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Barriers That Impede the Implementation of Circular Economy Practices for the Automotive Industry: The Conceptual Framework

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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 allows for the optimization of the manufacturing process by developing sustainable products that retain as much of their value as feasible. This study focuses on the constraints that obstruct the application of circular economy practices in the Malaysian automobile industry. Slight 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 among the barriers that impede the implementation of CE for automotive industry in Malaysia. Expected result will suggest the most significant variable influencing barriers to the implementation of CE practices. Researchers might use the proposed new conceptual framework to conduct future research or add more variables to the study.

1. INTRODUCTION

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

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, it includes three essences that are natural systems, utilization clean energy source and rejoice diversity. 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.

Industrial ecologists adopt a holistic approach by modeling production processes after biological systems. Initially, they assess the global impact of human activities, then focus on local ecological boundaries. The objective is to foster closed-loop systems that minimize waste by using byproducts as inputs, reflecting the field's multidisciplinary essence—often regarded as the science of sustainability. This approach not only recovers natural capital but also enhances social well-being, extending its principles to the service sector.

In 2019, Malaysia introduced the "Malaysian Circular Economy Roadmap for Plastics" as part of its broader 2018-2030 initiative aimed at phasing out single-use plastics. Articulated by Dr. Ong Kian Ming, the Deputy Minister of International Trade and Industry, this roadmap delineates a strategy for engaging policymakers and stakeholders, including local governments, to embrace sustainability. Dr. Ong emphasized the government's commitment to harnessing the substantial potential of a circular economy and enhancing recycling efforts. He also highlighted the necessity for a robust, efficient, and modern waste management system to support the country’s environmental objectives.

The Malaysian Investment Development Authority (MIDA) in 2021 described the circular economy as still in its nascent stages. MIDA encourages manufacturers to rethink business models to ensure that all products are designed to be easily recyclable, repurposed, or reused, utilizing sustainable raw materials sources. This involves designing components that can be effortlessly disassembled, reassembled, and retrofitted, aiming for zero waste and pollution. The principles of

maximizing product and material lifespan, alongside restoring and preserving ecological systems, are fundamental to the circular economy framework.

There were several studies have examined the drivers, practices, and barriers toward circular economy in terms of supply chain perspective [1], the benefits, opportunities, and barriers of circular economy in the manufacturing sector [2], breaking circular economy barriers and the drivers and barriers to circular economy implementation in Pakistan's automobile industry [3]. 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.

The surging COVID-19 infection rate and lockdowns in Southeast Asia are worsening. 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.

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. 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.

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 issues 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.

Furthermore, the pandemic has highlighted the importance of sustainable practices in the automotive industry. As consumer behavior shifts towards environmentally friendly products, there is an increasing focus on electric vehicles and sustainable manufacturing processes. This shift presents an opportunity for the automotive industry in Malaysia to integrate circular economy practices into its operations, creating a more resilient and sustainable business model for the future. The Malaysian government's response to the pandemic has also influenced the circular economy in the automotive industry. Policies and initiatives aimed at promoting sustainable practices and reducing environmental impact have gained traction, signaling a potential shift towards a more circular approach within the industry [4].

Therefore, the aim of this study is to examine the barriers in implementing circular economy practices for the automotive industry by identifying and evaluating the relationship between barriers to CE practices and the automotive industry is chosen as a sample.

ELVs are vehicles that have reached the end of its lifespan and can no longer be used [5]. 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 utilized 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 [6] (Table 1).

Table 1. Passenger and commercial vehicles produced and built in Malaysia is provided

Year	Total Vehicle
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

Source: Malaysian Automotive Association (MAA)

Malaysia's fast population expansion and industrialization have boosted garbage generation, which has become a serious threat to the environment [7]. 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.

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 [8].

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 [1].

Even though MITI has 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. 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 specialized tools and diagnostics systems are both costly and hard to procure in the market [9].

According to Choudhary and Kumar Singh [10]: 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.

1.1 Circular economy overview

The industrial system's closed-loop architecture is the core of CE: which improves resource efficiency [2]. In order to decrease the overall number of useable resources and energy input as well as waste production, CE is a theory that tries to increase the effectiveness of aid by delaying, closing, and minimizing material and energy loops. In terms of sustainability, the circular economy seems to be the most ecological post- production business model. It makes use of nature, human, cultural, and manmade resources to enhance the environmental, social, and economic variables that contribute to sustainable.

Circular economy in Malaysia seems to be an ambiguous long-term goal due to weak legislative framework, however, there have been widespread practices of greener production at company levels in Malaysia. In Malaysia, the legislative framework for waste control in terms of the circular economy, which includes the Solid Waste Management (SWM) Act, is still in its infancy, having been introduced in 2007.

