MEHMET AKİF ERSOY ÜNİVERSİTESİ
İKTİSADİ VE İDARİ BİLİMLER FAKÜLTESİ DERGİSİ
Mehmet Akif Ersoy University
Journal of Economics and Administrative Sciences Faculty

ISSN: 2149-1658
Cilt: 9 Sayı: 2 s.763-787
Volume: 8 Issue: 3 p.763-787
Temmuz 2022 July

ANALYSIS OF DRIVERS AND CHALLENGES IN CIRCULAR ECONOMY WITH SWARA AND BWM METHODS IN CLOTHING SECTOR

GİYİM SEKTÖRÜNDE DÖNGÜSEL EKONOMİNİN YÜRÜTÜCÜLERİNİN VE ENGELLERİNİN SWARA VE BWM METOTLARI İLE ANALİZİ

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Makale Türü Araştırma Makalesi — **Article Type** Research Article

Başvuru Tarihi 05.10.2020 — **Application Date** 10.05.2020

Yayına Kabul Tarihi 12.05.2022 — **Admission Date** 05.12.2022

DOI
https://doi.org/10.30798/makuiibf.822067

Abstract

The circular economy is a sustainability model that reduces environmental impacts and enables products to be recycled effectively. In this respect, the clothing sector is one of the sectors that has the highest environmental impact in the circular economy system. In this study, drivers and challenges of circular economy in clothing sector were analyzed with SWARA and BWM methods. The results show that the SWARA and BWM methods are quite similar and can be used by decision makers. In both methods, " Cost savings from conservation in resources" as the driver of the circular economy and "lack of training and knowledge" as a challenge took the first row. This study shows the lack of awareness and legitimacy for the institutionalization of the circular economy approach in the clothing industry in Turkey, will be useful in other developing and transition economies and improve the functioning of vision is considered.

Keywords:* *Circular Economy, Multi-Criteria Decision Making, Strategic Management, Clothing Sector, SWARA, BWM.

Öz

Döngüsel ekonomi, çevresel etkileri azaltan ve ürünlerin etkin bir şekilde geri dönüştürülmesini sağlayan bir sürdürülebilirlik modelidir. Bu bakımdan giyim sektörü, döngüsel ekonomi sisteminde en yüksek çevresel etkiyi bünyesinde barındıran sektörlerden biridir. Bu çalışmada, SWARA ve BWM yöntemleriyle giyim sektöründe döngüsel ekonominin yürütücüleri ve güçlükleri analiz edilmiştir. Sonuçlar, SWARA ve BWM metotlarının oldukça benzer olduğunu ve karar vericiler tarafından kullanılabileceğini göstermektedir. Her iki yöntemde de döngüsel ekonominin en önemli yürütücüsü olarak "kaynakların korunmasından elde edilen maliyet tasarrufu", güçlüğü olarak ise "eğitim ve bilgi eksikliği" yer almıştır. Türkiye'de giyim sektöründe döngüsel ekonomi yaklaşımının kurumsallaşması açısından farkındalık ve meşruiyet eksikliğini gösteren bu çalışma, diğer gelişmekte olan ve geçiş ekonomilerinin vizyonlarını ve işleyişlerini iyileştirmelerinde faydalı olacağı düşünülmektedir.

Anahtar Kelimeler:* *Döngüsel Ekonomi, Çok Kriterli Karar Verme, Stratejik Yönetim, Giyim Sektörü, SWARA, BWM.

GENİŞLETİLMİŞ ÖZET

Çalışmanın Amacı

Bu çalışmanın amacı, döngüsel ekonominin yürütücülerinin ve güçlüklerinin SWARA ve BWM yöntemleri kullanılarak, giyim sektöründe üzerinde analiz edilmesidir.

Araştırma Soruları

Çalışmada şu soruların cevapları aranmıştır: (a) Bir geçiş ekonomisinde döngüsel ekonominin yürütücüleri ve güçlükleri nelerdir? (b) Giyim sektöründe döngüsel ekonominin SWARA ve BWM yöntemleri kullanılarak belirlenen öncelikli yürütücüleri ve güçlükleri nelerdir? (c) Çalışamada ele alınan birbirine alternatif olabilecek bu yöntemlerin sonuçları tutarlılık göstermiş midir?

Literatür Araştırması

Son yıllarda sürdürülebilirlik konusunda döngüsel ekonomiye duyulan ilgi gittikçe artmaktadır. Ancak döngüsel ekonomi üreticileri ve müşterileri bazı sistematik sorumluluklara zorlamaktadır. Bu çalışmada da Piyathanavong vd. (2019)'nin döngüsel ekonomi konusunda belirlediği yürütücüleri ve güçlükleri revize edilerek analize alınmıştır.

Yöntem

Bu çalışmada, SWARA ve BWM yöntemleri kullanılarak, giyim sektöründe döngüsel ekonominin uygulanmasını etkileyen yürütücüler ve güçlükler analiz edilmiştir. SWARA yöntemi, 2010 yılında Keršuliene, Zavadskas ve Turskis tarafından ortaya koyulmuştur. Yöntemin en önemli özelliği, tek bir karar vericinin yanı sıra, çok sayıda karar vericinin olduğu durumlarda bile kullanılabilmesidir. Karar vericilerin çok olduğu durumlarda, her karar verici arasında birçok farklılık olabilmektedir. SWARA yöntemi sayesinde bu farklılıklar aritmetik veya geometrik ortalama alınarak ortak bir paydaya dönüştürülebilmekte ve bu sayede nihai kriter ağırlıkları belirlenebilmektedir. BWM, en iyi kriteri diğer kriterlerle ve en kötü kriteri diğer kriterlerle kıyaslamaya imkan tanımaktadır. BWM ile karar vericilerin tüm kriterleri arasında ikili karşılaştırmalara gerek yoktur. Farklı kriterlerin ağırlıklarını belirlemek için maksimum matematiksel model oluşturulmaktadır. Yöntemin güvenilirliğini kontrol etmek için bir tutarlılık oranı kullanılmaktadır.

Sonuç ve Değerlendirme

Her iki yöntem açısından da "kaynakların korunmasından elde edilen maliyet tasarrufu" en önemli yürütücü olarak, "çevre dostu ürün ve hizmetlere yönelik baskı" ise en az önemli yürütücü olarak bulunmuştur. Ayrıca her iki yönteme göre de "eğitim ve bilgi eksikliği" en önemli güçlük olarak, "çevresel sürdürülebilirlikten doğan faydaların eksikliği" ise en az önemli güçlük olarak belirlenmiştir. SWARA ve BWM yöntemleri ile elde edilen sıralamaların korelasyonları sonucunda her iki yöntemin de benzer sonuçlar verdiğini ortaya çıkarmıştır (N = 11, r =, 882 ** ve N = 10, r =, 964 ** 0,01 düzeyinde (2 kuyruklu)) ve bu sonuca dayanarak her iki yöntemin de karar vericiler tarafından kullanılabilir olduğu sonucuna ulaşılmıştır.

