UNIVERSITI TEKNIKAL MALAYSIA MELAKA

A STUDY ON END-OF-LIFE VEHICLE FOR USED PART DEALERS: PROTON WIRA CASE STUDY

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BACHELOR OF MANUFACTURING ENGINEERING TECHNOLOGY WITH HONOURS

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Faculty of Mechanical and Manufacturing Engineering Technology

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A thesis submitted
in fulfillment of the requirements for the degree of
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DECLARATION

I declare that this project entitled “A Study On End-Of-Life Vehicle For Used Part Dealers: Proton Wira Case Study” is the result of my own research except as cited in the references. The project has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : 

Name : Subramaniam a/l Somasundram

Date : 7 June 2022

APPROVAL

I hereby declare that I have checked this project and in my opinion, this project is adequate in terms of scope and quality for the award of the Bachelor of Manufacturing Engineering Technology (Bmmw) with Honours.

Signature : .....

Supervisor Name : Prof. Madya Ts. Dr. Wan Hasrulnizzam Bin Wan Mahmood

Date : 7 June 2022

.....

DEDICATION

This dissertation is dedicated to my beloved parents, my supervisor Professor Madya Ts Dr Wan Hasrulnizzam Bin Wan Mahmood and to those who are unwavering affection, guidance and encouragement have enriched my soul and driven me to undertake and complete this work.

ABSTRACT

An ELV is a vehicle that has reached the end of its usable life or services owing to ageing or the inability to use it due to a major accident with a high repair cost. In Malaysia, vehicles are often used, regardless of their age or condition. This issue does not only affect rural areas but it also affects major cities. Vehicle manufacturers normally anticipate their vehicles to survive 15 years, thus those that last longer are designated as End-of-Life Vehicles (ELV). The current stages for dismantling ELV cars are unregistered, dismantling, depollution, and dismantle. Each approach must follow the relevant guidelines. Extensive usage of ELV might lead to vehicle failure, putting the user's and other road users' safety at risk. Used part dealers(UPD) are particularly important in ELV management because they can substitute vehicle parts that aren't in good functioning order. This study is prepared to analyze the expectation of ELV product from used car parts dealers, to classify the types of automotive used part preferred by used car part dealers and to propose ELV product for Proton Wira as case study. This study also focused on case study about Proton Wira. This methodology used for this study is focuses on four types of data collection which are junk yard site observations on how the UPD deal with ELV vehicles, questionnaire survey, semi-structured interview with the junk yard owner and workers and finally capturing images of the vehicles used part items and the process of dismantling cars which are analyzed by performing a statistical analysis. All of these data are analyzed through Statistical Package for the Social Science (SPSS) software to identify the mean score of each elements in the questionnaire. Additionally, a few analysis such as reliability, correlation and factor analysis also have been conducted in this study. The results show the expectation and preferable used car part items by UPD. The results also show the understanding of ELV product acceptance of Proton Wira in the current market. According to the surveys, the UPD deals with the ELV parts in accordance with the current market demands, which means that the parts can be used as second-hand in good condition for a lower price. All of these considerations contribute to the importance of used part dealers in ELV. ELV is an emerging case study subject with a strong industrial presence. This project might provide them with references, crucial insights, and opportunities, as well as incentive to give greater attention to ELVs.

ABSTRAK

ELV adalah kenderaan yang telah mencapai akhir hayat atau perkhidmatannya yang boleh digunakan kerana penuaan atau ketidakupayaan untuk menggunakannya kerana kemalangan besar dengan kos pembaikan yang tinggi. Di Malaysia, kenderaan sering digunakan, tanpa mengira umur atau keadaan mereka. Isu ini bukan sahaja menjejaskan kawasan luar bandar tetapi juga mempengaruhi bandar -bandar utama. Pengeluar kenderaan biasanya menjangkakan kenderaan mereka bertahan selama 15 tahun, oleh itu mereka yang bertahan lebih lama ditetapkan sebagai kenderaan akhir hayat (ELV). Peringkat semasa untuk merungkai kereta ELV adalah tidak didaftarkan, pembongkaran dan pencemaran. Setiap pendekatan mesti mengikuti garis panduan yang berkaitan. Penggunaan ELV yang luas mungkin membawa kepada kegagalan kenderaan, meletakkan keselamatan pengguna dan pengguna jalan raya yang lain berisiko. Peniaga bahagian yang digunakan amat penting dalam pengurusan ELV kerana mereka boleh menggantikan bahagian kenderaan yang tidak berfungsi dengan baik. Kajian ini disediakan untuk menganalisis jangkaan produk ELV daripada peniaga bahagian kereta terpakai, untuk mengklasifikasikan jenis bahagian automotif yang digunakan oleh peniaga bahagian kereta yang digunakan dan untuk menyediakan prosedur operasi standard yang sesuai untuk operasi ELV produk dalam peniaga bahagian yang digunakan secara automatik. Kajian ini juga memberi tumpuan kepada kajian kes mengenai proton wira. Metodologi ini yang digunakan untuk kajian ini memberi tumpuan kepada empat jenis pengumpulan data yang merupakan pemerhatian laman web sampah tentang bagaimana UPD berurusan dengan kenderaan ELV, kaji selidik soal selidik, wawancara separa berstruktur dengan pemilik dan pekerja Junk Yard dan akhirnya menangkap imej kenderaan Bahagian bahagian yang digunakan dan proses pembongkaran kereta yang akan dianalisis kemudian dengan melakukan analisis statistik. Kesemua data ini dianalisis melalui perisian Statistical Package for the Social Science (SPSS) untuk mengenal pasti skor min bagi setiap elemen dalam soal selidik. Selain itu, beberapa analisis seperti kebolehpercayaan, korelasi dan analisis faktor juga telah dijalankan dalam kajian ini. Keputusan menunjukkan jangkaan dan item alat ganti kereta terpakai yang diutamakan oleh UPD. Hasilnya juga menunjukkan pemahaman tentang penerimaan produk ELV Proton Wira dalam pasaran semasa. Menurut tinjauan, UPD ini berkaitan dengan bahagian-bahagian kenderaan akhir hayat mengikut tuntutan pasaran semasa, yang bermaksud bahawa bahagian-bahagian itu boleh digunakan sebagai tangan terpakai dalam keadaan baik untuk harga yang lebih rendah. Kesemua pertimbangan ini menyumbang kepada kepentingan peniaga bahagian yang digunakan dalam kenderaan akhir hayat. Kenderaan akhir hayat adalah subjek kajian kes yang baru muncul dengan kehadiran perindustrian yang kuat. Projek ini mungkin memberi mereka rujukan, pandangan penting, dan peluang, serta insentif untuk memberi perhatian yang lebih besar kepada ELV.

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Last but not least, from the bottom of my heart I would also like to thank my beloved parents for their endless support, love and prayers. Finally, thank you to all the individual(s) who had provided me the assistance, support and inspiration to embark on my study.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ADC	-	Authorized Dismantle Center
AI	-	Artificial Intelligence
ASR	-	Automotive Shredder Residue
CIWM	-	Chartered Institution of Waste Management
CO2	-	Carbon Dioxide
CoE	-	Certification of Entitlement
DFD	-	Design For Disassembly
DOHC	-	Dual Overhead Camshaft
EEV	-	Energy Efficient Vehicle
ELV	-	End-Of-Life Vehicle
EoL	-	End-of-Life
EPA	-	Environmental Protection Administration
EU	-	European Union
GDP	-	Gross Domestic Product
IMP3	-	Third Industrial Masterplan
KMO	-	Kaiser-Meyer- Olkin
LTA	-	Land Transport Authority
MAARA	-	Malaysian Automotive Recycling Association
MMC	-	Mitsubishi Motors Corporation
NAP	-	National Automotive Policy
OEM	-	Original Equipment Manufacturer
RFMB	-	Recycling Fund Management Board
RPM	-	Revolution Per Minute
SME	-	Subject Matter Expert
SOHC	-	Single Overhead Cam
SPSS	-	Statistical Package for the Social Science
UPD	-	Used Part Dealer
VQS	-	Vehicle Quota Scheme

VTREC - Vehicle Theft Reduction Council of Malaysia

VVI - Voluntary Vehicle Inspection

WEEE - Waste from Electrical and Electronic Equipment

WRC - World Rally Championship

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Background

The global vehicle population is rapidly expanding. As the number of cars sold increases, so does the number of vehicles that are no longer in use, often known as end-of-life vehicles (ELVs) (Krishna Mohan & Amit, 2021). Vehicles are now considered a daily need, and annual manufacturing is expanding. As more new vehicle models join the market, this tendency will lead to a rise in End-of-Life Vehicles (ELVs). ELVs are governed by distinct rules and regulations in each nation. This is due to the various automobile circumstances in each nation (Akram Khan et al., 2021). Based on Wong et al., (2018) research, ELVs can arise in two ways: naturally (wear and tear) or prematurely (harm caused by accidents, explosion, floods, or theft).

An ELV is a deregistered vehicle that will be treated or recycled within the country using authorised techniques. It is a vehicle that has been or will be dumped by the owner. The vehicle is classified as ELV based on two factors. Because of the vehicle's age or because of extensive damage, it can no longer be utilised. They are characterized as scrap that can be thrown away. All of the car's components and parts are likewise considered waste (Harun et al., 2021).

Besides that, Akram Khan et al., (2021) stated that when a vehicle meets certain criteria, it is classified as an ELV. The age and mileage limit are two of the conditions. When the vehicles have reached the end of their useful life, they will be retired (by years or mileages). In Malaysia, the average vehicle life span is between 10 and 15 years, after which they are decommissioned. Aside from that, vehicles in Malaysia entered the ELV condition if they were deemed a “complete loss” as a result of a traffic accident, or if they were an old car classified as a junk car by the age of 25 or older. Figure 1.1 shows examples of vehicles that have been called as ELV.

Figure 1.1: Example of vehicles been classified as ELVs

ELV involves few process that disassemble the vehicles in a few phase. Initially, discarded vehicles are delivered to firms who dismantle them. Their fluids, batteries, tyres, and airbags are removed as a precaution. Following that, based on the vehicle type and market need, particular automotive parts are selected and removed to be resold as used spare components. Other process components are separated at this phase and re-cycled as alternative raw materials. The leftover autos are crushed and delivered to shredding companies, where they are crushed and metals are extracted mostly by magnetic separation. Finally, remnants are derived from automotive shredder residues (ASRs), which are mostly composed of plastics, foam, and textiles (Sato et al., 2019).

1.2 Problem Statement

Malaysia's automobile market has exploded as a result of the country's economic growth. As a result, the impact of ELV is growing in tandem with the number of vehicles on the road in Malaysia. However, there are high expectations for auto used part dealers in ELV because many vehicle owners choose to buy used parts rather than new parts, which may be costly. Alternator, distributor, crank shaft, and power steering pump are a few preferred car used component products at used part dealer. These are the most popular and in great demand used parts. However, many used part products are occasionally out of stock at used part dealers, and getting these items might be difficult due to strong demand in the market.

This project also focuses into proton wira end-of-life vehicle spare parts. According to the report, the Proton Wira is the most popular vehicle among thieves in Malaysia. Figure 1.2 shows the top 10 most stolen car 2020 in Malaysia. This is due to its strong demand for used parts. However, even with used parts, proton wira spare parts are still expensive until now.

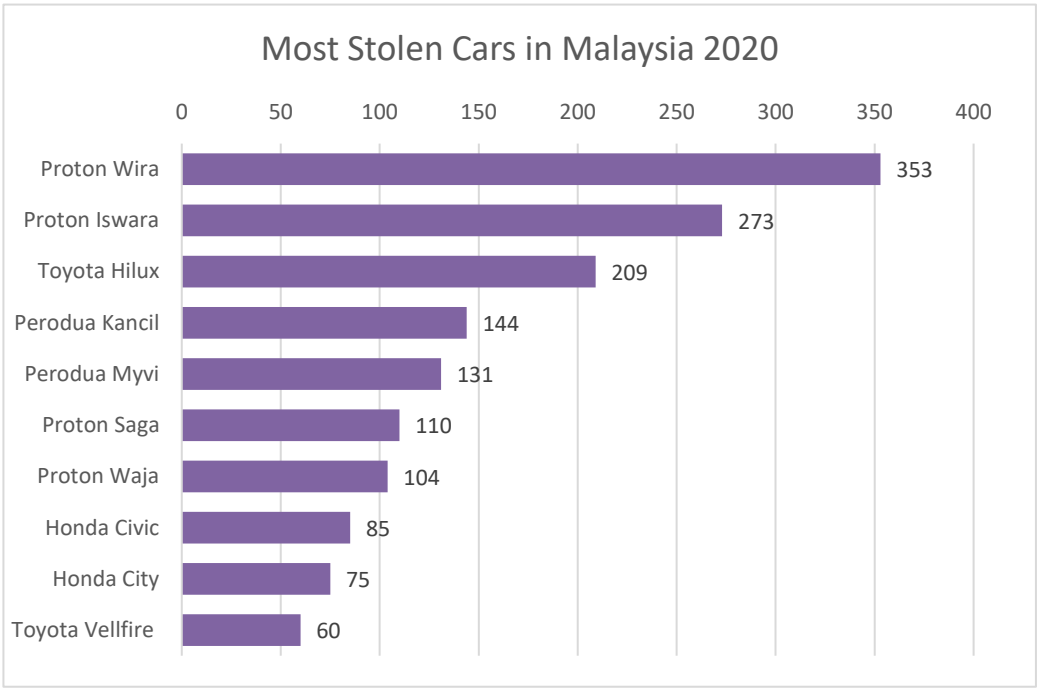


Figure 1.2: Top 10 most stolen cars in Malaysia (Jerrica, 2021)

1.3 Research Questions

In regarding to the problem statement, there are research question which are identified.

i. What is the expectation of ELV product from auto used part dealers?

ii. What types of automotive used part preferred by auto used part dealers?

iii. How ELV product for Proton Wira has been accepted with example in the current market?

1.4 Objectives

The objectives of this project can be outlined as the following:

i. To identify the expectation of ELV product from used car parts dealers.

ii. To clasify the types of automotive used part preferred by used car part dealers.

iii. To propose ELV product for Proton Wira as case study.

1.5 Scope of Study

In order to meet the project objectives, a few scopes are given. The study initially emphasizes the expectation used car part dealers on ELV product. Furthermore, this study also focuses on the sorts of automotive used parts favoured by used car part dealers. Aside from that, this study also emphasizes on how used car part dealers get their auto parts. This study is conducted in auto used part dealers. For data collection several methods like observations, questionnaire survey of auto used part dealers and semi-structured interview have been conducted. The duration of this study is almost one year, which started on March 2022 and will be ended on January 2023.The results can be used as a reference for a further study and research.

1.6 Significance of study

The benefits of this study is as follows:

i. Able to know the expectation of ELV product from auto used parts dealers

ii. To learnt the the types of automotive used part preferred by used car part dealers

iii. To understand the ELV product acceptance of Proton Wira in the current market.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter aims to explain about the End-Of-Life Vehicles process, definition, benefits and its importance in Malaysia. It also covers the driving factor for used part dealers to involve in end-of-life vehicles practices Besides, this section briefly describes the research studies related to this project regarding each main topics of the title given. There are several types of sources such as journals, books and newspaper will be utilized as a manual to decide the purpose and direction of this project. This literature review is important because it serves as a guide for the new study and a researcher can avoid repeating the same mistake by past researchers. In addition, the literature review can help to produce a better study.

2.2 End-Of-Life Vehicles: An Overview

The worldwide car population is growing at a rapid pace. As the number of vehicles sold grows, so does the number of outmoded automobiles, often known as end-of-life vehicles (ELVs) (Krishna Mohan & Amit, 2021). An ELV is defined as a deregistered vehicle that will be treated or recycled within the country using appropriate techniques. A vehicle can develop an ELV in 2 ways, according to researchers: naturally (wear and tear) or prematurely (harm caused by accidents, explosion, floods, or theft). Figure 2.1 shows vehicles that have been abandoned beside the streets and can be develop as ELV.

Figure 2.1: Example of abandoned vehicles

ELV encompasses a wide range of activities, including the ELV collection, components and part separation, product recovery methods, and waste disposal. Regardless of where they come from, they are all managed by the same reverse logistic chain. Besides, ELV is described as product recovery, which includes reusing, repairing, refurbishing, remanufacturing, cannibalism, and recycling (Wong et al., 2018).

As previously stated, ELV was defines as waste according to the Chartered Institution of Wastes Management (CIWM) of the United Kingdom, involving all of their components and materials. Waste is a term that has been defined as everything that is destroyed, intended to be discarded, or is forced to be abandoned. This contains materials that are recycled or reused. The average vehicle life lifetime in Malaysia is between 10 and

15 years, after which they are retired. Aside from that, automobiles in Malaysia entered the ELV state if they were judged a "total loss" due to a traffic accident, or if they were an old car that had been labelled as a junk car by the age of 25 or older (Akram Khan et al., 2021). Figure 2.2 shows vehicles that have been consider as total loss and must be processed as ELVs.

Figure 2.2: Example of total losses vehicle

Vehicles that pass the quality test at the inspection centre are sent to repair centres to be reprocessed before being sold on the used vehicle market. Those that fail the quality test are transported to dismantling centres to be dismantled (Figure 2.3). At the completion of the procedure, materials are sorted into three categories: reusable components, things that are later processed in shredding centres, and hazardous rubbish that requires special processing before being dumped of in landfills.

Figure 2.3: Vehicles that are being transfer to dismantling centers

Reusable parts are tested at least at thorough inspection centers before being sent to used part marketplaces. Items that do not pass the test are delivered to shredder centres. Shredding centres provide physical treatments such as sorting, ferrous classifying, crushing, balling, and so on. Raw materials that do not require chemical treatment are sold directly to used markets otherwise, they will be handled at a chemical treatment facility before being sold. After that, all hazardous waste is transported to Automotive Shredder Residue (ASR) centres to be processed before being disposed of in landfills (Phuc et al., 2017).

Similarly, (Kuşakcı et al., 2019) indicated that the first step is to transport ELV to designated collection or dismantling places (Figure 2.4). The owner is responsible for the vehicle's transportation at this point. The ELV must be transferred to an authorized dismantle centre (ADC) within sixty days of collection.

Figure 2.4: Example of dismantling place

Before deconstruction begins, the car's dangerous and toxic fluids and substances, such as hydraulic oil, gearbox oil, coolant fluid, and the remains of the gasoline, are emptied. The ADC then disassembles and barcodes reusable pieces from the ELV body. Some parts and materials are transferred to recycling centers, while useable portions are refurbished and sold on secondhand marketplaces.

End-of-life vehicles (ELVs), together with waste from electrical and electronic equipment (WEEE), are identified as main sources of secondary raw materials by experts. According to the most recent estimates, ELVs are produced in Europe in quantities ranging

from 7 to 14 million tonnes per year. Almost 70% of this quantity is immediately reused by businesses to create new products (Rosa & Terzi, 2018). Despite the fact that the ELV is a well-established sector in Europe, its management practices have remained unchanged for decades, totally reliant on raw resources market pricing, particularly in the case of ferrous metals (D'Adamo et al., 2020).

Battery, fuels, and filter, for example, are separated from the most harmful components, and ELVs are gathered and deleted from public records. Following that, the most of the valuable components (such as the catalyst, engine, and some mechatronic sections) are removed if they are in excellent working order and there is a market for it, and they are reused as spare parts in secondary markets. The automotive hulk is then crushed and broken into little parts. The scraps are then classified according to their physical features. (For example, density, weight, and magnetism) to establish consistent groups of parts. In most cases, ferrous metals (which account for around 65 percent of total mass) are quickly reintroduced into the vehicle supply network (as a source of raw materials for foundries). The vehicle life cycle and recycling method in ELV are depicted in Figure 2.5.

