# *Streamlining Style: Reducing Returns in Fast Fashion E-commerce with Lean Six Sigma*

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***Abstract*** *— The rise of fast fashion e-commerce, driven by consumer demand for trendy, affordable and quickly produced clothing, has led to high return rates, impacting customer satisfaction, profitability and sustainability. This study investigates the causes of 20% return rate of an online retailer, aiming to reduce to 12-15% within one month using Lean Six Sigma Techniques. Utilizing the DMAIC Cycle, the research combined qualitative surveys and quantitative return data analysis. Root Cause Analysis revealed that 75% of returns were due to quality and fit issues. In response, clearer product descriptions, enhanced sizing guides, and stricter supplier audits were implemented. As a result, return rates decreased to 15%, enhancing customer satisfaction, boosting sales, and achieving cost savings. The findings demonstrate that Lean Six Sigma effectively reduces return rates and boosts customer satisfaction, making it a valuable strategy for online retailers. Hypothesis testing confirmed significant improvements in both customer satisfaction and purchase frequency.*

***Keywords*** *— E-commerce, Fast Fashion, Lean Six Sigma, Return Rates.*

## INTRODUCTION

The intersection of technology and the Internet of Things (IoT) has transformed various industries, including fashion retail. The COVID-19 pandemic accelerated the shift towards e-commerce, particularly in the fast fashion sector, where consumers increasingly turned to online platforms for their shopping needs [1]. However, this rapid transition has also brought significant challenges, particularly concerning product returns. In 2022, the fashion e-commerce industry faced a staggering $218 billion in returns [2], with a notable increase in concern among retailers regarding this issue, from just 2% in 2022 to 49% in 2023 [3]. This trend highlights a critical problem that necessitates immediate attention and solutions.

This research specifically addresses a fast-fashion online store catering to customers in Puerto Rico and the United States that is grappling with high product return rates estimated at around 20%. A primary factor contributing to these returns is low product quality and fit, which undermines customer dissatisfaction and loyalty. This situation not only affects the company's profitability but also raises concerns about sustainability, since returned products become unsellable, making it more cost effective for companies to dispose of them in landfills. To tackle this pressing issue, the project aims to implement Lean Six Sigma methodologies designed to streamline processes and enhance product quality. By focusing on reducing return rates through systematic improvements, this research seeks to provide actionable insights that can benefit both the company and its customers.

### Objectives

- Identify key factors causing high return rates.
- Reduce return rates to 12-15% in one month by implementing Lean Six Sigma Techniques.
- Enhance product quality and streamline processes with Lean Six Sigma.
- Improve customer satisfaction by ensuring products meet quality and fit expectations.
- Achieve cost savings from reduced return-related expenses.

### Contributions

- Lean Six Sigma framework for fast-fashion online retailers facing similar challenges such as high return rates.

- Data-driven insights into consumer return behavior to enhance understanding of customer expectations.
- Actionable strategies to improve product quality across the supply chain.
- Reducing returns promotes sustainability by minimizing waste in the fast-fashion industry.

## LITERATURE REVIEW

This following section presents a review of the literature relevant to the research topic.

### E-commerce Boom

The rapid advancement of technology has transformed e-commerce in the fashion industry. The rise of smartphones and high-speed internet enables seamless online shopping anytime, anywhere. The COVID-19 pandemic exacerbated this, with U.S. e-commerce penetration rising from 16% in 2019 to 27% in June 2020 [4]. Consequently, fashion e-commerce is now vital for retail strategies, prompting companies to invest in technology-driven solutions for better customer engagement and streamlined operations. The fashion e-commerce sector has experienced significant growth due to evolving consumer behaviors. A GWI commerce report found that 59% of consumers, particularly younger shoppers, prefer online clothing shopping for its convenience over physical stores [5]. Social media has also become a vital marketing tool, allowing brands to connect with broader audiences through targeted ads and influencer collaborations. However, this expansion faces challenges like increased competition and rising expectations for product quality and customer service.

### Fast Fashion Trend

Fast fashion has revolutionized the clothing industry by enabling brands like Zara, Shein, Forever 21, and H&M to rapidly produce and distribute trendy apparel. The lead time from design to purchase varies among fast-fashion brands. Zara is highly efficient, delivering new garments in as little as two weeks, while Forever 21 takes about six weeks and H&M around eight weeks [6]. Shein has an even shorter lead time of just ten days [7]. The fast fashion model fosters a culture of disposability, where consumers frequently purchase and discard clothing. The term “fast” signifies not only quick production but also the short lifespan of lower-quality garments, which often leads to customer dissatisfaction. This model raises significant sustainability concerns, including increased textile waste and pollution. Moreover, the low quality of many fast fashion items results in consumer discontent, as shoppers tend to prefer durable products. Consequently, brands face the challenge of balancing speed with quality while addressing sustainability issues in the fashion industry.