1. INTRODUCTION

From past to present, as the industrialization enhanced, so the production and consumption increased eventually. This situation is growing even more with cutting-edge technologies today. People are consuming quickly; hence systems that adopt the 'buy-use-throw' logic called linear economy can no longer meet the sustainability targets within this consumption world, causing depletion of natural resources day by day.

The circular economy system, which can correspond to the logic of buy-use-use, is defined as by the principles of reduction, reuse, and recycling, which should apply throughout the return cycle of all production, consumption, and resources (Koszewska, 2018). In other words, the circular economy system aims to minimize waste and keep materials as long as possible in the production and consumption cycle (Jacometti, 2019). The cyclical economy system is defined as "an industrial system that repairs or regenerates, uses natural capital as efficiently and reuses as possible, finds value throughout the life cycle of products" even during the stages of design, production and even consumption (Stuchtey et al., 2016).

The European Clothing Action Plan, which took action in May 2016, pushed to redefine how we produce and consume together with all stakeholders in the sector. This plan started in an attempt to increase its sustainability from textile to the design cycle to the end of use to implement a cyclical economy model at the European Union (EU) level, with particular emphasis on reducing waste in textiles (Moorhouse and Moorhouse, 2016). Waste and pollution in all processes related to a product have become a primary global concern. In 2018, the EU took some legal measures aimed at adapting existing legislation to the cyclical economy transition goals that should be implemented in the EU Member States within two years (Jacometti, 2019). The EU is producing sharper and more concrete measures on this issue day by day and trying to apply it to its affiliated countries.

The accelerated production-consumption trend and short-term and more economical productions also changed habits in the textile and fashion sectors. Among all European clothing (apparel) companies, the average number of clothing collections has more than doubled; the number of collections, which took place twice a year in 2000, increased to five per year in 2011. That kind of fast fashion has led consumers to candy-like consummatory behavior, buy more clothes than they need, and treat increasingly lower-priced clothes as “disposable” products that can be discarded after being worn almost seven or eight times (Remy et al., 2016).

Today, pressures have emerged on the use of more sustainable systems in the textile, fashion, and clothing sectors, especially in European countries. People started using their clothes longer, so they began to prefer higher quality and environmentally friendly products. Wearing the clothes longer, effective recycling of textile waste, and reuse as raw materials can significantly reduce the need for final products and raw materials (Koszewska, 2018).

Along with the circular economy, environmentally friendly products with lower prices also appeared. Consumers began to show interest in these products. The way to consume without pollution has started resulting, in the number of clothes purchased annually by an average consumer increased by 60 percent between 2000 and 2014 (Remy et al., 2016).

The production of a large part of Europe and North America is being supplied by some emerging countries such as Cambodia, Turkey, Vietnam, Bangladesh, India, and expectedly China. The apparel value chain makes a significant contribution to economies, especially in the last ten years in (Jacometti, 2019).

The circular economy, which has a global impact, has been absorbed by many famous names and big companies, and the supports have started to reach serious dimensions. British fashion designer Stella McCartney announced in November 2015 that 53% of women's clothing and 45% of men's clothing collections are now sustainable (Rossily, 2016). Gucci introduced its 100% biodegradable shoes and started using recycled plastic for shoe heels (Beyond Our Limits: Sustainability Targets 2012-2016, 2016).

Although European Union countries are embracing the circular economy perspective in the very first place, via building declarations and embarking new green agenda for the peripheral regions (Turkey is a candidate country for EU under Western Balkans scope) there is a considerable effort to address environmental issues such as climate change being the broader scope, clean energy transition, waste disposal and air pollution as micro issues. Therefore, EU being a major contributor in economic growth and structural reforms in Turkey, single attempts in circular economy is expected a raise in competitiveness and economic growth as well as making social well-being of citizens.

Circular economy on the basis of textile also a policy tool for the Organization for Economic Co-operation and Development (OECD) referring the Extended Producer Responsibility which is an environmental policy approach in extending the responsibility of a producer for a product to the post-consumer stage of a product’s life cycle. In this legislation introduced in some European countries at first, however in 2018 amendments have been made and the principle is now let to the discretion of Member States as the producers’ regulations are needed to be harmonized with the national regulations.

However, there are many implications of circular economy on textile clothing sector, researchers are having yet to analyze circular economy transition via the drivers and challenges in alignment with the existing emerging economy, Turkey case specific. This study aims to deliver answers by offering academic gap in terms of highlighting drivers and challenges using multiple criteria decision making (MCDM) approach. This research offers new insight of the current status aligned with a number of perspectives of companies reflecting the transition in circular economy in textile clothing sector. The paper develops a two method analysis to be used by managers and policy makers in terms of analyzing of many critical factors on the path to reach the circular economy results for companies and any other emerging countries.

The remainder of the paper is structured as literature review, research and methodology, discussion and conclusion.

2. LITERATURE REVIEW

The circular economy is important for sustainability in recent years. Knowing that producers and end-customers forming the cycle, the adaption requires some systematic responsibility accompanied by both parties.

In general, the textile industry is a vast sector with nominal sales of over $450 billion worldwide (Resta et al., 2016). According to Euratex, in 2016, 177,700 textile and clothing companies (incl. 28 EU countries) employing more than 1.7 million people have reached a turnover of 171 EUR billion and invested EUR 4.8 billion (Euratex Key Figures, 2017). However, the textile industry is the most polluting sector after oil (Malik et al., 2014). The increasing consumption frenzy in all areas is also increasing in the textile clothing industry mutually. Environmental issues are not just at the stage of production of a product; design, a supply of raw materials, production, consumption, and even transportation, cleaning, ironing, re-preparation, maintenance, and so forth. The industry accounts for about 10% of the CO_2 emissions in the world (Intergovernmental Panel on Climate Change, 2014). The textile and clothing industry is a sector with a high environmental and social impact; it is known as one of the most polluting industries and with the highest consumption of water; producing a pair of jeans costs about 7,000 liters of water, given that the insensitivity of workplaces issue emerges (Fletcher, 2014; Snoek, 2017).

If the textile and apparel industry choose to replace the buy-use-throw model with a circular model, all negative environmental impacts can be reduced significantly. Wearing the clothes longer, effective recycling of textile wastes, and reuse as raw materials can dramatically reduce waste of final products and raw materials (Koszewska, 2018).

Although the circular economy awareness in the textile clothing sector is low for primary producers and suppliers (apart from credible brands and celebrities), public awareness is increasing day by day. Consumers prefer it as the system is more attractive and economically attractive. Through this motivation, by the enlightenment of literature review of the circular economy and textile clothing sector in both national and international literature, it has been observed that the studies carried out so far are very limited in numbers and context, especially in Turkey. Considering the clothing sector, particular research on the circular economy and the drivers and challenges in an emerging economy should fill the gap in the literature. The idea of industrial innovations and changes is progressing, and the information obtained might have been outdated in recent years; it also urges for new studies with new insights.

