SMITH TRANSPORTATION

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**Challenges**

The assets that we have worked on are high on value. The processes used to buy these assets are not so simple. Typical equipment will go through the four stages when the overall life cycle is considered. These stages include the conceptual phase, acquisition or purchase phase, the service stage and the disposal stage. The various stages discussed here have different implications for the businesses. The care should be taken on the part of the company regarding the asset will depend upon the stage in which the asset is in. The right decision in the right time will mean that the company is doing the optimal things on the optimal time and the results are in the favor of the company. The company should maintain proper records regarding the monitoring of vehicles and issuing the spare parts that is done on some specified time span. Some data is still recorded on the basis of manual methods. The various components of the costs are identified and recorded in different sets of records and by different people. It is not easy to measure the costs in a true manner. These aspects pose a significant challenge to the fleet management companies in order to ascertain the costs of running the fleet.

**Assumptions made**

The fleet cost analysis is prone to certain assumptions which have some significant impact on the research done and the researchers as well. This study states the assumption that the analysis used in the study will help the calculation of the costs associated with the truck fleet. It is however evident that the collection of data will not be an easy process. The linear relationship of every cost component is assumed to exist. This trend had been reported in many studies in the past. The variable costs are fuel, tyres and maintenance costs while the fixed costs are the license, insurance and interest charges. The study uses the model that only includes the variable costs and excludes the fixed costs.

**Factors and parts of operating and maintenance costs**

The maintenance is related to the production of some particular product. This aspect is closely related to the limit and the level of output produced. The maintenance costs account for almost 30% of the costs that are incurred. The main aim of the management is not only to keep the maintenance costs to be low but also to keep the assets in good working condition. As the age of the vehicles goes on, their maintenance costs will increase. There will also be an increase in the emissions that come from the vehicles in the environment. There have been various models that are developed to analyze the various costs associated with the maintenance of fleet.

There is not a huge research on the factors that affect the operating and maintenance costs. There have been a large number of reviews that contain the methods and modeling aspects of the study. Mostly the studies do not take into account the truck maintenance aspects and operating costs. The upcoming lines will elaborate in detail the selection of the various cost components.

The study is done to list down the major factors that affect the fleet costs. The special focus will be on the maintenance and operating costs. The assets for a company are purchase for a huge sum of money but the costs associated with the maintenance and operation is even higher. The costs mentioned account for almost 60 % of the total costs that are incurred to purchase these assets. The trends and forecasts that are studied in combination with these costs are badly affected if these costs are not properly identified and estimated. The management had to take the decision whether to replace the existing fleet or to continue to put the costs in it. The total expenditure is directly proportional to the maintenance costs.

One of the problems with this study and perhaps with all the statistical methods is that there is no one best model that can represent the costs to the fullest. The research has been done investigating the factors affecting and the components that make up the maintenance and operational costs. This study analyses the maintenance costs of various modes of transportation. This is particularly useful in jotting down the major factors affecting the operational and maintenance costs of each mode.

A study by Barnes and Langworthy noted the five elements of the operating costs. These include fuel, maintenance, tyres, repairs and depreciation. The study deduced that the personal vehicles use $ 0.20 on the operational costs. They calculated that the trucks used up almost double of the operational cost as compared to the personal vehicles. Six different studies were analyzed to see the sources of costs in the semi trucks. Another study used various aspects of the technical, economic and operational aspects to analyze differences in the cargo expenses in the rail, road and sea modes. The transportation costs include the capital, fuel, oil , operational and maintenance costs. The properties of the vehicles were also studied. The vehicle operations include the fuel, depreciation and the maintenance.