### Return Rates in Fast Fashion

The fast fashion industry has been characterized by its rapid production cycles and low-cost clothing, which often leads to high return rates. According to the National Retail Federation and Appriss Retail, return rates in the fast fashion sector can be as high as 20% to 50%, significantly impacting profitability and sustainability [8]. The surge in online shopping during the COVID-19 pandemic exacerbated this trend, with consumers increasingly purchasing multiple sizes or styles of clothing to try on at home before making a final decision. This behavior not only increases return rates but also results in higher operational costs for retailers due to reverse logistics and restocking processes. High return rates in fast fashion have significant environmental impacts since many returned items are either landfilled or incinerated, increasing waste and carbon emissions. The fast fashion model promotes excessive purchasing, leading to more returns. Retailers are addressing this issue through improved sizing technology, enhanced product descriptions, and virtual fitting rooms to reduce returns while keeping customers satisfied.

### Lean Six Sigma Methodology

Combining the ideas of Lean manufacturing, which emphasizes waste reduction, and Six Sigma, which seeks to enhance quality by reducing process variability, Lean Six Sigma is a data-driven methodology. A key component of Lean Six Sigma, the DMAIC framework (Define, Measure, Analyze, Improve, Control) offers an organized method for addressing problems. In the Define phase, the problem is articulated; Measure involves collecting data on current performance; Analyze identifies root causes of defects; Improve implements solutions; and Control maintains improvements. This methodology has been effectively used across industries to enhance efficiency and quality while reducing costs. In the fast-fashion sector, particularly for online retailers with high return rates due to low product quality and sizing issues, Lean Six Sigma helps systematically identify and eliminate factors causing customer dissatisfaction.

### Studies on Return Rates with Lean Six Sigma

Several studies have investigated Lean Six Sigma's effectiveness in reducing return rates, particularly in sectors such as e-commerce and fashion retailing. The methodology, which combines lean manufacturing principles with Six Sigma techniques, aims to improve quality and efficiency by systematically identifying and eliminating defects.

One notable study by Maday Pacheco-Bonilla and colleagues [9], emphasizes the application of Lean Six Sigma principles and the DMAIC framework to enhance quality management in small and medium-sized enterprises (SMEs) within the clothing industry. The research highlights how implementing structured processes can significantly reduce defects in clothing articles, thereby lowering return rates. By focusing on continuous improvement and waste reduction, SMEs can not only improve product quality but also enhance customer satisfaction, leading to a more sustainable business model.

Similarly, Dr. Pankaj M. Madhani's research [10], discusses how Lean Six Sigma can be strategically deployed across retail operations to streamline processes and improve efficiency. By analyzing various case studies, Madhani illustrates that retailers' who adopt these methodologies experience not only a reduction in return rates but also an increase in operational efficiency and competitive advantage. The findings suggest that integrating Lean Six Sigma into retail practices fosters a culture of quality and accountability, which is essential for maintaining customer loyalty and reducing costs associated with returns.

Both studies underscore a crucial aspect of Lean Six Sigma: its ability to not only streamline operations but also enhance product alignment with consumer expectations. This dual focus is essential for reducing return rates across various industries. In conclusion, Lean Six Sigma has proven effective in reducing return rates by improving product quality and aligning offerings more closely with customer expectations through systematic analysis and incorporation of feedback.

## METHODOLOGY

The e-commerce fast fashion store studied, specializes in trendy clothing for customers in Puerto Rico and the United States. As an online-only retailer without physical locations, it optimizes operations through a centralized inventory system. The store employs digital marketing strategies to connect directly with consumers via its user-friendly website, which offers easy navigation and a wide range of the latest fashion trends, ensuring quick access to items at competitive prices.

At the beginning of the study, the problem was identified with the owner's input, and the study parameters were established. The online store aimed to reduce its return rates, which were at 20%, significantly higher than the industry average of about 15%. Consequently, key metrics related to product quality and fit were monitored closely. The average monthly returns from customers were around 100. The team planned to use Lean Six Sigma methodologies to create a sustainable solution, targeting a reduction in return rates to between 12% and 15% within one month.