In the study of Koszewska 2018, which is among the most remarkable studies, the difficulties faced by the clothing and textile industry were identified and evaluated to adapt to the circular economy model where also the industry examples were used. In another study, the high environmental impact of the fashion industry has assessed, via focusing on the world's concerns in recent years, and aimed to analyze the current EU measures that affect the transition to the circular economy in the fashion industry (Koszewska, 2018; Jacometti, 2019).

Besides, Vasiljevic, et al. have discussed the SWARA Approach, and the evaluation of supplier criteria in the textile company, located in the territory of Bosnia and Herzegovina. Results revealed that as the quality of the materials; the price of the material, and the delivery time were found to be the most important criteria for the supplier selection in the textile company, as mentioned above earlier (Vasiljević et al., 2018). Furthermore, the Industrial symbiosis approach was examined in the context of cleaner production in the industry and transition to a circular economy, and evaluations were made on the basic principles of this approach (Özkan et al., 2017). Similarly, Chae and Hinestroza (2020) have proposed new approaches to apply concepts such as the material circularity index and clothing use at the personal and social levels. Sustainability of clothing sector through circular economy paradigm has been highlighted in various studies (Setterwall, 2016; Wang, 2018; Shaw and Williams, 2018; Hogge and Blome, 2019; James and Kent, 2019).

Among the studies in the given literature, Piyathanavong et al. (2019) study has offered some drivers and challenges in adoption of environmental sustainability approaches in a developing country, Thailand, ensuring this research as the adoption of the same factors in Turkey specific due to similar and EU and OPEC dependency reasons additionally. As stated in the study conducted by Piyathanavong et al. in 2019, the drivers are defined as getting financial incentives or supports from various institutions or organizations, identifies as financial support availability; demand for environmentally friendly products from the environment, customers or stakeholders, pressure for environmentally friendly products and services; to minimize the negative impact on the environment by the company, environmental risk mitigation; to become a more recognizable brand, brand recognition and sales improvement; reducing the environmental impacts of the business and using the goods and services on site, improvement of business sustainability; annihilate negative impressions about the company, improving or increasing the company's reputation, increase in the company's reputation; the aim of being per the environmental regulations and requirements recently released on this subject, compliance with environmental regulations and laws; to be ahead in competition with competitors by making progress in this context, improve competitiveness; to achieve more sales and profitability by providing more economical productions, improve operational efficiency; savings on the company's employee, energy and environmental protection costs by providing improvements on this issue, cost savings from conservation in resources; the company's initiative and will- except other factors, policy and initiative of the company.

As stated in the study conducted by Piyathanavong et al. in 2019, the challenges are defined as incompetency of training and expertise of company representatives and managers about the circular economy, lack of training and knowledge; too much initiative, motivation, and effort needed for the implementation of the circular economy, lack of effort than required; the company's funds and existing infrastructure are not sufficient for this system, lack of resources; failure of company management to provide adequate support to the circular economy, lack of support from upper management; insufficient benefits for environmental protection, lack of benefits from environmental sustainability; the financial deficit of the company for the circular economy, lack of financial support; environmental regulations and laws do not meet any requirements in this regard, lack of environmental regulations and laws; the customers and the community are not aware of the issue, lack of environmental awareness; inadequate support and encouragement from the state on the circular economy, lack of support from the government; the raw materials required for production are to be easily accessible and available, lack of accessibility to supply materials.

Also, when it has been searched in the clothing literature in regarding of the Multi-Criteria Decision Making Approach. Vanegas-López et al. (2021) have used AHP and TOPSIS methodologies for textile export sector not only in Colombia but also in Latin America. Yongbo et al. (2020) have used DEMATEL method for critical success factors in textile industry in China. Lin and Twu (2012) evaluated fashion trend alternatives by using Fuzzy-AHP methodology. Stefania et al. (2022) proposed industrial location selection in developing countries for textile sector in Africa by using AHP based cluster analysis (K-Means). Mousumi et al. (2020) proposed an integrated green management model for textile sectory in regarding of sustainability by using DEMATEL and ANP methodologies. Tayyar and Arslan (2013) proposed a model for selecting sub-contractor in clothing industry by using AHP and VIKOR methodologies. Eryürük et al. (2012) searched a site selection model for establishing a clothing logistics center by using AHP methodology in Marmara Region in Turkey.

When we look at the studies in which BWM and SWARA methods are used together, it is seen that they are used in various fields and in different number types. Zolfani and Chatterjee (2019) evaluated the factors that affect sustainable design by using SWARA and BWM methods comparatively. Tas and Akcan (2021) used the Fuzzy-Swara-Bwm Integrated Method for Supplier Selection that is Environmentally Friendly, Agile and Industry 4.0 compatible. Zavadskas et al. (2018) developed Rough SWARA approach. The developed approach has been validated by a sensitivity analysis, which includes comparing the results obtained by applying in the logistics industry with Rough BWM and Rough AHP to determine the weight values. Kumar et al. (2022) used SWARA and CoCoSo methods together to determine the most suitable spray painting robot for an automobile industry. The obtained results were also compared with other popular multi-criteria decision making (MCDM) techniques (TOPSIS, VIKOR, COPRAS, PROMETHEE and MOORA) and subjective criterion weighting methods (AHP, PIPRECIA, BWM and FUCOM). Sharma et al. (2021) compared the barriers to lean supply chain using AHP, BWM and fuzzy SWARA methods. Mishra and Satapathy (2020) evaluated the criteria that are effective for Flood Risk Reduction in India using SWARA and BWM methods.

In this aspect, by having an exploratory perspective, deriving inspiration from previous studies, this study constitutes a research question of what are the drivers and challenges to apply circular economy logic in a transition economy? This study has made a difference in the clothing sector to reveal the advantages and disadvantages of the circular economy.

3. RESEARCH AND METHODOLOGY

3.1. Data Collection and Sampling

In this empirical study, known as Turkey's textile regions, which operates in the clothing sector in Bursa, by interviewing with companies, data was collected through a questionnaire specifically designed. The companies were selected via purposive sampling from the industrial park listing, starting with one of the biggest importer and manufacturer for the famous brands, further companies selected via snowball effect. The questionnaire structured from two parts: descriptive statistics and method questions, was previously presented to respondents herewith their knowledge and consent of the company, and additionally informed that there would be no violation in terms of privacy of personal data and ethics.

