Prioritizing the Drivers and Barriers of Circular Economy (CE) Implementation for E-waste Management: A Case Study on Refrigerator Industries in Bangladesh

Sajib Ahmed, MD. Ibrahim, Md. Ariful Haque
Department of Industrial and Production Engineering (IPE)
Rajshahi University of Engineering and Technology
Rajshahi, Bangladesh
sajibahmed1888@gmail.com,mdibrahim.ipe17.ruet@gmail.com, arifulhaque.ruet@gmail.com

Abstract

Circular economy is a way of sharing, renting, reusing, repairing, and recycling, which is given priority while generating and consuming things from already manufactured goods. Researchers' interest in the circular economy (CE) has grown recently as a result of its advantages on both the social and environmental fronts. Electronic garbage, or "e-waste," has expanded dramatically over the past 20 years as a result of recent economic growth in Bangladesh, fast technical advancement, urbanization, growing consumer electronics demand, availability, a dropping price trend, etc. The refrigerator industry in Bangladesh is one of the major e-waste producers. For the study purpose, the refrigerator industry has been considered as the focal point. The paper aims to prioritize the potential drivers and barriers of the circular economy while implementing e-waste management in refrigerator industries in Bangladesh. A survey was conducted over a related target group of people. To accomplish this, the basic Multi-Criteria Decision Making (MCDM) method named the “Decision Making Trial and Evaluation Laboratory” (DEMATEL) technique is utilized. The study's findings show that resource efficiency and business principles are the most important motivators, whereas top management's resistance to change and a lack of public awareness are the two biggest barriers to the adoption of CE in Bangladesh's refrigerator industry.

Keywords
Circular economy, e-waste, refrigerator industries, drivers and barriers.

1. Introduction
The European Commission defines the concept of the circular economy under the EU Action Plan for the Circular Economy as follows: “In a circular economy the value of products and materials is maintained for as long as possible; waste and resource use are minimized, and resources are kept within the economy when a product has reached the end of its life, to be used again and again to create further value”. The circular economy (CE) emphasizes the use of solar, wind, biomass, and waste-derived energy throughout the product value chain and cradle-to-cradle life cycle. It also places a greater emphasis on product, component, and material reuse, remanufacturing, refurbishment, repair, cascading, and upgrading. This contrasts with traditional recycling (Agyemang et al. 2019). Since the beginning of the industry, the idea has also been put into practice because it lessens harmful environmental effects and stimulates new business opportunities (Korhonen et al. 2018). Recent projections from the European Commission suggest that the EU manufacturing sector alone might benefit annually by 600 billion euros from economic changes like the circular economy (Korhonen et al. 2018). The global economy would see annual gains of US$1000 billion (about $3,100 per person in the US) (Korhonen et al. 2018). The World Economic Forum estimates that adopting a circular economic model might result in 500,000 more jobs in the EU alone (World Economic Forum 2014:4). 100, 000 new employments might be created globally within five years of a move to the circular economy, according to the Ellen MacArthur Foundation. These positions are anticipated to become available in the recycling and remanufacturing industries (Islam 2021) recent economic expansion in Bangladesh has resulted in the emergence of a market for consumers of electrical, electronic, and domestic goods. The causes of the enormous rise in electronic trash (or "e-waste") during the past two decades have been attributed to rapid technological development, economic growth, urbanization, increased consumer electronics demand, availability, and a declining price trend. Home appliances include things like televisions, refrigerators, air conditioners, and washing machines that are used in the home. This industry is currently one of Bangladesh's

consumer electronics industry's fastest-growing categories, with a market value of BDT 20,000 crore. Due to expanding purchasing power and economic prosperity, the home appliance sector in Bangladesh has risen dramatically over the past 10 years, and as a result, sales volume has climbed significantly. Bangladesh produces over 2.7 million metric tons of e-waste per year whereas the entire world produces 20 million metric tons. Furthermore, Bangladesh is on the verge of becoming an LDC by 2027 following ten years of consistent economic growth. To accomplish this, the government will have to give up some of the markets where it currently has access to duty-free and quota-free goods. Exports will undoubtedly suffer if the nation is not fully prepared to handle this shift; in addition, the emergence of the Covid-19 epidemic adds even another level of complexity. The transition to a circular economy is the only best option available that can be used to reduce resource shortages and support Bangladesh's effort to achieve its Sustainable Development Goals (SDGs) considering these changes. The Circular Economy was ranked second among the top 10 ICT trends for development by the UK (Islam 2021).