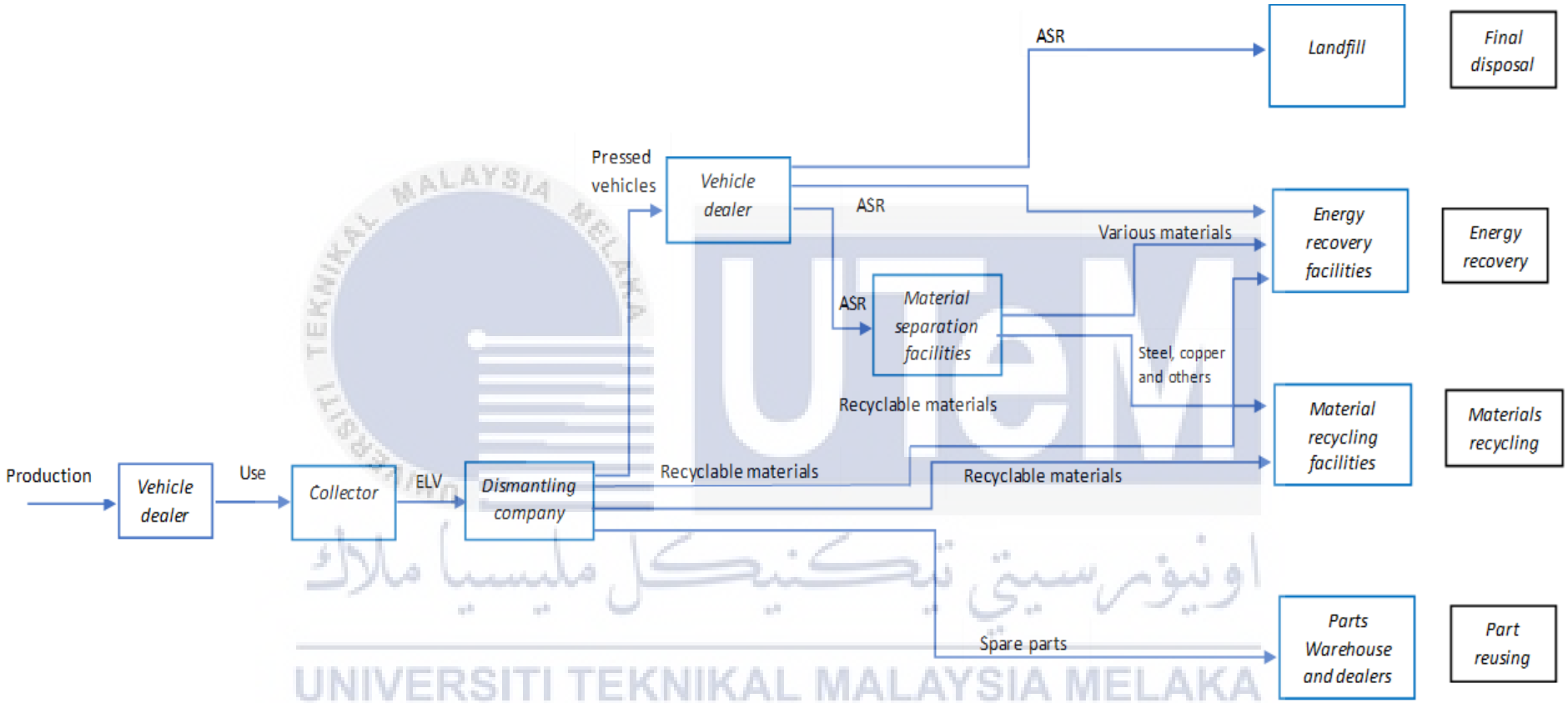


Figure 2.5: The existing vehicle life-cycle and recycling system in ELV (Sato et al., 2019)

Non-metals, also known as Automotive Shredder Residue (ASR), contribute for almost a quarter of total mass and are now landfilled or used to generate energy. Finally, depending on the specific treatment plant's setup requirements, nonferrous metals (about 5% of the average mass) become pollutants in both the ferrous and nonmetal fractions. The whole recuperation process, on the other hand, is based on the technology that was established more than half a century ago. Throughout the previous several decades, experts have offered a wide range of novel strategies. Alternative or improved techniques to increasing the recovery percentage of the so-called ASR (or the remaining mass of an automobile after depollution and deconstruction) which is typically burnt or landfilled are still being investigated. Figure 2.6 shows the percentage of the ELV cycle.

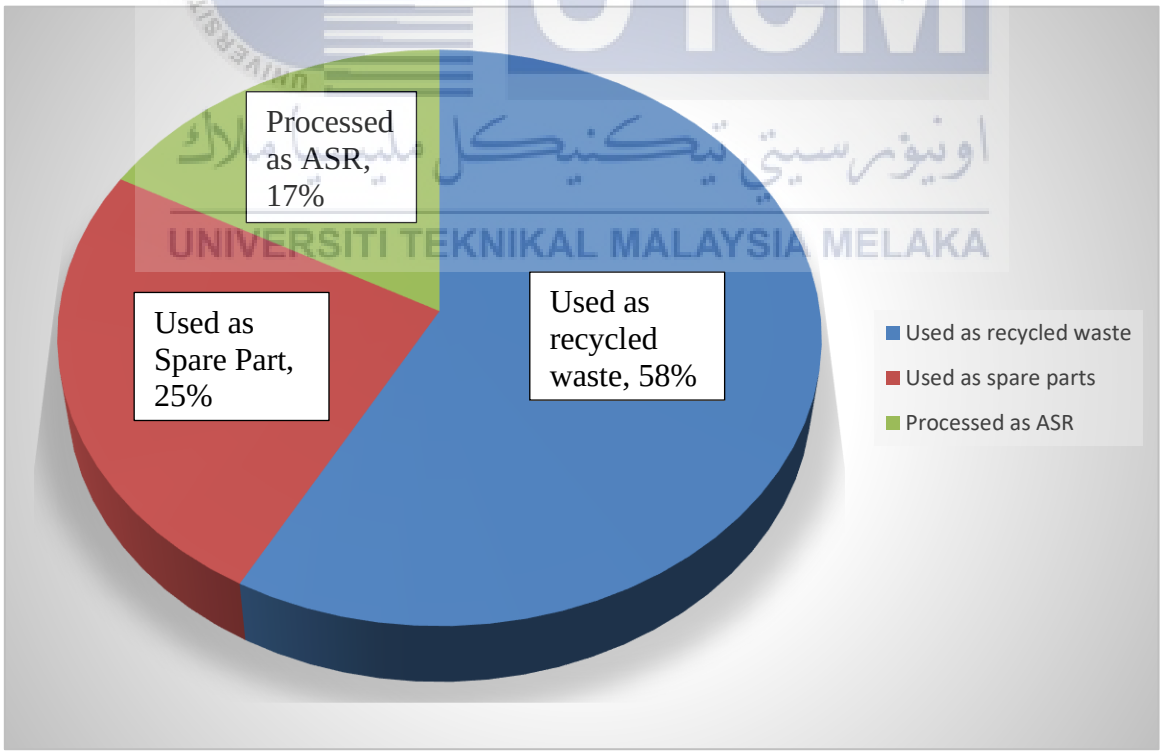


Figure 2.6: The percentage of the ELV cycle system

ELV reports indicate that 25 % of the weight of each abandoned vehicle is reused as spare parts, 58 % is segregated as recycled waste, and the remainder 17% is processed as ASRs. The final residue is automobile shredded residue (ASR), which is sent to ASR-treatment plants. The residue, which frequently comprises of plastics, textiles, sponges, rubbers, metal, glasses, wiring, and dirt, is estimated to account for 15% to 40% of the total weight of ELVs. At ASR facilities, crushing, screening, and other separations are utilised to recover ferrous and nonferrous metals (aluminium, copper, lead, and zinc), plastics, rubber, and glass (Sato et al., 2019). The theoretical structures of ELV are depicted in Figure 2.7 below.

Three of the 10 aspects of the conceptual structure are concerned with the values of scrap autos, car hulks, and metal scraps. The automaker's point of view is represented by the first element named "Automakers". Automakers have a significant effect on the ELV recovery chain because they make several decisions concerning the kind, volume, and composition of new automobiles that are released to the market. Depending on the materials used and the application of Design for Disassembly (DFD) methodologies. ELVs entering the recovery chain outperform both dismantlers and shredders in terms of overall performance.

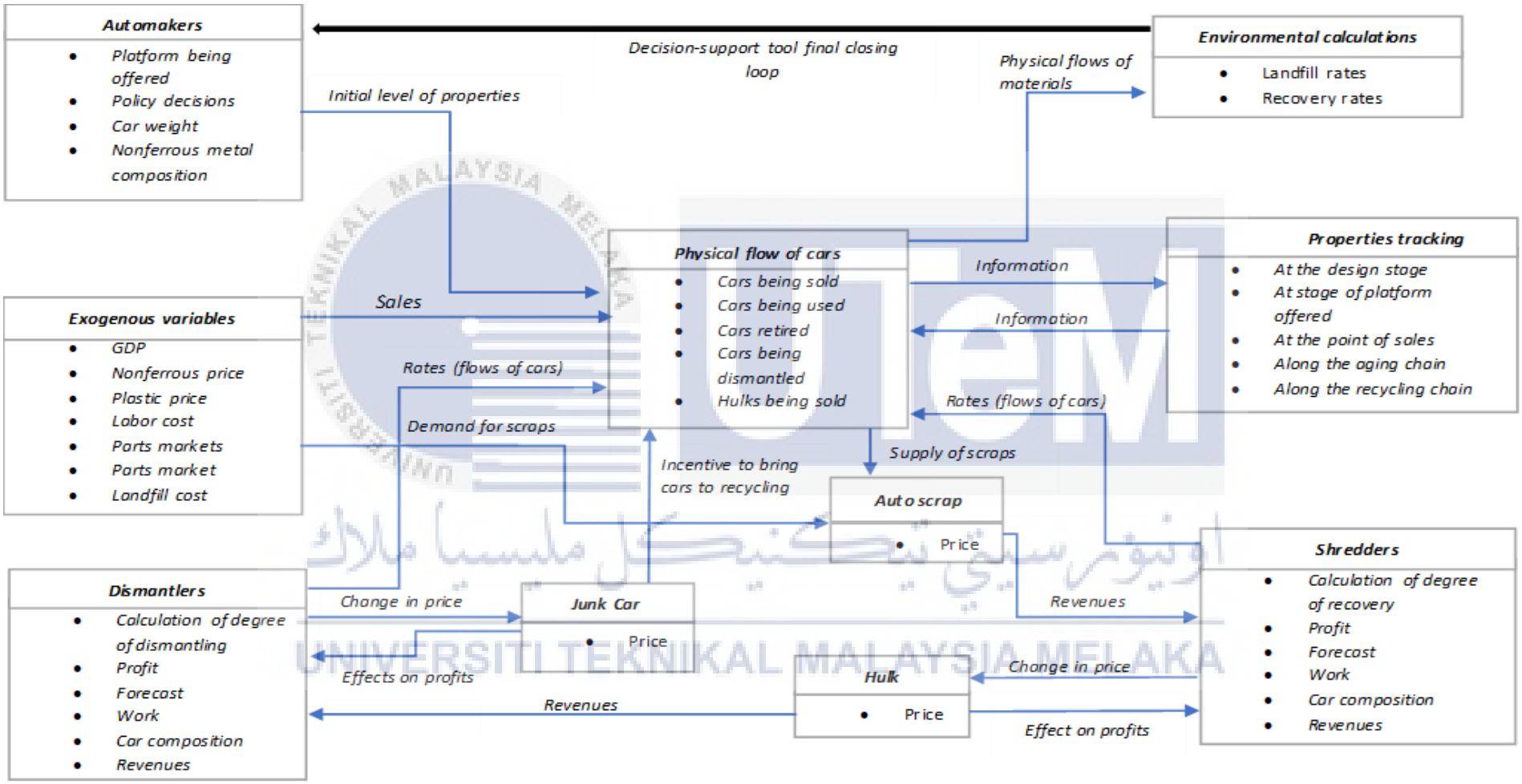


Figure 2.7: The decision-support tool's conceptual structure of ELV (Rosa & Terzi, 2018)

Exogenous variables are represented in the second element. Those are the factors that are out of the hands of any of the actors in the situation. They are divided into three categories: aspects that are dependent on the country such as Gross domestic product (GDP), factors that are dependent on the market (such as material and spare parts prices), and cost components (examples labour cost and landfilling fees). The third element is represented by the actual movement of automobiles. These are used to track a car's full operation throughout the recovery chain in order to maintain a consistent mass balance between both the incoming and outgoing parts.

The fourth part, "Environmental calculations," depicts the overall environmental impact of the ELV recovery chain. In this scenario, just the landfill and recovering rates are considered. The final part is "properties tracking," which reflects the collection of attributes associated with each vehicle. On a material level, it is the same as the third component in that it must maintain ideal balance all throughout the process.

The sixth and seventh portions, called "Dismantlers" and "Shredders," portray the viewpoints of dismantlers and shredders, respectively. These are explained together due to the shared rationale. For both of these actors, the model analyses a number of unique factors. Finally, the eighth, ninth, and tenth sections, called "Junk car," "Hulk," and "Auto scrap," detail the procedures utilized within the ELV recovery chain to calculate market value for various automotive wastes (such as scrap metal, junk cars, and automotive hulks) (Rosa & Terzi, 2018).

2.3 The Benefits of End-Of-Life Vehicles

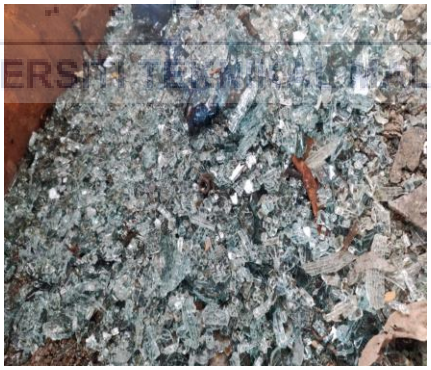
ELV have few benefits which may be a valuable alternative source of resources. Metals, nonmetals, plastics, and glass all are employed in the production of automobiles. End-of-life management methods seek to maximize the economic and environmental benefits of the recovery process. Recovery of material abundant ELVs amid global supply chain failures provides an alternative resource source and facilitates the establishment of a circular economy (Krishna Mohan & Amit, 2021).

In the face of flaws and deficiencies in Malaysia's legislative and regulatory aspects of ELV management, ELV's existing position and operations provide local industry players with either recycling or vehicle importing firms and component spare parts with economic opportunities and resources. The Malaysian government makes revenue by utilizing Japan's ELV experience and expertise, which aids economic growth as the vehicle sector expands. ELV management that is systematic and effective has resulted in increased environmental sustainability and control over natural and industrial resources.

Steel, copper, rubber, plastic, glass and aluminum made from ELVs have economic worth in other sectors. The landfill's ELV management not only serves as a disposal site for ELV vehicles, but the materials generated are also offered to other downstream industries that require such resources to cover a wide variety of other products depending on the materials. Recycling these items will reduce the reliance on natural resources even further. Table 2.1 shows the materials from the spare parts which can be very profitable for the economy.

Table 2.1: Examples of materials from spare parts

No.	Materials from spare parts	Figure	Description
1.	Aluminium	 **Figure 2.8:** Aluminium radiator	Figure 2.8 shows the use of aluminium in radiator spare parts. The ideal material for a radiator is frequently agreed upon to be aluminium.
2.	Copper	 **Figure 2.9:** Copper wire	Figure 2.9 shows that using copper wire material in vehicle wiring system. Because of its excellent heat conductivity, copper is used in numerous vehicle components.
3.	Plastics	 **Figure 2.10:** Rear tail lamp	Figure 2.10 shows that using plastic material as rear tail lamp. Door trim is another example of a plastic material that has been used.

4.	Rubber	 **Figure 2.11:** Rubber hose	Figure 2.11 shows that using rubber material as rubber hose in vehicle. Usually this rubber hose can been found in the engine bay.
5.	Steel	 **Figure 2.12:** Steel body frame	Figure 2.12 shows using steel material as body frame for vehicle. Steel is a material that is utilised in vehicles because it has a high strength and can absorb energy during a crash.
6.	Glass	 **Figure 2.13:** Glass material	Figure 2.13 shows glass materials that been found in vehicle. Generally glass material will be used for windscreen, side mirror and rear mirror.

As a result of the ELV operations, opportunities for technological improvement for local and international industry players to build a much more specialized automobile replacement centre arose. The Centre and hub of spare parts gain from supervised capacity due to today's technology breakthroughs in the Industrial Revolution 4.0 era. With the introduction of the Artificial Intelligence (AI) technology, new job possibilities have been created as a result of the transfer and exchange of technology, as well as opportunities for the development of technology specialists. Malaysia is anticipated to produce more subject matter experts (SMEs) in the disciplines of science, technology, and artificial intelligence (Akram Khan et al., 2021).

Parts reuse (Figure 2.14) also improves the use phase of the vehicle life cycle by lowering the energy and carbon dioxide (CO2) required to manufacture product replacement parts for vehicle maintenance. The Automotive Shredder Residue (ASR) is primarily concerned with energy recovery and thermal energy. As an alternate source of materials, recyclable materials are also sorted and recycled (Sato et al., 2019).

Figure 2.14: Example of auto spare parts for reuse

Environmental gains have resulted from the deployment of various End-of-Life (EoL) treatment options in countries with tougher ELV regulations. Despite the fact that material recycling rates have improved as a result of stronger regulation (Soo et al., 2021). End-of-life vehicle (ELV) have gained popularity since it aids in the safe disposal of hazardous materials, the reuse of valuable parts, and the recycling of materials. (Lin et al., 2018) claims that a well-developed automobile recycling sector may generate enormous profits while simultaneously promoting the circular economy and green economy.

D'Adamo et al., (2020) points out that ELVs are one of the most significant waste sources on the planet. Plants for materials recovery have become more adaptable and take advantage of economies of scale. Raja Mamat et al.,(2018) claims that End-of-life vehicles (ELVs) also help to conserve natural resources while also provide economic benefits and reducing pollutants in the water, air, and soil.

In terms of resource conservation, reusing auto parts (glass, tyres, motors, transmissions, doors, seats, and batteries) from ELVs is advantageous (Jang et al., 2022). By transforming waste into a resource and value for the economy, it strives to bring economic and environmental advantages while utilizing lesser materials and consuming fewer resources. It gives a high economic value in terms of recoverable components and valuable recyclable materials (Kuşakcı et al., 2019).

2.4 Current Practice of End-Of-Life Vehicle Including Other Country

In a world where environmental protection is becoming increasingly important, it is only natural that automotive, particularly ELVs, face legislative obstacles. From nation to country and continent to continent, legislation in this area differs greatly, yet there are some basic aspects found in all of them. Table 2.2 shows the ELV management system and their law based on different countries (Rovinaru et al., 2019).

Since the 1990s, European Union member states have implemented a variety of actions to address ELV issues. The European Union (EU) established the ELV Directive (2000/53/EC) in September 2000, which required manufacturers and component suppliers to satisfy four particular goals decreasing harmful compounds at the design phase; designing automobiles for re-use; recycling; dismantling and recovering ELVs; and lastly, supporting the use of recycled components in new vehicle manufacture. A mass recycling rate of 95% is required by the EU ELV Directive for vehicle design and manufacture in order to prevent the use of heavy metals. The EU ELV Directive specifies the assessment methods to be used.

The ELV Directive requires specific depollution objectives, measures of automotive reuse, recycling, and recovery, and pressure on manufacturers to create recyclable parts for new vehicles. Additionally, the rule authorizes automakers to pay for the cost of the goals specified are not economically viable, ELV treatment feasible. Wong et al., (2018). Recycling rates are expected to rise to 89 percent by 2030 as a result of improved resource-recovery measures, opening the way for a circular economy (D'Adamo et al., 2020).