Then, the respondents were presented with definitions of factors for the application of the circular economy adapted from the Piyathanavong et al. 2019 study (Piyathanavong, et al., 2019). After, factors asked to be ranked to the degree of importance within the context of the implementation of the circular economy. Assessment of the relationship of the listed factors with each other was asked accordingly. Respondents were asked to indicate the factors they listed as being determinative compared to the previous and next by scoring between 0-100. There are 5 decision makers in this study who are project managers and experienced in sustainability, working in 5 different companies. The experiences of decision makers range from 15 to 25 years. Within the scope of a project, 5 decision makers held 3 meetings to evaluate the criteria within the scope of the survey data and literature studies. Each meeting lasted approximately 2 hours.

Then, the respondents were given the definitions of the factors that prevented the implementation of the circular economy (Table 4). In this part, these factors are asked to be listed according to the situations where they are valid for the enterprise. In the last question, the factors listed in the previous section proposed to be scored according to the relations between each other.

3.2. MCDM Methods

There are sectoral advantages and disadvantages in terms of the implementation of the circular economy. In order to evaluate the circular economy with its advantages and disadvantages, it is necessary to use multi-criteria decision making methods. SWARA and BWM are the most frequently used methods of multi-criteria decision making methods. But for the usage their implementations are fully different. The main idea to use two methods that they do not require a large number of decision makers to take part in the process. Therefore, it has been emphasized at the end of the study that the results are different from each other but consistent. Hence two methods can be used as alternate of one another.

3.2.1. SWARA Method

The SWARA method is referred to in the literature as a Step-Wise Weight Assessment Ratio Analysis. The method was discovered by Keršuliene, Zavadskas, and Turskis in 2010. The most important feature of the method is that it can be used even when there are a single decision-maker and also many decision-makers. In situations where there are many decision-makers, there can be a lot of differences between each decision-maker. Thanks to the SWARA method, these differences have been converted into a common denominator by taking the arithmetic or geometric mean, and for this way, the final criteria weights have been determined.

The SWARA method has given decision-makers opportunity to choose their priorities by taking into account the current environmental and economic conditions. The role of experts determined as decision-makers are increasing in this method. The method has made it easier for different specialists to work simultaneously for a purpose due to the simplicity of the application. The number of comparisons between the criteria for weighting in the SWARA method is less than that of the AHP, ANP method. Therefore, the method has saved time (Çakir and Karabıyık, 2017).

SWARA method enables rational selection by determining relative importance values among multi-criteria decision making techniques. There can be more than one decision maker, as well as a single decision maker. Each decision maker is expected to express her/his knowledge and experience accurately and mathematically. In this respect, the method has the feature that enables experts to make decisions together at the same time leaving independent decision making areas. In the SWARA method, a data set is created for the criteria to be weighted. Criterion properties may overlap in the data set. The characteristics of the criteria to be weighted in the SWARA method should not overlap, hence, the criteria are weighted by each decision maker after determining the criteria's features that will not overlap. In the last case, the final criterion weights are created by taking the arithmetic or geometric means of the weighting values of the experts for each alternative. The method steps for each decision maker are as follows (Shukla et al., 2016).

Step 1: The criteria have been listed from most important to least important.

Step 2: Starting from the second criterion, relative importance levels have been determined for the previous criterion. If the criterion notation is shown as j, j. criterion is compared with j-1 criterion. This rate method has been named as "Comparative importance of average value" by those who found this method and it is indicated by the S_jicon.

Step 3: The coefficient (k_j) is determined by the following equation.

$$k_j=\begin{cases} 1 & j=1 \\ S_j+1 & j>1 \end{cases} \qquad (1)$$

Step 4: Importance vector q_j is calculated with the equation below.

$$q_j=\begin{cases} 1 & j=1 \\ \frac{x_{j-1}}{k_j} & j>1 \end{cases} \text{ The notation } x_{j-1} \text{ refers to } q_{j-1} \qquad (2)$$

Step 5: Calculation process of the weights (w_j) of the criteria;

$$w_j=\frac{q_j}{\sum_{k=1}^{n} q_k}, \qquad (3)$$

w_j shows the relative importance of the j. criterion

Step 6: Instead of the weighted average of the criterion weights, the geometric mean can also be taken. The formulas are as follows.

A weight vector is created for each priority criterion.

$$G_j=\text{C5}[\ \prod_{j=1}^{k} W_j\ ]^{1/k} \qquad (4)$$

Then, the normalization process of geometric averages for each criterion has been performed. Finally, the weight vector is denoted by W_{js}.

Available as $W_{js}=\frac{G_j}{\sum_{j=1}^{n} G_j}$ (5)

3.2.2. BWM Method

Decision makers should use one of the multi-criteria decision making methods in the process of evaluating many criteria and sub-criteria. One of these methods is the Best–Worst Method (BWM) (Rezaei et al., 2015; Rezaei, Wang, and Tavasszy, 2015; Rezaei, 2016; Moslem et al., 2020). BWM is a benchmark decision-making method that compares the best criterion to other criteria and all other criteria to the worst. With BWM, among all the criteria of decision makers there is no need for binary comparisons. It is only necessary to define the most and least desired criterion and then to make binary comparisons between the best/worst criterion and other criteria. It has been created maximum mathematical model to determine the weights of different criteria. A new consistency rate definition has been made to check the reliability of the method. But in BWM, it is not easy to determine which criterion is the best or worst when the number of criteria is too large. Therefore, it is necessary to apply a special procedure to determine the best or worst criteria. The biggest contribution of BWM is that decision makers first define the best and worst criteria and then make binary comparisons between each of these two criteria (best and worst) and other criteria. The implementation steps of the method are as follows:

Step 1: A number of decision criteria has needed to be determined. In this step, the decision maker determines the n criteria $\{C_1, C_2, \ldots\ldots, C_n\}$ used to make decisions.

Step 2: The best (most desired, most important) and worst (least desired, least important) criteria have been determined.

Step 3: It is the stage that the best criterion is determined and the preference rate according to all other criteria by using a number between 1 and 9. By using a number between 1 and 9, the preference of the best criterion is determined according to all other criteria (1: equally important, 3: moderately more important, 5: highly important, 7: much more important, 9: extremely important). As a result of this step, a vector called Best-Others (AB), which moves from the best to the others, has reached. This vector is as follows:

$$A_B = (a_{B1}, a_{B2}, \ldots\ldots, a_{Bn}), \qquad (6)$$

Each a_{Bj} in the A_B vector shows the preference of the best criterion B over the criterion j.

Also a_{BB}= 1. This means that the most important criterion is compared with it.

Step 4: It is about determining the preference rate of all other criteria relative to the worst preferred criterion, using a number between 1 and 9. In this step, the relative importance of other criteria over the worst criterion has been determined by the decision maker using a number from 1 to 9. As a result of this step, the worst of the vector should be as follows:

$$A_w = (a_{1W}, a_{2W}, a_{3W}, \ldots\ldots, a_{nW})^T, \qquad (7)$$

In this vector, each a_{jW} indicates the preference of criterion j over the worst criterion W. And also $a_{WW,}$ = 1. This means that the worst criterion is compared to it.

