

# EVALUATION ON KEY FACTORS AFFECTING ON THE PROFITABILITY OF THE CARRIER TRANSPORTATION SERVICES FOR AUTOMOBILE: A STUDY BASED ON THE AUTOMOBILE CARRIER SERVICES FROM HAMBANTHOTA TO COLOMBO IN SRI LANKA.

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**Abstract-** Automobile supply chain is one of the pillar chains of operations in Sri Lanka. In the current context, the paper proposes counter measures from the core entrepreneurial level in order to evaluate key factors affecting the profitability of carrier transportation services for automobiles. The scope of the study is compressed and focused on the ongoing carrier service operation originating from the Hambantota port to its destination from Colombo metropolitan area. The study elaborates the complex practical aspects of key variables which are correlated to the chain profitability; the research initially strives to identify a hierarchy of general parameters through literature. It constitutes a decision making algorithm for major stakeholders of the supply chain which arise measures for unforeseen, disincentive circumstances. Being a lucrative venture in transportation, vehicle carrier service is extremely sensitive in safety measures along with the engagement of high value cargo. Quandary between customer satisfaction and profitability has raised concerns with service providers. Implications of the skilled human factor are immeasurable whilst aspects of modern technology reflect a major revival on the bottom line over the rivals in the market. The crucial necessities related to service quality and value additions

via an appropriate professionalism interact the client for high volumes. Trivial circumstances might claim a vast disturbance whilst hindering the operational coherence of transport networks. Accordingly, the insight of this study enhances the traditional perspective to pure moderate era that demands greater flexibility and responsiveness amongst the profitability competition. This study comprises of an aggregate of practical proposals which derived through outcomes.

**Keywords** - Transportation, Profitability, Automobile Supply Chain

## I. INTRODUCTION

Being the best example to explain the problem of regressive taxation, importation of automobiles have been playing a major role in the high value supply chain in the Sri Lankan economy. The current fast paced development of Sri Lanka has caused a massive need for mobility. Even with a moderate pace of 4.5% increase in Sri Lanka's GDP in 2016, the number of vehicles import to Sri Lanka has

still keeps a number of 493,328. This particular demand depict that the service providers of the automobile supply chain remains stable in their position in the market. The expectation of the automobile customer is to be able to have a fast, reliable and safe transportation to the door step. In this scenario, it is challenging to find the most efficient and safe routes for delivery or pick-up from the port to different destinations of the country. The contemporary automobile supply chain can make use of a multitude of applications of modern technology to enhance performance, particularly in fleet operation. In par with that, the complexity of nodes of the supply chain or yard operations motivates adaptation of sophisticated technologies, cost savings, service level improvements, enhanced control, safety and security. Furthermore, service providers have inculcated concepts of sustainable transportation in order to go the extra mile for their customers and secure market share among other competitors in the market. Accordingly, as an untouched researched area, automobile supply chain in Sri Lanka. It looks in to the knowledge gap in the road transportation sector on evaluating the key factors affecting on the profitability of the carrier transportation service sector in automobile supply chain. The study primarily based on the automobile carrier service from Hambantota to Colombo metropolitan area. The study has selected such key variables with regards to the road transportation haulage industry. Strategies have been implemented by many rivals in order to promote their service delivery in a more efficient and productive manner. The study can be utilized by the rivals with a view to expand the share of the market while promoting a differentiated service delivery. These extend across a wide range of applications deviating from the basic features of the service. The lack of findings regarding the automobile and growing transportation sector in Sri Lanka makes the study more vital in practical applications of the modern transportation sector.

## II. RESEARCH OBJECTIVES

### *a. Main Objectives*

To evaluate the key factors affecting on the profitability of the carrier transportation services of automobile sector.

### *b. Sub-Objective*

- Selection of key factors which affect for the profitability of the carrier transportation.
- Discuss key factors in carrier transportation services.
- Analyze the relationship between considered factors and profitability of the service.
- Relationship analysis on the key factors considered by utilizing Pearson Correlation coefficient

## III. METHODOLOGY

Primarily data were gathered from distributing and administering a semi-structured questionnaire to randomly selected sample 100 professionals in the vehicle carrier industry, containing 37 responded respondents' demographic data and service delivery related data. The study continued the same questionnaire and personally interviewed 80 respondents. 68% of the total respondents are from the personally interviewed since the lack of literature review of the study.

