

# Circular Economy Framework in Recycling Company: Exploratory Study

Dede Iskandar Siregar\*

*Department of Management*

*Universitas Muhammadiyah Riau,  
Pekanbaru, Indonesia*

\*dedeiskandarsiregar@umri.ac.id

Hichmaed Tachta hinggo S

*Department of Management*

*Universitas Muhammadiyah Riau,  
Pekanbaru, Indonesia*

hinggo@umri.ac.id

Hammam Zaki

*Department of Management*

*Universitas Muhammadiyah Riau,  
Pekanbaru, Indonesia*

hammadzaki@umri.ac.id

**Abstract**—The Business transformation from traditional (take, make, use, and dispose) to a circular economy model has become a global discussion. This is due to an increase in various parties such as government institutions, scholars and business sectors towards environmentally friendly business practices. Recently, research that has been discussing circular economy is dominated by benefits and challenges as the focus of the investigation, so how to design a business based on circular economy principles is difficult to understand. This study aims to analyze how the circular economy is applied to companies. By using case studies from two recycling companies, this research confirms several strategies adopted by the company in the circular economy transition process. This finding broadens our understanding of how to conduct business transformation based on the circular economy. The results of this study, however, are not a static framework, so further research is very possible.

**Keywords:** *Circular economy, design, implementation, reverse logistics, recycling company*

## I. INTRODUCTION

The business transformation from the traditional model, linear economy, to the circular economy in the last few decades has become a global debated. This is due to a significant increase in attention from the government [1], NGOs [2,3] and scholars [4,5,6] towards environmentally friendly manufacturing policies. In supporting environmentally friendly business practices, the Ellen MacArthur Foundation [7] suggests that companies consider the circular economy model for their operational systems. The adoption of this model could help reducing material costs and increase the availability of raw materials.

As a new model in doing business, the circular economy was first introduced by Boulding [8], followed by Stahel [9,10] then Blomsma and Brennan [11]. This approach is believed to be able to realize economic resilience without neglecting environmental welfare due to the excessive use of raw materials by companies. However, the presence of a circular economy has brought a paradigm shift in doing business based on traditional approaches that dominate the industrial world. The traditional economic model is proven to have failed to realize economic and environmental welfare because the adoption of the model is done with the principle of take, make, uses, and dispose [12]. In other words, companies in carrying out their business activities only take resources from nature, process them into products,

use the product, and dispose in the form of waste. This approach is not in favor of the long-term goals [13] and endangers the environment due to the waste generated by the company. This is different from the circular economy that utilizes waste as a raw material in creating products so that business activities are ensured in favor of the environment [6] and the efficiency of using raw materials can be maximized.

Many studies have investigated the implementation of the circular economy in companies, but mostly emphasize the benefits of applying these principles to long term sustainability [14,15]. Others also review the potential competitiveness of companies that implementing the model [16,17,18]). To date, there is a lack of research that investigated how this principle implemented in the company. The implementation of the circular economy is dependent on design thinking, a business paradigm shift from take, make, use, and dispose of circular [19]. Design thinking also aims to help industry players to see the business value added gained from applying the circular economy model [19].

The implementation of the circular economy principle is carried out through the use of used materials as raw materials in producing products. Therefore, in addition to design thinking, the adoption of the circular economy can be done when the company is supported by a reverse logistics system [20,21]. Reverse logistics is a process of transferring used material from the customer to the company to be reused as raw material for producing or recycling products. A previous study by Bernon et al [21] in studying reverse logistics found that there were economic and ecological benefits to the company, and this finding confirmed by Cespón's [22]. Cespón's research was carried out by prioritizing quantitative methods which aimed to test the theory and this made the reverse logistic understanding difficult to explain.

Although the attention to the circular economy significantly increased, this is not followed by a better implementation. The lack of references that support the application of the model [23] especially in developing countries that have limited resources and technological support are part of the reasons. The lack of awareness of environmentally friendly business practices in developing countries compared to developed countries also makes adoption of the circular economy less desirable. This study aims to analyze how companies, especially recycling, design

businesses based on the circular economy. To this reason, the article conducted a case study approach from a recycling company. The selection of cases is considered the most appropriate considering that research on this topic is relatively scared.

This article consists of five parts. The next section will explain the methods and case descriptions used to answer the research questions. The third part is a description of the case study findings and the explanation of the arguments underlying the emergence patterns in each case. The conclusions are explained in the fourth section, followed by limitations and future research suggestions in the last section.