Brunei, Cambodia, Indonesia, the Lao People's Democratic Republic (Lao PDR): Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam comprise the Association of Southeast Asian Nations (ASEAN). ASEAN is already a manufacturing powerhouse, accounting for about 5% of global production in terms of value-added, with leading positions in industries such as autos, semiconductors, chemicals, fabrics, foodservice, and metal supplies.

The idea of CE is frequently ambiguous and varies based on practitioner, field, and geographical region as well as cultural, social, and political context. For example, in industrialized countries such as the United States, the United Kingdom, and the European Union, the CE idea focuses on the 3Rs, which are reduce, reuse, and recycle of resources, waste management, and promoting sustainable development for ecological sustainability [11]. While wealthy Asian countries such as South Korea and Japan focus mostly on creating public knowledge about consumer responsibility for material usage and China, on the other hand, embraced the CE idea to encourage urban development and attain a balanced economic growth of development in both the rural and urban areas. The CE push in China is heavily focused on the replacement of traditional industrial culture with revolutionary technology and processes that considerably boost production efficiency and profitability [9].

The decision to pursue a circular economy concept shows that the firm has begun to focus on environmental management and product lifecycle issues and may differentiate traditional supply chain operations from greener closed-loop supply chains. Closed-loop supply chains emerged as a result of the application of contemporary industry standards specializing in sustainability or eco-performance issues. This is expected to work with suppliers to reduce the negative consequences of processes and products.

2. LITERATURE REVIEW

The automotive industry in Malaysia plays a crucial role in the country's economy, contributing significantly to employment and GDP growth. However, it also faces unique challenges and opportunities when it comes to implementing circular economy practices. While there is limited research specifically focusing on the impact of circular economy practices on the automotive industry in Malaysia, some insights can be drawn from broader studies on the automotive industry and the circular economy. One aspect where the automotive industry in Malaysia uniquely contributes to the circular economy is through the promotion of electric vehicles. These vehicles have the potential to reduce carbon emissions and decrease reliance on fossil fuels, thus aligning with the principles of a circular economy. Additionally, the automotive industry in Malaysia can benefit from circular economy practices through the implementation of sustainable manufacturing processes. By integrating circular economy principles such as reuse, remanufacture, and recycle into their production processes, automotive manufacturers in Malaysia can decrease waste generation and maximize the utilization of resources, leading to more efficient and sustainable operations.

A shift to the CE method or any other business model for economic sustainability demands a significant shift for the entire organization, along with all stakeholders. This transition is truly largely unpredictable since the present mode of operation may be altered as a result of the new solution provided by the CE model. Because the CE model necessitates the collaboration of suppliers and manufacturers, supply networks are critical to its implementation. Coordination and cooperation across the supply chain are crucial, as upstream partners secure sustainable inputs while downstream stakeholders collaborate on environmental management strategies such as returned items, reuse, and recycling. Due to a variety of constraints, businesses are unwilling to move forward with the circular economy [12].

Manufacturing industries are defined as those that use sophisticated machinery and digital instruments to enhance their production. These businesses include the construction, automotive, defence and weapons industries, energy (electrical and petroleum): computer, and aerospace sectors. In these areas, large machine, raw metals, computerised and intricate industrial devices, drills and cranes, and certain other haulage equipment and appliances are employed (GSI, 2018). It is vital for these businesses to have a secure method of converting or disposing of hazardous metal and electrical waste.

The manufacturing industry is an economic cornerstone that is critical to long- term economic growth, but it is constrained by tradition, making change difficult and expensive [13]. Furthermore, Consumers desire value co-creation, connection, and long-term operations, which is blurring the barrier among both manufacturing and service industries. The CE is more advanced than the linear model, which provides barriers to transitioning to CE [14].

A transition to the CE model or any business strategy for

financial sustainability involves a significant shift for the entire company, including all stakeholders. This shift is rather uncertain because the existing mode of operation will change as a result of current CE model solution [15].

A comprehensive review, which is a systematic technique of acquiring available material, was employed. According to their findings, the vast bulk of published circular economy research consists of reviewed literature, reports, research papers, and conceptual frameworks. The majority of works focused on China as opposed to other geographical settings. As a consequence of their expanding population, the fast loss of non - renewable sources, and the nation's societal issues [16]. China is unquestionably more devoted to adopting the circular economy. A multi-perspective framework has been designed to offer the most comprehensive picture and to explain how various drivers, barriers, and practises influence each other in terms of stakeholders. Suppliers, organisations, and consumers comprise the internal environment, while the government and others comprise the external environment [17].