After investigating the data gathered from primary data set, the study utilizes Pearson Correlation to describe the relationship between these factors. Here, Statistical Package for the Social Sciences (SPSS) version 21 is utilized for analyzing primary gathered data. And, several statistical tools and graphical representations are carried out in SPSS.

Using the findings from the data analysis, study prepares a decision making algorithm according to result/outcome from the study which is useful for the service providers and customers as well (included in the conclusion).

Finally, Findings on profitability measures could adjust a service provider perspective to the service offered.

## IV. EXPERIMENTAL DESIGN

The data were collected from the main stake holders in the carrier operation. From the operational level, 50 numbers of respondents were personally interviewed, 30 numbers

of respondents were interviewed from the executive and managerial level out of 21 large scale and small scale companies in Sri Lanka. 37 respondents were replied out 100 sent electronic mail to the above said same 21 companies who are in the automobile supply chain trade. Total of 117 respondents have been replied with their ideas according to the semi-structured questionnaire.

V. DISCUSSION

Despite the downturn of the last two years, according to the statistics from the Department of Motor Traffic Sri Lanka, it is vivid that the average number of more than 1000 motor cars per month is registered in Sri Lanka where the study could garner the average number of vehicles which direct application towards the vehicle carrier transportation system.

In Du Tertre’s typology of production systems (“configurations productive”), freight transport would belong to logistics services, the productivity of which is mainly determined by direct intensity of labor, scale economies and material integration. This review of relevant vehicle carrier transportation found that many factors affect in achieving the optimum profitability of the service provider.

Here, it is mandatory to consider the factors carefully on the process of determining the profitability since it directly affects the performance attributes. According to various literature reviews, attributes in performance of vehicle carrier transportation could be suggested as follows:

1. Cost
2. Transit time (Lead Time)
3. Reliability of the human factor
4. Service Quality and Value Additions
5. Strategies for Carrier Capacity Optimization

Cost factor mainly depends on the fluctuations of the petroleum products which is affected according to the policy makers of the government. (Figure 1) But, impact disperses equally on the rivals. But, the usage of high efficient fuel consuming carriers has made the service providers more providers by generating extra bottom line than competitors cost driving vehicle carriersw.

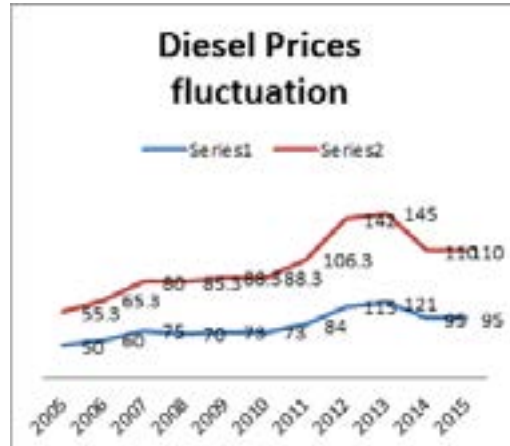


Figure 1. Fuel Price comparison in the last years from 2005-2015 using Microsoft Excell 2010 package. Source: Energypedia, Fuel Price Composition, Fuel Price Sri Lanka, GIZ International Fuel Price Database

Figure 1 depicts that the sudden downturn in 2015 for diesel prices which was crucial point for transportation sector which the market has become more competitive with the price elasticity. But, the impact has a serious influence thus the minor fluctuations do not necessarily makes a price change in the service.

The above fluctuations directly make an impact to the bottom line. Thus the figure 2 graph shows that profit margin of transportation reduces initially with the cost even though it makes a sudden hike at the end.