## II. METHODOLOGY

This research is an exploration that aims to analyze the design of the circular economy in the company. To answer research questions, a case study approach was carried out [24]. The sample of this research is the recycling company which in its operations has implemented the principles of reducing, reuse, and recycle so that it is considered under the topic under study.

The data collection process was carried out with several stages including desk research, semi-structured interviews, company visits, and document analysis. The first stage was carried out through the search for publicly available company information, which aims to find the general information of the company. The second data collection method was direct interviews with directors and employees to gather information on the implementation of the circular economy in the company. Next, the document study aims to increase research reliability through source triangulation [26,27].

As a scientific process, qualitative research data analysis is different from quantitative research. Qualitative research data analysis techniques are the core of case study research and are the most difficult stage to be done. But even so, some researchers [26,25,27] mentioned the stages that can be used to ensure that qualitative research data can be structured so that it is more argumentative and objective as shown in figure 1.

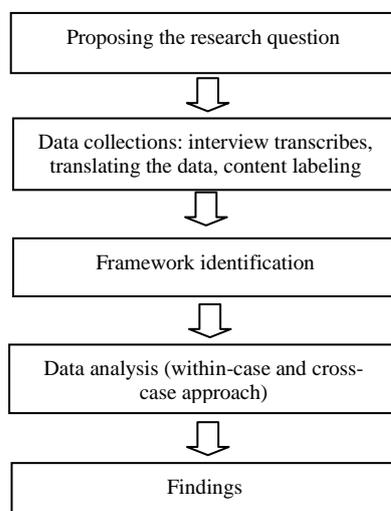


Fig 1. The Process of qualitative research based on case study

## III. RESULTS AND DISCUSSION

This study uses two recycling companies as a research sample. The first company is engaged in processing household waste into handicraft products that are managed by the social community in cooperation with the government. The second case is a family-owned company whose business activities are to recycle used oil for reuse as industrial raw material. General information on further case studies is explained in the following subsections.

### Company 1: Recycling household waste

The first case came from a household waste recycling company located in the city of Pekanbaru, Indonesia. This company is a group of SMEs managed by the community in collaboration with the local government, the Environment Agency. The raw material used to make products comes from waste plastic, paper and used cans with a production capacity of 2 tons every month.

Since its establishment in 2017, the company aims to empower communities, especially housewives, through the use of household waste as handicraft products that have a sale value. In carrying out its operations, the company is assisted by 27 employees with varied expertise. The work environment seems far from formal and employees can freely develop their creativity in making and developing product models.

The company's customers consist of government agencies, private companies, and individual customers. To fulfill product orders with certain models, the company applies a made-to-order system. The company also applies a made-to-stock production method to ensure product availability at the company.

### Company 2: Refining used oil

The second case was taken from a used oil waste treatment company in Pekanbaru. The company has started business activities since 2011, and the customers are manufacturing refined oil users. In carrying out its business, the company is assisted by 32 different employees to refine used oil. As an oil refining company, this company has received a license from the Ministry of Environment as the caretaker of hazardous and toxic materials to be used as industrial raw materials. In this company, production capacity can reach one ton every month and at certain times the production can be increased. When the raw material in the form of used oil exceeds the capacity, the oil management will be handed over to other similar companies so that the production process can still be carried out.

### Discussion on the circular economy framework

This section will discuss circular economy strategies that are applied in each case based on findings in the field. The circular economy strategy referred to here consists of a business design model and a logistics system. These two components serve as the unit of analysis to find the circular economy model applied by the company.

### Designing extending resource value

Circular economy design is quite complex and requires the transformation of thought from traditional systems,

linear economy, to circular models. The circular design aims to find the best solution in carrying out business activities without prejudice to environmental safety [27]. For this reason, circular design is can be done by maintaining the loss of value of a product or material by making it useful again. In other words, the principle of the circular economy is carried out by making every output to be returned as input for other remanufacturing processes.

In designing the circular business model, Ellen MacArthur Foundation [28] explained that companies must be equipped with information, skills, and work methods that can support the transformation of the circular economy. The selection of used materials, component standards, the model of design, sorting systems and material reuse must also be ensured. Case study findings in the first company indicate that the design of the circular economy is implemented through the use of waste paper, plastic and used cans into handicraft products. In this company, the material selection begins with creating a waste bank at several collection points. The manager of the waste bank is handed over to the community and they should carry out the initial sorting of the material before being transported to the company for further sorting in the company internal.

