

**BARRIERS THAT IMPEDE THE IMPLEMENTATION OF CIRCULAR
ECONOMY PRACTICES FOR THE AUTOMOTIVE INDUSTRY IN
MALAYSIA**

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Honors



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DEDICATION

I would like to dedicate this research to my beloved parents who have raised me up, siblings, companion in love who always give encouragement and guidance through my journey to complete study. Besides, I would like to thank Dr. Siti Norbaya Binti Yahaya who guide me all the way to complete my thesis.



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ABSTRACT

Researchers and practitioners have been paying close attention to the circular economy (CE) since it addresses both social and environmental benefits. It also allows for the optimization of the manufacturing process by developing sustainable products that retain as much of their value as feasible. The researcher focuses on the constraints that obstruct the application of circular economy practises in the Malaysian automobile industry in this research paper. Apart from China, little attention has been paid in the literature to the hurdles to CE adoption in Malaysia. Moreover, the pandemic COVID-19 that disrupted the supply chain in automotive industries are the foundation of issue that led to this study. Governmental, economic, and social barriers are identified as the barriers that impede the implementation of CE for automotive industry in Malaysia. This study employs a quantitative method. Primary data will be collected by a survey that will be distributed to all Malaysian that using motor vehicles. In addition, 384 respondents will be chosen using probability sampling. To verify data consistency, a pilot test and reliability analysis will be conducted. Statistical Package for Social Sciences will also be used to analyse the results gathered from respondents (SPSS). To evaluate the researcher's hypothesis, descriptive statistics, Pearson's correlation coefficient, and multiple regression analysis are utilised. From the result, governmental, economic and social barriers have significant relationship in influencing barriers to the implementation of CE practices and governmental barrier is the most significant barrier influencing barriers to the implementation of CE practices. Researchers might use the proposed new conceptual framework to conduct future research or add other variables to the study.

Keywords: circular economy, remanufacturing, closed-loop supply chain

ABSTRAK

Penyelidik dan pengamal telah memberi perhatian kepada ekonomi pekeliling (CE) kerana ia menangani kedua-dua faedah sosial dan alam sekitar. Ia juga membolehkan pengoptimuman proses pembuatan dengan membangunkan produk mampan yang mengekalkan nilainya sebanyak mungkin. Pengkaji memberi tumpuan kepada kekangan yang menghalang pengaplikasian amalan ekonomi pekeliling dalam industri automobil Malaysia dalam kertas penyelidikan ini. Selain China, sedikit perhatian telah diberikan kepada literatur tentang halangan kepada penerimaan CE di Malaysia. Selain itu, pandemik COVID-19 yang mengganggu rantai bekalan dalam industri automotif adalah asas kepada isu yang membawa kepada kajian ini. Halangan kerajaan, ekonomi dan sosial dikenal pasti sebagai halangan yang menghalang pelaksanaan CE dalam industri automotif di Malaysia. Kajian ini menggunakan kaedah kuantitatif. Data utama akan dikumpul melalui tinjauan yang akan diedarkan kepada semua rakyat Malaysia yang menggunakan kenderaan bermotor. Selain itu, 384 responden akan dipilih menggunakan pensampelan kebarangkalian. Untuk mengesahkan ketekalan data, ujian rintis dan analisis kebolehpercayaan akan dijalankan. Pakej Statistik untuk Sains Sosial juga akan digunakan untuk menganalisis keputusan yang dikumpul daripada responden (SPSS). Untuk menilai hipotesis penyelidik, statistik deskriptif, pekali korelasi Pearson, dan analisis regresi berganda digunakan. Daripada hasilnya, halangan kerajaan, ekonomi dan sosial mempunyai hubungan yang signifikan dalam mempengaruhi halangan kepada pelaksanaan amalan CE dan halangan kerajaan adalah halangan paling ketara yang mempengaruhi halangan kepada pelaksanaan amalan CE. Penyelidik mungkin menggunakan rangka kerja konsep baru yang dicadangkan untuk menjalankan penyelidikan masa hadapan atau menambah pembolehubah lain kepada kajian.