### DMAIC Framework: Phases in Study

The strategy was organized using the DMAIC framework (Define, Measure, Analyze, Improve, Control). In the Define phase, the project charter was established, which outlined the problem statement, goals, and scope of the project. The primary issue identified is the high return rate of 20%, primarily due to low product quality and fit. The goal was to reduce this return rate by 5-8%, targeting a new range of 12% to 15% within one month. A Voice of Customer (VOC) survey was conducted with 100 customers to gather insights into their experiences regarding return reasons, product accuracy, and overall satisfaction. This survey helped identify customer expectations and pain points related to returns. Furthermore, a post-return Voice of Customer (VOC) survey was administered to 15 customers who specifically cited damage or defects as their reasons for returning the items. This survey aimed to collect insights into these issues to evaluate product quality.

During the Measure phase, data on product returns was gathered, including categorizing return types. Tools like Process Flowchart were used to identify areas that lead to returns, visualize the product flow from production to delivery, highlighting bottlenecks. The reasons for returns were analyzed using customer feedback from the VOC survey. Furthermore, key metrics such as return frequency, return rate, defect rate, and cost of returns were calculated.

In the Analyze phase, tools such as 5 Whys, Fishbone diagrams, and Pareto analysis were employed to pinpoint root causes of high return rates. The Fishbone diagram helped categorize potential causes into specific areas. Through Pareto analysis, we identified the most common reasons for returns by examining data from our Voice of Customer (VOC) survey and historical return records from the past three months.

In the Improve phase, solutions were developed based on our analysis findings. Solutions included revising sizing charts based on customer feedback from the VOC survey, and improving quality control measures. Standardization by implementing better product descriptions and images also helped manage customer expectations more effectively.

Lastly, monitoring systems were put in place during the Control phase to make sure that advancements are maintained throughout time. This included setting up regular reviews of return rates post-implementation and continuing customer satisfaction surveys.

By applying DMAIC systematically through these steps—Define, Measure, Analyze, Improve, and Control—we aimed not only to reduce return rates but also enhance overall customer satisfaction in the fast-fashion online retail business.

## Results and Discussion

This section discusses the DMAIC steps' implementation in the e-commerce store and its outcomes.

### Define

The online clothing store began operations in 2018 with low sales, which improved in 2019 while maintaining low return rates, as shown in Figure 1. A significant sales surge occurred in 2020 due to the pandemic, still with low returns. By 2021, sales grew further, but product returns increased as demand surged from fast fashion practices. From 2022 to 2025, sales stabilized, yet return rates consistently rose, showing an 8% increase from 2020 to 2025, highlighting the severity problem and the study's importance for the store.

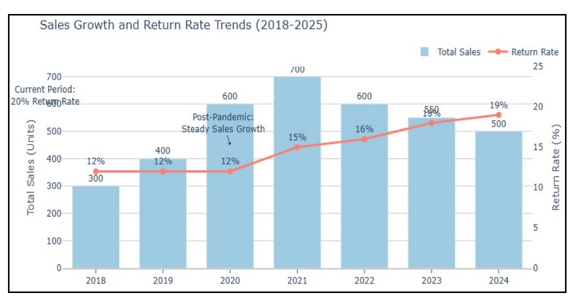



**Figure 1**
**Monthly Sales Average Growth and Return Rates**

| Project Title: Streamlining Style: Reducing Returns in Fast Fashion E-commerce with Lean Six Sigma | | | | |
|---|---|---|---|---|
| **Mentor** | | **Stakeholder** | | **Project Lead** |
| Prof. J. Morales | | Online Clothing Store Owner | | Brendlee Rivera |
| **Problem Statement** | | | | |
| High product return rates (estimated at 20%) due to low product quality and fit, leading to customer dissatisfaction, unsustainable practices, and impacting profitability. | | | | |
| **Objective, Scope, and Benefits:** | | | | |
| **Objective:** Identify root causes of high return rates. Apply Lean Six Sigma methodologies to reduce the return rates from 20% to between 12% and 15% within one month.<br><br>**Scope:** Focus on the online fast-fashion retailer's product quality and fit issues.<br><br>**Benefits:** Reducing return rates leads to increased customer satisfaction, long-term sustainability via established controls, and overall benefits including enhanced brand reputation/loyalty, reduced costs, increased profitability and sustainability gains by reducing waste from unsellable returns | | | | |