The process of collecting raw materials in the second case company does not have a significant difference from the first case study. As the refining company, materials in the form of used oil are obtained from car and motorcycle workshops around the city of Pekanbaru. This is done by placing the drum container in the workshops that are the company's partners. The workshop owner is in charge of collecting used oil that is produced from the workshop's activities into containers that have been provided by the company. The sorting process in this company is different from the first case. In the first case, the sorting is carried out in a shelter by the manager of the waste bank and internally within the company, but in the second company, it is only done internally by placing the used oil in the storage location to separate oil and water content. After that, the oil is then put into a special room for the sterilization and cleaning process so that it can be used safely again.

Findings from the two case studies companies indicated that the activity of extending the product life cycle is done in different ways. The circular economy design in the first case is implemented by utilizing used products as materials for making new products, handicraft products, while in the second company it is done by recycling and refining. Both findings, however, are aimed to extend the product life cycle through a circular economy approach [29].

#### *Building a reverse logistics system*

Business activity related to product usage, utilization and recovery cannot be separated from the reverse logistics system. This system is a process of returning used materials that have been used by customers to producers to be used as raw materials so that the economic value can be extended [30]. For manufacturing companies, the reverse logistics system becomes a basic requirement that determines the success of production [31].

Practically, managing reverse logistics is complex because it has to consider many things such as ensuring the

right location to collect used products from customers, decisions on incentives to be given to managers, and the mode of transportation used to transport used products to the company. In the first case study, the reverse logistic model implemented in collaboration with several parties such as the housing community, hospital managers and educational institutions and this was realized by creating a collection bank in the form of a garbage bank around residential residents, hospitals and educational institutions. On the side, the reverse logistic model applied by the second company starts from collecting oil from car and motorcycle workshops by placing the drum as a storage container. The reverse logistic model based on the case study findings can be seen in Figure 2.

In reverse logistics system, the used material is obtained from the collection place, it will then be sent to the warehouse for sorting by the company. For the first case study, the process of sorting or sorting the material is done twice, through waste grouping based on the type of material, which is done by the manager of the waste bank and sorting by the company to ensure that the material can be used as raw material for making handicraft products. When there is a type of waste such as steel material that is not possible to be treated, this is left to the manufacturing company that recycles the type of material. Meanwhile, the process of sorting raw materials in the second company is only done internally. The complexity of used oil makes the sorting process only possible by the company and the workshop owner is only responsible for collecting oil into the containers that have been provided.



Fig 2. Reverse logistic model in the case company

Products produced by the first case study company include tissue boxes, table covers, goody bags and other types of handicrafts distributed to institutional customers and individual customers. Institutional customers include government agencies and the private sectors that have a concern for the recycling business activities of the company. The process of distributing products to institutional customers is done when they hold seminars or workshops, where the company becomes a supplier of souvenir products in these activities. For individual customers, distribution is done through direct purchases to companies.

As a used oil recycler, the second case study company customers are industrial customers, manufacturing companies. The distribution of recycled oil is done directly where the company delivers the product according to the order. Customers can also make purchases directly to the company independently according to mutual agreement.

#### IV. CONCLUSION

This research at least offers academic contributions in several respects. First, this study confirms that the implementation of the principles of the circular economy in both companies is done through an emphasis on the recycling approach. Secondly, this research nevertheless broadens insights on how recycling companies in developing countries adopt the principles of the circular economy into their operational systems.

In practice, this research can be a consideration for manufacturing industry players and the government in encouraging business practices based on a more environmentally friendly circular economy. This study, however, has limitations. The sample used only came from one economic sector, the recycling industry, and was a group of small businesses. The circular economy design does not cover the possibility that it will be different considering that each industry sector has different characteristics and challenges. Therefore, further research is strongly recommended to include samples from various industries so that broader generalizations can be made.

#### DECLARATION OF CONFLICT OF INTEREST

The author states that there is no potential to cause a conflict of interest regarding the conduct of research, writing, and publication of this article.

#### FUNDING

This research was funded by the Directorate of Research and Community Service Directorate General of Research and Technology Strengthening Ministry of Research, Technology and Higher Education Development Number: 009 / L10 / AK.04 / CONTRACT-RESEARCH / 2019

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