Kata kunci: ekonomi sirkular, pembuatan semula, rantai bekalan gelung tertutup

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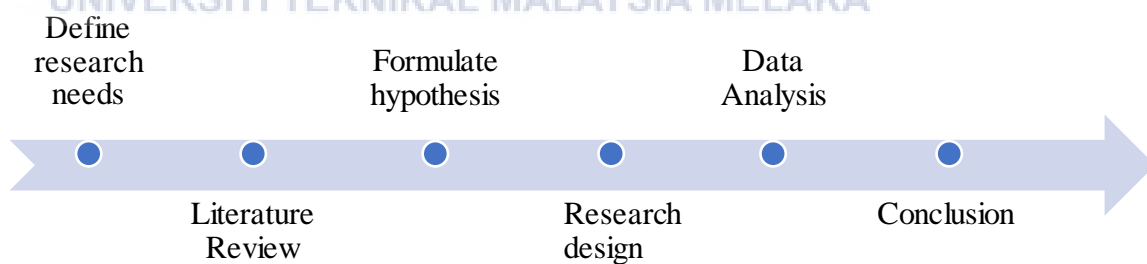
CHAPTER 1

INTRODUCTION

1.1 Introduction

An overview of the research process was provided in this chapter. Background, problem statement, aims, questions, scope, constraints, and significance are all evaluated in the study's introductory section.

1.2 Research Flow



1.3 Background of Study

The notion of circular economy has been mentioned since the 1970s with the aid of using numerous authors and schools of philosophy. The common idea has been improved and evolved with the aid of using numerous schools of philosophy from the “Cradle to Cradle” framework, performance economy, biomimicry, industrial ecology, and blue economy.

1.3.1 Cradle to Cradle

In Ellen Mac Arthur Foundation, the “Cradle to Cradle” notion and certification procedure has been evolved by German chemist Michael Braungart and American architect Bill McDonough. According to this notion, there are two primary classes after taking into account all substances entailed in industrial and business approaches to be nutrients that are technical and biological. The layout for effectiveness in name of manufacturing goods with positive effects has been the earlier attention in the “Cradle to Cradle” foundation.

“Cradle to Cradle” theory has 3 essences that are natural systems, utilisation clean energy source and rejoice diversity respectively. Because everything in a biological ecosystem can be used as a resource, it's possible that there is no such thing as waste. Technical nutrients should be reused repeatedly without degradation in quality, whereas biological nutrients must be returned to the soil in a sustainable manner. According to "use clean and renewable energy," this type of energy is preferred since it satisfies all four criteria: it is emission-free, cheap to operate, uses abundant resources, and is environmentally friendly. Lastly, variety is every other method essential to conquer the demanding situations and meet the possibilities supplied through specific geographies.

1.3.2 Performance Economy

In a study titled "The Potential for Substituting Manpower for Energy," Walter Stahel, an architect and economist, lays out a broad perspective on an economy that

operates in loops (or a circular economy). Job growth, economic competitiveness, resource conservation, and trash avoidance were all considered.

Stahel founded the Product Life Institute in Geneva over 25 years ago, after spending the late 1970s developing a "closed-loop" approach to manufacturing. Its primary focus is on preventing waste, increasing product longevity, reusing materials, and repurposing products.

1.3.3 Biomimicry

Janine Benyus, writer of "Biomimicry: Innovation Inspired by Nature" defines her approach as a brand-new subject that research nature's high-quality thoughts and then imitates those designs and techniques to resolve human problems". She believed that humans ought to discover answers to human demanding situations through emulating nature's styles and strategies.