Table 2.2: ELV Management in Different Countries (Rovinaru et al., 2019)

	ELV MANAGEMENT	DESCRIPTION
EU	• Law/Directive 2005/53/EC (2000)	• Measures for increasing automobiles shredder residue (ASR) • Measures for abandoned automobiles • Environmental measures of dismantling sites
ROMANIA	• Law/Directive 2005/53/EC (2000) • Law 212/2015 regarding ELV management "Rabla" governmental program	• Measures for abandoned automobiles • Environmental measures of dismantling sites, uses of resources • Bonuses for electric new cars bought
JAPAN	• Law for Recycling of ELV (2005)	• Lack of final disposal sites • Illegal dumping of ASR • Effective use of resources
KOREA	• Law Act for Resource Recycling of Electrical/ Electronic Equipment and Vehicles (2008)	• Measures for ELVs • Effective use of resources • Management of information on ELVs
CHINA	• Law ELV Recycling Regulations (2001) Automotive Products Recycling Technology Policy (2006)	• -Measures for illegal assembly • Effective use of resources • Measures for recycling economy
USA	• Related Law Resource Conservation Recovery Act, Clean Air Act, etc.	• Strict implementation of regulations • Environmental conservation measures associated with ELV recycling

On the basis of Japan's ELV Recycling Law, the country's ELV management system has been established (2005). Since the early 1990s, there has been much concern about this. Japan enacted the Basic Environment Act in 1993, laying the groundwork for the country's environmental policies. The Basis Act on Establishing a Sound Material-Cycle Society was enacted in 2000, laying the groundwork for a society whose operations already have an influence on the environment. In this sort of civilization, reuse, recycling, and energy recovery are the most important principles to adhere to. The principle of expanded producer responsibility is present in Japanese legislation, just as it is in European legislation. Recycling is not just the responsibility of producers, but also of consumers.

In the case of ELVs, the ELV Recycling Act of 2005 was enacted to regulate their management. Several issues, including a lack of final disposal locations, the need to prevent unlawful dumping, and unequal handling of ELV owing to market volatility in steel scrap, all contributed to the need to take action in this area. The Waste Management and Public Cleaning Act, on the other hand, governs ELV treatment. Fluorocarbons used as air conditioner refrigerants, gas generators used in airbags and seat-belt pretensioners, and energy recovery of gas generators used in vehicles are all responsibilities of vehicle manufacturers and importers by automobile shredder residue (ASR) paid by vehicle owners when they buy a new vehicle, according to the Waste Management and Public Cleansing Act (Rovinaru et al., 2019).

Since 2008, the Act on Resource Circulation of Electrical and Electronics and ELVs, in South Korea are managed by the WEEE and ELV Directive. This is identical to the WEEE and ELV Directives of the EU. A recycling system for electric vehicles (ELVs) is in operation, as a framework for regulating the restricted use and ban of hazardous

compounds in cars such as cadmium, hexavalent chromium, lead, and mercury. It set a mandated 95% recycling rate at the start of 2015, with a maximum of 10% energy recovery. Before 2015, the target recycle rate was just set at 85 percent only with a minimum of 5% energy recovery (Jang et al., 2022). Automobile manufacturers have partnered with recycling centers to process ELV.

In average, each year, 14 million automobiles are registered in Korea, South Korea produces just 0.5 million ELVs, or electric vehicles. Recyclability during dismantling and shredding is around 44 and 40 percent, respectively (Harun et al., 2021). Through their adherence to the act's ELV recycling and treatment criteria at each level, each stakeholder has participated in ELV regeneration and treatment (collection, disassembly, shredding, and disposal). For example, Automobile disassembly factories have followed recycling procedures and legislation, transporting non-reusable and recycled material to shredding facilities for further treatments and refrigerants from ELV disassembly to waste water treatment plants (Jang et al., 2022).

This issue has gained a lot of attention in Taiwan as a result of an increased use of motor vehicles, as well as environmental pollution and other pollution issues created by inappropriate vehicle disposal. Various compounds included in automotive products, the environment could get dirty if things like lubricants and liquid acids were thrown away in the wrong way. Wildlife may also use abandoned automobiles for refuge, endangering the ecosystem. Before 1994, associated industrial operators in Taiwan has recycled ELVs. ELV recycling has become more systematic since the Environmental Protection Administration (EPA) enforced the Waste Disposal Act in 1994.

Despite the fact that a substantial automobile tax has been implemented, Singapore has not been able to reduce the number of automotives on the road. The Singapore government implemented the Vehicle Quota Scheme (VQS) in 1990 to address this issue. The system works by auctioning off Certificate of Entitlement (CoE) for various types of cars on an open market. Before purchasing a car, purchasers must get a Certificate of Entitlement (CoE). The Land Transport Authority (LTA) will announce the quantity of CoE quotas allocated for bidding in each category. After obtaining the certificate, the vehicle can be bought and registered for a period of ten years. Even if the car is sold before the ten-year period finishes, the certificate must remain with it. After ten years, the owner has the option of cancelling the registration or paying the Prevailing Quota Premium for the vehicle type to renew it. The vehicle is no longer able to renew the CoE once it has surpassed its legal lifespan (Harun et al., 2021).

Because there is no national regulation controlling ELV disposal in Australia, ELV management is mostly driven by economic factors. ELVs are acquired by recyclers due to the high value of metal scrap, and that they are responsible for disposing of ELV rubbish at their own expenses. ELVs generate a substantial because there is no national regulation controlling ELV disposal, ELV management is mostly driven by economic processes. Due to the obvious high value of metal scrap, recyclers buy ELVs, and they are responsible for disposing of ELV waste at their own expense. ELVs create a significant amount of waste, which can be expensive.

Despite a lack of ELV regulation in Australia, a wide range of hazardous compounds are covered under a number of more broadly defined voluntary product stewardship agreements governed by the Product Stewardship Act 2011. The agreements

are governed by the Product Stewardship Act of 2011. Voluntary product stewardship refers to parties willingly obtaining Australian Government accreditation for their product stewardship arrangement, such as the Australian Battery Recycling Initiative, the Product Stewardship for Oil Program, and tyre Stewardship Australia. As a result, these businesses are in charge of recycling certain car components including batteries, lubricants, and tyres. The product stewardship framework is the responsibility of the National Waste Policy.

ELV Directive 200/53/EC, established in the year 2000, governs Belgium's ELV management system. On the basis of the subsidiarity principle and a policy of product stewardship, it includes a variety of aspects affecting all stakeholders, from car manufacturing through recycling phases. The best interest's principle is the way the principle is put into practice of Directive's principles based on the Member States' methods used on an individual basis in their respective countries. As a result, there have been some minor changes in the approaches employed to adapt with regulatory standards. In Belgium, the ELV Directive is implemented at the regional level and is managed by Febelauto, a non-profit organisation. Febelauto is in charge of ELV, consumers also contribute information and assistance to many stakeholders in the ELV management system includes the last car owners, Operators of recycling facilities, certified treatment centers, and governmental organizations (Soo et al., 2017).

The law intends to reduce chlorofluorocarbon emissions, prevent unlawful ELV waste dumping, and encourage ELV recycling. According to (Wong et al., 2018), out of the 76 million cars in use, around 3.5 million are processed as ELVs each year, while approximately 5 million area, among the many components wasted after shredding are metal, fibre, glass, dashboard plastics and rubber/elastomer; textiles, polyurethane foam,

paper, wood, and inert particles; and inert components of ELVs. Malaysia has yet to implement ELV-related legislation. Previous attempts were made by the government under the National Automotive Policy, which was amended in 2009.

As a first step towards fully implementing the ELV Program, all vehicles 15 years old or older must undergo an annual compulsory inspection. However, (Harun et al., 2021) notes that this policy was met with tremendous opposition and was quickly abandoned. ELV recycling has been carried out in Malaysia by 209 operators that are members of the Malaysian Automotive Recycling Association (MAARA). The Malaysian government started by encouraging local manufacturers to join in the car reuse programme. Finally, whereas the majority of industrialized nations have enacted ELV recycling criteria to manage ELVs, Malaysian vehicle design is limited in terms of allowing for reuse, recycling, and re-manufacturing (Wong et al., 2018).

2.5 The Important of End-Of-Life Vehicles to Malaysia

There are very few studies focused on the management or strategies for implementing ELV policy in Malaysia, according to a thorough study of the literature. The country's research on end-of-life vehicles (ELV) stretches back to the mid-2000s. On the other hand, was more adapted toward the automotive industry as a whole. In 2009, Malaysian researchers began to pay more attention to ELV management studies. According to (Kassim et al., 2020) this was most likely related to the intention to implement a required regulation requiring all vehicles over 15 years to be inspected annually.

By 2030, the private automobile market would be saturated and would end up having up to 12 million vehicles on the road. This situation could result in the arrival of 500,000 automobiles with ELV classification in Malaysia. At the same time, (Azmi & Tokai, 2017) stated that the number of ELVs is expected to rise significantly.

Aside from the increasing number of ELV-certified local cars, Since Malaysia is one of the nation's actively importing ELVs from other countries, mostly Japan, the number of ELV-certified cars imported into Malaysia has increased. Malaysia imports a huge quantity of car spare parts, making it a key hub for the region's auto parts trading activity. Dismantling, repair, part separation, and disposal are all important operations in the ELV recycling industry in the nation. Domestic or imported automobiles from other countries, particularly from Japan, are the source of these ELV disposal activities. Malaysia has 31.2 million registered automobiles, according to the Ministry of Transportation. This figure also includes automobiles, motorcycles, and commercial vehicles like trucks and buses. As a result of this situation, demand for car spare parts will rise (Akram Khan et al., 2021).

Despite the fact that there was no formal mention of the ELV policy in the revised version of the National Automotive Policy (NAP) in 2014, the term Voluntary Vehicle Inspection (VVI) was instead introduced. The word "compulsory" was replaced with "optional," which was perceived as a friendlier gesture. This decision was also in line with Malaysia's goal of reducing carbon intensity by 40% as part of the Safety, Security, and Environment thrust, which aims to reduce vehicle carbon emissions while also promoting vehicle fuel efficiency, environmental protection, and natural resource conservation (Kassim et al., 2020).

Malaysia, as an automobile-producing country, has made measures to guarantee that ELVs are handled properly. In response to a high average age of cars on the road and a low rate of automobile disposal, the government implemented the Vehicle Lifespan Policy in 2009. As a result, requiring an annual required inspection as part of the renewal of a vehicle's road tax for all vehicles over 15 years old is the first move toward full ELV adoption. The execution of the law, on the other hand, was heavily condemned by the public. The law was later shown to have been passed without proper scrutiny. Figure 2.15 shows a vehicle that have been over 15 years.

The vehicle of interest is one with at least four tyres. The vehicle is classified as a commercial vehicle, which covers both big vehicles such as buses and trucks and passenger vehicles such as automobiles. The environmental impact of ELV waste in Malaysia is growing in tandem with the number of automobiles on the road. The vehicle industry has a number of harmful environmental implications, including greenhouse gas emissions such as carbon dioxide and nitrogen oxide, which lead to global warming, uncontrolled raw material use, and also the wastage of poorly managed ELVs (Harun et al., 2021).

As a result, gas emissions and toxic substances are discharged into the atmosphere, hurting the ecosystem. This will have an effect on people's health, productivity, and overall quality of life. The implementation of the ELV policy should be reviewed to solve this issue. As a vehicle-producing country, Malaysian policymakers must take into account the environmental impacts of automobiles after they reach the end of their lifespans. The public must also contribute to the execution of the ELV policy (Harun et al., 2021).

Figure 2.15: Example of vehicle over 15 years

Cars having an ELV status are often taken to an ELV processing facility for resolution. The vehicle's leftover components will either be kept as spares or scrapped. Examining, disinfecting, and dismantling ELVs at a facility designated to this purpose are all part of the ELV treatment procedure. In addition to some by-products, this method will eventually yield materials that can be recycled or reused. ELV components that are still in excellent functioning order are referred to as reusable things. Figure 2.16 shows car parts are being dismantled for reused purpose. Before being sold to other firms, the recyclable ELV pieces will be segregated by material type. This includes iron, plastic, and other materials (Akram Khan et al., 2021).

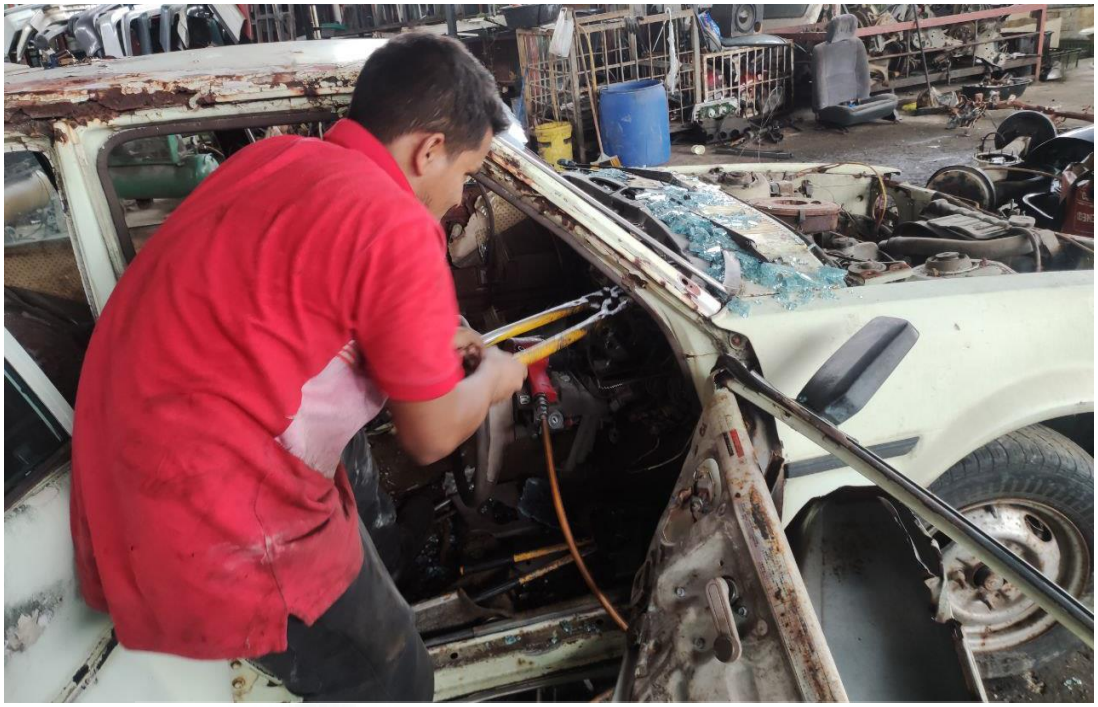


Figure 2.16: Example of dismantling process

All aspects of ELV recycling are administered and monitored in Malaysia by 5,000 small businesses associated with the Malaysian Automotive Recyclers Association (MARAA). However, because Malaysia is one of the countries that is still developing its recycling business, there are a number of challenges that have been identified as limiting the growth of this business. When it is determined that the Malaysian car recycling sector is uncontrolled and operates without a structured and regulated ELV management procedure, a problem develops (Raja Mamat et al., 2018).

Malaysia has no formal policies in place for the handling of ELVs. This is because all ELV waste management is covered by several laws and regulations, including the Solid Waste and Public Cleansing Management Act 2007 (Act 672), the Solid Waste and Public Cleansing Management Corporation Act 2007(Act 673) and the Local Government (Amendment) 2007 (Act1311) (Arif Fahmi Abdul Wahab & Abdul Hamid, 2017).

ELV management is a major topic that must be addressed because to the implications of global climate change, carbon emissions, and economic awareness. One of the key strategic tasks of the Malaysia Automotive Institute is to find possibilities to strengthen the local automotive sector and enhance competitiveness at the local and global levels. As a result, managing ELV waste is a major challenge in Malaysia. ELV have potential resources for building construction and applications instead of being treated as waste. Only a few projects in Malaysia used ELV garbage, such as shipping crates and tyres. In contrast, the global building industry has recently faced difficulty due to a lack of raw materials (Liu et al., 2017) .

In Malaysia, 3R (Reduction, Reuse, and Recycling) concerns are tough to manage because most towns are in need of new disposal sites because most of the present ones are virtually full. As a result of this circumstance, illegal vehicle dumping is on the rise, as it is a convenient way for people to dispose of their unwanted vehicles while also being hazardous to the environment. In this instance, producers, retailers, users, recyclers and the government are the ones responsible for ELV recycling to tackle the problems. Figure 2.17 shows vehicle parts that have been dumped for years which can be send for ELV.

Figure 2.17: Example of abandoned vehicle parts

Before it was produced, the vehicle's manufacturing process consumed a lot of natural resources and energy. Alloys, rubber, mirrors, plastics, paints, and other materials must be manufactured both in the manufacturing of a vehicle and through environmentally harmful methods. The fact that a vehicle is classified as an ELV does not guarantee that its environmental impact has been minimized. Plastic components, batteries, and other non-biodegradable things are still present in the environment as hazardous by-products (Akram Khan et al., 2021).

2.6 Used Part Dealers: An Overview

A single car has almost 30,000 pieces if you count every single one down to the tiniest screw. With such a large number of components and sophisticated arrangements, the risk of a car failing or performing poorly is fairly considerable due to a variety of variables. Along, used supplies can be classified as either domestic or imported.

Used part dealers are those who collect parts from cars in the system, such as trade-in operations, cars that are no longer roadworthy, cars involved in wrecks, particularly in 'total loss' instances, confiscated cars owing to legal action, and parts gained from car theft. Imported used supplies are typically derived from the 'half-cut,' which refers to cars that have been sliced in half for salvage reasons in (Figure 2.18).

Figure 2.18: Example of Half-Cut vehicles

Users can, for example, request specific sections from the half-unit – the front-end, which includes the engine, radiator, and transmission unit; the back-end, which includes the fuel tank, fuel pump, and part of the exhaust system – or purchase the entire half-unit (Arif Fahmi Abdul Wahab & Abdul Hamid, 2017).

According to Colin,(2022) a used car part dealers means any individual who engages in the business of dealing in used products for the primary goal of profit, but does not include a person who trades in used goods or precious metals. A person who is in the business of buying, selling, exchanging, or dealing in old motor car parts and has a physical location in this state where they do so. Figure 2.19 below shows a junk yard of used part dealer to store all the items.

