



Circular Economy: The Challenges and Opportunity in Fashion Recycling

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Abstract. To overcome environmental problems, experts developed the 3R concept (reuse, reduce, and recycle) to reduce community, industrial, and household waste. The 3R concept is a concept of integrating economic activities to create sustainability. Awareness of this problem has led to an increasing interest in the transition to a circular production model using the concept of the circular economy to optimize production with minimum resource consumption and side impacts, coupled with recycling waste made from the production process. The purpose of this paper is to discuss the circular economy as a whole, starting from the definition, challenges, processes, and advantages to make it easier for people to understand the circular economy concept, especially in fashion recycling. This research was carried out using the literature review method through collecting, reviewing, and reviewing articles discussing the circular economy using the keywords “circular economy,” “definition,” “challenges,” and “advantage.” The findings of this study indicate that a green economy will be the future compass for moving towards better awareness to protect our environment and the need to grow without sacrificing future generation resources potential. A circular economy could reduce pressure on the environment, improve the security of the supply of raw materials, increase competitiveness, generate stimulating innovation, and boost economic growth. Circular economy research in the Asian region is an essential consideration for future research.

Keywords: Circular economy · Sustainability · Fashion recycling · 3R concept

1 Introduction

The recycling industry has provided opportunities for entrepreneurs and would-be entrepreneurs of micro, small and medium enterprises (MSMEs). This industry differs from other industries because it involves the business chain of materials used to produce new goods. Two primary forms of recycling business consist of activities related to collecting and processing recycled materials to produce new goods. In the first phase of the activity, entrepreneurs will recycle goods and obtain supplies from homes and business premises, as well as suppliers who collect materials on a small scale and send them to collection centres using the existing transportation usually operated by large companies.

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The second activity involves more excellent resources because it requires machines and expertise which commonly operated by large companies.

The 3R concept has been developed and is better known as green environment or green economy concept consisting of the cycle of reuse, reduce, and recycle. The 3R concept is a concept of integrating economic activities to create sustainability using a linear economy approach. With the increasing public participation in environmental sustainability, the latest concept has developed to achieve the SDG's target in the form of sustainability, namely the circular economy [1]. In addition, the current production model is not sustainable, resulting in many side effects from the production process, such as high emissions of greenhouse gases as well as the decreasing resources available in nature which makes it a big risk for the supply chain and makes prices easy to rise and fall [2]. Awareness of this problem has led to an increasing interest in making the transition to a circular production model using the concept of circular economy to optimize production with minimum resource consumption and minimum side impacts coupled with recycling waste made from the production process [3].

A circular economy is defined by the theme of resource scarcity, impact on the environment and economic benefits, optimization of resources related to cleaner production, as well as increasing the value of the technical and biological cycles of materials through circular strategies. The circular economy concept carries the issue of reuse, repair, remanufacturing, and recycling of products, materials, and components [4].

The transition to a circular economy (CE) model requires various preparations from the industrial and government side as well as educating the consumers regarding the concept of CE. It also requires consumers to maintain their behavior to keep the expected level of consumption of the CE concept, by practicing borrowing or sharing a product, or giving out the product to other parties rather than destroy or discard it [5].

Fashion trends are rapidly changing over time. Clothes that are no longer used will be disposed of as waste, and this will cause harm to the environment. The practice of disposing of clothing is "to stop the wearing and disposal of clothing items by giving them to others, discarding, using them for purposes other than wearing clothing or selling it at a used clothing store or garage sale." [6]. "If a fashion thing comes out of the day, tomorrow there must be many who buy it", this is the current strategic view of fast fashion retailers to increase store visit rate with customers disposing of their clothes more often, which in turn will increase their income [7]. Many healthy-known fashion retailers produce a new range of clothes every two to three weeks at meager prices, as this strategy stimulates consumer motivation to buy their newer products [8].

The purpose of this paper is to discuss the circular economy as a whole, starting from the definition, challenges, processes, and advantages, in order to promote the understanding of the circular economy concept. The scope of this paper discusses the circular economy in the field of fashion recycling.