1.3.4 Industrial Ecology

Taking a holistic approach, industrial ecologists model their production processes after biological systems. To accomplish this, we must first consider the global impact of our actions before focusing on the local ecological limits we face. The goal of this method is to eliminate wasteful by-products by creating closed-loop systems that utilise waste as an input. Given its multidisciplinary nature, this approach is sometimes referred to as the "science of sustainability." Emphasizing natural capital recovery make certain specializes in social well-being wherein the concepts of industrial ecology also can be carried out withinside the services sector.

1.3.5 Blue Economy

Begun by Belgian businessman and former Ecover CEO Gunter Pauli, the Blue Economy is an open-source movement that brings together specific case studies. These were originally assembled in a report of the same name, which was then presented to the Club of Rome. The Blue Economy's 21 guiding principles emphasise the

importance of gravity as the primary source of energy and require that decisions be made in light of local conditions and physical or ecological factors.

According to Bursa Malaysia (2019), Malaysia will introduce the “Malaysian Circular Economy Roadmap for Plastics” through 2020 as a part of the 2018-2030 roadmap closer to zero single-use plastics. The roadmap objective is to offer a path for policy and stakeholders inclusive of state governments. Dr. Ong Kian Ming, The International Trade and Industry Deputy Minister said that Malaysia is now getting ready to take the following step toward sustainability. He additionally stated that authorities will make sure Malaysia does now no longer leave out the large ability of a circular economy and recycling. Malaysia additionally requires a feasible, effective, and advanced waste control system for the country.

According to the Malaysian Investment Development Authority, MIDA (2021), the circular economy appears at the infant level. MIDA inspires the producers to begin to remodel commercial enterprise models wherein all products manufactured are without difficulty recyclable, repurposed, or reused utilizing sustainable sources of raw substances. This may additionally apply in designing parts or elements that may be effortlessly disassembled, reassembled, and retrofitted. Designing for zero waste and zero pollution, maximising the lifespan of products and materials, and restoring and protecting ecological systems are the pillars upon which the circular economy rests. The intention is to allow the goods to retain to circulate long as they could and decrease the usage of raw sources to provide new products.

There were several studies have examined the drivers, practices, and barriers toward circular economy in terms of supply chain perspective (Govindan and Hasanagic, 2018), the benefits, opportunities, and barriers of circular economy in the manufacturing sector (Kumar et al., 2019), breaking circular economy barriers (Grafstrom and Aasma, 2021), and the drivers and barriers to circular economy implementation in Pakistan’s automobile industry (Agyemang et al., 2018). However, most of the studies were conducted outside of Malaysia and there is a scarcity in circular economy research in developing countries such as Malaysia.

1.4 Problem Statement

The surging Covid-19 infection rate and lockdowns in Southeast Asia are worsening (GlobalData, 2021). The arrival of the notably infectious Delta variant causes numerous countries in Southeast Asia including Malaysia, Indonesia, Vietnam, and Thailand to suffer from their worst because of new lockdowns.

Japanese and United States automobile producers have been suffering from the lockdowns that seriously disrupted the car component producers throughout the region as they may be an increasing number depending on providers primarily based totally in low-cost countries throughout Southeast Asia.

Thus, the issue of shortages in electronic components and semiconductors will costing OEMs in manufacturing and logistics. Other than that, the headlines more focusing on semiconductors and computer chips but overlooked the reality that many different commodities are presently in short supply, including leather, fabrics, steel, rubber, and lots more (Chow, 2021). According to Ortego et al. (2020), a conventional passenger automobile requires around 50 different varieties of metals, however, their practical recycling is almost absent.

In addition, there is an issue where there may be no circular economy roadmap specifically for the automotive industry in Malaysia. The finest attempt in Malaysia, according to Kasturi Nathan, Head of Board Advisory Services KPMG in Malaysia, is a "reuse economy" that involves recycling but still consumes new virgin materials (KPMG, 2022).

The automotive industry has been stretched to its limits in order to address the issues of supply problems in electronic parts and semi - conductor, a vague roadmap for the industry, and economic instabilities caused by the COVID-19 pandemic. These factors have made it urgent to switch to a more sustainable usage and production life cycle.