The biggest hurdles of using CE principles in the Pakistan automotive business, according to Agyemang et al. [3] are "unawareness," "cost and financial constraint," and "lack of competency." The drivers and potential barriers therefore provide basis for automotive sector company management and other stakeholders in Pakistan to formulate policies and strategies to address hurdles that impede CE implementation, as well as to publicise and facilitate successful enterprise implementation and transition to CE systems.

This holistic paradigm offers a valuable conceptual foundation for future research, especially in emerging economies. Internal and external constraints at the micro-level have been recognized as significant barriers to Circular Economy (CE) adoption [18]. Drawing on these insights, Table 2 presents a framework outlining the constraints to CE adoption within Pakistan's automotive sector.

Table 2. List of the potential barriers [3]

No.	Internal Barriers
1	Lack of expertise
2	Unaware/none
3	Top management/Resistance to change
4	Cost and financial constraint
5	Lack of technical and technological capacity
6	The learning process and associated risk
7	Lack of resource
8	Profit and market demand level
9	Feasibility of CE implementation
10	Quality of finished product
11	Unused material
	External Barriers
1	Government policies
2	Lack of industrial support
3	Lack of supply chain integration and effects of supply chain complexity

2.1 Governmental perspective

Municipal governments, on the other hand, should collect trustworthy data on the state of the circular economy in their provinces, which should subsequently be provided to national governments for planning purposes. Such mechanisms or cooperation of national and provincial governments do not exist at the moment. This frustrates local government policymakers since they have no notion what needs to be fixed or what goals they should pursue. Because there are differences between prosperous and poor regions, instead of relying on national measures, the government should develop local metrics for each region.

Furthermore, developed nations (EU) generally outsource their goods to low- wage and emerging economies, leading in waste production. As a result, regulating the whole supply chain, including second and third-tier suppliers, is crucial.

Government policies have a significant effect on how firms plan for the future. The majority of locations have disparate regulatory regimes. The government's and local governments' responsibilities in adopting CE are unclear. Several studies have found that this convoluted arrangement leads to poor local government accountability and the adoption of inefficient laws [19-21]. As a result, the necessary CE legislation and regulations cannot be adopted. Enterprises struggle to implement CE due to disconnected systems and, as a result, a lack of legislative backing.

As a result, businesses choose to remain with their present strategy rather than take chances, restricting CE's growth. In addition, several authorities lack a full understanding of CE procedures [19, 21, 22]. They are not able to take the lead, guide firms, or implement suitable legal guidelines due to the fact they are ignorant of the advantages of CE. They can't articulate a solid vision, targets, aims, goals, or measurements [23]. The lack of technical expertise of CE among policymakers also impedes the implementation of standard efficiency assessment, collection of data, computation, submission, and punishment procedures [21]. In addition, taxes that are levied by the government serve as a deterrent. Due to the high expense of CE in most places, existing tax regulations prevent businesses from utilizing it [19, 20, 22].

2.2 Economic perspective

CE is an expensive process that involves a significant expenditure right from the start [24]. It does not, however, repay you right away. It, on the other hand, benefits the economy in the long run. Managers who are under time constraints are less likely to engage in CE activities and are more likely to invest in other company operations [19, 24, 25].

Due to a lack of monetary support channels and government subsidies entrenched in budgeting systems from banks and governments, companies avoid implementing CE despite their willingness to do so [2, 22, 24]. With the exception of big businesses, it is an expensive practice that they cannot afford.

Government aid is essential to convert the traditional sequential economic model into a closed-loop system, and governments must provide a favorable environment for CE implementation. In order to guarantee a regular supply of materials and satisfy customer expectations, CE also needs collaborative business models. Due to a lack of reliable information [22, 26] as well as the significant costs associated with the development of eco-industrial chains, companies are unable to develop a faster feedback mechanism to adapt themselves [24]. As a result, they will engage in improper behavior, lowering their revenues. Furthermore, the high costs and uncertainties associated with CE may have an impact on a company's profitability. Companies avoid remanufacturing methods because of all these ambiguities, which raise questions about their long-term survival and profitability [27].

Furthermore, issues in financing CE business strategies, initial investment outlay expenses, and low raw material costs are also economic barriers to CE adoption. Market

accessibility is hampered by two factors. There is a deficiency in the pricing system for product recovery, which is most obvious in the market for recycled products. This market fails owing to the combined effects of difficulties such as fluctuating supply, fluctuating standards of quality, and a lack of economic incentives [27].