2 Methodology

This research was carried out using the literature review method by collecting, discerning, and reviewing articles discussing the circular economy using the keywords "circular economy" and "definition," "challenges" and "process," and "advantage". The

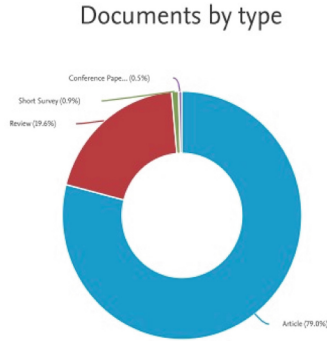


Fig. 1. Scopus Database Analyzes Based on Document Types

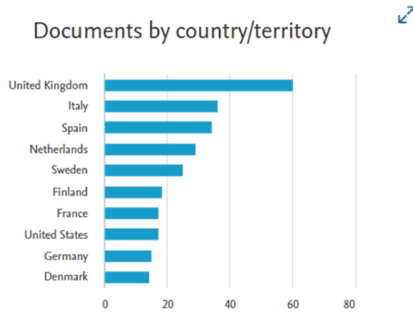


Fig. 2. Scopus Database Analyzes Based on Geographical Location

first search yielded 490 documents. Searches preferred on documents with “all open access” resulted in 253 articles. Based on the results of the search (Fig. 1), a bibliometric analysis was carried out by utilizing the Scopus database with the results of the most document types, namely 187 journal articles, 48 document reviews, 11 conference papers, 4 book chapters, 2 short surveys, and 1 book. Based on the geographical location (Fig. 2), most research on circular economies comes from European countries, for example UK, Italy, and Spain. Based on the subject area (Fig. 3), the most documents came from environmental science (154 documents), energy (104 documents), and social science (103 documents).

The network visualization was conducted using VosViewer’s analysis to analyze the distribution of research on the circular economy. From the results of the VosViewer (Fig. 4), it is discovered that the literature on circular economy is generally associated with sustainability, sustainable development, recycling, and life cycle. There is not much literature that links the circular economy with the challenges or with business recycling.

Documents by subject area

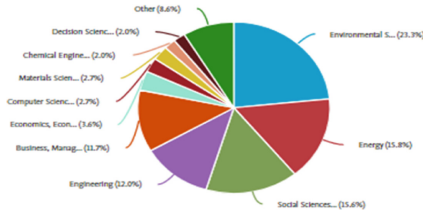


Fig. 3. Scopus Database Analyzes Based on Subject Area

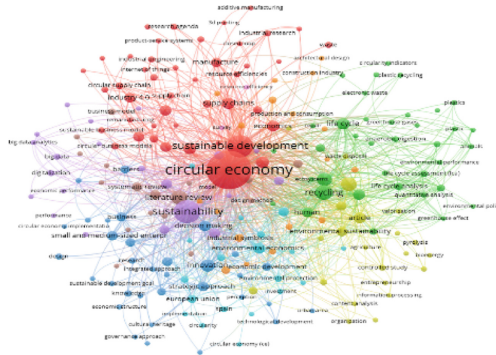


Fig. 4. Network Visualization of Co-occurrence Type of Analysis using VosViewer

3 Results and Discussion

3.1 Definition of Circular Economy

Circular economy initiatives have provided a potential path to a more sustainable future by redefining the recovery of materials and returns from waste or products and materials, including designing waste and pollution, maintaining products and materials for use as far as there is the regeneration of natural systems and ecology [9]. The circular economy advocates a significant departure from our current linear economic model and conventional business practices. Between 1970 and 2010, annual global material consumption nearly tripled to 75.6 billion tons, which could increase to 180 billion tons by 2050 if current trends continue [10].

Arguably, the decades-long reduction, reuse, and recycling paradigm have never been more relevant. The circular economy's focus on the corresponding curvilinear path of products, components, or material movement builds on this maxim by introducing maintenance, reuse, refurbishing, and then recycling as a general hierarchy of technical material loops based on environmental, economic value and efficiency [11].