Accordingly, the economies of scale in the fuel prices technically makes a decision maker to manipulate the fuel fleet of vehicles according to the efficiency of the fuel consumption of each type of vehicle does. Figure 2 depicts the inverse relationship of cost with the profit thus curve has bounced due the high rate of single carrier service which is used for emergency breakdown services.

a. Carrying Capacity

According to the “Global Truck Study 2016” by Deloitte, Rising cost pressure is leading to increased consolidation within the logistics sector. The trend towards larger fleets with more than 100 vehicles will continue to increase till 2016. Within the mode of trucks, it makes varieties of vehicles along with the capacity of each carrier. In reality, service providers are in an intense competition for a best

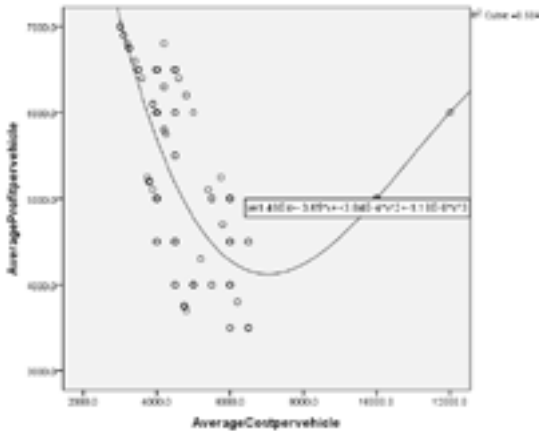


Figure 2. Average Profit per vehicle against Average Cost per vehicle unit transported.

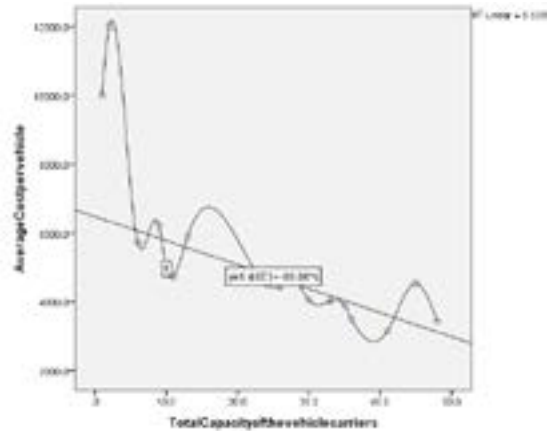


Figure 3. Average Cost per vehicle unit transported against the Total Capacity of Vehicle Carriers

carrying capacity. More the carrier indulge with a better capacity, more the service provider can cater the market in an efficient and productive way. Carrier can increase the number of unit-kilometers in their monthly and annually targets. Impact of the vehicle carrier capacity is crucial in vehicle carrier transportation since we experience the economies of scale with increment of the capacity. Carrying capacity has three main attributes such as maximum length of the carrier, maximum gross weight of the vehicle carrier and the maximum towing power of the trailer head.

According to the data gathered, the figure 3 suggests that an inverse relationship between capacity of the vehicles and transporting cost per vehicle. It indicates the economies of scales which the service providers achieve where the fleet increases its capacity. Here, the difference effect fluctuates upward and downward. Personal interviews suggest that it is due to different types of vehicle carrier brands. But, It shows a basic downward trend.

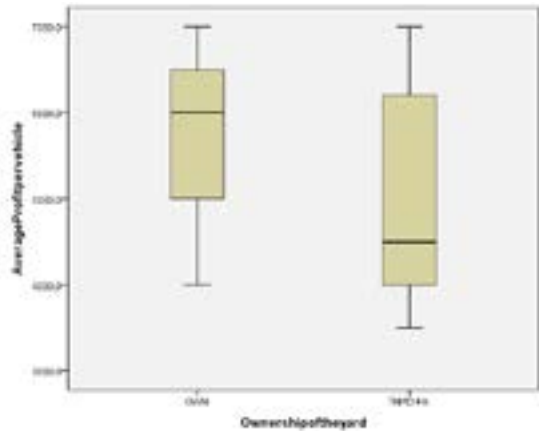
**b. Reliability of the human factor**

In the study “Critical Issues in the trucking industry” by American Transportation Research Institute, Driver shortage and driver retention are significantly become the top issues identified by the industry respondents. In transportation sector, human factor takes the most

prominent variable from which the organization could make profits and stimulate the customer satisfaction. Skilled driver paves the way for a safe itinerary and this intangible outcome makes a consistence customer demand in automobile supply chain. Non-familiar people with organizational systems might reduce quality of the service delivery. The study supports with its findings where the data depicts a Spearman Correlation coefficient 0.724 between “Average Experience of Drivers and “Average profit per vehicle” variables. Here, it is visible that well experienced and skilled drivers are engaged with large scale profitable companies whilst drivers with few experiences have joined with start-up type small scale organization. Basically, according to the personal interviews in the study, it was realized large scale company drivers could be benefited by the company performance reward systems.

