

## COST OF CAR OWNERSHIP AND LIFE CYCLE ANALYSIS IN MALAYSIA: SELECTED CASES

Abdul Yamin Saad  
School of Mechanical Engineering  
Universiti Sains Malaysia, Engineering Campus,  
14300 Nibong Tebal, Pulau Pinang  
Email: meyamin@usm.my

Nurul Alia Idayu Kamalul Bahrin  
School of Mechanical Engineering  
Universiti Sains Malaysia, Engineering Campus,  
14300 Nibong Tebal, Pulau Pinang  
Email: nurulaliaidayu@gmail.com

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### ABSTRACT

*Cars are essential in mobility, general and built environment as well as socio-economic well-being. Car ownership is a key issue in transportation policies especially in urban areas. Increasing car ownership is widely believed to cause exacerbated issues such as traffic jam, pollution, and public health. To seek for the solutions, it is imperative to understand car ownership and its subsequent life cycle in the real-world scenarios. In this paper, qualitative and quantitative research methods are used to determine and identify the car characteristics for the life cycle analysis for selected cases. The major behaviors of the buyers before purchasing are identified and ranked. The relationship between car ownership and income distribution are analyzed. The stipulated values for the maintenance cost are used as there are no standard methods to identify exactly the real values of the maintenance cost. Finally, the ranking and scaling are calculated based on the respondents' data.*

Key words: Car ownership, income distribution, maintenance cost.

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### INTRODUCTION

When populations develop and cities become denser, traffic continues to put higher demands on transportation networks. The cost of doing little to society would intensify transportation and accessibility problems and place much greater pressure on public infrastructure and budgets (Eliasson et al., 2018). Increasing car ownership is widely believed to have exacerbated externalize problems such as traffic congestion, air pollution, and public health. Studies by Statista Research Department stated that almost 77 million automobiles are expected to be sold by the end of 2019 through the global auto industry, which is projected to experience a downward trend on the back of a slowing global economy. In recent years, there has been a strong increase in the number of car owners in Malaysia. Today, Malaysia is facing an explosive growth in vehicle ownership which there are nearly 18 million registered motor vehicles in Malaysia and use, which has resulted in traffic congestion and emissions.

Due to the complex designs that consist of many parts, the price of the car is expensive (Wahab et al., 2018a). Different model of cars would obviously have different specifications. Therefore, the motivation of this research is to seek a clearer relationship between car ownership costs (maintenance, road tax, insurance, replacement intervals, instalment, fuel cost (Bezdek et al., 2005) and etc. based on the income distributions and consequences of owning a car as well as the life cycle analysis (Gransberg & O'Connor, 2015). The International Energy agency also still regards the cost of ownership as a significant factor for consumers' choice of adopting EV as their main transportation instead of current internal combustion options (IEA, 2021).

The objective for this research is to determine the car ownership based on the income distribution and consumers' spending decision in relation to individual cost, operating decisions, and replacement intervals. The paper will also attempt to determine the buyer's behavior before purchasing a car and to determine the life cycle of car ownership economics.

Thus, the significance of this paper is to add value to the current knowledge of vehicle ownership costs in Malaysia and it is hoped that the findings and recommendations at the end of this paper will enlighten consumers in Malaysia in a sustainable manner.

### METHODOLOGY

#### Qualitative Research Method

National Automotive Policy on Car Maintenance Issues stated that two primary concerns describe the cost of ownership of cars: fixed costs and variable costs. Insurance, road tax and licensing fees which are included in fixed cost of car ownership is known as the actual price and related taxes (Wahab et al., 2018b). Variable costs are same with costs incurred during car ownership such as gas, repairs, parking, toll fees and other charges for road use (Clark et al., 2016). Therefore, car maintenance is one of the main road safety concerns as it can prevent damage related to roadworthiness faults in a car. Purchasing a car is a big investment, irrespective of whether it is for personal use or for the entire family (Prabnasak et al., 2011). An unauthorized purchasing of a car (one that does not meet the needs or buying power) means that one might end up being tied up to a long-term obligation (minimum