1.1 Case Selection

The authors contend that when a particular case study is representative of the research issue, it can yield reliable results. The industries that produce refrigerators were chosen using a combination of convenient sampling and intentional sampling. The combination of context knowledge, and access to the CE policy-making elite in Bangladesh—the intended audience for the interviews—assured the selection of an exemplary instance using well-chosen criteria. Refrigerator manufacturing industries and related stakeholders were selected based on the criteria below:

- 41.3% of Bangladesh's 160 million people live in households with refrigerators, according to the Global Data Lab. Hence, a majority portion of e-waste is generated from household refrigerators which need to be recycled under the circular economy principle. So, the refrigerator-generated e-waste and manufacturing industries are major nominees to be considered for the case study.
- Refrigerator manufacturing industries do not assess their CE progress at the organizational level yet. As a result, they may offer first-hand knowledge of current implementation difficulties.
- Moreover, Bangladeshi consumers are attached to a few refrigerator brands as refrigerators normally serve a family for an average of 5-7 years. By this time, consumers do not need to switch their brands, eventually, it means those brands have a higher penetration rate on market. As a result, it is hard to enter the narrow marketplace for a new brand. To sustain or enter the narrow market, refrigerator industries can lower retail prices by reusing and recycling e-waste materials. This leads to the circular economy. So, circular economy principles are unavoidable to establish and sustain in the market.

1.2 The refrigerator manufacturing sector of Bangladesh

Since 1995, a Bangladeshi business called "Butterfly" has been selling LG home appliance items in Bangladesh under the exclusive distribution rights of the Korean corporation "LG". In 1997, Walton also entered the electronics industry. Another indigenous home appliance company in Bangladesh, My-One, began operations in 2002. A Walton Group subsidiary named Marcel joined the market in 2006, and in 2007 Walton founded Hi-Tech Industries and started producing air conditioners, refrigerators, and freezers at its production facility. Currently, the company also produces products for the house and electronics. Samsung, a South Korean electronics behemoth that produces

Figure 1. Some local and global refrigerator manufacturers in Bangladesh

LED televisions, refrigerators, air conditioners, and microwave ovens, opened two manufacturing facilities in Bangladesh in 2017 in a joint venture with Transcom Group and Fair Electronics. In 2018, LG constructed a production plant where the company's TVs, refrigerators, and air conditioners are made in a joint venture with a local partner. Some of the regional businesses that assemble and produce these goods are Walton, Rangs, Butterfly, Nova, Jamuna Electronics, Singer, Electra, and Eco +. Other international businesses include Sony, Samsung,

Panasonic, Toshiba, Phillips, and LG. Bangladesh is modernizing as more people use technology. Technology usage is a significant concern for Bangladesh. The refrigerator is a significant home appliance (Figure 1). In Bangladesh, the refrigerator market is anticipated to be worth $779 million in 2021. According to an EPB, exports of equipment and refrigerators totaled $12.263 million in value in FY 2021 *Export Promotion Bureau*. According to the Global Data Lab, 41.3% of Bangladesh's 160 million residents live in homes with refrigerators (Global Data Lab). As a result, the refrigerator market in Bangladesh is regarded as one of the largest markets. Air conditioners and refrigerators in Bangladesh meet about 65% of domestic demand, with 35% still requiring imports. Bangladesh exported machines and air conditioners worth $6.23 million in FY 2021 (Business Inspection BD 2021). By 2030, the market for televisions, refrigerators, washing machines, and other home appliances would triple in size to $10 billion (about $31 per person in the US) yearly, predicts UCB Asset Management, a new generation investment sector firm (Business Inspection BD 2021).In the present market share, a major portion (66%) is dominated by local refrigerator manufacturer giant brand WALTON, 5.7% acquired by Marcel, and the rest 28.3% occupied by other

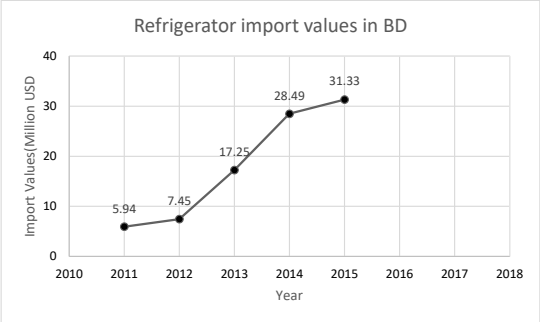

Figure 2. Refrigerator import values in Bangladesh

local and global manufacturers. The import value trend line is upward in the Bangladesh scenario where enormous growth can be seen. This indicates consumers' aggressive demand to buying refrigerators. Figure 2 represents import values selected for the study from the year 2012 to 2016.

On the other hand the export values of refrigerator in Bangladesh has gone through a huge drop in 2014 and then the trend line is upward shown in Figure 3.