These issue even more worse when the know-how of the capability sustainability synergy among developing countries stays slow-moving regardless of the growing interest toward sustainable improvement and circular economy throughout the world (Isa, Sivapathy, & Adjrina Kamarruddin, 2021).

1.5 Research Objectives

The aim of this study is to examine the barriers in implementing circular economy practices for the automotive industry. The objectives developed in this study was based on problem statement above as follows:

1. To identify the barriers to circular economy experienced by automotive industry.
2. To evaluate the relationship between the barriers toward the implementation of circular economy practices for automotive industry .
3. To examine the most significance barriers that impede the implementation of circular economy practices for the automotive industry.

1.6 Research Questions

The purpose of this study is to answer following questions:

1. What are the barriers to the implementation of circular economy practices experienced by automotive industry?
2. What is the relationship between the barriers toward the implementation of circular economy practices for automotive industry?
3. What are the most significant barriers that impede the implementation of circular economy practices for the automotive industry?

1.7 Scope and Limitations of Study

The research is about the barriers to the implementation of circular economy practices experienced by automotive industry. The scope of this study comprises the circular economy practices experienced by automotive industry. This research will be conducted in Malaysia and adopt a survey method by distributing questionnaire only. This study view Malaysia from the aspect of potential development and being aligned with the new demand requiring sustainability.

However, there are several limitations in this study. The limited sample size, $n=19$ probably cannot achieve the generalisability of the research. Lastly, the lack of study on circular economy or remanufacturing in Malaysia has slowed the growth of the circular economy and resulted in a lack of research base for circular economy studies in Malaysia.

1.8 Significance of Study

From research perspective, this study is expected to be significant in terms of barriers that impede the implementation of circular economy for automotive industry in Malaysia and to encourage more circular economy studies to be conducted specified in automotives. Besides, this study will bring benefits to automotive and parts manufacturers to act as a reference for them to have a deeper level of understanding about potential of circular economy in Malaysia.

1.9 Summary

The chapter's overview of the research project is presented here. The researcher has provided a brief overview of the study's context, a clearly stated problem statement, the study's stated goals, and the questions that will be explored. It is from this problem definition that the research aims, and questions are derived. In addition, the researcher has outlined the study's limitations and scope. Finally, the importance of the study is described by outlining the study's objectives and the benefits that have resulted from it.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Because of the expanding population, a rising economic structure, and a more complex way of life of humans, the exploitation of natural resources has increased in order to meet the increasing demand. As a result, businesses face several operational issues. The shortage of resources is resulting in higher input costs, and as a result, the product is considerably less viable within the market. Most manufacturing organisations continue to operate under the classic linear economy paradigm, in which traditional procedures of material reuse and recycling are inefficient and waste precious resources (**P. Kumar and colleagues, 2020**)

2.2 Recycling of End-of-Vehicle (ELVs)

End-of-life vehicles (ELVs) are vehicles that have reached the end of its lifespan and can no longer be used (Harun et al., 2021). ELVs are classified into two types based on their occurrence: natural and unnatural. In the case of a natural event, that is a vehicle which has met the end of its useful life once it has been wrecked or that could no longer work effectively. This occurs after the vehicle has already been in operation for at least ten (10) years. That is a vehicle that could no longer be utilised as a consequence of physical damage due to an accident, arson, or vandalism. There are further vehicles that cannot be used due to economic concerns, such as car owners neglecting to renew vehicle tax, expensive maintenance costs, or a market shortage of replacement parts. (Raja Mamat et al., 2016).

Table 2.2: For the period 2010 to YTD March 2022, a summary of passenger and commercial vehicles produced and built in Malaysia is provided.