**RESULT AND DISCUSSION**

**Results obtained in Qualitative Research Method**

**Table 4: Monthly instalment calculated based on the loan amount.**

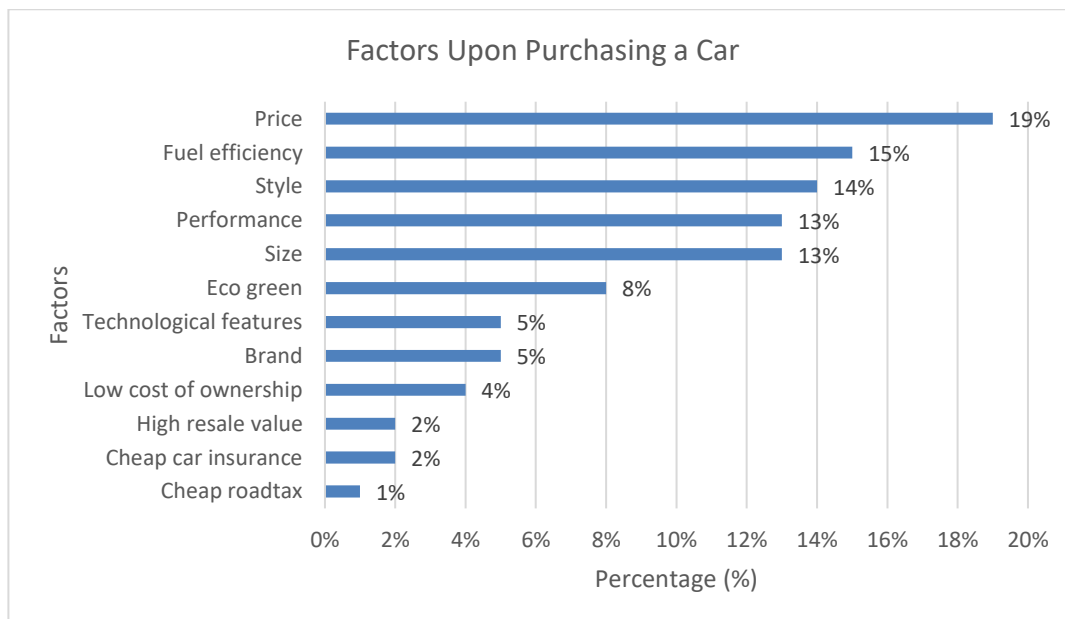
Loan Amount (RM)	Interest rate (%)	Total Loan (Years)	Total Interest (RM)	Monthly Interest (RM)	Monthly Instalment (RM)
20000.00	4	7	5600.00	66.67	304.76
35000.00			9800.00	116.67	533.33
50000.00			14000.00	166.67	761.90
70000.00			19600.00	233.33	1066.67
100000.00			28000.00	333.33	1523.81
150000.00			42000.00	500.00	2285.71
200000.00			56000.00	666.67	3047.62

Table 4 shows the month monthly instalment calculated based on the loan amount. The loan period is the length of time that buyers must pay off their loan which banks usually offer a up to nine years. If it is too costly for an additional traditional three- to five-year loan, which might be thirty-six to sixty months, buyers can think about an extended 72-month used car loan to urge that car. Buyers ought to be alert that the longer loan amount sometimes suggests that a lower monthly payment and makes the car more affordable. However, it additionally suggests that the longer the loan amount, the additional interest for them to pay.

**Table 5: Estimated costs for commonly used cars in Malaysia.**

Car (Type)	Road Tax (RM)	Insurance (RM)	Fuel Costs (RM)	Servicing Costs (RM)	Consumable Costs (RM)	Total (RM)
Perodua Myvi 1.3 Premium X AT (2015)	350.00	4146.19	16224.00	3141.85	920.00	24782.00
Perodua Axia Standard E 1.0 MT (2015)	100.00	2582.55	13936.00	3249.22	920.00	20787.80
Honda Jazz 1.5 S (2014)	450.00	6077.89	16224.00	3258.32	1004.80	27015.00

**Results obtained on Quantitative Research Method**



**Figure 1: Factors upon Purchasing a Car**

From Figure 1, it is shown that price (19%) is the first thing that buyers would look at in purchasing a car. According to Department of Statistics Malaysia, the mean and median gross income for Malaysian are RM7,901 and RM5,873, respectively (Department of Statistics Malaysia, 2020). Despite of purchasing only a car, they also need consider the worth of automobile insurance, fuel, and maintenance prices to urge actuality value of driving a specific automobile (Alexandra Twin, 2020). For an automobile with a

median market value of RM50,000 and power of 1,400cc, here are some further annual prices that buyers just may have to remember of (KWIKCAR, 2019):

