

DESIGNING A FLEET OF COMMERCIAL VEHICLES FOR SMART SHARING: DECISION SUPPORT FOR LOGISTICS COMPANIES

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Sharing of commercial vehicles is less popular than private vehicles despite their high volume of traffic on road. This paper addresses the difficulties of applying AHP framework of considering sharing commercial vehicles as part of a logistic fleet. An in-depth interview with an experienced logistic consultant was carried out. Due to the diversity and complexity of commercial vehicle sharing, the decision maker should know the technical issues of vehicle sharing. This paper raises an important point for AHP application: Information overload of developing technology and difficulty of pairwise comparison when alternatives are very different in scales and investment involved.

Keywords – AHP, Commercial fleet, Vehicle sharing.

Introduction

According to the Monthly Traffic and Transport Digest of the Hong Kong Transport Department, goods vehicle is the second largest vehicle type of licensed motor vehicle. It represents 14.9% of all road traffic in Hong Kong. Nearly all goods vehicles are diesel-driven, as

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listed in Table 1. While diesel vehicles cause more pollution than petrol vehicles. Reducing goods vehicles ownership and unnecessary mileage can reduce air pollution. Sharing goods vehicles can achieve the reductions with cost reduction to the owners and operators. This paper intends to investigate the feasibility of sharing commercial goods vehicle. From the perspective of logistics companies, effective management of a sharing fleet is considered with respect to three key areas: financial efficiency, safety and environmental sustainability (Department of Transport, UK (2013)). A case study of a Hong Kong project is written and some possible errors with the AHP frameworks are discussed.

Table 1 Licensing of Private cars and Goods vehicles by fuel type in Hong Kong (December 2017, Source: Monthly Traffic and Transport Digest, Transport Department, Hong Kong. <http://www.td.gov.hk>)

		Petrol (%)	Diesel (%)	Electric (%)	Total
Private cars		531,014 (96.1%)	11,238. (2.0%)	10,417. (1.9%)	552,669.
Goods vehicles	Light Goods Vehicles	739. (1.0%)	69,970. (98.9%)	73. (0.1%)	70,782.
	Medium Goods Vehicles	0 (0)	36,156. (100%)	0 (0)	36,156.
	Heavy Goods Vehicles	0 (0)	6,042. (100%)	0 (0)	6,042.

Building up a commercial fleet

A commercial fleet of a logistics company is composed of vehicles' models according to its clients' demand. The facilities and composition of different commercial fleets are therefore different. For example, commercial vehicles for health commodities are equipped with temperature -controlled facilities; vehicles for trafficking poultry should be equipped with cleaning and disinfecting equipment. According to their clients' needs, logistics companies used to build up

their fleet with the criteria of financial efficiency and safety. Now, environmental sustainability is becoming important due to clients' requests, laws and regulations.

A logistics company used to build up its commercial fleet by acquiring all of its own vehicles. Building up a fleet only by acquisition is challenging given the uncertainty of demand. The usage may be infrequent and its patterns of frequency and range of mileages may not be well understood. Despite the low usage or mileages, the idle vehicles depreciate. Early 2018, Ryder, a commercial fleet management company in the USA, developed a commercial vehicle sharing platform that links fleet owners with idle vehicles to those in need of rental vehicles.

With reference to Ryder, a logistic company may build up its own flight through acquisition and/ or sharing. An AHP framework is so developed to help the decision of the logistics company:

Goal: To build a cost-effective logistics fleet.

Criteria: financial efficiency, safety, environmental sustainability.

Alternatives: complete acquisition, rent from sharing platform, a fleet composing of acquisition and sharing.

