, Be able to indicate clearly the corruption problems that happened on Transportation Business, thus, the result were believable and acceptable. It was as follows:

The respondents, who was male 52.38% and female 47.62%. Educational background, most of them graduated with a bachelor's degree accounted for 76.49%, master's degree as 11.9%, Diploma/High Vocational Certificate as 9.52%, Vocational Certificate as 2.38%, to show whether the respondents knew what was happened in the organization.

Working period in the transport business, for 11–15 years accounted for 36.9%, for 5–10 years as 34.52%, meanwhile, the proportion of the working period 16–20 years as same as 20 years as 13.1%, at least 5 years as 2.38%. to show whether the respondents have enough experience to give the information.

The position of the respondents, the presidents accounted for 10%, the Managing director as 14%, the Head of Department as 26%, the General manager as 37%, Others as 14% such as an advisor and 11 employees. The high position would give the information in depth. in the transportation event, Proportion cost and Technology that was solved the corruption problem.

2.2 Characteristic of the establishments.

The proportion of 4 parts of the establishment, the fuel costs accounted for 33.79%, the depreciation as 28.47%, the wage including salary and allowance as 22.39%, Others such as maintenance as 15.44%. thus, Figure 3 to show the establishments have mostly transportation cost depend on the fuel cost.

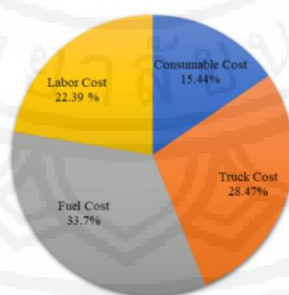


Figure 3 The proportion of transportation costs

Analysis data of fuel and transportation costs, which was accepted by Q-Mark on the corruption, the average of them accounted for 39.79% to show the fuel cost less harmonious than transportation cost, SD value as 3.45 which was quality and believable, in addition, CV value as 8.67% that was acceptable. Thus, there was the corruption in the establishment.

The fuel cost management, the establishment have used a fuel card accounted to 45%, a lump-sum payment as 25%, a disbursement bill as 20%, a fuel management program as 10%, Figure 4 to show the



establishment has the fuel cost management to control the amount of fuel cost of trucks. Most of the results which were inquired the survey, the establishments usually use a fuel card.

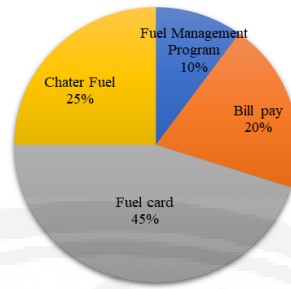


Figure 4 The fuel costs management

Nowadays, the trucks were installed tracking devices and review spending the fuel costs (Figure 5). The establishments where used GPS accounted for 53%, the oil meter as 16%, the fuel level sensor as 13%, the fuel tank cover 11%, the oil crankcase suction as 4%, the RFID rings as 3%. The tracking and revision were important; they must choose the fit devices. The devices which were used in the trucks cannot solve all the problem efficiently, thus, there was the high proportion of fuel costs (Figure 3). However, the entrepreneurs should standardize to persuade drivers by enhancing the compensation such as allowance or a special gift for the drivers who saved the fuel costs.

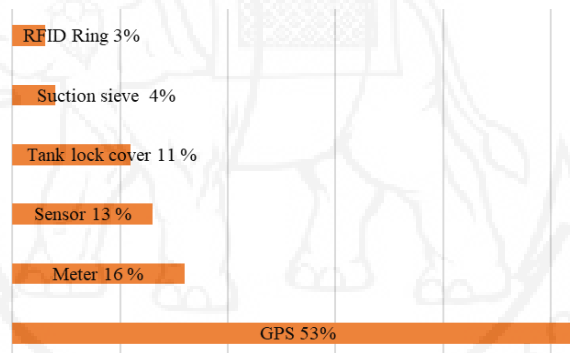


Figure 5 Fuel equipment tracking

2.3 Attitude the domestic road transport costs.

The consideration of the entrepreneurs' opinions, they determined the measure to managing the fuel costs, they never ignore the corruption. The policy encourage technology to protect the corruption, to show the drivers were willing to follow the establishments rules to represent their organizational relationship and the rewards were got by the establishments such as compensation and welfare. A lot of the information that was got by the entrepreneurs would be protection the fuel theft. Determination Key Performance Indicator (KPI) that was efficient to control the fueling. However, the employees knew to use the technology to inspect the fuel theft (Table 3).