It's also possible that an organization has a certain aim in mind and isn't allowed or has no motivation to expand out. Because of the consumer perception of recycled materials, switching to CE processes would not result in a price-performance ratio that is sufficiently beneficial [2]. Inexpensive raw material prices are one reason for low potential advantages, as well as evidence of poorly integrated externalities, as described in the literature [28]. Lock-in effects in linear economy infrastructure, in addition to the fact that externalities are not internalized by taxation or government subsidies, result in lower apparent raw material prices [29].

The availability of raw materials reacts relatively fast to price fluctuations than supply of recyclable resources since coal plants may operate when resource prices rise. The supply of recycled materials is inelastic since it is dependent on prior consumption trends. As a result, recycled material prices fluctuate more, creating uncertainty [30]. Uncertainty inhibits motivation to put the money in recyclable materials markets, and replacement to recycled material markets stays low.

High initial investment costs were also commonly cited as the most major constraints [29]. Any significant change in a society needs switching costs, which might vary. Attempting to renegotiate contracts, altering technology to accept new inputs, and investing significant development expenses for product creation are just a few examples. According to Rizos et al. [31], centre for European Policy Studies (Brussels, Belgium): insufficient evidence of benefits magnifies the difficulty of securing capital for SMEs.

2.3 Social and cultural perspective

A resistive corporate tradition, an absence of awareness among consumers, and a lack of coordination throughout the supply chain might all be barriers to CE adoption. Managerial opposition, CE initiatives separated from key operations, and low engagement in management planning are all signs of a CE resistant organisational culture. Changes in the direction of CE were resisted by top and intermediate management because they would conflict with their incentive structures [32]. While CE initiatives may occur inside a larger organisation observed that not all divisions are aware of the benefits. Some firms claim that a CE is not now part of their innovation strategy, and that they lack precise CE objectives, indicating a lack of strategic participation.

Singh and Giacosa [33] developed a paradigm to explain low consumer knowledge and interest in CEs, indicating that psychological ownership of products, dominating status-quo bias, and a consumerist lifestyle to satisfy desires and status were all key contributors to negative attitudes about CEs. CE was a minor issue in customers' judgement process, according to Rizos et al. [31], and many cited a lack of awareness of the concept's relevance as well as the circularity of their previous purchases.

Industrial symbiosis and the exchange of by-products are hampered by the confidentiality of production techniques and quantities [29]. Collaboration all through the supply chain is seen as intrusive in business models, is not economically productive, and has impeded the supply chain's competitiveness [3].

Furthermore, there is still an evident customer resistance to purchasing things [34, 35]. Consumers have a prevalent misconception that remanufactured items are of poorer quality than their newly made counterparts [34]. The reduced pricing of second-hand items has long been connected with compensating for their perceived inferior quality and consequently encouraging the market's need for remanufactured goods [13]. Consumers' lack of product understanding may be one of the challenges to the circular economy's mainstream adoption. This is due to the fact that a consumer's brand awareness effects their assessment criteria for a particular product which in turn determines their purchase behaviour. According to Matsumoto et al. [36], 80% of US customers have heard of remanufactured car parts, however only 20% of Japanese consumers have heard of the term "remanufactured auto parts." A prior research by Hazen et al. [35] discovered a relationship between customers' "tolerance for ambiguity," or the amount of tolerance when there is a complete lack of information regarding remanufacturing, and their readiness to pay for a product, indicating that understanding about the product or process leads to increased buy intention of a product.

Milios and Matsumoto [37] discovered that 58.6 percent of respondents had never heard of remanufactured car parts, and an even greater percentage of the sample (76.4 percent) had never purchased remanufactured auto parts for personal use. Furthermore, as compared to the experience of Japanese drivers, who seldom engage in such operations, the personal participation of the respondents with replacing damaged auto parts with identical remanufactured parts is very low (14.8 percent). This is because automotive parts are often updated in Japan during obligatory inspections, generally before a problem arise.

2.4 Proposed conceptual framework

According to Pomponi and Moncaster [26], based on Six Pillars's framework, it is best to integrate the use of several fields in order to successfully achieve the aims of overall sustainability studies. According to their framework, the peripheral arrowed arcs stand for the necessity of a comprehensive strategy and a coordinated collaboration of research activities in each of the six pillars (refer to Figure 1). Second, the inner dashed lines emphasise how crucial it is to have real-world connections between each pillar and the others. The framework also provides for sub-groups of two, three, four, and five dimensions because not all research dimensions may be required in some circumstances. The impact of basic innovation may be just as significant as that of forward-thinking state policy, therefore top-down and bottom-up initiatives are viewed equally.

