Proceedings of the 3rd International Conference on Business and Policy Studies
DOI: 10.54254/2754-1169/81/20241435

Navigating Inventory Management Challenges in Contemporary Fashion Retailing: A Circular Economy Approach

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Abstract: Our research focuses on decreasing the pollution caused by excess inventory in the fashion retailing industry. We choose to focus on this problem due to the lack of solutions in this region. In the past, people just focused on how to use environmentally friendly materials and how to produce with the lowest amount of pollution. To find a new method to solve the pollution problem during and after the consumers' purchasing, we built a model containing the primary fulfillment, retailers, secondary fulfillment, secondary retailers, brands and factories, etc. We use them as examples to find out how to end the combustion of excess inventory. We try to change the linear (in the end, the clothes are useless and combusted) to a circle(we could use one raw material several times) to avoid lots of pollution. The final answer is that we did that by increasing the service age of the products and information transparency inside the fashion retailing industry.

Keywords: Inventory Management, Fashion Retailing Industry, Retailers

1. Introduction

The contemporary fashion retailing industry plays a crucial role in the global economy, including the intricate processes of production, distribution, and consumer engagement for clothing, accessories, footwear, etc. [1]. This dynamic sector, however, is struggling with a significant challenge that has significant implications across profitability, sustainability, and environmental preservation. Central to this issue is the predicament faced by fashion brands as they navigate the complexities of inventory management in a fast-paced market [2].

The problem lies in a twofold fulfillment process that characterizes the journey of fashion goods from factory to consumer [3]. The initial stage involves the dispatch of products to various retailers, marking the first fulfillment. However, in this process, a recurring dilemma emerges – the creation of surplus stock. This overstock subsequently compels retailers to choose a secondary fulfillment strategy, in which excess items are sold to the secondary market at considerably reduced prices. While this approach helps clear surplus stock, it simultaneously triggers a domino effect of challenges in inventory control due to the sheer volume of goods involved.

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The influence of this complex retail ecosystem extends beyond the realm of inventory management. With the secondary market often yielding low profitability, retailers frequently find themselves at a crossroads, faced with a difficult choice: to bear the cost of managing surplus inventory or to resort to drastic measures. Distressingly, most retailers often take the form of discarding unsold items sending them to landfills. This disposal practice not only aggravates the environmental crisis but also highlights the obvious inefficiency in the fashion industry. – the inability to reincorporate returned merchandise back into circulation.

A striking aspect of this problem is the increasing costs associated with the re-consolidation of returned items into the inventory cycle [4]. In many cases, the costs incurred exceed any potential benefits, forcing the company to seek recourse from the secondary market. However, this will bring huge financial losses and make the company try to cope with the thorny reality of waste of resources. In addition to the financial impact, this practice has also greatly exacerbated the rapidly developing environmental problems of our era because abandoned clothing has found its disgraceful resting place in landfills, increasing the ecological burden.

The importance of addressing these challenges resonates deeply in the structure of the global fashion industry, so it is necessary to coordinate innovative solutions in the field of business and sustainable development [5,6]. With the evolution of consumer preference patterns, the task of fashion companies is to keep up with changing trends to maintain competitiveness. In this changing atmosphere, the pursuit of a new paradigm has become more urgent.

The main goal of this paper is to comprehensively explore these challenges and propose a reform method rooted in the principles of circular economy. Circular economy emphasizes minimizing waste, maximizing resource efficiency, and extending product life, providing a promising framework for reimagining the way fashion brands manage inventory. By adopting the recycling method, the company can potentially reduce the amazing cost of processing returned goods and, at the same time, take significant steps in reducing the environmental losses caused by its operation.

Given the multi-faceted impact of the challenges faced by fashion companies, it is necessary to study more deeply the potential factors that make the current situation exist for a long time. Through a comprehensive analysis of industry trends, consumer behavior, and existing paradigms, this paper aims to clarify the path to a more sustainable and economically feasible fashion retail approach.

In the pages that follow, this paper will dissect the intricacies of the fashion retailing industry, laying bare the complexities that give rise to surplus inventory and wastage. Through a detailed examination of existing models and emerging frameworks, this article will outline the principles of circular economy and explain how to use their principles to completely change the inventory management pattern. As the fashion industry strives to solve the problem of how to balance business and environmental responsibilities, the proposed method strives to draw a new trajectory that combines profitability and sustainability.

2. Literature Review

2.1. Current Situation in the Fashion Retailing Industry

Consumer habits play a pivotal role in shaping the dynamics of the fashion retailing industry. Retailers are keenly aware of the significance of understanding and catering to these habits. Notably, teenagers aged 12 to 19 have emerged as a significant consumer demographic, spending a staggering $153 billion on fashion goods. Investigating consumer habits, including brand preferences, experiences, and services, becomes vital to ensuring satisfaction, loyalty, and consumer intentions [7].