Source: Malaysian Automotive Association (MAA)

YEAR	TOTAL VEHICLES
2010	567,715
2011	533,515
2012	569,620
2013	601,407
2014	596,418
2015	614,664
2016	545,253
2017	499,639
2018	564,791
2019	571,632
2020	485,186
2021	481,651
YTD March 2022	154,160

Malaysia's fast population expansion and industrialization have boosted garbage generation, which has become a serious threat to the environment (Wong, Al-Obaidi, & Mahyuddin, 2018). Malaysia, as an automotive production country, has taken various steps to guarantee proper ELV handling. In 2009, the government enacted the "Vehicle Lifespan Policy" in response to the high average lifespan of cars and the low rate of auto disposal. Therefore, the first step toward full ELV adoption is to demand an annual inspection as a prerequisite for vehicle tax renewal for all fifteen (15) year old or older cars (MITI 2009). However, the execution of the law was met with intense public condemnation. Then it was established that policy was implemented without sufficient monitoring (Azmi et al., 2013).

On February 16, 2014, the Malaysia Automotive Institute (MAI) and the Ministry of International Trade and Sector (MITI) released six roadmaps for the growth of the local automotive industry, one of which is the Malaysia Automotive Remanufacturing Roadmap (MARR). Nonetheless, there are significant challenges in Malaysia's remanufacturing businesses. (Ngu, Lee, Bin Osman, 2020)

The majority of buyers in Malaysia have incorrect assumptions and misunderstandings regarding remanufactured items and the remanufacturing process. The quality of refurbished items had been misconstrued as being comparable to old or repaired products. This situation is owing to Malaysia's unclear, confused, and incomplete definition of remanufacturing (Govindan, Jimenez Parra, Rubio, Vicente Molina, 2019; Singhal, Jena, Tripathy, 2019).

Even though MITI have already established a broadly accepted as well as comprehensive definition of the remanufacturing cycle under the "National Remanufacturing Policy" by the end of 2019, MITI Malaysia had described the remanufacturing process as "the remanufacturing process is in compliance with appropriate technical requirements, including engineering, quality, and testing requirements established by OEM" (MITI Malaysia, 2019). However, because modern cars have complex embedded systems and electronic control unit (ECU) systems, remanufacturers in Malaysia are having trouble gaining access to specific technological data, performance standards, toolkits, examination, and machineries created by Original Equipment Manufacturer (OEM). This is because specialised tools

and diagnostics systems are both costly and hard to procure in the market. (Steinhilper and Brent, 2003).

Furthermore, most OEMs are always afraid to disclose their resources with remanufacturers since they see remanufacturers as a possible rival. Local manufacturers are also concerned that the widespread availability of remanufactured items may reduce the sales volume of newly made items (Ijomah & Childe, 2007).

As according to Sharma, Garg, Sharma P.B. (2016), remanufacturing is a labour-intensive business, with labour costs accounting for 34% to 45% of overall remanufacturing costs. Malaysia is highly competitive in comparison to other industrialised countries owing to the accessibility of a steady, well-educated personnel with a low median income. Malaysian remanufacturers, on the other hand, are having problems finding highly experienced technicians and engineering management specialists in industry 4.0 practise (Choudhary and Singh, 2011).

Furthermore, the bulk of Malaysian remanufacturers are small and medium-sized standalone remanufacturers (Andrew-Munot et al., 2015). In comparison to huge OEM remanufacturers, these unrestrained reproducers offer the advantages of flexibility, quick responsiveness to client requests, and a quick and easy judgement chain due to their basic organisational processes and procedures (Abe and Proksch, 2017; Chang & Cheng, 2019; Ian Burke & Jarratt, 2004; Terziovski, 2010; Williamson, Lynch-Wood, Ramsay, 2006).

However, unrestrained Malaysian manufacturers confront a lack of readily available finance and R&D resources (R&D). They also lack remanufacturer business organisations or sector engagement to help them build partnerships with reproducers and OEMs, federal agencies, consumers, vendors, and other stakeholders. (Ijomah & Childe, 2007).