Round fashion is a new concept that combines the concept of circular economy and sustainable fashion. A circular economy process is not linear but based on a "take, make and throw" production model. This take is based on an economy with a closed

loop that minimizes environmental pollution by recycling waste and reducing resource consumption [12].

Sustainable fashion has a movement and commitment to foster change in fashion products and the fashion system towards greater ecological integrity and social justice. Thus, round fashion has been defined as clothing, footwear, and accessories designed, procured, manufactured, and made available for use and distributed responsibly and effectively in society for as long as possible in the most valuable form possible. In addition, round fashion also refers to a regeneration system that considers resource efficiency, non-toxicity, biodegradability, shelf life, and recyclability from the time a fashion product is designed until disposed of so that the product life cycle does not result in socio-economic losses or environmental damage [13].

3.2 Fashion Recycling

Fashion plays a significant role in decisions about consumption. It represents social differentiation, mobility, and societal identity [14]. Moreover, fashion is also about social differences and assimilation. Fashion allows someone to “mark” his/her identity, but at the same time its fragility allows people to change their identity [15]. An essential aspect of fashion is the novelty that allows consumers to accept new fashions and change their tastes [16].

Fashion contributes to the accelerated rate of consumption. Recycling is finding other uses for existing clothing; in the case of textiles, sometimes it also means converting waste to reusable materials. Clothing recycling generally involves finding another use or consumer by re-entering a new phase of its life starting from retail [17].

In the 18th century in Western Europe, a rapid change known as fashion became apparent in clothing and other consumer goods. As for clothing, the rate of change is accelerating from time to time in line with the development of consumer culture and mass production. For example, haute couture clothing has been copied in industrial production [18].

In the past few decades, “fast fashion” involving a combination of short product life cycles, limited editions and low prices has increased [19]. Meanwhile, in Malaysia, fashion changes very fast. Changes and the new birth of classic styles such as *baju kurung kebaya* for festivals are essential factors in changes in fashion. Fashion is not necessarily the birth of “out of the blue”, a new style but more to the re-rotation (read rotation) of old fashion given a new breath.

Innovation is also essential in fashion when the old fashion round comes out again. An example is when modern *baju kurung* fashion is added with the innovation of custom-printed fabric, which gives a new breath. Modern *baju kurung* that uses custom-printed is more limited to the fashion brand, and the overall colour and design are more attractive than the non-custom ones.

3.3 Challenges in Fashion Recycling Business

The fashion recycling business is facing several challenges, especially in Malaysia. The most crucial point is that we need better technology, especially in this field, because

it receives less attention from the government in Malaysia. Consumer preferences for remanufactured products are still largely unfavourable, hence the need to educate the public regarding the concept of remanufacturing and its effects on the environment and society [20]. Other challenges are the complexity of the textile recycling value chain, the technology barriers, and the systemic challenges for enhancing textile recycling.

The Complexity of the Textile Recycling Value Chain

In line with the definition from the EU Waste Framework Directive, textile recycling is essentially designated from a technical perspective as the “breakdown and reclaiming of textile raw materials to new ones” involving a degree of deconstruction. However, textile recycling is embedded in a broader and more complex textile flow management system involving several preceding stages [21].

Textiles are usually classified depending on their collection point along the value chain. Textile flows are either designated as “pre-consumer” if collected at the industrial level or “post-consumer” if collected after use. “Pre-consumer” usually comprises all types of waste from companies resulting from manufacturing and distribution activities, from textile offcuts to unsold products, whereas “post-consumer” refers to used articles discarded by consumers once no longer wanted. Upstream, some also distinguish between the “post-industrial” (side-effect of clothing manufacture) and the “pre-consumer” (inferior quality garments or unsold products at the retail stage) feedstocks depending on the source in the value chain.

In general, the post-consumer underreported part entails significant challenges for the sector. Overall, 15%–20% of clothes have been estimated to be collected for reuse and recycling practices within Europe, and essential disparities in collection schemes have been addressed [22].