Step 5: In the last step, the most suitable weight should be determined for each criterion.

$$(W_1^*, W_2^*, W_3^*, \ldots\ldots, W_n^*) \qquad (8)$$

The goal in this step is to determine the optimal weights of the criteria to provide maximum absolute differences. The optimum weight for the criteria, each $\frac{W_B}{W_j}$ and $\frac{W_j}{W_W}$ pair for $\frac{W_B}{W_j} = a_{Bj}$ and $\frac{W_j}{W_W}$ = a_{jW} respectively. There must be found j values $\{|w_B - a_{Bj}w_j|, |w_j - a_{jw}w_w|\}$ where the maximum absolute differences are minimized. Therefore, it has been converted to the min - max model below:

Under the constraints, $minmax_j\{|w_B - a_{Bj}w_j|, |w_j - a_{jw}w_w|\}$ (9)

$\sum_j w_j = 1$

$w_j \geq 0,$ for all j (11)

The problem equation has been transferred to the following linear programming problem:

$$min\ \xi^L \qquad (12)$$

$$\left|\frac{W_B}{W_j} - a_{Bj}\right| \leq \xi \text{, for all j} \tag{13}$$

$$\left|\frac{W_j}{W_w} - a_{jw}\right| \leq \xi \text{, for all j} \tag{14}$$

$$\sum_j w_j = 1 \tag{15}$$

$$W_J \geq 0 \text{, for all j} \tag{16}$$

It has been obtained those optimum weights (w_1^*,w_2^*, w_3^*, ……., w_n^*) and ξ value, with the completion and resolution of all this model. ξ value, the consistency of the analysis rate has shown. It has been concluded that as the value of ξ increases, the comparisons are less reliable, and their consistency is weak, and as it decreases, the consistency rates are high.

4. RESULTS

4.1. Descriptive Statistics

The first questions of the survey belonging to the study were asked in order to learn the descriptive statistics of the companies participating in the survey. The descriptive statistics of the companies participating in the study are given in Table 1 below.

Table 1. Descriptive Statistics of The Companies

Company Profile	**N**	**Company Profile**	**N**
Company size		Business segment	
Large (≥201 employees)	3	Apparel- children's clothing	3
Medium (51-200 employees)	1	Apparel- clothing	2
Small (≤50 employees)	1	Target market	
Operating period		Domestic	3
5 to 10 years	2	International	2
11 to 15 years	2	Circular Economy Adaption	
16 to 20 years	1	Partially	5

Three of the companies participating in the study are large, one is medium, and the other is small. Looking at the operating periods, two of them operate as 5 to 10 years, the other two as 11 to 15 years, and one as 16 to 20 years. When you examine the business segment; It was stated that three were apparel children's clothing and two were apparel-clothing. Looking at the target markets of the companies, it is seen that three of them are domestic, and two of them are international. It is also stated that all of them are partially circular economy adaption.

4.2. Evaluation of Drivers of Circular Economy

4.2.1. Evaluation results with SWARA method

To evaluate the drivers for companies to be able to adapt, the circular economy has asked through 11 criteria on five experts in managerial positions (decision-makers). Given criteria and the importance ranking from major to minor can be seen in Table 2.

Table 2. Drivers Sorted Based on SWARA by Decision Makers

Factors/Criteria	**D**	**DM1**	**DM2**	**DM3**	**DM4**	**DM5**
Financial support availability	D1	10	9	5	5	4
Pressure for environmentally friendly products and services	D2	9	11	6	4	6
Environmental risk mitigation	D3	8	8	8	3	9
Brand recognition and sales improvement	D4	11	10	9	1	3
Improvement of business sustainability	D5	7	7	10	2	8
Increase in the company's reputation	D6	3	5	11	6	1
Compliance with environmental regulations and laws	D7	5	6	7	8	5
Improve competitiveness	D8	6	4	4	9	11
Improve operational efficiency	D9	2	3	3	11	2
Cost savings from conservation in resources	D10	1	1	1	10	7
Policy and Initiative of the company	D11	4	2	2	7	10

As can be seen from Table 2, for example, the most important driver for DM1, DM2, and DM3 is "Cost savings from conservation in resources (D10)", it is designated as "Brand recognition and sales improvement (D4)" for DM4 and "Increase in the company's reputation (D6)" for DM5. The least important driver is expressed differently for each DM. In Table 3, the important levels of each decision-maker according to the ranking of the criteria in Table 2 are presented.

Table 3. Importance Levels of Drivers Sorted Based on SWARA by Decision Makers

	DM1		**DM2**		**DM3**		**DM4**		**DM5**	
k	**Rank**	**Sj**	**Rank**	**Sj**	**Rank**	**Sj**	**Rank**	**Sj**	**Rank**	**Sj**
1	D10		D10		D10		D4		D6	
2	D9	0.10	D11	0.40	D11	0.40	D5	0.40	D9	0.50
3	D6	0.40	D9	0.60	D9	0.50	D3	0.60	D4	0.70
4	D11	0.10	D8	0.40	D8	0.40	D2	0.6	D1	0.60
5	D7	0.20	D6	0.50	D1	0.50	D1	0.40	D7	0.70
6	D8	0.30	D7	0.60	D2	0.50	D6	0.40	D2	0.70
7	D5	0.60	D5	0.40	D7	0.60	D11	0.70	D10	0.50
8	D3	0.20	D3	0.40	D3	0.40	D7	0.40	D5	0.60
9	D2	0.70	D1	0.60	D4	0.60	D8	0.60	D3	0.50
10	D1	0.90	D4	0.50	D5	0.50	D10	0.60	D11	0.60
11	D4	0.30	D2	0.50	D6	0.40	D9	0.70	D8	0.60

According to Table 3, the most important driver for DM1 is D10. and D10 is 10% more important than D9, and D9 is 40% more important than D8. This is the evaluation for all other DM decisions. In Table 4, drivers' means are given.

Table 4. Drivers Means by SWARA

C	**DM1**	**DM2**	**DM3**	**DM4**	**DM5**	**Mean**
D1	0.013	0.014	0.072	0.066	0.092	0.051
D2	0.025	0.006	0.048	0.093	0.032	0.040
D3	0.042	0.022	0.021	0.149	0.009	0.048
D4	0.010	0.009	0.013	0.333	0.147	0.102
D5	0.051	0.031	0.009	0.238	0.013	0.068
D6	0.139	0.069	0.006	0.047	0.374	0.127
D7	0.105	0.043	0.030	0.020	0.054	0.050
D8	0.081	0.104	0.108	0.012	0.003	0.061
D9	0.194	0.145	0.151	0.005	0.249	0.148
D10	0.214	0.325	0.316	0.008	0.021	0.176
D11	0.126	0.232	0.226	0.028	0.006	0.123

Using equality 1, 2, and 3, the driver weights of each decision-maker and the average weights and rankings were determined by taking the average of these drivers, and Table 4 was obtained. According to this, the driver with the highest average is D10. the driver with the lowest average is D2.