- Road Tax – RM90/year
- Insurance – RM1,500/year
- Service and Maintenance – RM1000/year
- Petrol – RM2,400/year (RM200/month)

Fuel-efficiency refers to the ability of a vehicle to extract energy from the fuel. The additional energy a vehicle will extract from fuel, the larger fuel-efficiency the vehicle is claimed to own (Green et al., 2014) and the less energy a vehicle extracts, the less fuel-efficient the vehicle (Bezdek et al., 2005). Moreover, due to the pandemic issue (COVID-19) that happened recently the fuel price has not been in stable state. As the rising fuel costs, fuel consumption rate has become an increasingly necessary consider selecting a brand-new automobile. If they need to have a bigger vehicle attributable to the quantity of passengers they transport, they will need to carefully compare mileage among obtainable models in their size and value vary. Following time once getting into an automotive concern, take care to ask the vendor concerning the car's fuel-efficiency (Bezdek et al., 2005). Cheap road tax which might be the last choice when it comes to the factor in purchasing car as it has the lowest votes with only 1% among the 200 respondents.

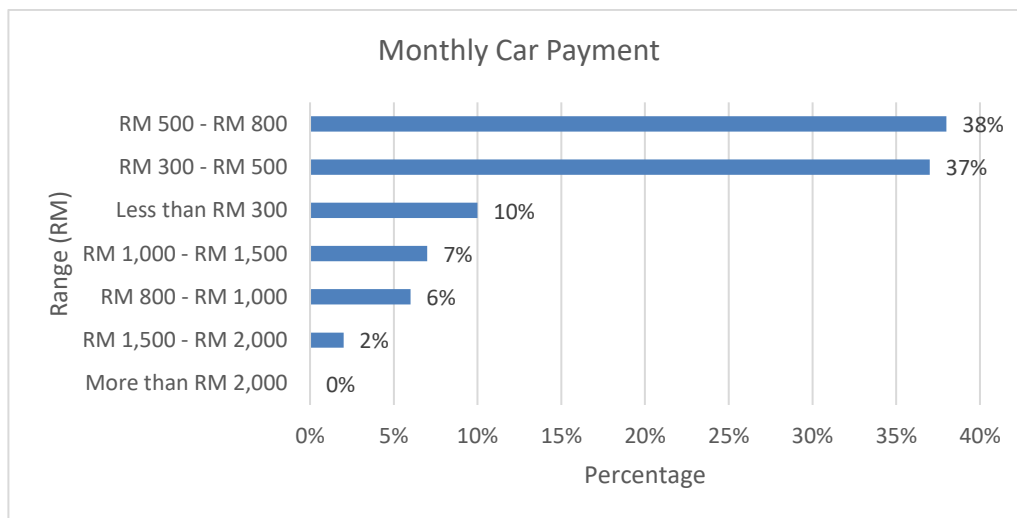


Figure 2: Monthly car payment.

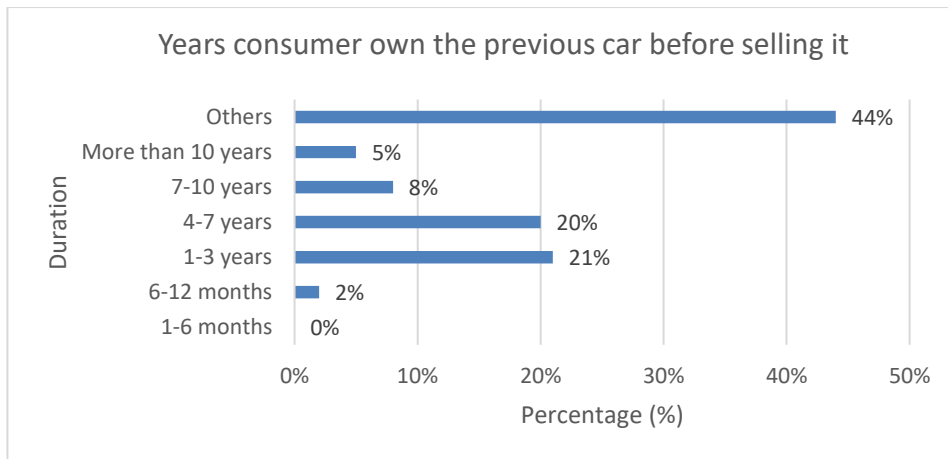
The monthly car payment was shown in Figure 2. As stated by Department of Statistics Malaysia, for Malaysian, the mean and median gross income are RM7,901 and RM5,873. Related to the monthly car payment, majority of the respondents stated that they pay for the payment in the range of RM300 to RM800. There is an easy way to calculate what is the affordable car based on the gross income using formula in equation below:

$$\text{Income(Salary)} \times 12(\text{months}) = \text{Price of the car} \quad (\text{Equation 2})$$

Using the mean income as an example,

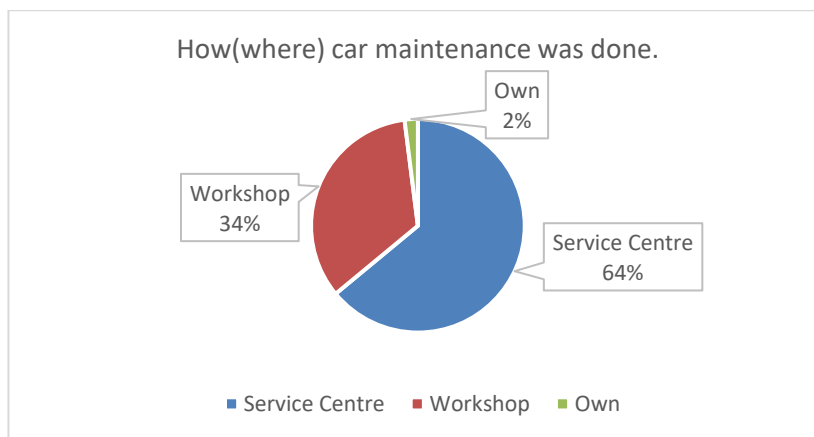
$$RM 5,873 \times 12(\text{months}) = RM 70,746$$

Using formula in Equation 1, the monthly car payment is roughly around RM1000, meaning it is acceptable for the respondents to spend some money to pay the monthly car payment either they have the mean or the median gross income.



**Figure 3: Years buyers own the previous car before selling it.**

Figure 3 shows that years consumer owns the previous car before selling it. 'Others' option is neglected as assuming that either consumer has not selling their car yet or they did not own a car to sell. With 21%, respondents stated that it took about 1-3 years for them to sell their car before purchasing a new one. Related to this, depreciation is the highest cost in owning a car. The vehicle begins to depreciate in price the instant buyers receive the keys from the dealer. However, there is the simplest way to manage the vehicle depreciation, and it is extraordinarily necessary to try to it because it can facilitate buyers verify that car to shop for. in this example, car A depreciates 53% within the initial four years (Lim & Yeok, 2017). The lower the rate of depreciation, the better. Do a similar calculation for many completely different models and find one that incorporates a lower charge per unit. Try and keep the vehicle in mint condition, and for the long, because the rate of depreciation is usually higher within the initial years of possession. A decent rule of thumb is to assume that a brand-new car can lose just about 20% of its price within the first year and 15% year subsequently till, once ten years, it's value around 10% of what it originally value (Joseph Chisasa, 2013).



**Figure 4: How (Where) car maintenance was usually done.**

Figure 4 shows majority of the respondents with 64% stated that they usually did the car maintenance at the service centre, whereas 34% of them send it to the nearest workshop and 2% of them decided to do the maintenance by their own. The possibilities of the reason why 64% chose service centre is because of warranty issue. The good thing about aiming to the service centre is that the

challenge of latest technology (Palinski, 2017). The new- generation vehicles are advanced and are available equipped with electronic systems like European, fuel systems, ignition, and in-car entertainment systems (Wahab et al., 2017).