Bradley and Alalawi used the variables of battery and tire replacement to show the overall maintenance costs model. Another aspect of the research is the area of farms and agriculture to review the maintenance cost of tractors of a specific type. The factors that affect the costs are the initial out flow of cash to purchase the tractors based on the hours used for operations. A study also compared the traditional approach to the mixed integer programming in order to judge which is better in minimizing the maintenance costs of the vehicles. The findings suggested a clear superiority of the MIP systems in estimating the costs associated with maintenance. The major aspect of this study is to provide a mechanism that is successful in estimating the maintenance cost of the vehicle.

A large number of studies also examine the cost components of the fleets that are working on the business level. The major aspect that was studied was the segment of hybrid cars. The full life cycle of the vehicle is seen as the base for study. The costs measured are operational, maintenance and ownership. The fuel and electricity costs were considered the operational variables. The engine overhaul, battery, change of various oils was considered the operational variables. The results showed that the customers preferred the single clutch parallel system. The study compared the diesel trucks with the electronic vehicles. Although it was found that the environmental affect of the electric vehicles is very less but the major problem that hinders the preferences is the unavailability of the charging facility in any given area? The diesel engine gives off carbon particles but it has no requirement of being charged. The running costs of the electric vehicles include the cost of fuels and electricity. The cost of the electric vehicles was found to be half of the diesel vehicles.

A study in Riyadh was conducted to allocate the costs associated with a mass transit bus project. The study used the correlation matrix to identify the linear relationship between some of the variables like operation kilometers, vehicle age and many other related variables. The results showed that these variables were affected by the maintenance costs involve in the system. The scrutiny of the variables deleted some of the variables and the study was confined to mean travel speed, age of vehicle and the condition of the route.

**Model and Methods**

The past studies have analyzed the studies that have tried to analyze the costs of operating the fleet of trucks. There has been a large data published on the subject of cost efficiency of vehicles. Some studies have used the regression techniques to analyze the relationship between the cost of running the vehicles and the factors affecting them. The costs of keeping the trucks or fleet of some other vehicles. The costs of maintaining a specific vehicle depends upon the characteristics of the specific model. The heavier machines eat up more fuel as compared to the lighter ones but other differences in the costs are also seen. The studies are interested in calculating the total costs rather than the marginal costs that are added to the totals. The modeling approach is used in the study. The study tries to find some relationships between the models presented in this study and the data analysis of the past studies. The problems that the researchers face are that the system used to assess the data should be reliable and robust.

There is a thorough set of literature available on the regression analysis in the fleet management costs. Khoub et al studied the costs associated with the maintenance and repair costs for the farm machines. The maintenance costs comprised of the spare parts, salaries of repair persons, oil consumption and the oil filter replacement. The power model was found to be the best model as the value of correlation is higher. This will help the ability of the model to predict the dependent variable based on the different values of the independent variables.

Some other researchers as Bowers and Hunt carried out a survey on farm machines and modeled the maintenance and operating expenses for the agricultural societies. A study conducted by Tan tried to improve the prediction of the costs associated with the inventory items of US navy. A regression model was used after transforming the variables to the logarithms.

**Hypotheses**

The study will be based on the following hypotheses:

H1: The fuel cost has a significant impact on the total cost of maintaining the vehicle

H2: The milage cost has a significant impact on the total cost of maintaining the vehicle

H3: The engine oil cost has a significant impact on the total cost of maintaining the vehicle

H4: The spare parts cost has a significant impact on the total cost of maintaining the vehicle

H5: The repair frequency cost has a significant impact on the total cost of maintaining the vehicle

H 6: The tires cost has a significant impact on the total cost of maintaining the vehicle

H7: The battery cost has a significant impact on the total cost of maintaining the vehicle

H8:  The latest mileage has a significant impact on the total cost of maintaining the vehicle





Above are the two models that will be used to analyze the data. The first model is a breakdown of the total operational costs of the vehicle into three major components. The acquisition costs are the genuine purchase price of the vehicle. The maintenance cost is the costs incurred to maintain the vehicle. The operating costs are the costs associated with the operations of the vehicle. The second model is the multiple regression models that will assess or estimate the result for our study.

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