**Table 3** Attitude of truck transportation business operators

Point of opinion	Mean	Standard Deviation	Variance	Interpret results
1.Establishment has measures or policies on fuel management for trucks.	4.64	0.569	0.323	Most
2.Truck drivers willingly accept and comply with the establishment's policy.	4.44	0.712	0.507	Most
3.Establishment pay close attention to the problem of corruption. (Even though a little bit of corruption)	4.80	0.408	0.167	Most
4.Establishment has a policy to promote the use of technology to prevent corruption.	4.56	0.768	0.590	Most
5.Your truck driver feels bound to the organization.	4.4	0.500	0.250	Most
6.Truck drivers receive adequate and fair welfare, compensation or incentives.	4.72	0.458	0.210	Most
7.Truck drivers work according to the standard working hours.	4.4	0.764	0.583	Most
8.The establishment has frequently modified the truck driver on the route.	2.92	1.2	1.493	Moderate
9.The establishment acknowledge comprehensive of the cost of internal activities.	3.84	1.248	1.557	Very
10.The establishment has key performance indicators for transport activities and costs.	4.36	0.995	0.990	Most
11.The establishment has an efficient refueling control system.	4.68	0.476	0.227	Most
12.Information systems staff gain knowledge about the use of oil smuggling detection technology.	4.12	0.971	0.943	Very
13.The establishment can efficiency apply prevent corruption technology.	4.16	0.943	0.890	Very
Overall opinion results	4.31	0.770	0.672	Most

Discussion

Transportation has important to propelled domestic economy and industry, especially in road transportation. Which was highest proportions of the transportation owing to be able to transpose to receivers from senders directly and to connect with other transports. The road transportation businesses tended high competition, there was increasing on Economic recovery. Cost management was important to show "What was successful?". The fuel costs of road transport were mostly that difficult to control, the losing costs was useful. therefore, this research was an in-depth studying business as to survey and analyze the actual data, to present the new technology cost management.

Nowadays, the actual transport problem is the corruption, which is the fuel theft for offensive strategies in business. The proportion of the establishments have inversed with the transportation. However, the transportation by using trucks has a tracking device, there is the inspection of amount of fuel in the trucks including the measure is used to persuade drivers such as benefits, bonus or allowances.

The survey of the new technology cost management indicates the establishments have used GPS technology and some of them have used others, there are more than one to manage the fuel cost. However, using the measure and the technology together, to urge the drivers economize using fuel cost. the respondents responded the whole of technology cannot solve this problem, the drivers are able to cheat all the time. Thus, they must



take legal action to prevent the corruption. Some responses offered to use NGV instead of using gas but, the NGV is not accepted by Government.

From the result of A Critical study of Transportation Cost in Inland Road Transportation Business, Researchers have concluded the results as follow:

The proportion of the business of transportation cost structure, there was highest fuel cost account for 33.70% followed by the depreciation as 28.47%, the wage including salary and allowance as 22.39% and Others such as maintenance as 15.44%, which were harmonious as Mr.Phongchai Arthikomkul and Mr.Padol Ratshum, who researched the costs for transportation cost of the Siam Cement Group or SCG and the Truck Shipment Business. The proportion of the costs account for 82.76% due to the main cost related with the variable of vehicles as consist of Fuel, Engine Oil, Car Tires, Maintenance and Goods Costs.

Analysis overviews of transportation cost, the corruption had happened in the establishment, from the survey to show there was fuel cost management by Fuel card account for 45% as harmonious as the Shell (2015) Company that surveyed the corruption in 2015, there were 92% of the managers have commented that this the biggest problem as 85%. Thus, to prevent the corruption would reduce the cost more 5%, there were 4 in 10 of the managers have been strict inspection more 10% meanwhile, 85% of users have believed the corruption as the problem in transportation industry, 64% of the users have accepted that they used to see their colleague had been cheating, fuel theft was mostly happened and the others such as using the fuel card in other purpose and paying the fuel cost by cash to covered up paying any stuff. Moreover, the result showed the fuel cost corruption was happened by drivers. Mostly, there was gaps for their corruptions, the main cause of this as environmental driver's working that long-time workers did it so any workers doing the same. Therefore, they should improve their behavior. The researcher recommend they should use technology as the best way to solve this problem that might reduce the corruptions.

Conclusion and Suggestions

Conclusion

From the survey research, it was found that establishments had a problem of illegal fuel smuggling for illegal selling. This greatly affects the cost structure of the fuel establishment. Because the real cost of fuel is not fully utilized. Although most establishments adopt anti-corruption technologies to solve the problem, However, corruption has still been discovered and the solution cannot be fully prevented. Because of truck drivers are able to learn to find gap of defense technology as well.