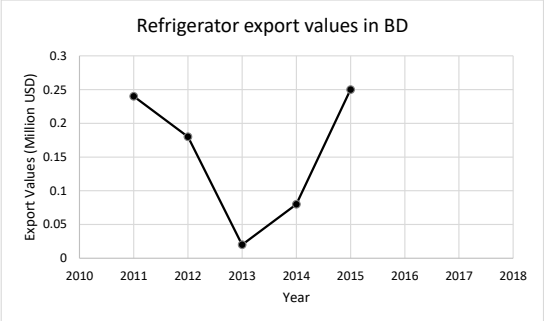

Figure 3. Refrigerator export values in Bangladesh

To conclude, the refrigerator industries are booming toward an enormous growth in Bangladesh. Traditional linear manufacturing procedure is not up to date to follow by these industries to sustain in the narrow market. Here comes the circular economy with its circular principle of reusing the materials to sustain by providing low cost refrigerator to the consumers.

1.3 Objectives

The main objectives are as follows:

1. To find out significant drivers of circular economy implementation in e-waste management in refrigerator industries of Bangladesh.

2. To find out crucial barriers to circular economy implementation in e-waste implementation in refrigerator industries of Bangladesh.

2. Literature Review

The circular economy promotes sharing, renting, reusing, repairing, refurbishing, and recycling of pre-existing resources and goods for as long as is practical. In this approach, the product's life cycle can be prolonged. The idea is centered on the product and is frequently used throughout the stages of design, production, consumption, and waste management (Zhijun and Nailing 2007). It alludes to reducing waste to the barest minimum. When a product has served its purpose no longer, its components are recycled as much as possible. These have a higher value since they can be put to effective use again. This contrasts with the classic, linear economic paradigm, which follows a take-make-consume-throw-away cycle. This strategy is based on a significant amount of low-cost, readily available materials and energy. A review has been conducted of published works relevant to this idea to determine how the circular economy, from the point of view of Bangladesh, has been studied in the academic literature within the context of industrial waste management specifically refrigerator industries. In terms of social integration, environmental damage, and economic sustainability, waste mismanagement continues to be a global issue(Hoornweg and Bhada-Tata 2012). These problems with irresponsible mismanagement, however, are widespread in many developing nations. This poses a critical issue. Issues in these areas require attention, and integrated and holistic approaches must be used (Bing et al. 2016). The lack of understanding about the implementation processes and the lack of information are two aspects that contribute to the non-adoption of CE in low and middle-income countries (Kamruzzaman and Najmus Sakib 2022). Over the years, many low- and middle-income countries have paid truly little attention to the circular economy concept. However, in recent years, experts in international development and the academic research community have started to pay attention to developing nations' use of the circular economy (Chertow and Park 2015). Bangladesh being a developing country is suitable for circular economy adoption. The ease with which a circular economy can be established within a nation is gauged by the trade dependency rate, which is the ratio of total exports and imports of goods and services to gross domestic product. The country's high trade dependency percentages indicate that a variety of industries are not based there. Because the recycling supply chain may not be located within the country, such countries may have challenges in establishing a circular economy (Arthur et al. 2022). In countries where CE adoption is already common, the practical benefits have been widely documented at the national, subnational, and local government levels as well as in economic sectors; however, CE is still a new idea in South Asian nations like Bangladesh. Because most Asian countries have been unable to adopt the notion due to a lack of understanding of how it might be applied, research efforts should be directed in this direction (Ezudu 2019). On this point, Bangladesh is compatible to welcome the circular economy principle as Bangladesh has a lower dependency rate and a vast supply chain throughout the world. Several countries throughout the world have abandoned traditional waste management procedures and legislation in favor of fully embracing CE principles (Mathews and Tan 2011). East Asian nations adopted several circular economic strategies during the 1990s, including expanded producer responsibility (ERP). Southeast Asian economies have steadily adopted circular economy ideas since 2000(Linda Arthur et al. 2022). According to the Bangladesh Environment Conservation Act of 1995, the Bangladeshi government has authorized the Hazardous Waste (e-waste) Management Rules, 2021, and it will soon be published in the official gazette. To the best of the authors' knowledge, no research has examined the industrial solid waste management system in Bangladesh to offer a CE solution. We have predicted the market size for consumer electronics items up to 2025 based on the data on a market size that is currently available from the years 2013 to 2016. (Figure 2). According to estimates, the market for consumer electronics would be worth about 6.31 billion USD by 2025.

3. Methods

Throughout the section, the research methodology and its alternatives evaluation were done based on the literature review. All the alternatives were categorized by their applications in different prospects. Finally, the best-fitted methodology was finalized and a brief description of the selected method is documented.