4.2.2. Evaluation Results with BWM Method

Decision makers have been determined to determine the best and worst among the circular economy drivers. As a result of determining the best and worst drivers, first of all, the evaluation matrix ranging from 1 to 9 has been determined with the importance matrix. Then the importance levels have been determined with the grading matrix ranging from 1 to 9. The evaluations of decision makers are given in Table 5 and Table 6.

Table 5. Matrix of Comparison of The Most Important Drivers with Other Drivers

	Best to Others	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**	**D7**	**D8**	**D9**	**D10**	**D11**
DM1	D10	9	8	8	9	7	3	5	6	2	1	4
DM2	D10	9	9	8	9	7	5	6	3	3	1	2
DM3	D10	5	6	8	8	8	9	6	4	3	1	2
DM4	D4	5	4	3	1	3	6	7	8	8	8	7
DM5	D6	4	6	8	3	8	1	5	9	2	7	9

Table 6. Matrix Comparison of Other Drivers with The Least Important Drivers

	DM1	**DM2**	**DM3**	**DM4**	**DM5**
Others to the Worst	**D1**	**D2**	**D6**	**D9**	**D8**
D1	1	3	7	6	7
D2	2	1	7	8	6
D3	2	3	4	8	3
D4	2	4	3	9	8
D5	3	3	2	8	4
D6	6	6	1	6	8
D7	5	6	5	4	4
D8	7	5	8	4	1
D9	8	8	9	1	8
D10	9	9	9	2	5
D11	8	7	9	5	2

In Table 5, the most important of the drivers in question was determined by the DMs, and the other drivers were evaluated according to the most important. According to this, for example, the most important driver for DM1 is D10. and D10 is two times more important than D9; It is three times more important than D6. In Table 6, the least important drivers in question were determined by the DMs, and the other drivers were evaluated according to the least important. According to this, the least important driver for DM1 is D1 and D1; D2 is two times less important than D3 and D4.

Linear programming model analysis has been performed by applying all of the Best-Worst steps with the comparisons obtained with the surveys made with each decision-maker, and the weights of the drivers were obtained as in Table 7. Then, the average driver weights of all decision-makers have been taken, and the final driver weights were reached. In the table, the average consistency rate was calculated as 0.086.

Table 7. Drivers Weights

	D1	**D2**	**D3**	**D4**	**D5**	**D6**	**D7**	**D8**	**D9**	**D10**	**D11**	**Ksi BWM**
DM1	0.020	0.045	0.045	0.040	0.051	0.120	0.072	0.060	0.180	0.274	0.090	0.086
DM2	0.038	0.022	0.043	0.038	0.049	0.069	0.058	0.116	0.116	0.273	0.174	0.074
DM3	0.071	0.059	0.044	0.044	0.021	0.039	0.059	0.089	0.119	0.266	0.179	0.092
DM4	0.076	0.095	0.126	0.285	0.126	0.063	0.054	0.047	0.023	0.047	0.054	0.095
DM5	0.089	0.059	0.044	0.119	0.044	0.270	0.071	0.023	0.179	0.051	0.039	0.083
Mean	0.059	0.056	0.060	0.105	0.058	0.112	0.063	0.067	0.123	0.182	0.107	0.086

As can be seen from Table 7, according to the BWM method, the most important driver was D10. and the least important driver was D2. Since all consistency rates are close to 0. it has been observed that the answers given are consistent.

4.3. Evaluation of Challenges of The Circular Economy

4.3.1. Evaluation Results of SWARA Method

To evaluate the challenges to be able to adapt, the circular economy has asked through 10 criteria on five experts in managerial positions (decision-makers). Given criteria and the importance ranking from major to minor can be seen in Table 8.

Table 8. Challenges Sorted Based on SWARA by Decision Makers

Factors/Criteria	**C**	**DM1**	**DM2**	**DM3**	**DM4**	**DM5**
Lack of training and knowledge	C1	2	3	2	2	3
Lack of effort than required	C2	3	10	3	3	10
Lack of resources	C3	6	5	5	5	6
Lack of support from upper management	C4	7	6	6	6	7
Lack of benefits from environmental sustainability	C5	10	9	8	7	9
Lack of financial support	C6	9	1	7	10	4
Lack of environmental regulations and laws	C7	8	2	10	8	2
Lack of environmental awareness	C8	5	4	9	9	1
Lack of support from the government	C9	4	7	1	4	5
Lack of accessibility to supply materials	C10	1	8	4	1	8

As can be seen from Table 8, for example, the most important challenge for DM1 and DM4 is "Lack of accessibility to supply materials (C10)", it is designated as "Lack of financial support (C6)" for DM2, "Lack of support from the government (C9)" for DM3 and "Lack of environmental awareness (C8)" for DM5. The least important challenge for DM2 and DM5 is “Lack of effort than required (C2)”, it is designated as " Lack of benefits from environmental sustainability (C5)" for DM1, "Lack of environmental regulations and laws (C7)" for DM3 and " Lack of financial support (C6)" for DM4. In Table 9, important levels of each decision-maker according to the ranking of the criteria in Table 8 are presented.

Table 9. Importance Levels of Challenges Sorted Based on SWARA by Decision Makers

	DM1		**DM2**		**DM3**		**DM4**		**DM5**	
Rank	Rank	Sj	Rank	Sj	Rank	Sj	Rank	Sj	Rank	Sj
1	C10		C6		C9		C10		C8	
2	C1	0.10	C7	0.40	C1	0.50	C1	0.40	C7	0.50
3	C2	0.50	C1	0.50	C2	0.60	C2	0.60	C1	0.60
4	C9	0.70	C8	0.70	C10	0.70	C9	0.50	C6	0.50
5	C8	0.20	C3	0.40	C3	0.50	C3	0.60	C9	0.60
6	C3	0.80	C4	0.60	C4	0.70	C4	0.50	C3	0.60
7	C4	0.20	C9	0.60	C6	0.50	C5	0.70	C4	0.50
8	C7	0.50	C10	0.50	C5	0.50	C7	0.40	C10	0.70
9	C6	0.70	C5	0.60	C8	0.70	C8	0.50	C5	0.40
10	C5	0.60	C2	0.60	C7	0.50	C6	0.60	C2	0.50

According to Table 9, the most important challenge for DM1 is C10. and C10 is 10% more important than C1, and C1 is 50% more important than C2. This is the evaluation for all other DM decisions. In Table 10. challenges means are given.