Also, the positioning of consumers for fashion retailing is essential as well. For example, there is one fashion retailer called Gap. It is very successful with its products and selling strategies. Gap

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focuses on consumers aged 15 to 35, with an average of 23 years old. Because Gap is a fashion brand, it could be easier to trap consumers in over 4171 offline and online stores [8]. They have cool designs on their clothing and inside their offline stores. This makes them popular among the youth over the globe [9].

However, there is a big problem that firms always neglect, which is the excess inventories [10]. They always produce more than the demand, and for the excess inventories, firms just landfill or combust them and release lots of harmful chemicals into the environment [11].

2.2. Social Problems in the Current Situation

Overproduction leads to inventory accumulation and causes pollution from many angles. There are over 130 million tons of waste sent to landfill stations over the globe. They break down into methane and cause global warming. Overproduction impedes the natural renewal of resources. For example, in some nations like the USA, many plastic products are overproduced, causing excessive inventory in lots of firms. These plastic products may end up in the water, damage the ocean ecosystem, and pollute the water [12]. Also, most excess inventory is not managed correctly. They end up in some landfills or waste incineration plants and will emit lots of harmful gases and chemicals into the air. In 2018, the USA combusted and landfilled 35.7 million plastics, and most of them caused environmental pollution to the atmosphere. Therefore, the more excess inventory a firm has, the more pollution it will contribute to.

Moreover, there is also a waste of valuable resources, producing excess inventory, such as energy, water, and raw materials. Non-renewable resources such as coal and oil are used to produce excess inventory and cannot show their real, practical value. This is also a waste of resources and environmental harm.

2.3. Current Methods to Solve the Problems

To avoid the pollution caused by eliminating excess products, many solutions have been proposed to solve the problem.

Firstly, firms could produce products according to the demand of the customer. They could use some methods to investigate the customers' purchasing habits: their shopping tendencies and the fashion and taste of the whole society. Also, firms should do a complete stock count before changing their inventory. They could use AI technology to manage inventory counts to prevent human errors. In this way, firms could order the materials and products based on their storage demand and market movements and efficiently avoid overproduction.

Secondly, firms could change their raw materials from plastic (which is not environmentally friendly) to some other materials, such as glass, jute, natural fiber, and so on. Although glass is not easy to decompose in the soil, it will have no toxic or harmful gas released during its self-decomposition in the ecosystem. Therefore, less pollution will occur even though the firms need to discard the excess inventory.

2.4. Improvements Could be Taken to Better Overcome the Problem

It is said that the circular economy could recycle waste materials into things of value, and this is an essential part of the production industry. Not only the firms but also the customers should follow the "4R Principle". The firms in the circular economy should reduce the usage of raw materials and energy and reuse and recycle their products. For costumers, they should sort and recycle the waste they have used. For example, in Germany in 1972, a policy called "Abandoned Material Limitation and Waste Disposal Law" was published. This law aimed to make residents and firms participate in managing waste and excess materials [12]. Also, nowadays, firms should pay more attention to a

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product's service life, which could help a product to cycle for not only one time, increase its value, and decrease pollution at the same time. A plan said that in London, there will be a 50% decrease in the waste produced by firms and factories in 15 years. In 70 years, the reuse and recycling rate will increase by about 20 to 30 percent, and it will control the global warming temperature under 1.5℃ [13]. Obviously, a circular economy could help to solve the problem of pollution caused by dealing with excess inventories.

In conclusion, the pollution resulting from excess inventories in the fashion retailing industry is a severe issue with far-reaching consequences, including accelerating global warming, damaging water sources, and contributing to disease spread. Embracing circular economy principles and sustainable practices represents a promising path toward reducing pollution and creating a more environmentally responsible fashion retailing industry. While some industries have made strides in adopting circular economy practices, the fashion retailing industry, particularly the luxury segment, must raise awareness and explore the feasibility of integrating circular economy principles to effectively tackle the problem of pollution caused by excess inventories [14]. More extensive investigations and initiatives in this direction are imperative to foster a sustainable and eco-conscious fashion retailing industry.

3. Analysis

3.1. Demand Forecasting and Lean Production

Demand forecasting and lean production are fundamental strategies to address the challenges of excess inventory in the fashion retailing industry. By leveraging advanced analytics and market insights, fashion brands can make informed decisions regarding production quantities. This approach enables them to produce only what is needed, reducing the risk of overproduction and surplus stock.