3.1 Research Methodology

This research paper explains the opportunities and obstacles of applying circular economy principles for electronic waste (e-waste) management in the automobile industries of Bangladesh. A survey was conducted with over 8 respondents from reputed refrigerator industries of Bangladesh. The survey data was collected and extracted to analyze by the basic Multi-Criteria Decision Making (MCDM) method named “Decision making trial and evaluation laboratory” (DEMATEL) technique. MATLAB was used for the formulation of the total matrix of the

DEMATEL model. Then drivers and barriers were categorized by evaluation and were used to rank the drivers and barriers by their strength of effects. Causes and effects from drivers and barriers were also identified by the method. Moreover, secondary data has been used from previous and similar studies for the research. Articles from national dailies have been adopted for the quotations. Recently published papers in renewed journals, economic overviews,

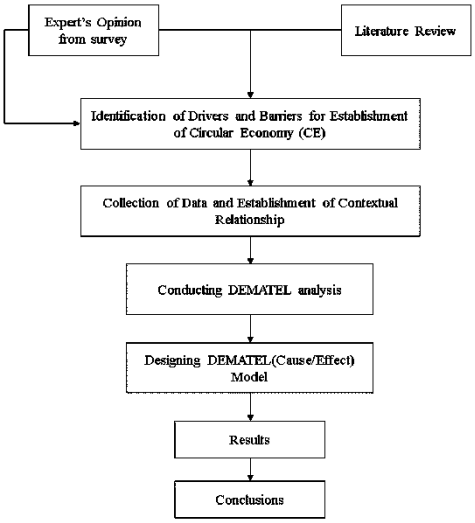

Figure 4. Research framework

newspapers, e-papers, magazines, etc. have been used to find relatable data about the progress and innovations in refrigerator industries for the adoption of circular economy principles in the e-waste recycling process. The author employed a combination of comparative and historical analysis to highlight the evolution of ethical awareness and social responsiveness of the circular economy over time. Figure 4 shows the theoretical framework of our study.

3.2 Alternatives

Researchers in CE are paying attention to multi-criteria decision-making (MCDM)-based methods. For instance, Gupta et al. employed the Best-Worst Method (BWM) to evaluate the manufacturing sector's sustainability performance considering the principles of the circular economy, sustainable cleaner production, and Industry 4.0 criteria. Measurement of Alternatives and Ranking according to the Compromise Solution (MAR- COS) based CE model was presented by Hasheminasab et al. to reduce unsustainable consequences and ensure the environmental resilience of fossil fuels(Hasheminasab et al. 2022). The adoption hurdles for the agriculture supply chain for industry 4.0 and the circular economy were identified by Kumar et al. using the ISM technique. The DEMATEL technique was used by Taghavi et al. to identify and rank the essential elements for implementing green supply chain management in the construction sector. Other MCDM methods, such as fuzzy complex proportional assessment (FCPA), multi-objective optimization based on a ratio analysis (MULTIMOORA), Technique for Ordering of Preference by Similarity to Ideal Solution (TOPSIS), data envelopment analysis (DEA), analytical hierarchy process (AHP), and Evaluation of Data based on Average Assessment method, are also available (EDAS). The table below provides a brief overview of the MCDM-related literature in CE. Table 1 contains the literature review of the methodology.

Table 1. Methodology selection based on literature review

Objectives	Industry/Field	MCDM Method
To assess sustainability performance based on concepts of CE, sustainable cleaner production	Manufacturing industry	BWM
To develop a CE model to minimize the unsustainable effects of fossil fuel	Fossil fuel	MARCOS
Objectives	Industry/Field	MCDM Method

To explore the inhibitors to circular economy practices in emerging economies	Leather industry	Grey-DEMATEL with FCPA
To identify the industry 4.0 and circular economy adoption barriers	Agriculture supply chain	ISM
Objectives	Industry/Field	MCDM Method
To identify and prioritize the effective factors for the green supply chain management	Construction industry	DEMATEL
To impede the challenges of industry 4.0 in the circular economy	Palm oil industry	ISM
To implement green supply chain management	Electronics industry	DEMATEL
To assess the social dimension in the context of circular economy	Countries	MULTIMOORA and TOPSIS
To assess the enablers of e-waste management in circular economy	Electronics industry	DEMATEL
To develop a CE assessment tool for end-of-life product recovery strategies	Automotive industry	Product Recovery MCDM tool
To evaluate the energy and environmental efficiency in the context of the circular economy	Countries	DEA
To evaluate indicators for international manufacturing networks under circular economy	Manufacturing	AHP, ISM
To impede the process of circular economy-driven sustainability practices	Food supply chain	ISM
To identify the effects of flood risk drivers on sustainability in connection with a circular	Agriculture	EDAS
To evaluate the benefit based on circular economy and sustainability	Eco-industrial parks	BWM

From the methodology literature review, researchers prefer DEMATEL approach in electronics industries over other methods. Moreover, DEMATEL is the best preferable technique to identify the causes and effects of any problem, which is aligned with the case objectives. So, the “DEMATEL” is considered the best-fitted method for the case study.