| Milestones Phase | Date Start | Date Finish | Deliverables | Risk | Constraints & Dependencies |
|---|---|---|---|---|---|
| Define | 2025-03-04 | 2025-03-04 | Project Charter, SIPOC | Lack of Clarity, Stakeholder Resistance | *Constraints:* • Time (one-month project timeline), limited data access<br><br>*Dependencies:* • Stakeholder input, data access, customer engagement |
| Measure | 2025-03-04 | 2025-03-06 | Data Collection Plan, Establish Metrics and KPI's | Inaccurate Data, Resistance from Customers | |
| Analyze | 2025-03-06 | 2025-03-07 | Root Cause, Statistical Analysis | Misinterpretation of Data, Overlooking Minor Issues | |
| Improve | 2025-03-09 | 2025-04-09 | Improvement Action Plan | Implementation Challenges within timeframe | |
| Control | 2025-04-01 | 2025-04-09 | Control Plan Ongoing, Reporting | Lack of Monitoring Compliance, Insufficient Training | |

**Figure 2**
**Project Charter**

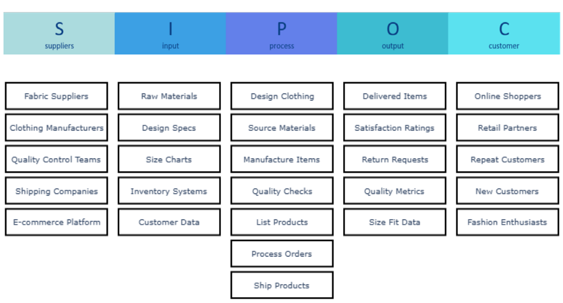



**Figure 3**
**SIPOC Diagram**

To investigate the causes of item returns, feedback was collected from 100 customers who returned items to evaluate satisfaction and reasons for returns, shown in Figure 4. A follow-up survey, shown in Figure 5, was conducted with 15 customers who cited damage or defects as their return reason to assess material quality metrics.

| *Question* | *Response Options* | *Percentage (%)* |
|---|---|---|
| How satisfied are you with the quality of our products? | Very Satisfied<br>Satisfied<br>Neutral<br>Dissatisfied<br>Very Dissatisfied | 10<br>30<br>25<br>20<br>15 |
| What was your primary reason for returning the product? | Sizing issues<br>Material Quality<br>Damage/Defect<br>Not as Pictured | 50<br>25<br>15<br>10 |
| How likely are you to purchase from us again? | Very Likely<br>Likely<br>Neutral<br>Unlikely<br>Very Unlikely | 15<br>25<br>30<br>20<br>10 |
| What Improvements would you like to see in our products? | Better Quality Material<br>More Accurate Sizing Information<br>Improved Product Descriptions/Images | 70<br>15<br>15 |

**Figure 4**
**VoC Survey – Satisfaction and Return Reasons (100 sample)**

| *Question* | *Response Options* | *Responses* | *Percentage (%)* |
|---|---|---|---|
| How would you rate the fabric quality? | Excellent<br>Good<br>Fair<br>Poor | 2<br>5<br>6<br>2 | 13<br>33<br>40<br>13 |
| How satisfied were you with the stitching? | Very Satisfied<br>Satisfied<br>Neutral<br>Dissatisfied | 3<br>4<br>5<br>3 | 20<br>27<br>33<br>20 |
| How durable did you find the product? | Very durable<br>Durable enough<br>Not very durable<br>Not durable at all | 1<br>4<br>7<br>3 | 7<br>27<br>47<br>20 |
| How would you rate the finish and overall appearance? | Excellent finish<br>Good finish but could improve<br>Poor finish and appearance issues | 3<br>7<br>5 | 20<br>47<br>33 |

**Figure 5**
**VoC Post Return Survey – Material Quality (15 sample)**

## Measure

The data collection plan in Figure 6 involved reviewing online store records and conducting VoC surveys to analyze product return causes, categories, and frequency while employing the DMAIC model for structured analysis and improvement.

| *Key Metrics* | *Description & What will be collected?* | *How it will be collected?* | *Baseline* | *KPI's* |
|---|---|---|---|---|
| Return Rate | Primary metric<br>~Three-Month Return Data Categorized<br>Trend analysis and understanding seasonal variations in returns<br>~Current Month Return | Online Store Data System | 20%<br>15% market average | Reduce Monthly Return Rate |
| Return Reasons | Categorized<br>~Three-Month Reasons Data | VoC Survey<br><br>Online Store Data System | 50% sizing<br>25% quality | Improve Quality Score & Fit Accuracy Rate |
| Product Quality Measures | Categorized<br>Customers cite damage/defects as reason for returning products<br>~Defect Rates<br>Percentage of products returned due to defects<br>~Material Quality<br>Assess the quality of materials used in products | VoC Post Return Survey | 15% defects | Improve Quality Score |
| Customer Satisfaction Score (CSAT) | Gauge customer satisfaction levels regarding product quality and fit<br>~Customer Return Frequency | VoC Survey<br><br>Online Store Data System | 40% overall | Increase CSAT Score |
| Cost per Returns | Cost associated with each return to understand the financial impact of high return rates | Online Store Data System & Stakeholder | $15/item total return $1,500 | Cost Savings |