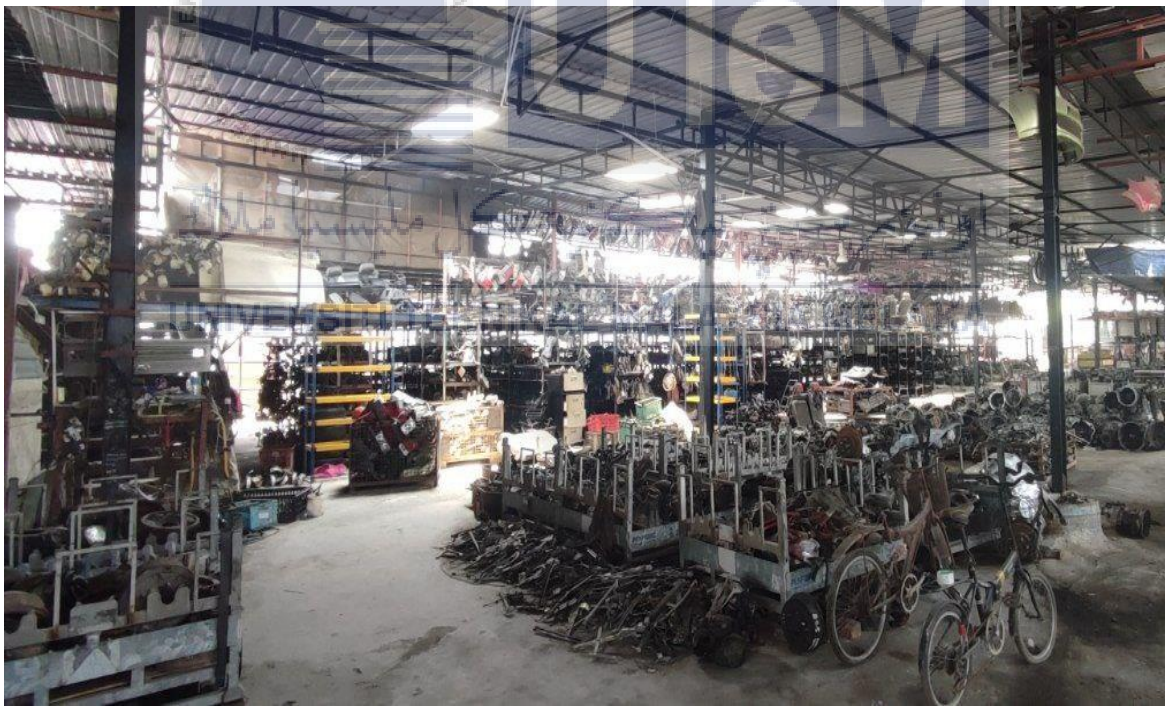


Figure 2.19: Example of Junk Yard

Used part dealers are a subset of the automotive sector that handles with the replacement of automobile parts after the original manufacturer's warranty on the vehicle has expired. Online vehicle part transaction datasets provide a wealth of information about individual purchases as well as specifics about the parts themselves. Trends and patterns produced from automotive transaction research are utilized to better inform the industry, such as when specific car parts are purchased and, as a result, Which parts should be kept in stock at different times of the year in order to anticipate increased sales (Smith et al., 2019).

2.6.1 Driving Factor for Used Part Dealers to Involve in End-Of-Life Vehicles Practices

Having an understanding of returned products is essential for establishing a profitable goods-supply firm. Returns could be problematic for a business for a variety of reasons, such as the cost of restocking, deciding whether a product is suitable for resale, the future cost sales, and so on. However, while returns are inconvenient for a firm, they should assist part dealers grow their turnover and profitability. These can be utilized to better inform the industry. Part dealers' turnover and business are heavily influenced by return rates. Supplier parts can be compared to estimated factory standards to determine which parts can be matched to cars that they weren't designed to be matched to in the first place This highlights the potential profitability for a used part provider, as they can resale these parts to other automobiles with little or no modification (Smith et al., 2019).

Vehicles achieving ELV status, as well as those requiring repair after an accident, are often in the second quarter of their lifespan, once they're no longer covered by full insurance and it is less cost efficient to invest in new parts. In the future years, there will be a significant need for replacement parts for older vehicles all across the world, as well as a continuance of the used part industry's growth trend (Rovinaru et al., 2019).

Another driving factors for the used part dealers to become involve in ELV is that the Government financial assistance for renewable energy installations. Renewable energy installation could be very beneficial to used part dealers. Many dealers have implemented renewable energy on-site, but to varying degrees and with various technologies. Volkswagen, for example, gets one-third of its energy from renewable sources across the board; the percentage attained at specific locations varies based on local renewable sources and can reach 100% when hydroelectric power is available. When the government likes a dealer's or manufacturer's concept and project proposal and sees a lot of potential for large profit from such an investment, the government will help them finance it. As a result, financial support from a third party or the government may be demonstrated to be extremely valuable to larger firms in the event of end-of-life vehicles (Gaudillat et al., 2017).

2.7 History About Proton Wira

The Proton Wira was launched as a four-door saloon on May 21, 1993. The Proton Wira is a rebadged Mitsubishi Lancer, 1992 6th generation Lancer with slightly different appearance. At the time of launching, three versions were available back then which is 1.5 litre GL Manual priced at RM39,278, 1.5 litre GL Automatic priced at RM42,301, and 1.6 litre XLi Automatic priced at RM54,306. Figure 2.20 shows Proton Wira vehicle.

The Wira 1.6 XLi was the highest-spec Wira at the time of its release. The Wira XLi had a four-speed automatic gearbox, four power windows, electric side mirrors, rear disc brakes, and a rear anti-roll bar. In 1994, the Wira 1.6 XLi manual gearbox option was added to the range. Mitsubishi Motors Corporation (MMC) supplied the 1.6 litre SOHC 4G92 engine for the Wira 1.6 XLi. This is also Proton's first electronic fuel-injected engine for the Malaysian market. The Wira 1.5 GL's 1.5 litre carbureted SOHC 4G15 engine. Figure 2.21 shows 1.5 litre GL manual engine bay from proton wira car.

Figure 2.20: Example of Proton Wira car

Figure 2.21: Example of 1.5 litre GL manual engine bay

The front design of the Wira differs greatly from the Lancer since it is more rounded as opposed to the squarish shape featured on the Lancer. However, only the hood and grill were developed by Proton, while the remainder of the front end was based on the 1992 Mitsubishi Mirage sedan. The front light, fenders, and bumper are identical to those seen in Wira. The rear lamps on the Wira are substantially different from those on the Lancer. In reality, the Wira's rear boot area is slightly longer than the Lancer's. As a result, the Wira is longer than the Lancer. But, once again, this back design is not completely Proton's. It was inspired by the Mitsubishi Galant hatchback from 1987. This is why components from older Lancer are so popular among Wira owners, as the majority of the parts are interchangeable.

A 1992 Mitsubishi Lancer with the right-side rear lamp reflector removed and a Wira with a facelifted rear lamp. A Mitsubishi Galant hatchback from 1987. The back lamp's resemblance to the Wira. In contrast to the simpler torsion beam suspension seen in the Proton Saga and Mitsubishi Lancer Fiore, all Proton Wiras were equipped with independent rear multi-link suspension, the same as the 1992 Lancer. A multi-link rear suspension is more sophisticated than a basic torsion beam suspension, but it provides the automobile with superior comfort and handling.

Later that year, in November 1993, a hatchback variant of the Wira was released. This is referred to as the Wira Aeroback, and it is comparable to the Saga Aeroback. Proton also released a diesel-powered Wira in 1995. It is known as the Proton Wira 2.0D and is powered by a 2 litre 4D68 engine from Mitsubishi. The Wira underwent a slight redesign in 1995, which modified the front grill style and back lights. During this time, the market also saw the introduction of a lower-spec 1.3 GL model. It used the same carbureted 1.3 litre SOHC 4G13 engine featured in the 1990 Proton Saga 1.3 Megavalve. The Wira 1.3 GL was only offered with a manual gearbox, and some interior trimmings, including the Revolution Per Minute (RPM) gauge and rear power windows, were eliminated. The Wira rear lamp has been updated with clear signal lamp indicators. The lamp designs were no longer grooved, as they had been in the previous. Figure 2.22 shows the front view and Figure 2.23 shows the rear view of proton wira 1.3 GL manual variant.

Figure 2.22: The front view of proton wira 1.3 GL manual variant

Figure 2.23: The rear view of proton wira 1.3 GL manual variant

Wira, the most searched vehicle, was debuted in 1996. The Wira 1.8 EXi. The Wira 1.8 had a different grill design than the 1.3, 1.5, and 1.6 variants. All Wira 1.8 EXi chassis were strengthened and stiffened in comparison to other Wira chassis. These Wira 1.8 EXi models came with two engines that were slightly different. The manual variations were powered by a DOHC 4G93 engine, while the automatic models were powered by a Single overhead cam (SOHC) 4G93 engine. There were a few automatic models available with a Dual Overhead Camshaft (DOHC) 4G93 engine.

The FIA Homologated Special Edition Wira 1.8 EXi is the rarest of them. 2500 of these unique Wira 1.8 EXi models were produced for WRC (World Rally Championship) homologation. Recaro seats, a Momo steering wheel, a Momo gear knob, bigger disc brakes, larger anti roll bars, an additional welding strengthened frame, a twin tip exhaust muffler, and an optional rear spoiler were standard on this Wira. The FIA Homologated Special Edition Wira 1.8 EXi is the most exclusive of the bunch. WRC (World Rally Championship) homologation required 2500 of these one-of-a-kind Wira 1.8 EXi vehicles. This Wira came standard with Recaro seats, a Momo steering wheel, a Momo gear knob, larger disc brakes, stronger anti roll bars, an extra welding reinforced frame, a twin tip exhaust muffler, and an optional rear spoiler.

The Wira 1.5 and 1.6 received a distinctive grill makeover in 1999, which is the same grill featured on the Wira 1.8 EXi. The grill remained the same on the 1.3 variants. At the same time, all carburetor-powered Wira 1.3 GL and 1.5 GL vehicles were converted to electronic fuel injection. It was alternatively dubbed GLi, with the i representing injection. Following this redesign, the lighting for the metre cluster was also changed to green rather than white.

The electronic fuel injection module and parts were replaced in 2001. Instead of using Mitsubishi (MMC) parts, Siemens VDO, a German business, now manufactures them domestically. Several changes have been made, including the transition from a mechanical-based distributor present in older MMC models to a fully electronic distributor. More sensors have also been added to the VDO 4G13 and 4G15. Power is also marginally reduced in VDO-powered units when compared to older MMC-powered units. One thing to keep in mind is that the Wira 1.6 XLi and 1.8 EXi were discontinued during this time period, hence the 4G92 and 4G93 engines in Wira never got a VDO ECU upgrade.

Wira had its fourth and final makeover in 2004. The front grill was altered again this time, and the old Mitsubishi Mirage-based front bumper was replaced with a Proton-designed bumper. It was also speculated that some Wiras received suspension tuning from Lotus, which was bought by Proton several years ago. Wira Special Edition (SE) was launched at the same time in 2004. The Wira SE was only available in the hatchback Aeroback body design, and it was powered by a 4G15 engine. The Wira SE was priced at RM49,476, which was much pricier than the standard Wira 1.5 GLi. In comparison to the ordinary 1.5, the Wira SE receives lots of new upgrades. Even Though this Wira SE has many extra add-ons, they aren't as nice as the add-ons offered with the previous Wira 1.8 EXi. As a result, many of these add-ons were gradually eliminated in successive batches of Wira SE until just a few aesthetic add-ons remained. Later on, the 4-2-1 extractor, rear disc brakes, rear anti roll bar, and Sports exhaust muffler were all removed.

To summaries, the Mitsubishi Lancer-based Proton Wira performed admirably as Malaysia's second national automobile. The Proton Wira is one of the company's best-selling vehicles. During the Wira's 16-year manufacturing run from 1993 to 2009, the

company have sold 952,215 units. It was a well-built vehicle with low maintenance costs. A secondhand Proton Wira can now be obtained for around RM3,000 to RM6,000. Despite its age and bad reception, the Wira, like the Saga before it, had consistently served to the requirements of countless Malaysians. Its adaptable chassis allows it to serve a number of functions depending on the demands of its owner. It may be a solid family vehicle, a daily driver for work, a first car for new drivers, or an entry-level performance vehicle for individuals interested in modifications.

2.8 The Preferable Used Part Items of Proton Wira from End-Of-Life Vehicles

The car is dismantled and divided into several groups. Engine oil, fuel, refrigerant gases, and the automobile battery are removed first since they are the most polluting. They're delivered to specialist recycling facilities that additionally store them till they're properly disposed of. Mechanical components (engine, gearbox, turbine, suspension system, injectors), automobile hulk (divided by parts: Doors, bumpers), tyres, plastic, glass, and fabrics are then collected (Rovinaru et al., 2019). Figure 2.24 shows the assembly parts of Proton Wira from engine bay.

Parts containing dangerous substances, such as mechanical fluids, lead batteries, and refrigerant gas, are dismantled and collected first. Engines, tyres, and bumpers are among the most valuable components in ELV. Engines, batteries, catalytic converters, and mechanical elements, as well as other high-value reusable parts/components, are removed and sold as used spare parts (Wong et al., 2018).

Figure 2.24: Example of assembled engine bay parts

There are many preferable used part items of Proton Wira which can be found in used part dealers. Alternator (Figure 2.25), distributor (Figure 2.26), power steering pump (Figure 2.27), Brake booster pump (Figure 2.28), crank shaft (Figure 2.29), intake manifold (Figure 2.30) and cylinder head (Figure 2.31) are the most selling items from the Proton Wira.

Figure 2.25: Alternator

Figure 2.26: Distributor

Figure 2.27: Power steering pump

Figure 2.28: Brake booster pump

Figure 2.29: Crank shaft

Figure 2.30: Intake manifold

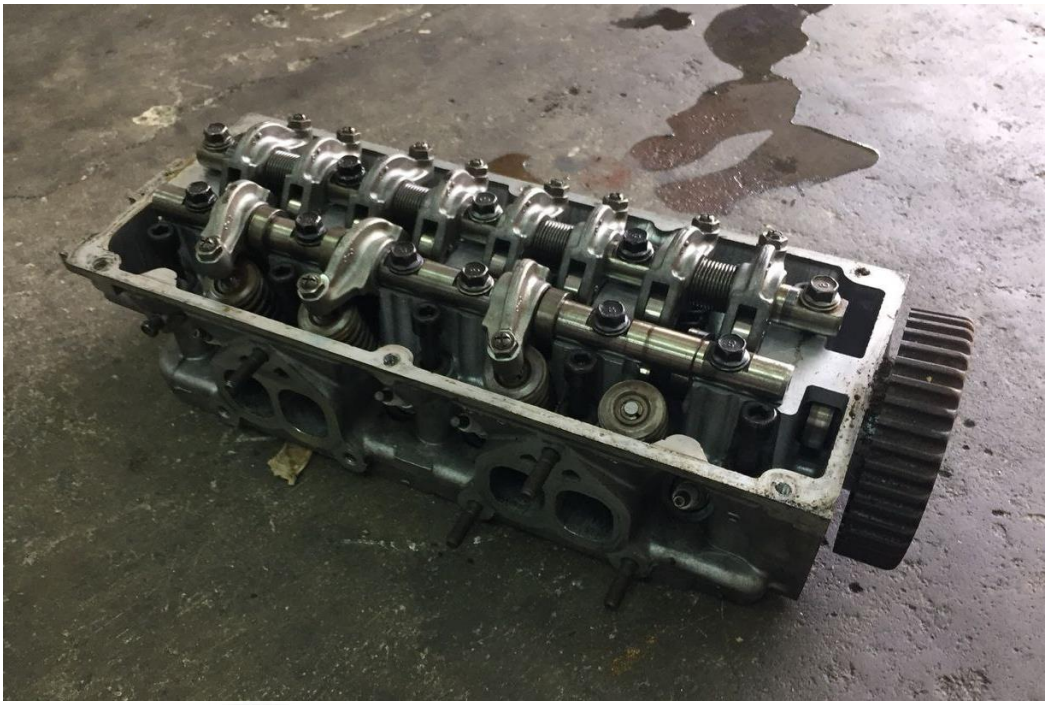


Figure 2.31: cylinder head

2.9 The Challenges of Using Proton Wira in Malaysia

One of the reasons there are so many Proton Wiras on the road today is that there are so many used parts and Original Equipment Manufacturer (OEM) replacement parts available for owners to keep their old reliable operating. However, according to the source, Proton and local third-party manufacturers have permanently discontinued production of Wira components because the demand has long been dropping. This renders continual spare component manufacture unprofitable. It's been 13 years since the last Wira was released, and 29 years since the first model was manufactured.

Wira components are no longer cost effective for original equipment manufacturers (OEMs), hence they are focusing on newer models. Although the Wira shared similar components with the Mitsubishi Lancer on which it was based, replacement parts for the

Japanese model are likewise no longer available on the market, as that generation of Lancer was created more than 30 years ago. As a result, finding spare parts for proton wira owners has become extremely difficult in recent years as the only option isto find the spare parts at the junk yard only.

Another disadvantage of using a proton wira in Malaysia is that it is still the most stolen vehicle in the country. According to the Vehicle Theft Reduction Council of Malaysia (VTREC), Every 1 hour and 15 minutes, a car is stolen in Malaysia. This equates to 20 automobiles being stolen per day in 2020. The Proton Wira is the most favoured model among thieves throughout history. Proton Wira rank first as most stolen car in Malaysia as its spare parts are highly demand. Because proton wira parts are still in great demand and expensive even for their used part items.

The gearbox, for example, can be priced between RM800 and RM1000. The cyclinder head, on the other hand, can be purchased for roughly RM250-RM300. The carburetor costs RM150, and the distributor is also RM150. The carburetor and distributor are the most popular selling used parts items. The alternator costs RM80, the air conditioner pump costs RM150, and the crank shaft costs roughly RM200.

Aside from spare parts, the Royal Malaysian Police (PDRM) has stated that Proton Wiras are one of the most popular vehicles used by thieves. This is due to the fact that there are so many Wiras on the road that it is difficult to identify one from the other. Figure 2.32 below shows the of Proton Wira used part item.

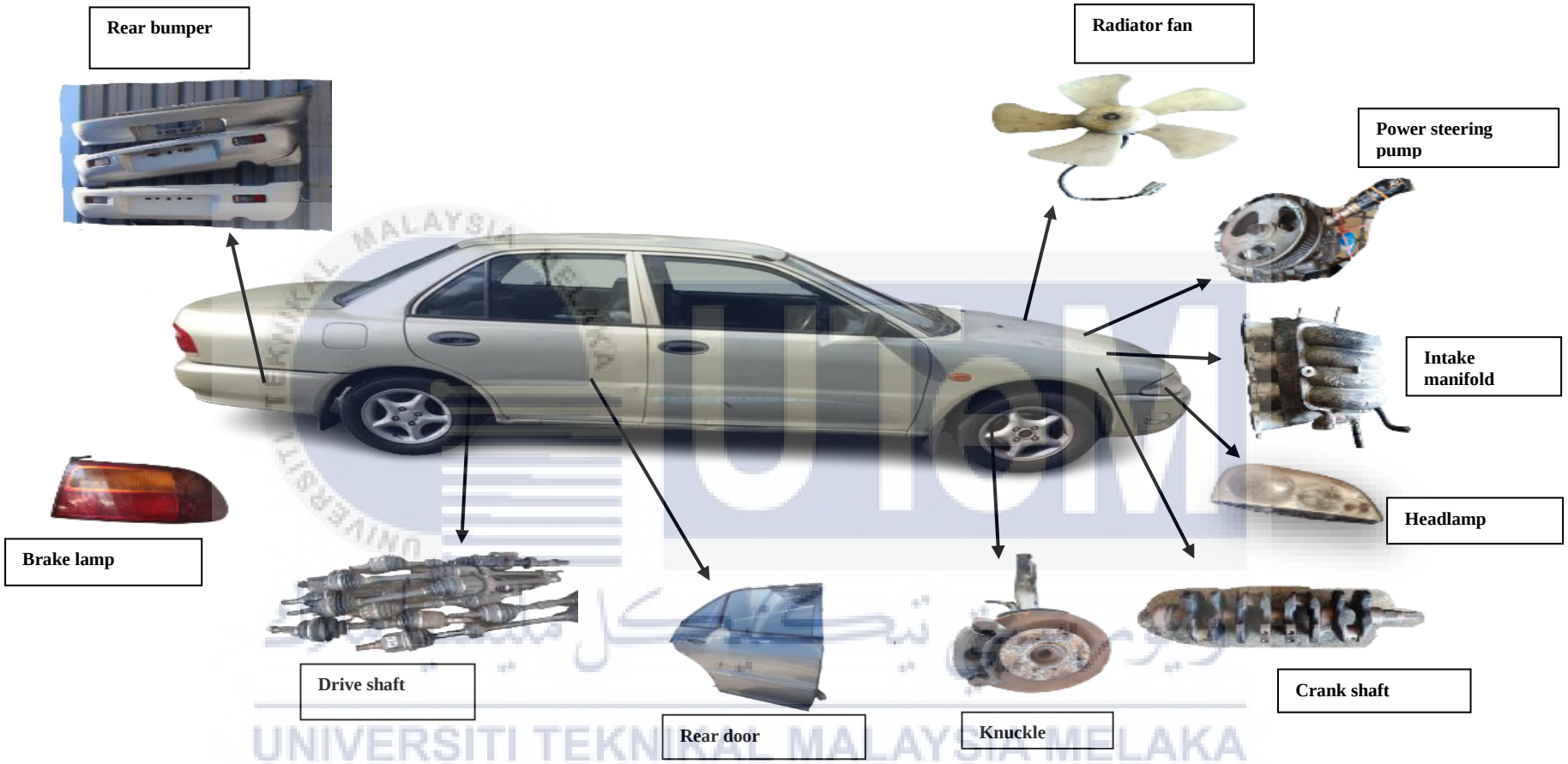


Figure 2.32: Proton Wira spare part item

2.10 Visiting Auto Used Part Dealers

This project is based on the analysis that is being carried out at few auto used part dealers. Figure 2.33 shows used part dealer A, Figure 2.34 shows used part dealer B and Figure 2.35 shows used part dealer C. Used part dealer A and B was located at Ipoh, Perak while used used part dealer C was located at Malim Jaya, Melaka. These used part dealers are specialized in buying, selling, exchanging used part items from ELV vehicles and dismantling vehicles which has been no longer used anymore. These used part dealers also have been a supplier for various small automotive retailer.