Table 10. Challenges Means by SWARA

C	**DM1**	**DM2**	**DM3**	**DM4**	**DM5**	**Mean**
C1	0.249	0.160	0.244	0.242	0.148	0.209
C2	0.166	0.007	0.152	0.151	0.007	0.097
C3	0.045	0.067	0.060	0.063	0.039	0.055
C4	0.038	0.042	0.035	0.042	0.026	0.037
C5	0.009	0.011	0.016	0.025	0.011	0.014
C6	0.015	0.336	0.023	0.007	0.099	0.096
C7	0.025	0.240	0.006	0.018	0.237	0.105
C8	0.081	0.094	0.009	0.012	0.356	0.110
C9	0.098	0.026	0.365	0.101	0.062	0.130
C10	0.274	0.017	0.090	0.339	0.015	0.147

Using equality 1, 2, and 3, the challenge weights of each decision-maker and the average weights and rankings were determined by taking the average of these challenges and Table 10 was obtained. According to this, the driver with the highest average is C1, the driver with the lowest average is C5.

4.3.2. Evaluation Results with BWM Method

Decision-makers have been determined to determine the best and worst among the cyclical economy challenges. As a result of determining the best and worst challenges, first of all, the evaluation matrix ranging from 1 to 9 has been determined with the importance matrix, then the importance levels have been determined with the grading matrix ranging from 1 to 9. The evaluations of decision-makers are given in Table 11 and Table 12.

Table 11. Matrix of Comparison of The Most Important Challenges with Other Challenges

	Best to Others	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**	**C10**
DM1	C10	2	3	6	7	9	8	8	5	4	1
DM2	C6	3	9	5	6	8	1	2	4	7	7
DM3	C9	2	2	4	6	7	7	9	7	1	4
DM4	C10	2	3	5	7	7	8	8	8	4	1
DM5	C8	3	9	6	7	8	4	2	1	5	8

Table 12. Matrix Comparison of Other Challenges with The Least Important Challenges

	DM1	**DM2**	**DM3**	**DM4**	**DM5**
Others to the Worst	C5	C2	C7	C6	C2
C1	9	7	9	9	8
C2	8	1	8	8	1
C3	5	5	6	6	5
C4	4	4	5	5	4
C5	1	2	3	4	2
C6	2	9	4	1	7
C7	3	8	1	3	9
C8	6	6	2	2	9
C9	7	3	9	7	6
C10	9	3	7	9	3

In Table 11, the most important of the challenges in question was determined by the DMs, and the other drivers were evaluated according to the most important. According to this, for example, the most important challenge for DM1 is C10. and C10 is two times more important than C1; It is three times more important than C2. In Table 6, the least important of the challenges in question was determined by the DMs, and the other drivers were evaluated according to the least important. According to this, for example, the least important driver for DM1 is C5, and C5 is two times more important than C6; It is three times more important than C7.

Linear programming model analysis was performed by applying all of the Best-Worst steps with the comparisons obtained with the surveys made with each decision maker and the weights of the challenges were obtained as in Table 13. Then, the average challenge weights of all decision makers were taken and the final challenge weights were reached. In the table, the average consistency rate was calculated as 0.074.

Table 13. Challenges Weights

	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**	**C10**	**Ksi BWM**
DM1	0.186	0.124	0.062	0.053	0.024	0.041	0.046	0.074	0.093	0.295	0.076
DM2	0.121	0.025	0.072	0.060	0.045	0.298	0.181	0.090	0.051	0.051	0.064
DM3	0.169	0.169	0.084	0.056	0.048	0.048	0.022	0.048	0.268	0.084	0.069
DM4	0.187	0.125	0.075	0.053	0.053	0.025	0.046	0.046	0.093	0.290	0.085
DM5	0.123	0.024	0.061	0.052	0.046	0.092	0.185	0.293	0.074	0.046	0.076
Mean	0.157	0.093	0.071	0.055	0.043	0.101	0.096	0.110	0.116	0.153	0.074

As can be seen from Table 13, according to the BWM method, the most important challenge was C1, and the least important challenge was C5. Since all consistency rates are close to 0. it has been observed that the answers given are consistent.

5. DISCUSSION

In this study, by making circular economy on the textile clothing sector, a specific system selection and adaptation of a new method in the literature has been made. In this way, a difference has been presented in terms of both subject and application technique. Weights of the criteria have been found in the literature with recently used SWARA and BWM. The original criteria has been reached with the questionnaire, 5 different expert opinions and a literature review. Drivers and challenges of circular economy have been tried to be determined with original criteria. Thanks to SWARA and BWM, which allow the use of different expert opinions, drivers and challenges of circular economy has been presented in Table 14.

Table 14. Final Weights of Drivers and Challenges of Circular Economy Based on Comparison of Two Methods

Drivers Factors/Criteria	**Weight**		**Ranking**			
	SWARA	**BWM**	**SWARA**	**BWM**	**The Mean Rank**	**Total Rank**
Financial support availability	0.051	0.059	8	9	8.5	9
Pressure for environmentally friendly products and services	0.040	0.056	11	11	11	11
Environmental risk mitigation	0.048	0.060	10	8	9	10
Brand recognition and sales improvement	0.102	0.105	5	5	5	5
Improvement of business sustainability	0.068	0.058	6	10	8	7
Increase in the company’s reputation	0.127	0.112	3	3	3	3
Compliance with environmental regulations and laws	0.050	0.063	9	7	8	8
Improve competitiveness	0.061	0.067	7	6	6.5	6
Improve operational efficiency	0.148	0.123	2	2	2	2
Cost savings from conservation in resources	0.176	0.182	1	1	1	1
Policy and initiative of the company	0.123	0.107	4	4	4	4
Challenges Factors/Criteria	**Weight**		**Ranking**			
	SWARA	**BWM**	**SWARA**	**BWM**	**The Mean Rank**	**Total Rank**
Lack of training and knowledge	0.209	0.157	1	1	1	1
Lack of effort than required	0.097	0.093	6	7	6.5	7
Lack of resources	0.055	0.071	8	8	8	8
Lack of support from upper management	0.037	0.055	9	9	9	9
Lack of benefits from environmental sustainability	0.014	0.043	10	10	10	10
Lack of financial support	0.096	0.101	7	5	6	6

Lack of environmental regulations and laws	0.105	0.096	5	6	5.5	5
Lack of environmental awareness	0.110	0.110	4	4	4	4
Lack of support from the government	0.130	0.116	3	3	3	3
Lack of accessibility to supply materials	0.147	0.153	2	2	2	2

According to both SWARA and BWM methods, the most important driver was determined by DMs as "Cost savings from conservation in resources" and the least important driver as "Pressure for environmentally friendly products and services". As shown in the studies in the literature, the cost factor is seen among the most important issues that businesses care about. Therefore, it is not unexpected that “Cost savings from conservation in resources” is ranked first as the driver. The driver in the second row is determined as "Improve operational efficiency". Operational efficiency is defined as less input, more output, that is, less cost, higher quality work, and is defined as an indispensable part of businesses in the way of sustainability. In third place is "Increase in the company’s reputation". One of the biggest effects of the circular economy on textile companies is the "reputation" factor. Such practices increase the reputation of companies on society. “Policy and initiative of the company” and “Brand recognition and sales improvement” drivers are ranked fourth and fifth, respectively. These drivers are related to the policies that the company has created in their own right. For this reason, it is important to develop such policies and brand awareness, especially in order to reveal the circular economy. The ranking of other drivers according to the method varies. However, “Pressure for environmentally friendly products and services”, which is the last driver in both methods, reveals that the printing element is less effective than the other drivers (Kirchherr, Reike, and Hekkert 2017; Korhonen, Honkasalo, and Seppälä 2018).