3.3 Proposed Method

Duval et al. (1974) developed a method known as the "Decision Making Trial and Evaluation Laboratory (DEMATEL)" at the Battelle Memorial Institute of Geneva Research Center. This approach was first created to address complicated real-world issues by considering and examining various dimensions and circumstances involving several stakeholders (Dalvi-esfahani et al. 2019). DEMATEL is a form of structural modeling technique used to examine and identify relationships between a system's constituent parts. The DEMATEL approach is used to study elements that have an impact on a particular system and to draw on the knowledge of specialists to better understand how various aspects interact and are interdependent. The technique uses impact relation diagrams to identify the essential elements of a system as well as transform the interdependencies of factors into cause-and-effect relationships(Dalvi-esfahani et al. 2019, Wu and chang 2015).According to Atthirawong et al.(Atthirawong et al. 2018), "the DEMATEL approach can help to prioritize factors based on the type of interaction as well as identify the intensity of their effect on other factors" through a study of the visual relationship among entities and their groupings." Based on an understandable structural model, this method creates matrices to examine cause-and-effect linkages between criteria and/or sub-criteria, stressing the interdependence among components and creating a diagram that depicts their behavior ((Falatoonitoosi et al. 2013,Si et al. 2018). Additionally, each criterion's influence is assigned a numerical number so that decision-makers may distinguish between criteria that are causes and those that are effects (Falatoonitoosi et al. 2013).

4. Data Collection

Professional experts were targeted to conduct the survey. of them are Head of Refrigerator Research & Innovation, Sr. Deputy Assistant Director, Assistant Director, Process Engineer, Deputy Assistant Director, Officer of Talent Acquisition, and Deputy Chief Production Officers shown in Table 2.

Table 2. Designations of survey respondents

Designation of the respondents	Number of persons
Sr. Deputy Assistant Director	1
Assistant Director	1
Head of Refrigerator Research & Innovation	1
Process Engineer	1
Officer, Talent Acquisition	1
Senior Manager	1
Managing Director	1
Deputy Chief Production Officer	1
Total	8

5. Results and Discussion

Circular Economy (CE) plays a vital role in emerging Economy growth. So, it is necessary to prioritize the Drivers and Barriers of CE implementation for E-waste management. In the part of the research paper, the result with the relation matrix containing the cause-effect relationship among drivers and barriers has been presented with their ranking. Most of the respondents are from large-scale Refrigerator industries in Bangladesh. In addition, all of them are highly experienced. After collecting data and establishing of contextual relationship 'DEMATEL' analysis was conducted. All the drivers and barriers are in two categories: internal and external. From the 'DEMATEL' analysis, the ranking was completed.

5.1 Analysis of the drivers

The evaluation and ranking were done by D-R and D+R values consecutively in Table 3.

Table 3. Ranking and cause-effect evaluation of the drivers

Drivers	Codes	D	R	D+R	D-R	Evaluation	Rank
Profitability, market share, and benefit	D1	2.7951	2.8265	5.62	-0.03	Effect	4
Reduction of cost	D2	2.5153	2.8265	5.34	-0.31	Effect	6
Business principles, environmental awareness, and appreciation	D3	3.4597	2.7977	6.26	0.66	Cause	2
Unaware and interested to gain insight	D4	2.0780	3.4908	5.57	-1.41	Effect	5
Resource efficiency, lean manufacturing, and design for recycle material	D5	3.8097	3.4355	7.25	0.37	Cause	1
Sustainable business and growth	D6	3.2005	2.4813	5.68	0.72	Cause	3

Finally, the causal diagram of derived from the analyzed data. Figure 5 shows that Resource efficiency, lean manufacturing, and design for recycled material (D5) and Sustainable business and growth (D6) are acting as causes of other drivers. Others drivers are considered affected by these two drivers. Figure 6 shows a comparative view of all the drivers where the arrow indicates the effect or influence of one driver over another. From this figure, it is seen

that driver 'Profitability, market share, and benefit (D1)' has an impact on the driver 'Unaware and interest to gain insight(D4)' and 'Resource efficiency, lean manufacturing, and design for recycling material(D5)'. Here D1 is the cause and D4 and D5 are affected by D1. Again, due to the driver- Reduction of cost(D2) another driver Resource efficiency, lean manufacturing, and design for recycled material(D5) is affected. From the causal diagram 'Profitability, market share, and benefit,' 'Reduction of cost' and 'Unaware and interest to gain insight' are the cause