Figure 1. Six pillars framework [26]

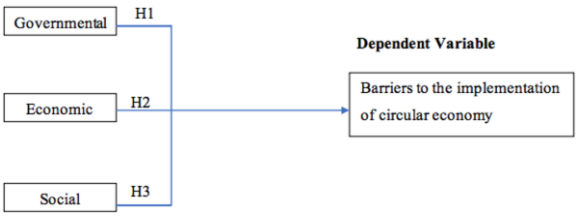

Figure 2. Proposed conceptual framework

In this study, the suggested conceptual framework is to depict a diagram of the constructs and variables, as well as the interrelationships between variables (Figure 2). Government, economic, and social factors comprise the independent variable. The link between independent and dependent variables is depicted in the framework below.

Based on the conceptual framework proposed, the hypotheses that are developed for this research are shown below.

H1: There is a significant relationship between governmental barrier and the implementation of CE for automotive industry.

H2: There is a significant relationship between economic barrier and the implementation of CE for automotive industry.

H3: There is a significant relationship between social barrier and the implementation of CE for automotive industry.

3. METHODOLOGY

The research design in this study is explanatory studies. Explanatory studies are being used to gather information on the impediments to the implementation of the circular economy in Malaysia's automobile industry.

Respondents were chosen for this study to complete the questionnaire. The survey questionnaire was standardized and included various questions about the hurdles to the implementation of the circular economy in Malaysia's automobile industry. The questions will be classified into three categories: governmental, economic, and societal impediments. The questionnaire will allow respondents to react using a Likert Scale, which shows their degree of agreement or disagreement.

Multiple regression is a statistical technique that uses ANOVA to anticipate the relationship between a given dependent variable and a set of independent variables. The correlation between one continuous dependent variable and two or more independent variables is explained by multiple regression analysis. The regression analysis in this study focused on three independent variables: governmental, economic, and social barriers. The regression equation is created to demonstrate how the independent variables fit together and to investigate the relative influence of each determinant of total variance. The multiple regression equation is as follows:

$$Y = a + bX_1 + cX_2 + dX_3 + e$$

Y = dependent variable (the barriers that impede the implementation of circular economy)

a = constant/intercept

b = Influence of X_1 (governmental)

c = Influence of X_2 (economic)

Quantitative research only uses a single data collection technique to conduct the research. The study collected data from both primary and secondary sources. The survey method of distribution of questionnaires is utilized to perform the research. Pilot tests, Cronbach's alpha, reliability analysis, Pearson's correlation coefficient, multiple regression analysis, and SPSS are being used in analysis of data to meet research objectives and analyze study results.

4. RESULT AND DISCUSSION

Through a review of the literature, analysis of Pearson's correlation coefficients, and testing of the relationship between the independent factors (governmental, economic, and social) impacting barriers to the implementation of CE, the researcher was able to complete the study's objectives. In summary, governmental, economic, and social barriers influence the barriers to CE implementation and governmental barrier is the most significant barrier that can impede the implementation of CE practices.

The critical barriers that can impede the implementation of CE practices is crucial to have in depth understanding on barriers for automotive industry and automotive and parts manufacturer to gain insights potential of CE in Malaysia. For consumers, they can increase awareness of their own by having a good understanding about the potential of CE so that this will create a new culture of mindset and perception towards remanufactured products. As Malaysia's fast population expansion and industrialization have boosted garbage generation, which has become a serious threat to the environment [7]. Malaysian government enacted few policies in response to the high average of lifespan of cars and the low rate of auto disposal.

5. CONCLUSION

For future research, the researcher proposed a new conceptual framework as this study only consists of three independent variables (governmental, economic, and social). It was the researcher's opinion, however, that other, equally weighty elements can play a role in shaping the obstacles that prevent CE practices from being put into reality. It's also worth noting that people's lack of knowledge stands as a significant roadblock to CE's widespread adoption in the automotive sector. The most common obstacle to CE in the automotive industry is a lack of awareness, which might be investigated in future studies. In order to generalize the results, future researchers can simply increase the sample size of the study. Based on the study of Milios and Matsumoto [36], Individuals' perceptions towards refurbished goods are a significant roadblock to the widespread adoption of CE procedures. In Swedish municipalities found that selection bias and user preferences of the procurement officers occur frequently during the drafting of tender specifications [2]. This is consistent with findings from studies by Mabgla [32] that indicate procurement officials have personal preferences that are reflected in the methods they use to make purchases. The researcher constructs a new research framework for future research as below.

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