According to both SWARA and BWM methods, the most important challenge is "Lack of training and knowledge". The least important challenge is "Lack of benefits from environmental sustainability" by DMs. As shown in the studies in the literature, the training and knowledge factor is seen as one of the most important factors for businesses to make a breakthrough in new issues. Therefore, it is not unexpected that he is ranked first as a "Lack of training and knowledge" driver. At the point where there is no training and knowledge element, there is no development. The second challenge is determined as "Lack of accessibility to supply materials". The lack of access to supply products makes it difficult to create a circular economy. Unless the supply of the needed materials is realized, all other factors are affected. "Lack of support from the government", which ranks third, is one of the challenge elements that are seen as the most effective. Governments play an important role in this. Especially in the clothing sector, it should be possible to develop the circular economy with the policies produced by supporting the manufacturers in this regard. In the fourth place, there is "Lack of environmental awareness". The main purpose of the circular economy is the environment. For this reason, environmental awareness, which is seen as lacking, has to be supported. Training and activities on this subject will raise awareness in the clothing industry. "Lack of environmental regulations and laws" ranks fifth according to SWARA and sixth according to BWM. Environmental regulations will support the formation of a circular economy structure. A challenge that ranks seventh and fifth according to SWARA and BWM is "Lack of financial support". In realizing the circular economy, the importance of education, awareness and regulations, as well as the importance of financial support cannot be ignored. "Lack of effort than required", "Lack of resources", "Lack of support from upper management" and "Lack of benefits from environmental sustainability" are among the less important obstacles, respectively. It is necessary to work on this issue, to reach resources, to see the support of senior management and to raise awareness about the benefits of environmental sustainability (Kirchherr, Reike, and Hekkert 2017; Korhonen, Honkasalo, and Seppälä 2018).

Considering the correlation between the sequencing results obtained with the SWARA and BWM methods, it was revealed that both methods are significantly similar (N=11, r=,882**and N=10. r= ,964** at the significance 0.01 level (2-tailed)) and can be used by decision makers.

6. CONCLUSION

The textile clothing sector was used to be the leading manufacturing industry in Turkey before outsourcing has become inevitable in terms of globalization. Whether it is outsourced or not, global environmental issues are affecting every country, especially developing nations. To become sustainable, circular economy has become an incremental approach for countries and companies to be proactive based on environmental operations. Knowing that this approach is familiar with developed nations, it still has an unclear definition in developing nations as in Turkey. The circular economy providing new lenses on how to be sustainable; nevertheless, the meaning should put forth. To fill this gap, not only for Turkey specific but also for all developing nations, this paper aimed to expand our knowledge in the operational field and strategic logic by:

- Investigating the circular economy in the textile clothing industry in Turkey,
- To understand the drivers and challenges in the implementation of the circular economy that motivates the textile clothing companies to adopt the circular economy approach to be environmentally sustainable,
- To focus on the general picture at first, what to be done proactively in the next steps.

Apart from the theoretical side, the paper also has some contribution on the implementation side. From the research findings, the factors that are effective in the implementation of the circular economy is cost savings from conservation in resources, and textile clothing companies think and act with cost-saving concerns whether they are in and out of the circular economy paradigm. Relevantly, factors such as “Improve operational efficiency”, “Increase in the company’s reputation”, “Policy and Initiative of the company,” and “Brand recognition and sales improvement” are among the top five rankings for the implementation of the circular economy. Thus, it would not be wrong to conclude that textile clothing companies think that implementing a circular economy is peculiar at the organizational level. As businesses are acting with cost concerns, they may not be so sensitive to comply with environmental regulations and laws. Also, they are not sensitive enough to reduce environmental impact in the first place. In another interpretation, issues such as environmental impact and compliance with the law are not more important than organizational focus (efficiency vs. sustainability) in Turkish textile clothing companies.

In terms of challenges, factors preventing the implementation of the circular economy, it can be concluded that issues such as education, knowledge, resources, and awareness are primary concerns for companies in implementing circular economy. However, if one sees that a circular economy approach is not only a full set of implementations that requires a considerable amount of investment but a philosophy, may find the factors with minor importance controversially. Relevant to drivers, companies stand on the logic of being efficient is being sustainable. Hence, within a holistic view, stakeholders should create a prevision to increase external motivation for companies to implement sustainable implementations that are apt by being proactive, building strategies, and incentives to implement and put forth. In addition, companies must first of all know the opportunities the circular economy offers to the clothing industry. They should improve themselves by receiving training from the necessary experts in this field. They should do research to meet the required procurement needs. They should inform themselves about environmental policies. It is important that they act together.

Nowadays, people are familiar with classic recycling systems, but the circular economy system is getting newer in memory. People can mix classical recycling and savings systems with circular economy systems. Therefore, innovation and prevalence in the circular economy should be provided through education, and consumers should be focused on products produced from sustainable or renewable sources. Also, not only the environmental effects and benefits of the products but also the conditions for their use and sustainability should be taken into consideration by the designers and manufacturers. Thus, the paper findings highlight this approach has many shafts besides being efficient vs. sustainable.

This study has several limitations. The data was collected quantitatively and was in the umbrella of five experts' responses. This limitation may reduce the generalizability of results to all textile clothing companies. For this reason, a larger sample is recommended for further studies. This paper's focus was on the textile clothing sector; however, the same drivers and challenges may apply to other industries as well. Further studies may use different statistical techniques and compare the findings. As this paper aimed was to take a picture of the general status of the circular economy approach, in further studies, the research question should be narrowed on a single pillar, the social one, etc. companies in the textile sector, specifically in apparel. Also, for further studies, the methodology can be enlarged with fuzzy sets. And the results of the fuzzy sets can be compared SWARA and BWM, multi-criteria decision making methods. Finally, the authors hope this paper would meet with companies and decision-makers who are currently or willing to implement the circular economy approach.

In this study, it has been handled within the framework of sustainability in textile clothing industry. In this context, the most distinguishing factor in ensuring sustainability is the economic dimension. So, the boundaries of this study have been examined within the scope of the drivers and challenges of the circular economy.

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