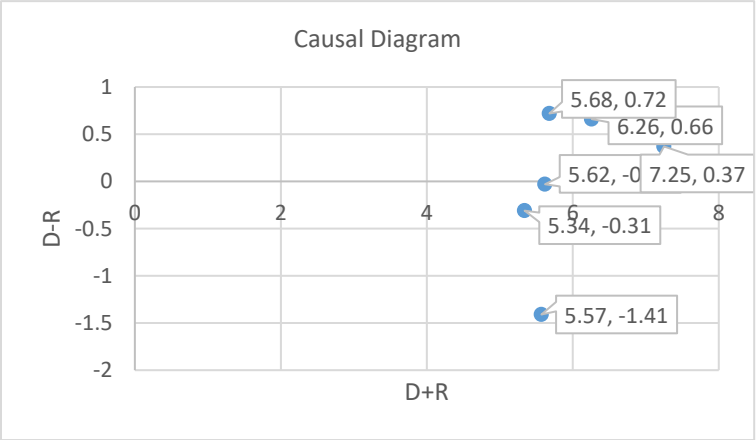

Figure 5. Causal diagram of the drivers

and for which the other drivers- 'Business principle, environmental awareness, and appreciation,' 'Resource

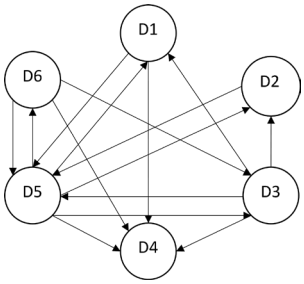

Figure 6. Influence of the drivers

efficiency, lean manufacturing, and design for recycling material,' 'Sustainable business and growth' are affected.

Ranking of the drivers:A comparative view of drivers is shown in the Figure 7 where it is seen that resource efficiency, lean manufacturing, and recycling of material is at the top of the rank. Which indicated it is the main driver considered by industry personnel from the survey.

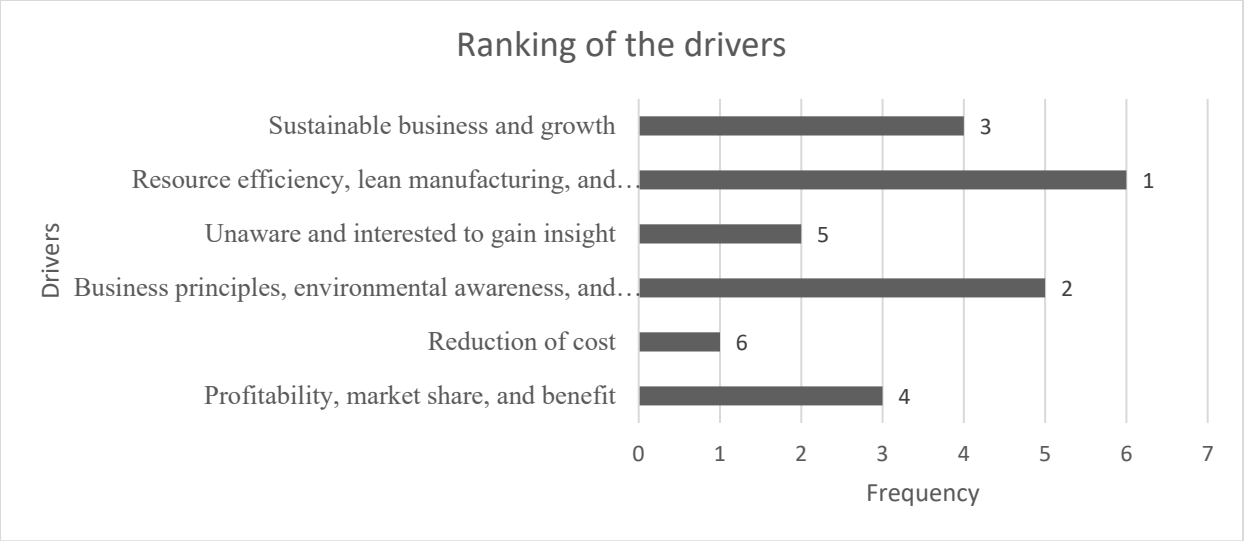

Figure 7. Ranking of the drivers

5.2 Analysis of the barriers

The evaluation and ranking were done by D-R and D+R values consecutively in Table 4.