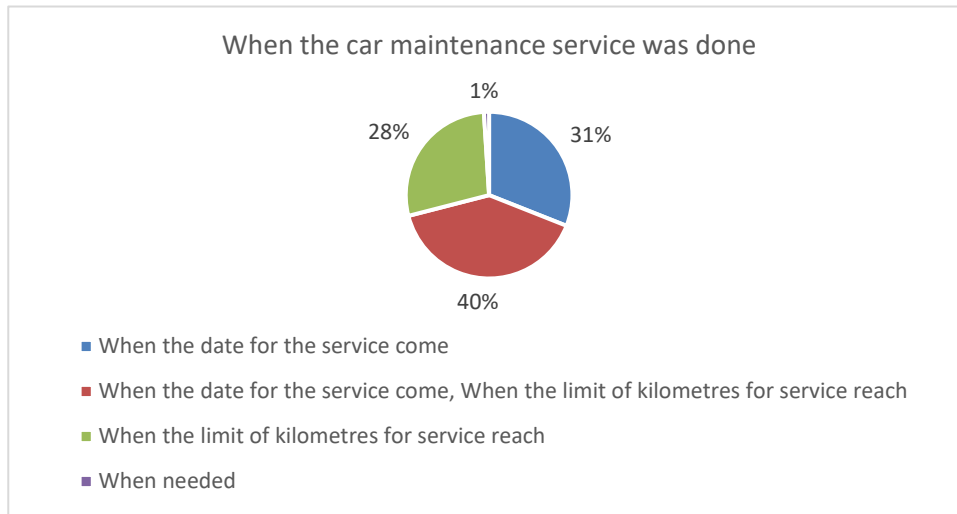


Figure 5: When the car maintenance service was done

However, for routine services that do not need any complicated work, visiting a general workshop can facilitate buyers save plenty of cash. However, buyers should make sure that the spare components, oil, and filters are genuine. Cheaper labour price is one among their biggest benefits. The value of components and oil can stay identical if real spares are used, however the labour charges are less expensive than at licensed service centres (Wahab et al., 2017, 2018a).

**CONCLUSION AND FUTURE WORK**

**Conclusion**

Through qualitative research method, it showed that the estimated maintenance cost is different for every car. Service cost are usually based on basic scheduled maintenance intervals for respective variants obtained from authorised dealerships. It may vary depending on the vehicle condition and any additional requirements based on wear and tear. The monthly instalment is also calculated as shown as in Table 1. Monthly instalment calculated based on the loan amount. The interest rate usually would be in the range of 3% to 5% as it wavers up or down depending on how the economy is doing.

Through quantitative research method, it is revealed that price is one the biggest concern when coming to purchasing a car. However, buying a car is not as simple as just comparing prices. To ensure the vehicle is a smart financial decision, consider all aspects of owning a car and buyers will see a much lower cost of vehicle ownership. Next, is the monthly car payment was shown in Figure 2. Related to the monthly car payment, majority of the respondents stated that they pay for the payment in the range of RM300 to RM800 which is acceptable for consumer who has the range of mean and median gross income. When it comes to life-cycle analysis, the impact of the vehicle's manufacture is entirely attributed to the service, whereas the vehicle solely has 2 years within the service for a life of 10 years (eight years out of service) (Guyon, 2017).

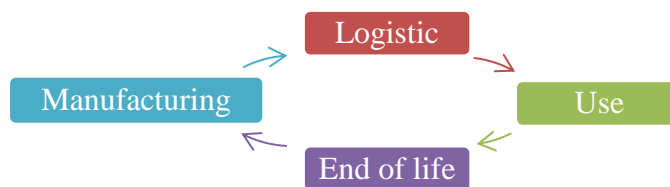


Figure 6: Conventional private vehicle life cycle.

**Future Work**

In this research, the estimated maintenance cost is difficult to be quantified as the were no exact price to be verified. This research is to determine the economics of the car ownership and life cycle analysis. For future work, questions should be asked in even more detailed and the targeted sample should be increase in terms of number to improve the accuracy. The estimated maintenance cost and life cycle analysis should be asked from the expert in this specific field. Despite this pandemic issue that happened recently, it is better to do face-to-face interview with the respondents when conducting survey through many online platform or video call.

Although efforts were spent mainly on the life cycle of car ownership at the initial stage, the research on the whole life cycle or multiple cycles of car ownerships would have to be expanded in the future.

## ACKNOWLEDGEMENT

This work is supported by School of Mechanical Engineering, Universiti Sains Malaysia. The authors would like to express sincere gratitude to everyone involved for their cooperation, guidance and assistance throughout completing this paper. This research was funded by a Bridging-Insentif grant from Universiti Sains Malaysia (304.PMEKANIK.6316449).

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