A Critical study of Transportation Cost in Inland Road Transportation Business, which purposed to study the depth of Road Transportation, synthesis and presentation how to use model technology to manage the real road transportation costs, this was a survey research by collecting data from the establishment as be assured Q-mark and Measure of Quality on online by using Google Form and analyses data from the questionnaire to find the level of comment on the transportation cost structure and management while there was the corruption that conclude as follow:

1. The depth problem of Road Transportation

The recent this problem as the fuel theft to illegal sale, analysis data by statistic methods to show the average as harmonious with the fuel and transportation cost as less valuable than norm account for 39.79%, the variance value as 3.45 to show the establishment cost had the proportion opposed the transportation, the



Coefficient of variance as 8.67% that able to accept and to confirm the actual corruption has happened. However, the establishments have used tracking to review amount of fuel in tank including, determine the measures for magnetic employees such as allowance, travel expenses and extra jobs. If there is no day off or any corruption, would be special gifts as bonus. Nevertheless, the entrepreneurs have never ignored to solve it but still default the appropriate technology.

2. Using the model technology

Mostly, the establishments have used GPS as 53%, the oil meter as 16%, the fuel level sensor as 13%, the fuel tank cover 11%, the oil crankcase suction as 4%, the RFID rings as 3%. Some place used more than one technology to manage fuel cost. Moreover, using either of the measure and technology to manage the problem, to urge them to recognize and save petrol. The suggestions in the questionnaire has shown the technology cannot solve all the corruption due to the drivers have new cheating methods. Therefore, the entrepreneurs must take legal action seriously to make an example of others. The other advice as using NGV but the government has not support it yet.

Suggestions for future research

1. There should study about legal to strengthen control and prevent corruption.
2. More demographics should be studied in the transportation business. This will result in more accurate and accurate data analysis, as well as the results of the analysis will be applied to the transportation business appropriately.

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References

- Krungsri Research. (2018). *Business/Industry trend 2018–2020: Road Freight Service Business*. Retrieved from <https://www.krungsri.com/th/research/industry/industry-outlook/logistics/road-freight-transportation/IO/io-road-freight-transportation-20>
- Kasikorn Research. (2018). *Increasing the power of SME transport with digital technology*. Retrieved from https://kasikornbank.com/th/business/sme/KSMEKnowledge/article/KSMEAnalysis/Documents/SM E-Logistic_Digital-Technology.pdf
- Shell. (2015). *Results of the 2015 fuel corruption survey*. Retrieved from <https://www.racharoad.com>
- Chancharoen, K. (n.d.). *Determination of Population and Sample*. Retrieved from http://www.ict.up.ac.th/surinthips/ResearchMethodology_2554/เอกสารเพิ่มเติม/การกำหนดประชากรและกลุ่มตัวอย่าง.PDF
- Thailand Development Research Institute. (2010). *TDRI Report No.84: Cost of operation Buses vs trucks in Thailand*. Retrieved from <https://tdri.or.th/wp-content/uploads/2012/09/wb84.pdf>



- Department of Land Transport. (2018). *Project to study transportation and distribution costs to support the development of freight stations throughout the country*. Retrieved from <https://www.thaitruckcenter.com/tdsc/ViewFile?fpath=FileReportdoc&sname=1925244878.pdf&fname=FileReportdoc1925244878.pdf&id=16>
- Yangthisarn, T., & Prasertwong, P. (2012). *Anti-Corruption Guidelines for Car Fuel Transportation. The Bangchak Oil Distribution Center (Bangchak Petroleum Public Company Limited), Industrial Education Journal*. Retrieved from <http://ejournals.swu.ac.th/index.php/jindedu/article/download/2322/2363>
- Rossukhonsakul, S., & Rittirod, T. (2016). Cost Analysis of Logistics System for Private Transport Entrepreneurs: A Case Study of Buriram Phanom Rung Transport Ltd. *Journal of Community Development Research (Humanities and Social Sciences)*, 10(3), 93-100.
- Worakitkasemsakul, S. (2011). *Methodology of behavioral and social science*. Retrieved from <http://pws.npru.ac.th/pheerathano/data/files/ระเบียบวิธีการวิจัยทางพฤติกรรมศาสตร์และสังคมศาสตร์.pdf>
- Athikomrattanakul, P., & Rattanachum, P. (2017). Activity-Based Costing in Freight Transportation Case Study: Cement Transport Company. *KMUTT Research and Development Journal*, 40(1), 117-136. Retrieved from <http://www.thaiscience.info/Journals/Article/KMIT/109850666.pdf>