Figure 2.33: Auto Used Part Dealer A

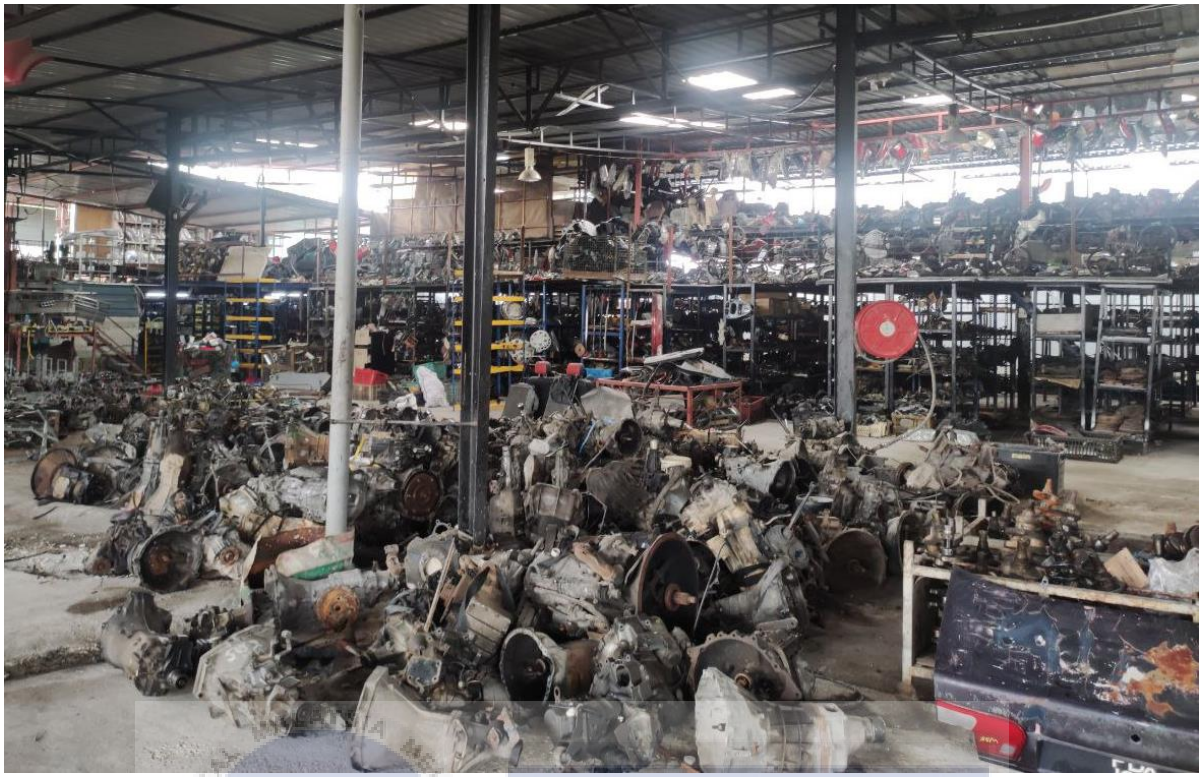


Figure 2.34: Auto Used Part Dealer B

Figure 2.35: Auto Used Part Dealer C

2.11 Summary

This chapter summarised that using End-Of-Life Vehicles has a significant impact on all aspects of life, including the environment and the economy. In ELVs, even used parts dealers play a significant role. This literature review has examined all aspects of the end-of-life vehicle. This chapter has identified a number of advantages to practising ELV, one of which is that it may provide an alternate supply of resources such as metals, steels,aluminium and glass. This chapter also explains how ELVs are managed in various countries. Different countries' legislation has different practises. Various researchers also stress the importance of ELVs in Malaysia. Furthermore, this area has aided in the development of a deeper understanding of ELV and the activities of Malaysia auto used part dealers. These studies are being made to determine the End-Of-Life Vehicles for Proton Wira used part dealers. To begin, learning about the history of Poton Wira is one of the most important tasks in doing this survey. Apart from that, identifying the most often utilized proton wira part items from ELV is critical in this research.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter highlights the different types of methods that are arranged accordingly to achieve the objective of study. Moreover, there are flow chart constructed to show the starting point until the end of the study conducted. In addition, for each process that are mentioned in the flow chart, there are given explanation with proper statement that supports on the process that is being conducted to complete the research conducted. The methods and tools that are used for the study are based on previous case studies with achievable results.

Besides that, this chapter also mentions the proper method for data collection that is being done during the junk yard visit. Data collection technique is very crucial in this survey and it is necessary to further describe the data collected. The data obtained from the observation throughout the project is subsequently used in the data analysis of this project. In order to enable further study, all data should be precise to ensure that any analysis is made. The motive of data analysis is to analyze the data in a more useful way so that some of the data from the analysis can be made by additional research. The data needed for this survey is collected from auto used part dealers.

3.2 Research Design

The design of study is an approach of defining the details of research design that are carried out during the study. The type of research has been conducted is quantitative research method. Quantitative research is concerned with gathering quantifiable data, statistical methods, and other observable data. Case studies, questionnaires, and other quantitative analysis methods have emerged as a resultis based on statements that are approved or justified with proper evidence such as journals, experience, opinions and theory. These types of data can be collected by using techniques such as surveys, interview with workers, and literature reviews that are made based on others findings.Thus, for the planning of this study,the aim is to study on end of life vehicle for auto used part dealers.

3.3 Phase 1

According to the process flow chart,the study starts with the problem statement.The objective of the project is discovered based on the identification of the problem, followed by the scope,literature review and data collection. The development of the literature review is achieved through journals,books,articles, and web pages or internet. For data collection, the sources are basically those that are direct or firsthand observed, including junk yard visit or observation and semi-structured interview.

Next, after all of the sources of data have been presented,the Gantt chart need to be developed in order to make sure all the processes to complete the study are followed by the time guideline. Later, after all of the data have been gathered, analyses need to be done, followed by the discussion of the results. Then, the conclusion is stated,followed by some recommendation and report writing is finalised.

In order to achieve each of the objectives that have been stated in an earlier chapter,which is in Chapter 1, a flow chart is developed to show and seperate the methodology. This flowchart is important as it explains in more details how does this study will be carried out in every step and route. It goes precisely into a deep explanation about what will be done, how it will be done, and an action that will be taken in order to fulfill the objectives of the study. Other than that, the flowchart is showing activities from start untill the end of the study which also separate between the PSM 1 and PSM 2. Thus, Figure 3.1 shows flowchart that has been narrowed down into the root of this study in order to show the steps to achieve all three objectives that have been stated earlier.

3.4 Phase 2

In phase 2, it describes in more details on how the process of collecting data and gathering information in implemented. These processes are conducted to show method in order to achieve the first and second objective of this study. The methods that has been used in this phase 2 was by distributed questionnaire survey form randomly to used part dealers.

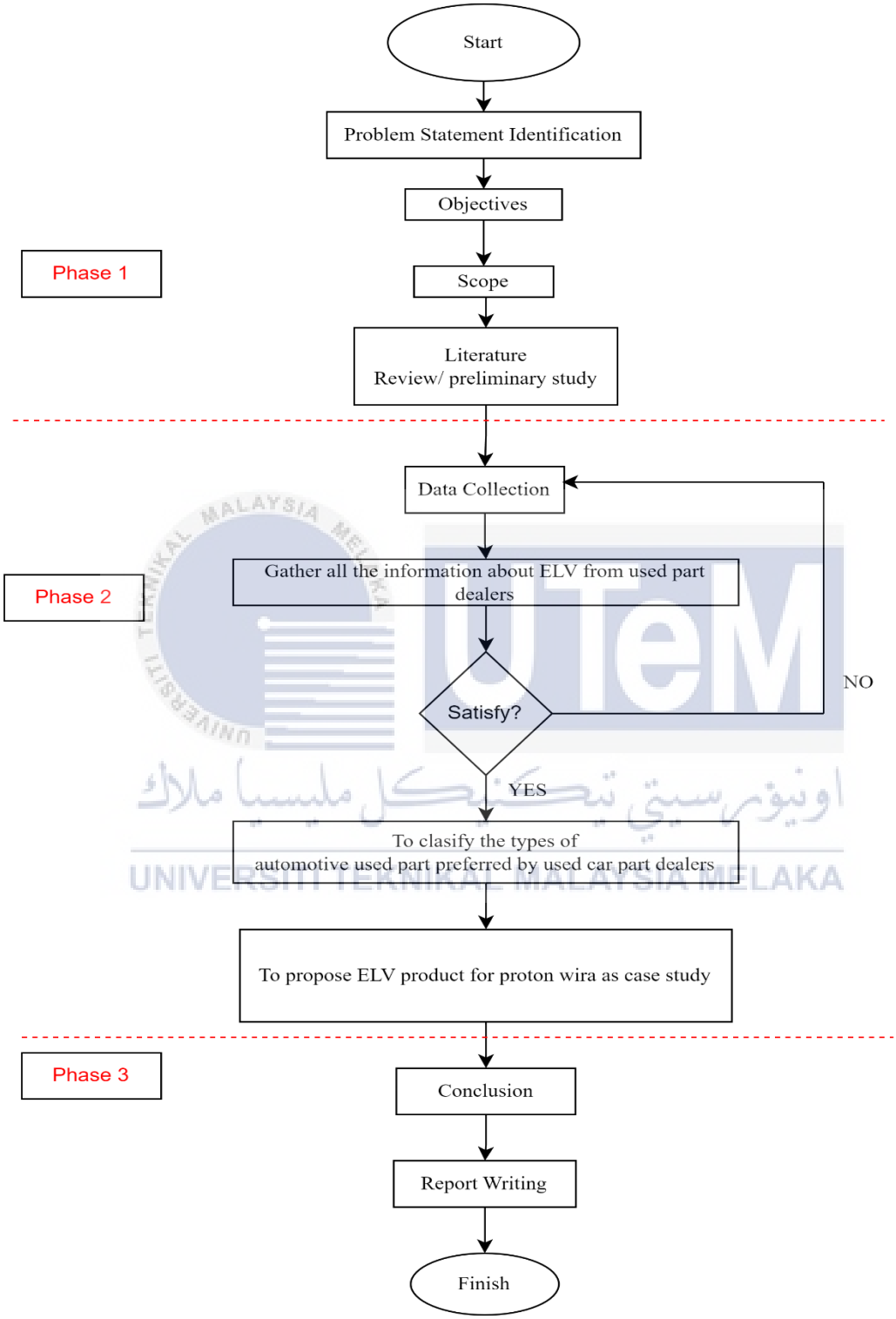


Figure 3.1: Flowchart of the study

3.4.1 Literature Review

The literature review is conducted through obtaining data in the form of document that relates or discusses information that works to interpret or explain the data generalization, analysis, synthesis, interpretation, or evaluation of the original information. Somestimes, the data obtained from this method is used to argue a contention or to persuade the reader to hold a certain opinion. These resources can be found online or as documents which can be dated from 5 years. It involves less cost, time and effort. Common sources get from books, articles, journals, and internets. So as in this study, it will be conducted during PSM 1, with the beginning of gathering as many information possible including the definition and objectives of end-of-life vehicles, the benefits of end-of-life vehicles, the current practice of end-of-life vehicle including other country and driving factor for used part dealers to involve in end-of-life vehicles practices from various researchers and past studies.

3.4.2 Data Collection

Data collection is a term used to describe a process of preparing and collecting data. Systematic gathering of data for a particular purpose from various sources, that has been systematicaly observed, recorded, and organized. Data are the basic inputs to whatever decision making procedure in the study. The purpose of data collection is to acquire information, to keep on record, to make decisions regarding crucial issues and to distribute the information to others. The data collection for this study will be conducted during PSM 2 in order to obtain a comprehensive data after the last step in PSM 1 which is the literature review has been conducted and finished.

3.4.2.1 Used Part Dealer Visit / Field Observation

Field observation means that the situation of interest is checked and a person or some mechanical device records the relevant facts, action, or behaviors. This method deliver ways to conform for nonverbal expression of feelings,identify who interacts with whom, grasp how participants communicate with each other, and check for how much time is spent on various activities. For this study this method is believed to be beneficial in order to get a better and clearer view about auto used part dealers on ELV. Other than that, it can be helpful in determining the way they handles the used part items. Then, an accurate data about how the workers dismantling the vehicles and selling the used part items in junk yard is provided by observations.

3.4.2.2 Semi-structured Interview

Semi-structured interview is another method to gather data and conducted in this research project. Semi- stuctured interview is a good way to gather data from similar backgrounds or experiences to discuss a specific topic of interest. Semi structured interview is more flexible than structured interview because the question asked is not fixed to the protocol. Interviewers have the room to ask additional information such as respondent background to relate with the study while they also can be friendlier to the respondent. Interview in a semi structured method is essential to research task that is personal to participant and can lead to participant trust and can gained specific information regarding to the question. For this study, the target group to implement this method is generally the person in charge mainly in the junk yard. The interview is essential to analyze the expectation of ELV product for used car parts dealers in Malaysia.

3.4.2.3 Capturing Image

Capturing image of the car used part items and the process of dismantling end-of -life vehicles at junk yard is also an important data collection method. The main purpose of capturing image is to show the studies focus and collecting enough evidence for the thesis. Capturing images are a good way of collecting information which can be captured in a single shot or series of shots. Photographs may be produced for research purposes or existing photographs may be used for analysis.

3.4.2.4 Questionnaire survey

A questionaire is simply a tool for collecting certain information about a particular issue. It is mainly made up of a list of questions which include clear instructions and space for answers or administrative details. This method is very effective and valuable as it can develop certain crucial data's and research procedures. This survey questionnaire in **APPENDIX A** is the method used to gather data about End-Of-Life Vehicles. It is given to the respondents. The questionnaire focuses on the respondent information as starting then followed by some information about ELVs. The questions are generated through the development of the the literature review also.

3.5 Phase 3

In order to present the accurate data and information,it is very important to wisely choose the best method of analysis. So, Phase 3 is conducted to show the method in order to achieve the third objectives of this study which are to verify ELV product acceptance using proton wira as case study. Phase 3 is where report writing are conducted to make analysis based on the data collection.

3.5.1 Quantitative Data Analysis

Data analysis is an important aspect in research as it allows to produce results which can be obtain by pointing out the problem statement, summarize the gathered data and then finally suggest on future improvement. The method that has been used for this project is data quantitative. Data quantitative help to understand the scale of the research and the question addressed. Quantitative data are often discussing the significance of statistical relationship which is analyzed numerically and the data can be presented in graphical measure like tables, graphics and statistics and can also go through test pre-determined hypotheses. In this study, a total of 33 sets of questionnaires were distributed randomly to 33 used part dealers in Perak. The questionnaires have been answered by either the directors, assistant directors or managers of the junk yards, which are responsible to be in charged and closely related to the activities at used part dealers.

3.6 Gantt Chart

A Gantt chart is a bar chart that shows the tasks of the project, when each must take place and how long each will take. As the study progresses, bars are shaded to show which tasks are completed. It is a graphical representation of the duration of tasks against the progression of time. The Gantt chart provides pictures of the whole tasks that need to be done for the project for specified of time. So, Table 3.1 shows the Gantt chart of the planning and actual activities conducted in the following period of time. The duration for this study is started on March 2022 and has ended on January 2023. The activities is started with overview of the project background by the lecturers, until the report submission by the students, and report review. To summarize , the actual activities are alligned and followed the planning activities that have been schedule earlier.

Table 3.1: Gantt Chart of the study

ACTIVITY	PSM 1 (2022)								PSM 2 (2022-2023)							
	March		April		May		June		October		November		December		January	
Overview Project Background																
Problem Statement Identification																
Define Objective and Scope																
Literature Studies																
Preliminary Study																
Report Writing																
Preparation for Presentation																
Report Submission																
Data Collection																
i. Field observation																
ii. Semi-Structured interview																

Table 3.1: Continue

ACTIVITY	PSM 1 (2022)								PSM 2 (2022-2023)							
	March		April		May		June		October		November		December		January	
iii. Capturing images																
iv. Questionnaire survey																
Result Analysis																
Report Writing																
Preparation for Presentation																
Final report submission																
Report Review																

LEGEND:	
	PLAN
	ACTUAL

3.7 Summary

This chapter described the method to perform a study concerning in data collection, data analysis and research plan. For PSM 1, methodology critically explains the view of study planning in perspective before the study is started. After the process of problem identification up until the scope, the literature review is conducted through various sources in order to collect data generally about the topics that going to be discussed from the past studies done by researchers. The data collection is implemented through various methods including junk yard visit/observation, semi-structured interview and capturing images. All of the data are being analyzed to interpret the results which will then show the results. All of the activities need to be conducted in the study is planned and shown in Gantt chart presentation which is essential for the process of study to be systematic and well organized.

CHAPTER 4

ANALYSIS AND DISCUSSION

The goal of this chapter is to present and analyze the survey results from this study. This information was gathered using three study research method, which is questionnaire survey, site visit, and semi-structured interviews. By focusing on the objective (to identify the expectation of ELV product from used car parts dealers and to clasify the types of automotive used part preferred by used car part dealers), all the data collected from the used part dealer were analyzed using Statistical Package for the Social Sciences (SPSS) software. The analysis includes a descriptive analysis of the variables and respondents. Additionally, a few analyses such as reliability, mean, correlation, and factor analysis also have been conducted. Discussion of the results was carried out throughout this chapter.

4.1 Descriptive Statistics Analysis

This project has applied quantitative research method in order to quantify and examining the numerical data and relationship between various factors. SPSS used to analyze the questionnaire surveys. The questionnaire is one of the imperative parts to examine the used part dealers.

The purpose of this survey is to determine the expectation of End-Of-Life (ELV) products from auto used part dealers. Next, this survey is also conducted to determine about most automotive used part preferred by used car part dealer at the junk yard through the level of agreements given by the respondents which later will be crucial for the purpose of analysis and verification.

All of the questionnaires have been distributed randomly to 33 auto used part dealers which takes place at Perak. The questionnaires have been answered by either the directors, assistant directors or managers of the junk yards, which are responsible to be in charged and closely related to the activities at used part dealers. The set of the survey questions that have been distributed can be referred in **APPENDIX A**. All of the questions that have been asked in the survey have been answered and filled well by all of the respondents.

4.1.1 Demographics of Auto Used Part type

Table 4.1 represents the auto used part type prefer by those junk yards that has been distributed to all the respondents. From the questionnaire, the majority of the respondents prefer cars for their junk yards.