One of the primary advantages of demand forecasting is its ability to align production with actual customer demand. Through historical data analysis, market trends assessment, and consumer behavior understanding, companies can make accurate predictions about the popularity of specific fashion items. This allows them to adjust production accordingly, minimizing the generation of excess inventory.

Lean production complements demand forecasting by optimizing the production process itself. It emphasizes efficiency, waste reduction, and continuous improvement. By streamlining operations, eliminating non-value-added activities, and employing just-in-time inventory management, companies can achieve greater control over their inventory levels. This approach reduces the need for large safety stock quantities and mitigates the challenges associated with managing surplus items.

Furthermore, implementing demand forecasting and lean production can enhance a company's overall competitiveness. By reducing waste and costs associated with overproduction, fashion brands can allocate resources more efficiently, potentially leading to higher profit margins. Additionally, aligning production with demand can enhance customer satisfaction as products are more likely to be available when customers want them.

In conclusion, demand forecasting and lean production are essential solutions to the excess inventory problem in the fashion retailing industry. These strategies enable companies to operate more efficiently, reduce waste, and align production with actual customer demand. By doing so, they can mitigate the environmental and financial challenges associated with surplus stock, ultimately contributing to a more sustainable and competitive industry.

3.2. Recycling and Circular Economy

The adoption of recycling and circular economy principles represents a transformative approach to addressing the social and environmental problems linked to excess inventory in the fashion retailing

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industry. This solution involves rethinking the entire product lifecycle, from design to disposal, with an emphasis on sustainability.

Recycling and circular economy strategies aim to extend the life of fashion products, minimize waste, and reduce pollution. Fashion brands can achieve this by designing products for longevity, ease of repair, and recycling. By creating durable items and providing repair services, companies can encourage customers to keep their clothing in use for longer periods, reducing the frequency with which they need to replace their wardrobes.

Moreover, recycling materials from old or unsold clothing into new products is a core principle of the circular economy. By collecting and reusing textiles, companies can reduce the demand for virgin resources and minimize the environmental impact of textile production. This approach also presents opportunities for innovative designs and sustainable materials, such as recycled fibers and eco-friendly dyes.

Consumer engagement is crucial to the success of recycling and circular economy initiatives. Fashion brands can incentivize customers to return or recycle their clothing by offering discounts on future purchases, organizing take-back programs, or collaborating with recycling facilities. Increased consumer participation in recycling and circular practices can significantly reduce the volume of clothing ending up in landfills.

In conclusion, recycling and embracing circular economy principles offer a holistic and forward-thinking solution to the excess inventory problem in the fashion retailing industry. By reimagining the product lifecycle and encouraging sustainable consumption, companies can reduce waste, minimize pollution, and contribute to a more eco-conscious industry.

3.3. Supply Chain Traceability

Supply chain traceability is a critical solution for addressing excess inventory challenges in the fashion retailing industry. It involves implementing technologies like blockchain to enhance transparency and accountability throughout the supply chain, from sourcing raw materials to delivering finished products to consumers.

One of the primary benefits of supply chain traceability is its ability to identify inefficiencies and bottlenecks in the production and distribution process. By tracking the movement of products and materials in real-time, fashion brands can quickly identify areas where excess inventory tends to accumulate. This insight allows for proactive measures to adjust production or distribution to prevent overstocking.

Traceability also plays a pivotal role in ethical and sustainable sourcing. Fashion brands can use blockchain technology to verify the authenticity and origin of materials, ensuring they come from ethical and environmentally responsible sources. This transparency not only aligns with consumer preferences for sustainable products but also reduces the risk of excess inventory resulting from unethical practices.

Additionally, supply chain traceability can improve demand forecasting accuracy. By having access to comprehensive data on product movement and consumer preferences, companies can refine their forecasts, ensuring that they produce the right quantity of products. This reduces the likelihood of overproduction and minimizes the environmental and financial consequences of excess inventory.

In summary, supply chain traceability, enabled by technologies like blockchain, is a pivotal solution to the excess inventory challenge in the fashion retailing industry. It enhances transparency, identifies inefficiencies, promotes ethical sourcing, and improves demand forecasting accuracy. By implementing traceability measures, companies can operate more sustainably and efficiently while reducing the environmental impact of surplus inventory.

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3.4. Collaborative Supply Chain Management

Collaborative supply chain management is a strategic approach that involves fostering close partnerships and coordination between fashion retailers, suppliers, and manufacturers to optimize the entire supply chain. This solution addresses the excess inventory problem by improving the responsiveness and efficiency of the supply chain.