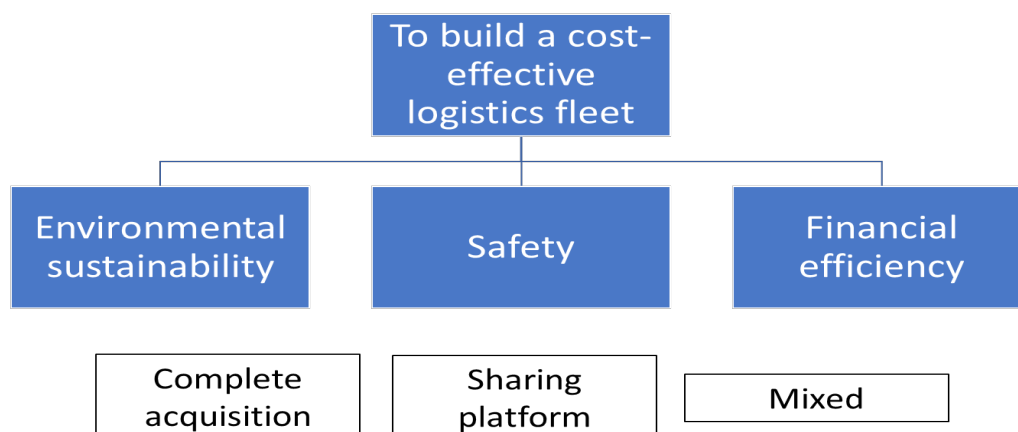


Figure 1 An AHP framework of building up a logistics fleet

An in-depth interview with a logistics consultant was carried out. He was briefed about the AHP characteristics during the interview, e.g. pair-wise comparison, consistency, sensitivity analysis, etc. He agreed with the concept of introducing car-sharing platform which may reduce the vehicle inventory; improve the overall vehicle utilization. The sharing concept for building up a logistics fleet provide a framework for converting technical inputs into economic outputs (Chesbrough and Rosenbloom, 2002). Obviously, much research works on vehicle sharing systems proved the positive effects on the environment (e.g. Firnkorn and Muller, 2011). However, he also commented that the logistics company needs to know more about car sharing before making a decision. Some of his comments are given below:

1. In a car sharing model, all costs are distributed across use. Therefore, the marginal costs of each use are close to average costs (Prettenthaler and Steininger, 1999). The more frequent the vehicle is used, the lower the total cost per ride (the sum of fixed cost and variable cost) is.
2. The investment on the smart technology for sharing platform may be significant (e.g. online security) though it is to be absorbed by the sharing platform owner. Finally, the users will bear the cost and probably the risk.
3. Regarding the application of AHP framework for the decision of fleet building, the linguistic variable of (1-9) is better than completely intuitive inputs, especially given the lack of reliable forecasting information. The Input information quantity (e.g. during the briefing before AHP framework is applied) and output AHP quality is not automatic. It depends on the experience of logistics company executive. In many cases, input data are misused, misrepresented or even negatively related to outcome quality. It is nothing to do with the AHP framework.
4. The AHP framework, if applied correctly, may be a good tool for the organizational decision-making processes which link between input information and judgments.
5. The 3 alternatives may be a misleading direction for the decision makers since vehicle sharing for logistics is complicated while owning a complete fleet of acquisition is much simpler.
6. It is admitted that all the three criteria are important factors to build up a logistic fleet. However, environmental sustainability is an ethical consideration. It should not be considered while the goal is about cost effectiveness.

Conclusion

Two issues were noted when the AHP framework was designed to help the decision of logistics companies to build up a fleet with the alternatives of sharing and acquisition. Firstly, decision makers may find information overload regarding developing a sharing platform. It is too technical to be handled by the logistic company. The same situation may appear for other industry when a new complicated technology is involved. Information may overload in different aspects: in quantity produced, ease of dissemination, and breadth of audience reached (Evaristo et al, 1995). Secondly, pairwise comparison is difficult when alternatives are very different in scales and investment involved. In the case discussed above, leasing vehicles through a sharing platform is much more complicated than acquisition. In addition, it is also noted that decision makers may find it difficult when ethical value is involved in the criteria.

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