**c. Service Quality and Value Addition**

Considering the type of service provided, yard operations, intermodal platforms, and other such facilities may be described as “Value Added Points” of carriers where the customer could be attracted whilst conveying more convenience and productive stance for the service. Thus the service provider is equipped with such facilities; the maintenance cost of these could be higher than maintaining a third party facility.



**Figure 4. Box plot diagram for the categorization & comparison of Third Party yard owners and company owned yard**

From the gathered data, it is graphically represented that company owned yard facility has catered higher profit margin for the service provider. Company owned and Third party yard operations mean values are indicated Rs.5, 711.00 and Rs.5, 042.53 respectively.

Accordingly, owning a company owned yard facility is crucial decision which has to be taken from the higher management of a company. It is mandatory to carry out a separate feasibility study before the implementation of the yard premises since it cost many labor and other cost such as building and security measures such as CCTV operations and so on. Complete Setting of Safety system is of vital importance.

According to the study findings, more companies have implemented security measures such as CCTV operation. In “Transportation Research Circular” by Transportation Research Board of National Academies, Transportation worker identification number (TWID) regarding the Transportation Worker Identification Credential (TWIC) can be identified in international instances, but not in Sri Lanka.

The above table is presented that majority of respondents have activated the usage of CCTV operation in organizational level and considerably invested on this regard since the operation consists of high value cargo.

**d. Strategies for Carrier Capacity Optimization**

According to the study “Impact of Technology Advancements on Transportation Management Center Operations by United States Department of Transportation, the convergence of big picture influences with rapidly evolving Intelligent Transportation System (ITS) technology reveals an opportunity to meet growing needs with careful application of technologies within progressive agency structures. Planning the route and optimizing is of vital importance for the road transportation services. National movements can be usually planned and co-ordinate more easily. For effective route planning and scheduling, the transport officers need to be involved in the development of the distribution plan or at least be aware of it and understand it. Vehicle routing and scheduling process needs to fulfill the following objectives such as Maximizing vehicle payload, Minimizing distance and minimizing time, Meeting customer requirements, in terms of cost, service and time and meeting legal requirements, in terms of vehicle capacity and driver’s hours.

The nature of the movement can be split into two basic types as in Primary movements are those that involve typically bulk movements between two specific locations and Secondary distribution relates to movements that may involve multiple deliveries within a defined area, such as a regional car sales to extended delivery points. In both cases, the emphasis is on achieving full utilization of the resources used; filling the vehicle to capacity minimizing the distance travelled and optimizing the hours which the driver is being paid to work. In Sri Lanka, service providers cater with single carriers with individual vehicle unit for area which could not be reached by large capacity vehicle carriers.

In such scenario, organizations utilize computer software in order to optimize the vehicle carrier usage over the fleet of trucks. With reference to the data gathered from 117 respondents, it is vivid that majority of high end companies utilize software packages in order to optimize the route map of the vehicle carrier. Introduction and Implementation of software has a positive relationship with the number of vehicle carriers in the operation, number of drivers in the operation and the capacity of the vehicle carriers. When the capacity increases, it is

mandatory to get necessary steps to organize the company assets to the best efficiency and most productive level.

***Analysis the relationship between considered factors and profitability of the service***

Thus, the study finds an inverse relationship in figure 3 on average cost per vehicle thus the single carrier has the highest due to the less capacity and the cost incurred whilst earning a high rate of income by transporting emergency breakdown vehicles. Here, the discussion with professionals realized that breakdown service providers who transport extremely high value automobile brands charge higher rates with the extra safety and precautionary steps taken. But, the real operational aspect depicts the initial sector of the curve.

Carrying Capacity directly makes a positive relationship with “Transit Time”, since the service provider utilizes his best strength when a bulk quantity is offered. Lower Carrying capacity leads to more itineraries in order to carry the same lot. This basically depends on the distance of the itinerary as well. Similarly, a high capacity organization has a better bargaining power against the shorter lead time where the company could really makes an impact to the bottom line. Roster basis operational schedules are given to drivers with a view to cater the bulky demand. Therefore, companies with high carrying capacity could cater giant customers, whose demand is uniform enough to have a stable and profitable supply chain for the service provider.