Table 4.1: Auto used part types

	Percent (%)
Car	97.0%
Lorry	24.2%
Bus	9.1%
Bikes	-

Fewer types of vehicles should be accepted by junk yards in terms of used parts so that the process of selling, buying, and trading-in can continue. The different vehicle types are crucial for used part sellers to remain competitive in the market today and to keep their attention on growing their business.

As represented in the Table 4.1, 32 respondents which is 97% have choose cars as their primary used part type because of its demand in the current value market. While about 8 respondents (24.2%) have chosen lorry as their second type of used part items which they will accept at their junk yards. On the contrary, only 3 respondents (9.1%) choose bus while no one have chosen bike for its used part items which is 0%. Figure 4.1 shows types of used auto parts

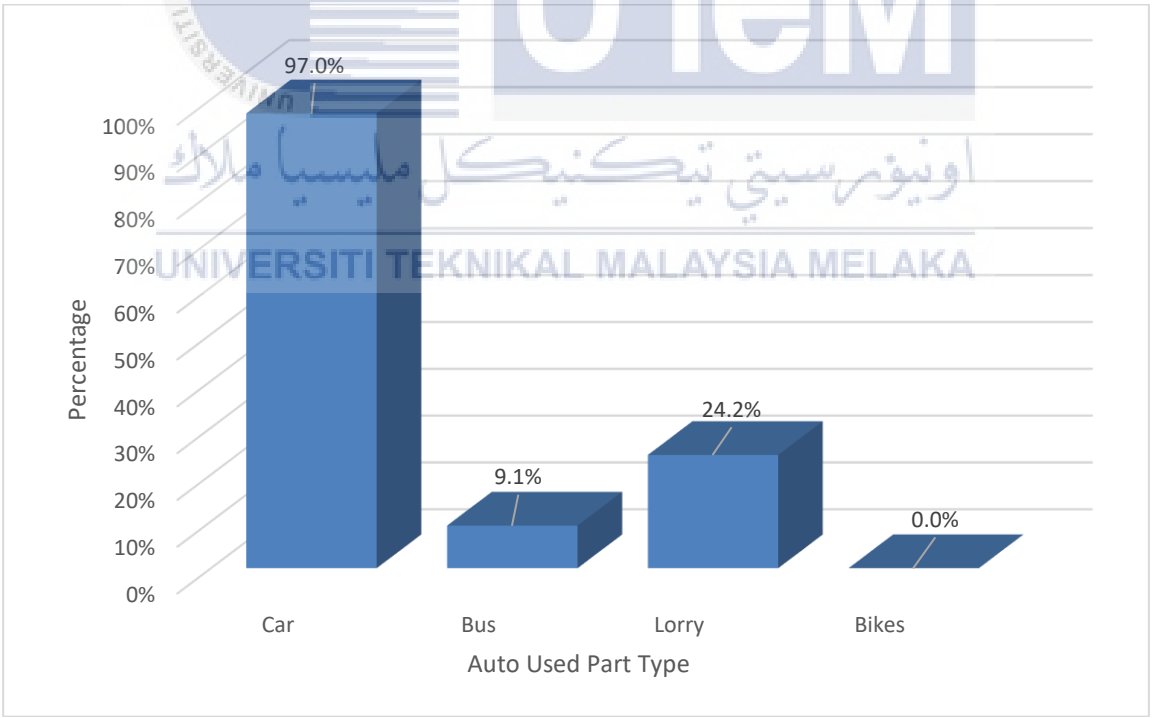


Figure 4.1: Types of used auto parts

4.1.2 Demographics for Number of Employees

The number of employees in the junk yards is depicted in Table 4.2. The size of the used part dealers determines the size of the workforce, and if there are more used part items stored at the junk yards, then a larger workforce is required.

Table 4.2: The number of employees in junk yard

No of employee	Percentage
Below 5	67%
6-10	24%
11-15	3%
More than 16	6%

The used part dealers with number of employees below 5 have the most with 67% employees followed by the used part dealers with 6-10 employees (24%). While about 3% of the number of employees with 11-15 are working at the junk yards. Only 6% used part dealers have more than 16 employees at the junk yards respectively. Hence, it can be concluded that employees with below 5 have the highest at junk yards. Figure 4.2 shows the percentage of employees in the junk yard.

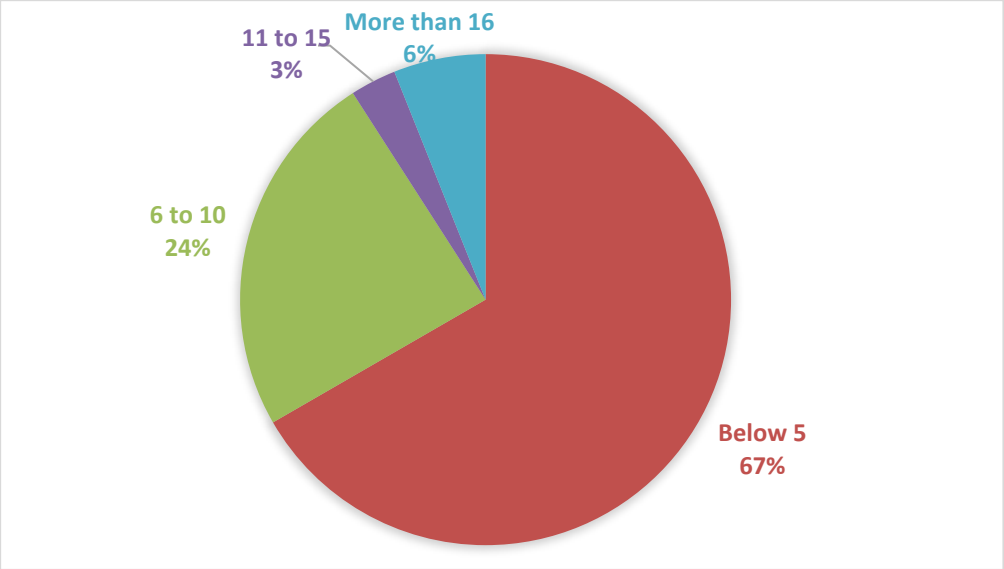


Figure 4.2: The percentage of employees

4.2 Expectation of ELV Product

There are 14 elements on expectation of End-Of-Life Vehicle product from auto used part dealers that have been identified and all of these have been denoted as EX1 to EX14 in the questionnaire as shown in Table 4.3. All of the expectation of ELV are based on literature review that have been stated previously. The respective respondents need to give their perspective based on a rank from 0 to 5 which comes with "not applicable" to "strongly agree" which indicate to the extent of agreement towards the expectation of ELV products from auto used part dealers.

The results from the survey showed that the respondents agreed that all of 14 elements in the questionnaires of expectation of ELV product (EX) in the junk yard. Then all of those expectation of ELV products ranks are calculated in percentage units and tabulated as shown in Table 4.3. These percentages are obtained by a calculation through a SPSS software. For the first element which is the ideal life span for a vehicle is 10 years and denoted as EX1, there is only 21.2% respondents give disagree/strongly disagree.

Then, 36.4% of respondents gives neutral and 42.4% respondents gives agree/strongly agree. This shows many of the respondents prefer the ideal life span for a vehicle is 10 years.

For the second element which is determining the vehicles that have reached its ELV by life span and denoted as EX2, the frequency of the perspective of the respondents are 30.3% for disagree and strongly disagree combine, 30.3% of respondents choose neutral while others choose agree/strongly agree with the percentage of 39.4%.

Table 4.3: Expectation of ELV Product between used part dealers.

No.	Expectation of ELV Product	Frequency (%)			
		Not Applicable	Disagree/ Strongly Disagree	Neutral	Agree / Strongly Agree
EX1.	The ideal life span for a vehicle is 10 years	-	21.2	36.4	42.4
EX2.	Determining the vehicles have reached its ELV by life span only	-	30.3	30.3	39.4
EX3.	Auto used part dealers are important in ELV practices	-	-	3.0	96.9
EX4.	ELV parts should be accident free	6.1	3.0	9.1	81.8
EX5.	Used part items price are determine by its condition	-	-	6.1	93.9
EX6.	Used part items are determine by its condition	-	-	12.1	87.8
EX7.	Consider the environment issues in process of ELV parts.	-	-	9.1	91
EX8.	Increase the used part item trade-in	12.1	6.1	27.3	54.6

EX9.	Prefer exporting the used part items to other country	-	-	24.2	75.7
EX10.	Prefer imported vehicles of ELV parts from other country	-	-	3.0	97
EX11.	Prefer used part items from cars only	6.1	12.1	6.1	75.7
EX12.	Need proper documents of the car to dismantle the vehicles	-	-	-	100
EX13.	Need customers details for selling/buying the ELV parts	-	-	36.4	63.7
EX14.	Accepting broken used part items	-	6.1	51.5	42.4

Besides that, the third element which is auto used part dealers are important in ELV practices has denoted as EX3. For its frequency, there are 96.9% of respondents chooses agree and strongly agree combine. This shows the important of used part dealers in ELV practices which gives a major advantage for all the used part dealers to continuously engage in the business of dealing in used products for the primary goal of profit to expand their business and sustain in the current market. With only 3.0% of respondent chooses neutral with this element as it does not really cause a change for the important in ELV practices. Figure 4.3 shows the used part dealers engaging with business.

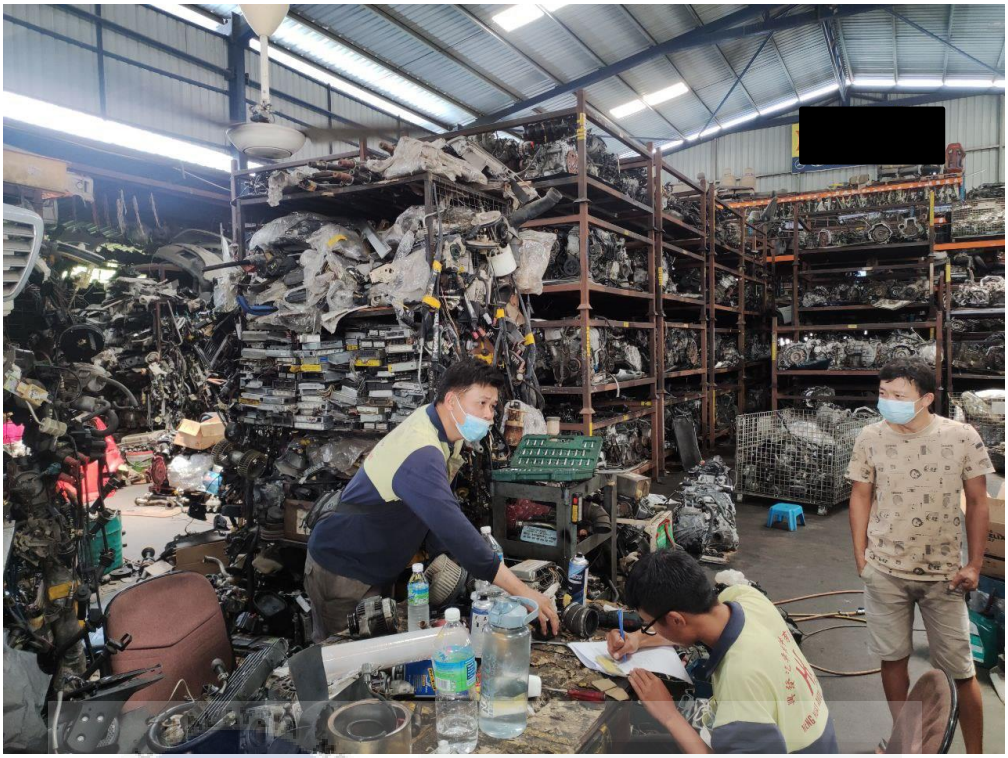


Figure 4.3: Example of used part dealers involves in ELV business

Turning now to the fourth element in the table which is ELV parts should be accident free and denoted as EX4, the majority of the respondents chose this element for agree/disagree with the frequency of 81.8%. There are 9.1% respondent chose neutral while 3.0% respondent even chose disagree/strongly disagree. 6.1% respondents chose to not applicable which can lead a loss to the organization. The fifth element tabulated is EX5 which is used part items price are determine by its condition. The frequency of the perspective of the respondents are 93.9% which chose agree/strongly agree while only 6.1% respondents chose neutral. This shows that majority of the respondents are agree and strongly agree that cost of used parts depends on their condition.

Moving on now to consider the seventh element recorded, which is consider the environment issues in process of ELV parts and denoted as EX7, there are 91% respondents chose agree/strongly agree which shows majority of them really considering it. With only 9.1% respondents chose neutral as it doesn't give any impact to the statistics.

The eight elements have denoted as EX8 which is increase the used part item trade-in. Out of 100% there are 12.1% chose not applicable while 6.1% respondents chose disagree/strongly disagree, 27% of respondents have chosen neutral and others which is 54.6% chose agree/strongly agree.

Moving on now to ninth element which is prefer exporting the used part items to other country and denoted as EX9, 75.7% of respondents chose agree/strongly agree for this section while the other 24.2% have chosen neutral. It shows they are encouraging to export the used parts to other countries. Besides that, prefer used part items from cars only are in the eleventh element recorded and has denoted as EX11 and have the frequency as follows. 6.1% of respondents have stated not applicable in this element,12.1% of respondent has chosen disagree/strongly disagree, 6.1% of them chose neutral while others have agree/strongly agreed which is 75.7%.

Furthermore, need proper documents of the car to dismantle the vehicles (EX12) falls on the twelfth element with the maximum frequency which is 100%. All the respondents agree/strongly agree that customers should have all the documents before they scrap or dismantle the vehicles to prevent from any problems in future and to make sure the vehicles are belonging to them. By providing documents can speed up the process of dismantling. The thirteenth element (EX13) which is known as need customers details for selling/buying the ELV parts has the frequency of respondents as follows. Most of the respondents with frequency 63.7% has agree/strongly agree that these elements can prevent dismantling the vehicles that have steal by having customers details. With only 36.4% respondents have chosen neutral for these elements.

Finally, the last element in the table is by accepting broken used part items which denoted as EX14. The frequency of opinions of the respondents are 42.4% where they chose agree/strongly agree, 51.5% have chosen this element as neutral while others which is 6.1% respondents have chosen disagree/strongly disagree both combine.

4.2.1 Mean for Expectation of ELV Product

There are 14 indicators that were derived from the literature reviews and used to access the Expectation of ELV Product (EX) in the End-Of-Life Vehicle studies. Using the IBM SPSS for descriptive statistics procedure, the mean score value for EX ranging from 3.12 to 4.82 out of scale of 5, is as per Figure 4.4. As depicted in Figure 4.4, the need of proper documents of the car to dismantle the vehicles (EX12) have ranked at the highest mean score value of 4.82 out of 5. This was followed by the used part items price are determine by its condition (EX5, mean score 4.58), used part items are determine by its condition (EX6, mean score 4.42), auto used part dealers are important in ELV practices (EX3, mean score 4.3) and consider the environment issues in process of ELV parts (EX7) at a mean score value of 4.06 out of 7, respectively. The results indicate that the implementation of EX has a vital role in improving the performance of ELV.

Despite that, determining the vehicles have reached its ELV by life span only (EX2, mean score 3.12), the ideal life span for a vehicle is 10 years (EX1, mean score 3.21), increase the used part item trade in (EX8, mean score 3.24) and accepting broken used part items (EX14) at mean score value of 3.36 are given the lowest ranking. Based on the mean score given, all these indicators did not reach the expectation of ELV from the auto used part dealer and results as the lowest in mean score.

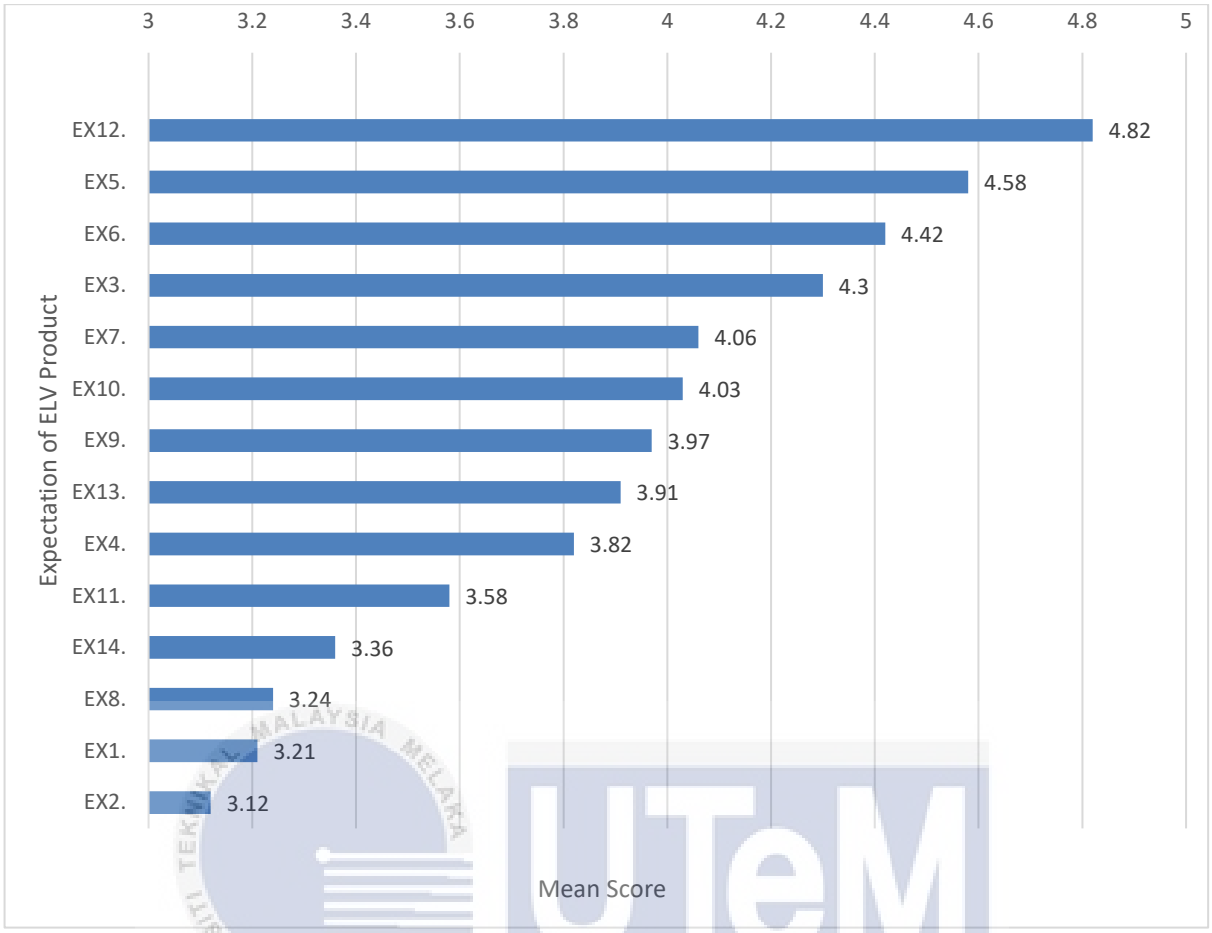


Figure 4.4: Mean Score of Expectation of ELV Product

Besides, all 14 expectations of ELV product in the questionnaire can form as the basis of an assessment tool in evaluating the study on end-of-life vehicle for used part dealers. It could be interpreted as the higher the score is,the higher the expectation of ELV product is. To summarise all the mean scores which have a positive agreement and indicate as a strong values will be later be used for further analysis.

4.2.2 Correlation Analysis of ELV product

The correlation analysis is conducted to determine the correlation between all the elements that want to be discussed and analyzed its interdependencies between each other. For this study, correlation analysis is done by using the IBM SPSS software by conducting

a Spearman Rho Correlation Test with two-tailed which considering all the values falls under the bell shape curve and test at both confidence interval.