One of the fundamental aspects of collaborative supply chain management is communication and information sharing. By sharing real-time data on inventory levels, production schedules, and consumer demand, all stakeholders in the supply chain can make more informed decisions. This enhanced visibility reduces the risk of overproduction and ensures that products are manufactured and delivered according to actual demand.

Collaborative supply chain management also enables a more agile response to changes in market conditions. In the fast-paced world of fashion, trends can shift rapidly. With close collaboration, fashion brands can quickly adjust production quantities, alter product designs, or even switch suppliers to adapt to changing consumer preferences. This flexibility minimizes the chances of being stuck with an excess inventory of outdated or unpopular items.

Moreover, this approach encourages the adoption of just-in-time (JIT) inventory practices. By maintaining lower safety stock levels and relying on efficient supply chain coordination, fashion brands can reduce the need for large stockpiles of excess inventory. JIT principles ensure that products are produced and delivered precisely when needed, reducing waste and improving cost efficiency.

Collaborative supply chain management also promotes sustainability. By working closely with suppliers and manufacturers, fashion brands can assess and improve environmental and ethical practices throughout the supply chain. This includes responsible sourcing of materials and ethical labor practices, which can contribute to a more socially and environmentally responsible industry.

In summary, collaborative supply chain management offers a comprehensive solution to the excess inventory challenges in the fashion retailing industry. By fostering close collaboration, improving communication, and embracing agile practices, companies can minimize overproduction, reduce waste, and adapt to changing market conditions. This approach not only enhances efficiency but also promotes sustainability and responsible sourcing practices, contributing to a more eco-conscious industry.

3.5. Consumer Education and Engagement

Consumer education and engagement represent a crucial solution to address excess inventory issues in the fashion retailing industry. This solution focuses on raising consumer awareness about the environmental impact of excess inventory and encouraging responsible consumption practices.

One of the primary objectives of consumer education is to inform customers about the consequences of excessive inventory, including pollution, waste, and resource depletion. By communicating the environmental challenges associated with overproduction and excess inventory disposal, fashion brands can inspire consumers to make more informed purchasing decisions.

Fashion brands can also educate consumers about the benefits of sustainable and responsible consumption. This includes promoting the concepts of durability, quality, and timeless design. Encouraging customers to invest in high-quality clothing that lasts longer reduces the frequency with which they need to replace their wardrobes, decreasing the demand for new products and excess inventory.

Consumer engagement initiatives can take various forms, such as reward programs for returning or recycling clothing, organizing clothing swap events, or providing platforms for customers to resell or donate unwanted items. These efforts incentivize consumers to actively participate in reducing waste and extending the lifecycle of fashion products.

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Another aspect of consumer engagement is transparency. Fashion brands can provide customers with information about the sourcing of materials, ethical manufacturing practices, and the environmental impact of their products. Transparency builds trust and empowers consumers to make environmentally conscious choices when selecting fashion items.

Moreover, companies can collaborate with influencers and advocates in the sustainability and fashion industries to amplify the message of responsible consumption. Partnering with individuals or organizations that promote eco-friendly fashion practices can expand the reach of educational campaigns and inspire more consumers to embrace sustainable fashion choices.

In conclusion, consumer education and engagement are essential components of the solution to excess inventory challenges in the fashion retailing industry. By raising awareness, promoting responsible consumption, and incentivizing sustainable practices, fashion brands can empower consumers to make environmentally conscious choices. Engaging customers in the journey towards reducing waste and extending product lifecycles contributes to a more eco-conscious and responsible industry.

4. Conclusion

In conclusion, the logic chain presented in this essay highlights the significance of the paper's topic. Through a precise analysis of our main problem-solving-chain, it becomes explicit how the circular economy could help the fashion retailing industry reduce the waste in their inventories and decrease their environmental pollution. Many examples and evidence in this essay demonstrate our key findings and understandings.

Our research found that current solutions to excess inventories could be more sustainable and acceptable. The method of landfilling will not only release toxic and harmful gases into the atmosphere (for products with raw materials plastic) but also decrease the land value and land utilization rate in that particular region. Also, the method of combustion will only work sometimes. It will cause a large amount of greenhouse gas emissions (which is pollution). Therefore, we plan to use a circular economy to increase the service life of a product and the information transparency of a circle for the flow of the products.

This essay provides detailed information on how our circular economy method will work in the fashion retailing industry system to solve the pollution problem caused by excessive inventory. However, this essay covered only some of the angles of a circular economy, such as the cost of mobilizing the merchants in this system, how the consumer experience will be after so many times of circulation, etc. These investigations could be done in subsequent works in the future.

Acknowledgement

Lingyao Yan and Yuhan Zhang contributed equally to this work and should be considered co-first authors.

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