Consistency in the customer demand is of vital necessity. More the service provider provide a good accident free service exposure, more the customer base will be increased accordingly. Experienced and skilled drivers are engaged with large scale profitable companies whilst drivers with few experiences have joined with start-up type small scale organization. At the same time, it is mandatory to cluster a set of human resource whose experienced and knowledge is well versed in the transport section. And, the technical know-how is the basics of the venture which is quite supportive for a smooth operational schedule.

***Security measures such as CCTV operation.***

Vehicle routing and scheduling process needs to fulfill the following objectives such as Maximizing vehicle payload, Minimizing distance and minimizing time, Meeting

customer requirements, in terms of cost, service and time and meeting legal requirements, in terms of vehicle capacity and driver’s hours. At the same time, skilled people factor is one of the prominent which the field requires more competent labour in order to enhance the quality and accuracy of planning.

**VI. LIMITATIONS OF THE STUDY**

This study has been carried only under the itinerary from Hambantota port to Colombo metropolitan area. But, considering to the other areas of the island, the factors can be changed by itself or its prioritization. This is due to the geographical difference which has taken place in different parts of the country. Hill country geography is different that of the coastal areas accordingly it affects the different in profitability aspect.

Technology which organizations utilize is old comparing to the international context. Value added services has stepped upon to a next level in some other countries with reference to tracking systems, safety systems etc.

Yard facilities in the route we considered and the other areas can be differed by its design and architecture. Therefore, profitability aspects can be different. Human competencies are different in other countries. In Countries in Europe, USA or Australia, competencies have an advance stature in technology and safety measures and motor mechanical know how.

**VII. CONCLUSION**

In this study, it is obvious that not all the factors positively or negatively make an impact on the profitability of the carrier transportation process. But, in this scenario, the study follows the Pearson correlation coefficient since it has a parametric version of data with the more than 100 respondents and coefficient depicts the intensity of the relationship with the independent variables to the dependent variable which is the profitability of the service provided. The calculations of the Pearson correlation coefficient are as follows by using the Statistical Package for Social Sciences(SPSS) version 21. As per the discussion, the study has utilized the statistical tool of Pearson Correlation method in order to carry out the importance of each variable to the profitability. And,



the algorithm herewith indicates a method which could be used by service offered customers for checking the suitability of the service provider.

**Table 1. Pearson Correlation Coefficient for the explanatory variables of vehicle carrier operation which affects to the Average Profit per vehicle variable.**

Pearson Correlation		Dependent Variable	RS
		Average Profit per vehicle	
	Average Profit per vehicle	1.000	
	Age of the Company	.559	+6
	No of Vehicle carriers operated by the company	.597	+4
	Total Capacity of the vehicle carriers	.750	+1
	Investment of the software	.630	+3
	No of Drivers Occupied	.582	+5
	Average Experience of Drivers	.697	+2
	Average Cost per vehicle	-.444	-1

Considering the factors analyzed in the study, an algorithm is developed to select the most suitable service provider for transporting automobiles. And, service providers could enhance their quality of service as well.

$$Y_i = (0.559 * C_1) + (0.597 * C_2) + (0.750 * C_3) + (0.63 * C_4) + (0.582 * C_5) + (0.697 * C_6) - (0.444 * C_7)$$

Y<sub>i</sub> = Relevant Service Provider Score  
 C<sub>1</sub> = Age of the Company

C<sub>2</sub> = Number of Carriers

C<sub>3</sub> = Total Capacity of the Carriers

C<sub>4</sub> = Investment for Software

C<sub>5</sub> = Drivers Occupied

C<sub>6</sub> = Average Experience of Drivers

C<sub>7</sub> = Average Cost per vehicle

Lack of previous literature in the Sri Lankan context in automobile carrier perspective and the context of automobile supply chain is the main limitation of the study. But, the in depth analysis of the transportation industry provides a wide range of knowledge in understanding the key factors which makes an impact to the profitability of the automobile supply chain internationally. Accordingly, the research identifies a critical approach of industry analysis and supplier selection model construction. However, the findings of the study encourages that companies are eager to adapt to such practices in spite of their concerns regarding the hassle free transportation process. Thereof, the key factors underscored in the study have a vital importance of balancing the aspiration of an efficient operation in automobile transportation system.

### VIII. ACKNOWLEDGEMENT

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