Technology Barriers of Textile Recycling

The need for more technology to support the development of textile-to-textile recycling was identified as an essential ongoing barrier. Textile recycling is mainly based on pre-established mechanical recycling. Concerning existing processing routes, a standard classification is made between mechanical and chemical recycling.

Mechanical recycling implies cutting the fabric into smaller pieces and then pouring it gradually through a rotating drum until it reaches a fibre state, which is ideal for re-spinning into new yarn or for other manufacturing products. Less commonly, “thermal recycling” is sometimes defined as recycling synthetic fibres through liquid extrusion, which is often referred to under “mechanical recycling” as implying previous mechanical processing. This process can be used to recycle fabrics made from natural fibres as well as synthetic fibres. However, tearing the fabric during the mechanical process shortens the fibre length, thus reducing the quality output [23].

Systemic Challenges to Enhance Textile Recycling

As part of this complex textile flow management system, textile recycling involves various other stakeholders such as charities, municipal waste collection services or resale organizations [24]. Only a few textile flow mappings can be found in the academic literature, and empirical studies investigating textile flow in this exclusion facility still need

to be included. However, change is needed throughout the value chain, as the performance of this ecosystem determines the number of textiles collected which can be reused and recycled [25]. Thus, beyond technical matters, many obstacles are encountered in optimizing textile recycling, which involves it as a systemic challenge.

Several studies, both theoretical and empirical, have begun to explore textile-specific barriers associated with the implementation of a circular economy. Although some studies provide in-depth analysis, they investigate the barriers associated with the circular economy as a whole. Hence, they do not allow for a holistic and systematic analysis of the recycling value chain.

The latest extensive research took a qualitative approach through semi-structured interviews with 11 stakeholders. It investigated the drivers, inhibitors, and enablers of creating a textile-to-textile recycling system in the Scandinavian fashion industry. The main inhibitors found were limited recycling technology to segregate materials, high research and development costs, supportive logistics, and the complexity of the supply chain, including various stakeholders. However, while expanding the knowledge of the types of systemic and technological changes required, the study did not allow to take advantage of the amplitude of opinion and the lack of sample representation [26].

3.4 Opportunities in Fashion Recycling Business

This section will discuss several opportunities in fashion recycling business based on literature reviews. The opportunities will be explored for mechanical and chemical textile recycling business as well as the garment upscaling/recycling business.

The mechanical textile recycling business is the most straightforward recycling process, as there is very little research and development involved. Moreover, it has been practiced for a long time with recycled products ranging from rags, carpets, insulating materials, and filling materials [27]. Nevertheless, modern machines have made it possible for upcycled products such as yarns that can be used for apparel, making the process much more profitable.

On the other hand, the chemical textile recycling business has entirely different process. It requires an active knowledge of textile materials and chemistry before constructing a business plan. Chemical recycling often involves a mechanical aspect of shredding the material [28]. Most of the technology in chemical textile recycling is either in the development or various testing stages, except for recycling cellulosic fibres from cotton. With most of the work based on research and development, this business will require huge investments and partnerships from big apparel companies and academic institutions.

The garment upscaling/recycling business has a different approach from the rest. The recycling process takes unused or broken consumer items and converts them into valuable products, such as fashionable apparel, accessories, home decor and others, by reconstructing and redesigning the waste. The recycling business is the easiest to set up with minimal investments, as it can be done through boutique shops, online brands, social enterprises, and cooperatives with NGOs. Textile wastes, such as leftover and cut fabrics, can also be collected from the apparel industry, as they are relatively cheap. This process could become one of the solutions that helps companies to move towards sustainable business performance [29].

4 Conclusion

Recycling is a common way to recover materials for many products, whereas the current struggles some recycling programs face in other countries highlight the significant challenges underlying recycling. In this literature review paper, we elaborated on several challenges that fashion recycling businesses face, where consumer preferences for remanufactured products are unfavourable. Therefore, it is necessary to publicize the concept of remanufacturing and its effects on the environment and society.

Based on existing data, circular economy research is widely carried out in the European region, and there is limited literature that conducts circular economy research in the Asian region. Therefore, circular economy research in the Asian region is an important consideration for future research.

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