Spearman correlation test generates a total of 196 matrices of the relationship from the total of 10 EX in End-Of-Live vehicle. As recorded, there are three pairs of matrices found to have a very strong relationship ranging from 0.807 to 0.858, four pairs of matrices with strong relationship ranging with 0.631 to 0.695 and 10 pairs of the matrices has a moderate relationship at a value of 0.401 to 0.569. The summary of the Spearman correlation test is presented in Table 4.4

There is a very strong correlation between the used part items price are determine by its condition (EX5) and the used part items are determine by its condition at a significant value of 0.858. This showed that both have close ties with each other. When these elements exist between the used part dealers, the used part items price will be always determined accordingly to its conditions.

Meanwhile, the second highest of a very strong correlation are between the increasing the used part item trade-in (EX8) and the need of customers details for selling/buying the ELV parts (EX13) which have a significant value of -0.842. These results showed that the importance of customer details on the used part items trade-in have a strong close relationship in the process. This was followed by the increase of the used part items trade-in (EX8) and prefer exporting the used part items to other country (EX9) at a correlation value of 0.807.

Table 4.4: Results of Spearman Rho Correlation Test for the Expectation of ELV Product

	EX1	EX2	EX3	EX4	EX5	EX6	EX7	EX8	EX9	EX10	EX11	EX12	EX13
EX2	.451(**)												
EX3	0.007	-0.027											
EX4	0.204	0.039	.438(*)										
EX5	-0.190	0.096	0.232	0.163									
EX6	-0.225	-0.013	0.209	0.006	.858(**)								
EX7	-.428(*)	-0.259	-0.048	-0.224	.378(*)	0.161							
EX8	0.010	0.106	0.263	.673(**)	.401(*)	0.189	0.098						
EX9	0.002	0.096	0.321	.695(**)	0.171	-0.002	0.001	.807(**)					
EX10	0.113	-0.014	-0.200	0.150	-0.118	-0.255	0.200	0.325	.453(**)				
EX11	0.187	.569(**)	-0.033	-0.023	-0.271	-0.300	-0.321	-0.285	-0.125	-0.118			
EX12	.408(*)	0.100	0.137	0.185	-0.200	-0.078	-.429(*)	-0.129	0.096	0.050	0.211		
EX13	0.033	-0.090	-0.337	-.631(**)	-.484(**)	-0.297	-0.142	-.842(**)	-.633(**)	-0.119	0.299	0.237	
EX14	0.112	.471(**)	0.001	-0.146	0.167	0.116	0.025	0.009	-0.049	0.113	.376(*)	0.279	0.127

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

Correlation strength: 0.200-0.399 weak, 0.400-0.599 Moderate, 0.600-0.799 Strong, 0.800-1.000 Very strong

Conversely, the relationship between consider the environment issues in process of ELV parts (EX7) and prefer exporting the used part items to other country (EX9) have the lowest correlation relationship at a value of 0.001. This indicates that the environment issues in process of ELV part does not influence the exporting of used part items to other country.

4.2.3 Factor Analysis of Expectation of ELV Product

Referring to (Chaabane et al., 2021), the procedure for factor analysis using IBM SPSS was referred. The analysis was executed based on principal components analysis with the Varimax rotation with eigenvalues of discontinuity greater than 1, and the factor loading exceeding 0.5. Varimax rotation method was chosen because it can reduce the number of complex variables and improve yield expectations.

In the first trial, the Kaiser-Meyer-Olkin (KMO) is 0.512, exceeding 0.5. This demonstrates the adequacy of sampling where all the indicators are interconnected and share the same factor . Meanwhile, Bartlett's test of sphericity yields p-value = 0, less than the 0.05. The results indicate that the data has a significant relationship between sub-scale, suitable, and adequate for factor analysis. Summary of the KMO and Bartlett's test results is presented in Table 4.5.

Table 4.5: Results of Kaiser-Meyer-Olkin (KMO) and Bartlett's Test for Expectation of ELV Product

KMO measure of sampling adequacy	Bartlett's test of sphericity		
	Approximate Chi-square	df	Sig.
0.512	237.829	91	0.000

After the first trial, the remaining of 14 indicators of EX has turned into uni-factorial, and extracted into three factors, at loading value from 0.216 to 0.872. The KMO value is 0.512 which is good enough. As summarized in Table 4.6, the EX5, EX13, EX8, EX6 and EX7 are extracted below the first factor at loading value between 0.531 to 0.872. This factor has the highest variation with the eigenvalue of 3.466 and the cumulative variation of 21.988%.

Table 4.6: Results of Factor Analysis for Expectation of ELV Product

Factor	Indicator of EX	Item loading	Cumulative Percentage	Eigenvalues
G1	Used part items price are determine by its condition (EX5)	0.872	21.988	3.466
	Need customers details for selling/buying the ELV parts (EX13)	0.808		
	Increase the used part item trade-in (EX8)	0.785		
	Used part items are determine by its condition (EX6)	0.779		
	Consider the environment issues in process of ELV parts (EX7)	0.531		
G2	Prefer exporting the used part items to other country (EX9)	0.822	43.394	3.019
	ELV parts should be accident free (EX4)	0.710		
	Prefer used part items from cars only (EX11)	0.654		
	Determining the vehicles have reached its ELV by life span only (EX2)	0.529		
	The ideal life span for a vehicle is 10 years (EX1)	0.460		
	Need proper documents of the car to dismantle the vehicles (EX12)	0.425		

	Auto used part dealers are important in ELV practices (EX3)	0.216		
G3	Accepting broken used part items (EX14)	0.426	59.553	1.853
	Prefer imported vehicles of ELV parts from other country (EX10)	0.319		

Meanwhile, seven indicators which is EX9, EX4, EX11, EX2, EX1, EX12, and EX13 have the loading factor ranging from 0.216 to 0.822 and are grouped into the second factor. This factor has the eigenvalue value of 3.019 and the cumulative variation of 43.394%. As for the third factor group, only two EX indicators which is EX14 and EX10 were extracted into this factor with the factor loading ranging from 0.319 to 0.426, and with the total cumulative percentage of 59.553%.

4.3 Preferable auto used part

There are 7 elements on Preferable auto used part from auto used part dealers that have been identified and all of these have been denoted as PR1 to PR7 in the questionnaire as shown in Table 4.7. All of the preferable auto used parts are based on literature review that have been stated previously. According to the survey's findings, all seven of the preferred auto part (PR) criteria were viewed by respondents as important survey. The ranks of all of these preferred used auto parts are then determined in percentage units and tabulated as shown in Table 4.7. These percentages were calculated using the SPSS programmed.

For the first element which is preferred vehicles used part items from ELV are denoted as PR1, there is only 15.2% respondents give neutral. The other 84.8% respondents give agree/strongly agree. This shows most used part dealers prefer used part

items from ELV. For the second element which is prefer used part items from abandoned vehicles and denoted as PR2, the frequency of the perspective of the respondents are 3.0% for not applicable. There are respondents whom gives 3.0% for disagree/strongly disagree, 3.0% of respondents gives neutral while others choose agree/strongly agree with the percentage of 90.9%.

Table 4.7: Preferable auto used part items for used part dealers

No.	Preferable auto used part	Frequency (%)			
		Not Applicable	Disagree/ Strongly Disagree	Neutral	Agree / Strongly Agree
PR1.	Prefer vehicles used part items for ELV	-	-	15.2	84.8
PR2.	Prefer used part items from abandoned vehicles	3.0	3.0	3.0	90.9
PR3.	Prefer used part items from total accident vehicles	-	-	15.2	84.8
PR4.	Prefer used part items from the vehicles which reached its life span	-	-	9.1	90.9
PR5.	Prefer used part items from vehicles that effected by flood	-	42.4	42.4	15.2
PR6.	Prefer accepting used part items from theft vehicles	3.0	78.8	6.1	12.1
PR7.	Prefer used part items from Proton Wira	-		12.1	87.9

Besides that, the third element which is prefer used part items from total accident vehicles has denoted as PR3. For its frequency, there are 84.8% of respondents choose agree and strongly agree both combine together. This shows they willing to accept the components from a accident vehicle or a total loss vehicle as used part items. Only 15.2% of respondents chose neutral with this element. For the fourth element in the table which is prefer used part items from the vehicles which reached its life span (PR4), the frequency of opinions from the respondents are as follows. Most of the respondents with frequency 90.9% have chosen agree/strongly agree that used part from vehicles which has reached its life span would be a good factor for ELV practices since those parts can be used again as a second hand. These practices could boost their business as well. Only 9.1% of respondents chose neutral which does not really affect the percentage for this element in the table.

The following is a brief description of fifth element which is prefer used part items from vehicles that effected by flood which denoted as (PR5). The frequency of the perspective of the respondents are 42.4% which chose disagree/strongly disagree, followed by another 42.4% of respondents chose neutral and only 15.2% of respondents chose agree/strongly agree.

Meanwhile, the second last element which is prefer accepting used part items from theft vehicles (PR6), 78.8% of respondents has chosen disagree/strongly disagree which clearly shows that used part dealers won't accept any theft vehicle used part items to avoid any problems in future. 6.1% of respondents have chosen neutral while 12.1% of respondents have chosen agree/strongly agree. Finally, the last element in the table is prefer used part items from proton wira (PR7). The frequency of opinions of the respondents are 12.1% where they chose neutral while other 87.9% has chosen this element as agree/strongly agree.

4.3.1 Mean for Preferable auto used part

There are7 indicators that were derived from the literature reviews and used to access the preferable auto used part (PR) in the End-Of-Life Vehicle studies. Figure 4.5 shows the mean score value for PR, which ranges from 1.69 to 4.18 on a scale of 5, using the IBM SPSS descriptive statistics process. As depicted in Figure 4.5, prefer used part items from proton wira (PR7) have ranked at the highest mean score value of 4.18 out of 5.

This was followed by the preferred used part items from total accident vehicles (PR3, mean score 4.06) and preferred used part items from the vehicles which reached its life span (PR4, at a mean score value of 3.94. Furthermore, all these aspects are part of preferable auto used part that should be prioritized in implementing the PR.

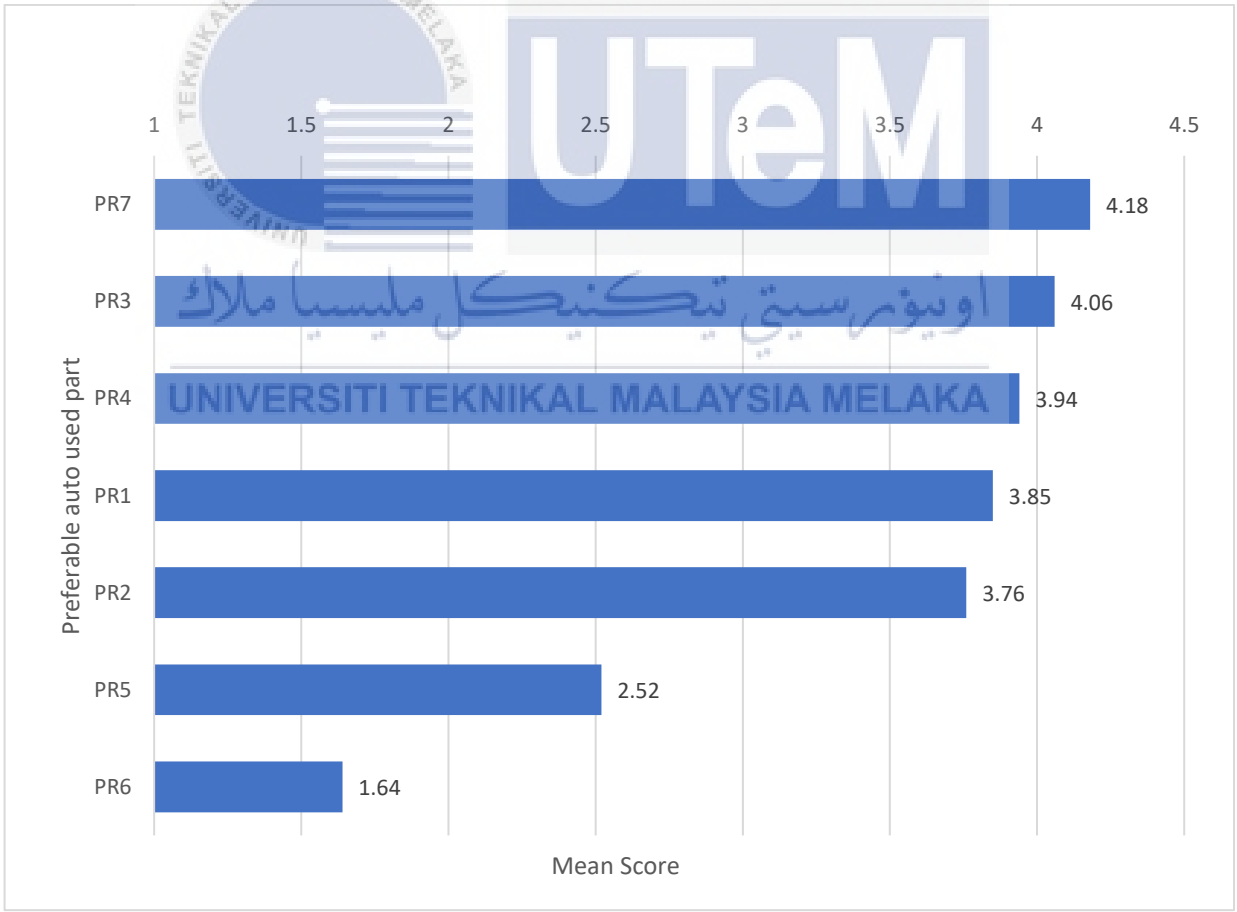


Figure 4.5: Mean score of Preferable auto used part

Conversely, prefer accepting used part items from theft vehicle (PR6, mean score 1.64), preferred used part items from vehicles that effected by flood (PR5, mean score 2.52) and preferred used part items from abandoned vehicles (PR2) at a mean score value of 3.76 are given the lowest ranking. All these indicators fell short of the preferred auto used part item from auto used part dealers and had the lowest mean score according to the stated mean score.

The study on end-of-life vehicles for used part dealers can also be evaluated using all seven of the preferred auto used parts listed in the questionnaire. According to one interpretation, the anticipation for the preferable auto used part rises as the score does. In conclusion, any mean scores that show positive agreement and suggest strong values will be used for additional study.

4.3.2 Correlation Analysis of Preferable auto used part

Spearman correlation test generates a total of 49 matrices of the relationship from the total of 7 PR in End-Of-Life Vehicle. As recorded, there are one pairs of matrices found to have a very strong relationship ranging at 0.878, two pairs of matrices with strong relationship ranging from 0.606 to 0.681 and five pairs of the matrices has a moderate relationship at a value of 0.454 to 0.580. The summary of the Spearman correlation test is presented in Table 4.8.

There is a very strong correlation between the prefer used part items from abandoned vehicles (PR2) and the prefer used part items from the vehicles which reached its life span (PR4) at a significant value of 0.878. This showed that both have close ties with each other. This indicates that the used part items from both are preferable and have high demand for this part.

Table 4.8: Results of Spearman Rho Correlation Test for the Preferable auto used part

	PR1	PR2	PR3	PR4	PR5	PR6
PR2	0.142					
PR3	0.187	.543(**)				
PR4	0.172	.878(**)	.454(**)			
PR5	-0.29	-.385(*)	-.606(**)	-.379(*)		
PR6	-0.051	0.332	-0.113	0.235	0.293	
PR7	0.266	.544(**)	.521(**)	.580(**)	-.681(**)	-0.051

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

Correlation strength: 0.200-0.399 weak, 0.400-0.599 moderate, 0.600-0.799 strong, 0.800-1.000 very strong

Meanwhile, the second highest of a strong correlation are between the prefer used part items from vehicles that effected by flood (PR5) and the prefer used items from proton wira (PR7) which have a significant value of -0.681. This was followed by the prefer used part items from total accident vehicles (PR3) and prefer accepting used part items from theft vehicles (PR5).

Moving on now to consider the lowest correlation relationship. There are two same values with the same lowest correlation which is prefer vehicles used part items from ELV (PR1) and prefer accepting used part items from theft vehicles (PR6). On other hand, prefer accepting used part items from theft vehicles (PR6) and prefer used items from proton wira (PR7). These both correlations have the same value of -0.051. This indicates that there is no influence between each element.

4.3.3 Factor Analysis of Preferable auto used part

The Kaiser-Meyer-Olkin (KMO) in the initial trial is greater than the minimal threshold value of 0.5 and is at 0.707 (still superb). This illustrates the effectiveness of sampling when all the indicators are connected to one another and share a common factor. Bartlett's test of sphericity, meanwhile, results in a p-value of 0, which is less than 0.05. According to the findings, there is a substantial correlation between the data's sub-scale, suitability, and sufficiency for component analysis. Table 4.9 provides a summary of the test findings from KMO and Bartlett.

Table 4.9: Results of Kaiser-Meyer-Olkin (KMO) and Bartlett's Test for Preferable auto used part

KMO measure of sampling adequacy	Bartlett's test of sphericity		
	Approximate Chi-square	df	Sig.
0.707	89.927	21	0.000

Following the initial trial, the remaining seven PR indicators were converted to a uni-factorial structure and split into two factors, with loading values ranging from 0.219 to 0.808. The KMO value is 0.707 which is good enough. As summarized in Table 4.10, the PR2, PR4 and PR7 are extracted below the first factor at loading value between 0.742 to 0.808. This factor has the highest variation with the eigenvalue of 3.266 and cumulative variation of 37.613%. Meanwhile, four indicators which is PR1, PR3, PR5 and PR6 have the loading factor ranging from 0.219 to 0.773 and are grouped as the second factor. This factor has the eigenvalue of 1.340 and with the total cumulative variation of 65.800%.

Table 4.10: Results of Factor Analysis for Preferable auto used part

Factor	Indicator of PR	Item loading	Cumulative Percentage	Eigenvalues
G1	Prefer used part items from abandoned vehicles (PR2)	0.808	37.613	3.266
	Prefer used part items from the vehicles which reached its life span (PR4)	0.796		
	Prefer used part items from Proton Wira (PR7)	0.742		
G2	Prefer vehicles used part items for ELV (PR1)	0.219	65.800	1.340
	Prefer used part items from total accident vehicles (PR3)	0.631		
	Prefer used part items from vehicles that effected by flood (PR5)	0.773		
	Prefer accepting used part items from theft vehicles (PR6)	0.637		

4.4 Preferable auto used part from proton wira

The questionnaire, as shown in Table 4.11, contains 12 elements on Preferable auto used part from proton Wira from auto used part dealers, all of which have been identified and denoted as UP1 to UP12. All of the preferable auto used parts from proton wira are based on literature review that have been stated previously. The survey's results show that respondents thought the twelve preferable auto part from proton wira (UP) criteria were all very essential. The rankings of each of these preferable autos used parts from Proton Wira are then calculated in percentage units and summarized as shown in Table 4.11. Using the SPSS application, these percentages were determined.

For the first element which is brake lamp and denoted as UP1, there is only 12.1% respondents give neutral while other respondents which is 87.9% gives agree/strongly agree. This shows that many used part dealers prefer proton wira brake lamp which is highly demand in the market. For the second element which is crank shaft and denoted as UP2, the frequency of the perspective of the respondents are 3.0% for disagree and strongly disagree combine, 24.2% of respondents choose neutral while others choose agree/strongly agree with the percentage of 72.7%.

Besides that, the third element which is steering has denoted as UP3. For its frequency, there are 42.4% of respondents have choose neutral and 57.5% of respondents have choose agree/strongly agree. Turning now to fourth element which is head lamp and denoted as UP4, the majority of the respondents chose this element agree/strongly agree with the frequency of 90.9% which shows that head lamp is a highly demand parts for the for the used part dealers between customers. Only 9.1% of respondent chose neutral.