Table 4. Ranking and cause-effect evaluation of the barriers

Barriers	Codes	D	R	D+R	D-R	Evaluation	Rank
Lack of Experts to lead e-waste practices	B1	2.07	3.18	5.25	-1.11	Effect	6
Lack of Public Awareness	B2	3.46	3.00	6.46	0.46	Cause	2
Top management/Resistance to change	B3	3.69	3.12	6.81	0.57	Cause	1
Cost and financial constrain	B4	2.80	3.52	6.32	-0.72	Effect	3
Lack of technical and technological capacity	B5	3.30	2.07	5.37	1.24	Cause	4
Lack of resource	B6	2.41	2.85	5.27	-0.44	Effect	5

The causal diagram was derived from the analyzed data. Figure 8 shows that Lack of Public Awareness (B2), Sustainable business and growth (B3), and Lack of technical and technological capacity (B5) are acting as the cause of other drivers. Others drivers are considered to be affected by these two drivers.

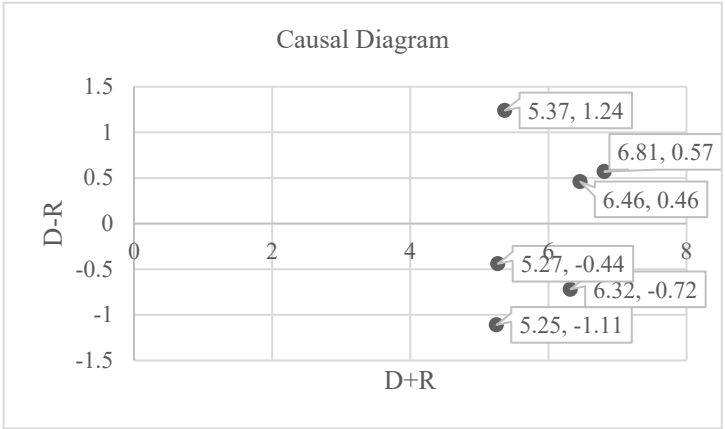

Figure 8. Causal diagram of the barriers

Figure 9 shows a comparative view of all the drivers where the arrow dictates the effect or influence of one driver over another. From this figure, it is seen that barrier 'Lack of Public Awareness (B2)' has an impact on the others barrier- 'Lack of Expert to lead e-waste practices (B1)', 'Cost and financial constrain (B4)' and 'Lake of resource (B6)'. Here B2 is the cause and B4 and B6 are affected by B1. Again, due to the barrier- 'Lack of resource' (B6) another barrier Cost and financial constrain (B6) is affected. From the causal diagram 'Lack of Public awareness,' 'Top management/Resistance to change,' and 'Lake of technical and technological capacity is the cause, and for which the other barriers - 'Lake of Experts to lead e-waste practices,' 'Cost and financial constrain' and 'Lake of resource' are affected.

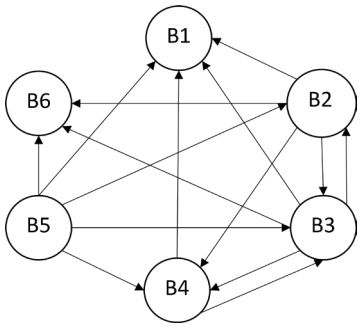

Figure 9. Influence of the barriers

Ranking of the barriers: A comparative view of barriers is shown in Figure 10. Where top management's resistance to change, lack of public awareness, and cost and financial constraints are at the top of the rank, which are the top barriers considered by industry personnel from the survey.