Table 4.11: Preferable auto used part items from proton wira between used part dealers

No.	Preferable auto used part from Proton Wira	Frequency (%)			
		Not Applicable	Disagree/ Strongly Disagree	Neutral	Agree / Strongly Agree
UP1	Brake lamp	-	-	12.1	87.9
UP2	Crank shaft	-	3.0	24.2	72.7
UP3	Steering	-	-	42.4	57.5
UP4	Head lamp	-	-	9.1	90.9
UP5	Radiator fan	-	-	9.1	90.9
UP6	Intake manifold	-	6.1	6.1	87.9
UP7	Brake booster pump	-	3.0	6.1	90.9
UP8	Gearbox auto	-	-	6.1	93.9
UP9	Engine	-	3.0	6.1	90.9
UP10	Alternator	-	-	6.1	93.9
UP11	Distributor	-	-	6.1	93.9
UP12	Cylinder head	-	-	6.1	93.9

The fifth element tabulated is UP5 which is radiator fan. The frequency of the perspective of the respondents are 90.9% which chose agree/strongly agree while only 9.1% respondents choose neutral. This shows that majority of the respondent are agree and strongly agree that radiator fan is one of the highly preferable used part items for proton wira. For the sixth element recorded, which is intake manifold and denoted as UP6, there are 6.1% respondents chose disagree/strongly disagree, 6.1% of respondent chose neutral and other respondents which is 87.9% have chosen agree/strongly agree.

Moving on now to consider the seventh element recorded, which is brake booster pump and denoted as UP7, there are 3.0% of respondents have chosen disagree/strongly disagree, 6.1% of respondents have chosen neutral and 90.9% of respondents have chosen agree/strongly agree. The eight elements have denoted as UP8 which is gearbox auto. Only 6.1% of respondents have chosen neutral while others respondents which is 93.9% have chosen agree/strongly agree for this element. This is because gearbox auto can be so profitable for the used part dealers even its second-hand. This is due to the strong demand for the gearbox.

Turning now to ninth element which is engine and denoted as UP9, 3.0% of respondent have chosen disagree/strongly disagree, 6.1% of respondent have chosen neutral and 90.9% of respondent have chosen agree/strongly agree. Alternator are the tenth element recorded and has denoted as UP10 and have the frequency as follows. Only 6.1% of respondents have choose this element as neutral and majority of the respondents with the frequency of 93.9% have chosen agree/strongly agree. This shows that alternator is one of the most valuable parts in proton wira and still have high value in the current market. Based on the market's supply and demand, the price of the alternator may vary.

Next, for the eleventh element tabulated is cylinder head and has denoted as UP11 and have the frequency as follows. 6.1% of respondents have stated neutral in this element while others have agree/strongly agreed which is 93.9%. Finally, the last element in the table is prefer used part items from proton wira which denoted as UP12. The frequency of opinions of the respondents are 93.9% where they choose agree/strongly agree while only 6.1% of respondents have choose neutral for this element.

4.4.1 Reliability Analysis

Using IBM SPSS reliability analysis procedure, the Alpha coefficient of the UP was recorded at a value of 0.916. This result was considered acceptable as the indication of reliability for basic case study should be greater than 0.7. This indicates that the data and UP between used part dealers stated in questionnaire has high internal consistency and are reliable for the next analysis. Table 4.12 shows the reliability analysis of the Preferable auto used part items from proton wira.

Table 4.12: Reliability analysis of preferable auto used part item from proton wira

Cronbach's Alpha	N of Items
0.916	12

4.4.2 Mean for Preferable auto used part items from Proton Wira

There are 12 indicators that were derived from the literature reviews and used to access the preferable auto used part items from proton wira (UP) in the End-Of-Life Vehicles studies. Figure 4.6 shows the mean score value PR, which ranges from 3.61 to 4.58 on a scale of 5, using the IBM SPSS descriptive statistics process.

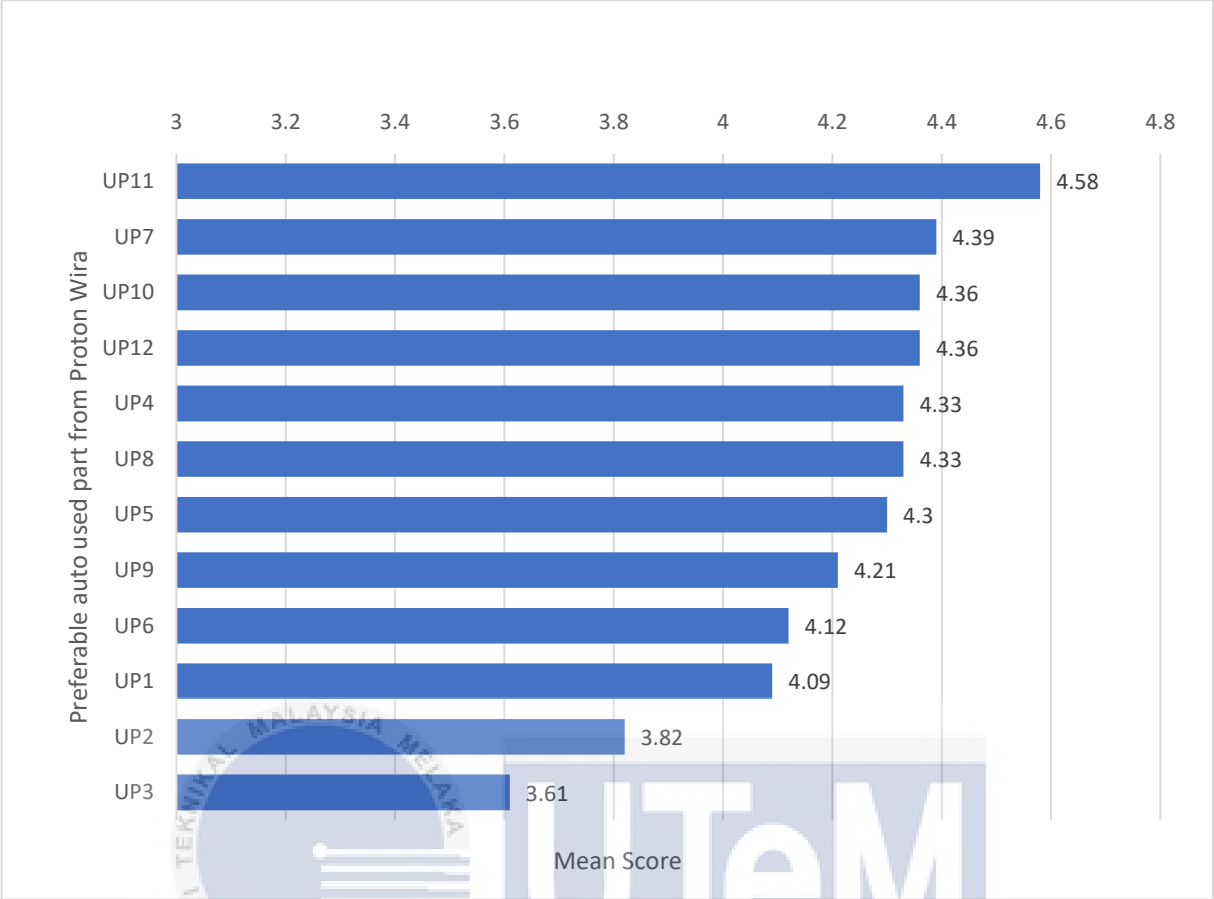


Figure 4.6: Mean score of Preferable auto used part from proton wira

As depicted in Figure 4.6, Distributor (UP11) are the most preferable auto used part items from the proton wira among the used part dealers have ranked at the highest mean score value of 4.58 out of 5. This shows that distributor have a very high demand in the current market where auto used part dealers able to make huge profits from selling it as used part items. Brake booster pump (UP7) come in second with a mean score of 4.39.

This was followed by the alternator (UP10) and cylinder head (UP12) which have the same mean score value of 4.36 out of 5. Additionally, the UP implementation has given priority to using the proton wira's most preferred auto used part, which includes all of these elements. Conversely, steering (UP3, mean score 3.61), crank shaft (UP2, mean score 3.82)

and brake lamp (UP1) at a mean score value of 4.09 are given the lowest ranking. According to the stated mean score, each of these indicators had the lowest mean score value and fell short of the proton wira parts that were the most preferable used vehicle parts.

All twelve of the preferable cars used parts items from Proton Wira specified in the questionnaire can also be utilized to evaluate the study on End-Of-Life Vehicles for used part dealers. One interpretation holds that when the mean score increases, buyers become more eager to purchase Proton Wira's preferred used auto parts products. In conclusion, any mean scores that indicate strong values and positive agreement will be considered in further study.

4.5 Summary

Overall, the survey that have been conducted is helping in obtaining the important data needed such as the expectation of ELV product, preferable auto used part and the most preferable used part items from proton wira as well. All of these data is then been analyzed through Statistical Package for the Social Sciences (SPSS) software to identify the mean score of each elements in the questionnaire. Then all of these elements are later been further analyzed by conducting a Spearman Rho Correlation Test to determine the correlation between the element. Additionally, a few analyses such as reliability and factor analysis also have been analyzed in this case study.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The objectives of this study are to identify the expectation of ELV product from used car parts dealers, to clasify the types of automotive used part preferred by used car part dealers and to verify ELV product acceptance using proton wira as case study. All of these objectives were achieved due to the data that have been discussed in Chapter 4.

The first objective which is to identify the expectation of ELV product from used car parts dealer is done by determination of the ELV product from used car part dealers through literature review and later through the survey via distribution of questionnaire. The survey is one of the useful methods in order to collect the data for the expectation of ELV product from used car part dealers. It is quick and easy method compared to other methods.

In addition, the survey is done through the site visits at the junk yard. All of the questionnaires have been distributed randomly to 33 auto used part dealers which takes place at Perak. The questionnaires have been answered by either the directors, assistant directors or managers of the junk yards, which are responsible to be in charged and closely related to the activities at used part dealers.

All of the EX elements have been analysed in the IBM SPSS software to determine the mean score of each of the expectation of ELV product presented. The highest value of the mean score is identifed and all of the elements have been rearranged in the descending order from the highest value of the mean score to the lowest value of the mean score. The highest value of the mean score has been identified to be the element which has been categorized in the expectation of ELV product; EX12 which is known as the need of proper documents of the car to dismantle the vehicles with the mean score of 4.82 out of 5.

Next, is the second objective which is to clasify the types of automotive used part preferred by used car part dealers, is also successfully achieved through the survey via distribution of questionnaire.The data that have been collected are then analysed by using IBM SPSS software. The data has showing the result that meets the objective of the study. The types of automotive of automotive used part preffered by used car part dealers have discovered through the analysis of the survey. There are total of 7 elements of preferable auto used part. The IBM SPSS software was used to analyse each PR element in order to calculate the mean score. The Spearmen Rho Correlation Test and factor analysis were also successful in reaching this goal.

The final objective is to verify ELV product acceptance using proton wira as case study. This objective is achieved through the case studies that have been conducted in few junk yards at perak. The acceptance of ELV product using proton wira between few junk yards is studied and discussed comprehensively, and it resulted that there are still demand for the used part items of proton wira in the current market. Finaly, all of the elements that have been detected earlier is verified and explained to be accepted for the ELV product using Proton Wira.

5.2 Project Implication

5.2.1 Implication to Industry

The implication to industry is when the used part items are sold to the used part dealers, the used part dealers will gain profit through selling back the used part items for a reasonable price to the customers. Therefore, increase in profit as dealers are from selling the parts for a higher price than the price they bought the parts for.

5.2.2 Implication to Sustainability Development

End-of-life vehicles (ELV) have become more popular because they help with the recycling of materials, the reuse of valuable parts, and the safe disposal of hazardous chemicals. This has implications for sustainable development. The circular economy and green economy may both benefit from a well-established automotive recycling industry's enormous earnings. In terms of valuable recyclable materials and recoverable parts, it has a high economic value. Recovery of parts ELVs in the face of global supply chain breakdowns offers a different resource source and makes it easier to construct a circular economy.

5.2.3 Implication to Knowledge

The implication on knowledge is the understanding on ELV and its benefits such as reduce the amount of waste produced from vehicles when they are scrapped. Moreover, learning about the process of ELV done by the dealers in the junkyard like dismantling the car parts from the vehicle. Deeper understanding of the main part of used part dealers.

5.3 Limitation of the project

There are some limitations when conducting this study on end-of-life vehicle for used part dealers Proton Wira case study. The first limitation is that this survey has only been done in the Perak region. This is due to the fact that Perak has a large number of used part dealers that conduct their business by purchasing, selling, exchanging, or trading in junk yards. There are many used part items available from Perak's used part dealers, making it unnecessary to travel to another state to purchase them. At perak, you may also find a larger variety of vehicles to suit any budget and better financing alternatives. As a result, Perak has been chosen to carry out this survey.

The fact that this study only included 33 used part dealers as respondents is another limitation. To obtain information regarding end-of-life vehicles for used part dealers, the questionnaire survey form has been randomly distributed to 33 used part dealers. 33 used part dealers provided the data, which was then collected and analysed using IBM SPSS software. The data from these used part dealers has shown outcomes that satisfy the study's goal.

The fact that this case study is limited to Proton Wira is another limitation. The goal is to collect and analysed data as much as possible about proton wira used part items and its acceptance to the current market for used part dealers. The strong availability and demand for proton wira used parts among customers has encouraged used part dealers to emphasis more on this car type, which can be highly profitable.

5.4 Recommendation for Future Study

The recommendation for the future studies are more programmes relating to ELV reuse should be developed and implemented by the government and industry in order to promote public community understanding, knowledge, and awareness of ELV. In addition, government officials should play significant responsibilities and act quickly to address the ELV issue. The government should do more study and create regulations and legislation on ELV recovery similar to the nations that have succeeded in reducing the ELV problem.

This largely relates to the management of ELVs, which involves raising the number of locally produced cars as well as importing car parts, both of which have the potential to provide significant amounts of revenue for the used part dealers. Recognizing the economic advantages of reuse used part items is a critical element that can increase the used part dealers revenue while creating new opportunities in a more competitive automobile industry.

Future research on this case study has to be broadened to include all of Malaysia, not just the state of Perak. Additionally, only 33 used parts dealers are surveyed via questionnaires in this case study in order to obtain data. To obtain even more recommended data for future study that will result in improved understanding and findings, more used part dealers should be surveyed. In this case study, only Proton Wira has been focused therefore for future case study different car models should be chosen to know their acceptance in the current market by used part dealers.

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APPENDIX

APPENDIX A Survey Questionnaire Form

A STUDY ON END-OF-LIFE VEHICLE FOR USED PART DEALERS: PROTON WIRA CASE STUDY

End-of-life vehicles (ELVs) are vehicles that have reached the end of their useful life. It is a vehicle that the owner has discarded or intends to discard. The vehicle is classified as ELV based on two criteria. Either due of the vehicle's age or because of extensive damage, it can no longer be used. They're referred to be scrap that can be thrown away. All of the car's components and parts are likewise classified as waste. Anything that will be discarded, whether it is mandated to be discarded or is discarded on purpose, is considered waste. A case study on End-Of-Life Vehicle for used part dealers is being carried out at the Faculty of Mechanical and Manufacturing Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM). The purpose of this survey is to get an overview of the practices of ELV for used part items at Auto Used Part Dealers through gathering data from this survey. Data collected in this survey will remain **CONFIDENTIAL** and be used only as material for academic purpose. Group data will be presented in the final report so that confidentiality can be maintained. Please pass this questionnaire to the appropriate member(s) of your organization (at least 2-years experience in auto part dealer) if you do not feel comfortable to complete it. To complete this questionnaire, you are just required to TICK the boxes, and write in the space provided. A high response rate is vital for the success of this study. We would delight to answer any query regarding the questionnaire. Please return the complete questionnaire using the enclosed envelope. Thank you for your time and kindness.

Best regards,

Subramaniam a/l Somasundram

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76100 Hang Tuah Jaya, Melaka, Malaysia.

SURVEY QUESTIONNAIRE FORM

INSTRUCTION:
To complete this questionnaire, you are just required to TICK (✓) boxes and write in the space of the required information provided, if necessary.

SECTION A: AUTO USED PART DEALER INFORMATION

1. Auto Used part name:

   _____

2. Auto Used part Address:

   _____

   _____

3. Year Established: -

   _____

4. Auto Used Part type

   □ Cars □ Lorry

   □ Bus □ Bikes

   □ Others, please specify : _____

5. No. of Employees: -

   _____

SECTION B: INFORMATION ON EXPECTATION OF ELV PRODUCT FROM AUTO USED PART DEALERS

In your experience, please indicate to the extent to which you agree or disagree with the following statements as they related to expectation of ELV product

No.	Expectation of ELV Product	Not Applicable	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	The ideal life span for a vehicle is 10 years	0	1	2	3	4	5
2.	Determining the vehicles have reached its ELV by life span only	0	1	2	3	4	5
3.	Auto used part dealers are important in ELV practices	0	1	2	3	4	5
4.	ELV parts should be accident free	0	1	2	3	4	5
5.	Used part items price are determine by its condition	0	1	2	3	4	5
6.	Used part items are determine by its condition	0	1	2	3	4	5
7.	Consider the environment issues in process of ELV parts.	0	1	2	3	4	5
8.	Increase the used part item trade-in	0	1	2	3	4	5
9.	Prefer exporting the used part items to other country	0	1	2	3	4	5
10.	Prefer imported vehicles of ELV parts from other country	0	1	2	3	4	5
11.	Prefer used part items from cars only	0	1	2	3	4	5

12.	Need proper documents of the car to dismantle the vehicles	0	1	2	3	4	5
13.	Need customers details for selling/buying the ELV parts	0	1	2	3	4	5
14.	Accepting broken used part items	0	1	2	3	4	5

SECTION C: INFORMATION ABOUT AUTOMOTIVE USED PART PREFERRED BY USED CAR PART DEALERS

In your experience, please indicate to the extent to which you agree or disagree with the following statements as they related to preferable auto used part by used part dealers.

No.	Preferable auto used part	Not Applicable	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	Prefer vehicles used part items for ELV	0	1	2	3	4	5
2.	Prefer used part items from abandoned vehicles	0	1	2	3	4	5
3.	Prefer used part items from total accident vehicles	0	1	2	3	4	5
4.	Prefer used part items from the vehicles which reached its life span	0	1	2	3	4	5
5.	Prefer used part items from vehicles that effected by flood	0	1	2	3	4	5
6.	Prefer accepting used part items from theft vehicles	0	1	2	3	4	5
7.	Brake lamp	0	1	2	3	4	5

8.	Crank shaft	0	1	2	3	4	5
9.	Steering	0	1	2	3	4	5
10.	Head lamp	0	1	2	3	4	5
11.	Radiator fan	0	1	2	3	4	5
12.	Intake manifold	0	1	2	3	4	5
13.	Brake booster pump	0	1	2	3	4	5
14.	Gearbox auto	0	1	2	3	4	5
15.	Engine	0	1	2	3	4	5
16.	Alternator	0	1	2	3	4	5
17.	Distributor	0	1	2	3	4	5
18.	Cylinder head	0	1	2	3	4	5
19.	Prefer used part items from Proton Wira	0	1	2	3	4	5

GENERAL INFORMATION

Respondents Information:

Name : _____

Job title : _____

Working experience (years) : _____

Contact number : _____

E-mail : _____

Would you like to receive a concise summary of the results from the survey?

☐ Yes ☐ No

Would you like to take part in the next phase of this study?

☐ Yes ☐ No

Thank you very much for your time and kind-co-operation. Please ensure that you answer as many questions as possible.