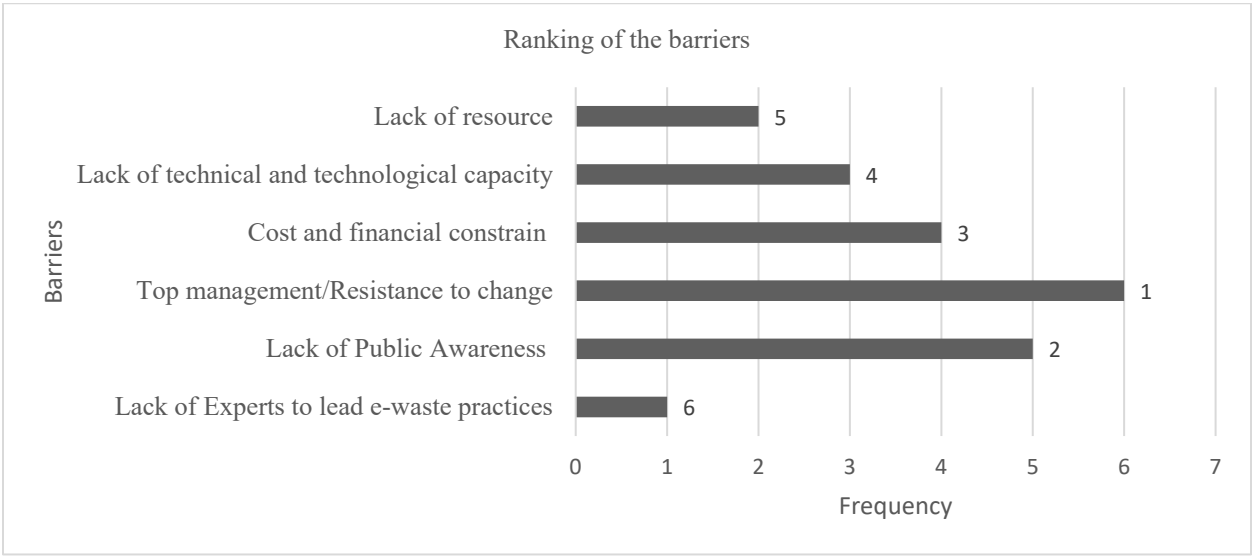

Figure10.Ranking of the barriers

5.3 Proposed Improvements

From the graphical results of the driver- it is seen that resource efficiency, lean manufacturing, and recycling of material is the main driver of CE.The resource is decreasingday by day. So, it is important to reduce the consumption of resources and increase their efficiency. By implementing CE, it is possible to minimize waste, here waste becomes a new resource. Ines's principle, environmental awareness is another top prioritized driver here. In many national and international documents, concern for the environment and recognition of the shared concerns of sustainable development are enshrined as basic business principles. CE are strategic ways to guarantee that these principles are upheld. Another view from the graphical results of the barrier- top management's resistance to change the system and policy as the biggest barrier to CE implementation in refrigerator industries is seen.The authorities of

industries should be flexible and aware of the impact of CE. This concept will reduce waste and the process of any system will be smooth. These will influence the unaware public to be aware and motivate them to recycle their product. The public has the misconception about the quality of the recycled product will be reduced.

6. Discussion

The findings of this study have shed light on the factors that promote and obstruct the circular economy's adoption for Bangladesh's refrigerator industries' e-waste management. The limitations of the available study call for caution in how the results are interpreted. The research process is discussed in this paragraph. While conducting the survey, the data collection was constrained. To obtain more precise results, it could be advantageous to collect additional data. For the aim of the investigation, only the refrigerator industries were used. Future study can benefit from interpreting additional e-waste generating industries. Even the outcome can change depending on the viewpoint and socioeconomic circumstances of the nation. For the analysis, only six drivers and barriers were taken into account. Taking into account extra drivers and obstacles might have a significant impact on the outcomes. Researchers can take into account flexible industries from many different angles for next study. To conduct the research, more influences and obstacles from the perspectives of other nations or areas might be taken into account

7. Conclusion

The case uprooted the main drivers and barriers from the literature review and ranked them based on prioritization. Survey data supports the basement of the study. The data extracted from the survey was used to evaluate and analyze the whole methodology. The study ranked and identified the cause and effect among all the drivers and barriers of the circular economy while implementing on refrigerator industries of Bangladesh. Hence, researchers and industry personnel will get an insight into the top barriers and drivers of refrigerator industries by reading the paper. For further research surveys, data can be used to align and compare with new data. Further research with more survey responses can be used to compare the result. New research to find out the reasons behind the rank can be done. Alternatives were rejected for the study based on the literature review. But the same data can be analyzed by different methods to find and differentiate the reliability.

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Biographies

Sajib Ahmed is currently pursuing his BSc. Degree in the Department of Industrial & Production Engineering (IPE) at Rajshahi University of Engineering & Technology (RUET). With an interest in research work, he participated in several national and international case studies and idea competitions in his undergraduate life and got rewarded by reputed organizations. He had been nominated as a regional finalist in Hult Prize. He ended up securing the first runner-up as a team in BD STEM national idea competition. Currently working on several research projects under the supervision of his university teachers.

MD. Ibrahim currently studying for his undergraduate degree at the department of Industrial & Production Engineering at Rajshahi University of Engineering & Technology, Rajshahi, Bangladesh. He has completed his higher secondary Certificate (H.S.C) program at Dhaka College, Dhaka, Bangladesh. He has got a scholarship in his H.S.C and S.S.C programs. He has participated in many seminars, workshops, etc.

Md. Ariful Haque is currently working as a lecturer in the department of Industrial & Production Engineering (IPE) at Rajshahi University of Engineering & Technology (RUET), Bangladesh. He started his early academic career at the National Institute of Textile Engineering and Research under the department of IPE. Currently, he is pursuing his M.Sc. in Industrial and Production Engineering from the Department of IPE of Bangladesh University of Engineering & Technology (BUET), Bangladesh. He obtained his B.Sc. in Industrial & Production Engineering from RUET. His research area covers Operation Research, Production Management, Supply Chain Disruption, and Solid Waste Management.