**Figure 6**
**Data Collection and Key Metric Identification**

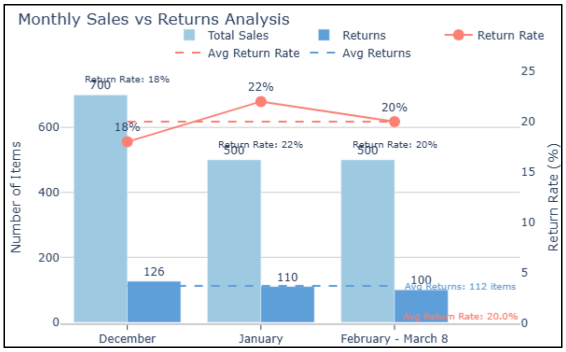



**Figure 7**

**Return Rates**

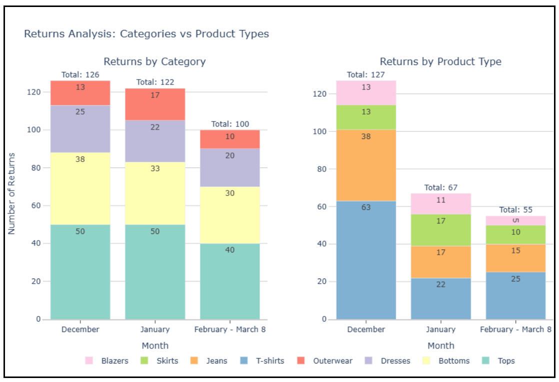



**Figure 8**

**Monthly Returns by Category and Product Type**

Monthly historical data on Figure 7, shows a consistent 20% return rate, with approximately 112 items returned monthly from 500 sold. In the current month, sales remained at 500 units with 100 returns, sustaining the same return rate. December experienced peak sales but had a lower return rate than January, which saw an increase to 22%. Sales declined from December to early March due to seasonal demand changes. Analysis of customer returns by product type indicated that shirts and jeans had the highest return rates over the past three months, as shown in Figure 8.

Sizing issues decreased slightly from January to February but remain high compared to December, as shown in Figure 9. Material quality has stabilized at 25%, and damage and defect rates have improved. The percentage of products labeled "Not as Pictured" has increased since January, although it is still better than December's figures. Sizing problems are the primary cause of returns, followed by material quality and defects, highlighting ongoing challenges.

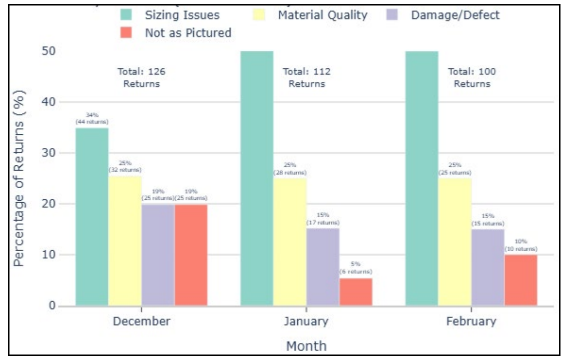



**Figure 9**

**Return Reasons**

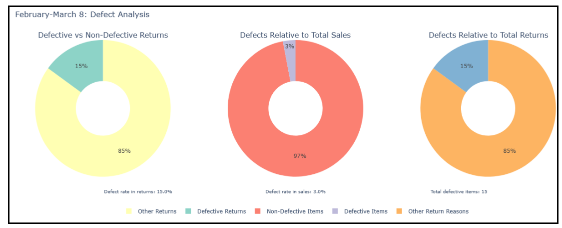



**Figure 10**

**Defect Rates**

The defect rate relative to total sales is 3%, indicating generally acceptable quality. However, as shown on Figure 10, the defect rate concerning total returns is 15%, revealing that a significant portion of returned items are defective. This discrepancy highlights the need for improved quality control measures to effectively reduce product defects.

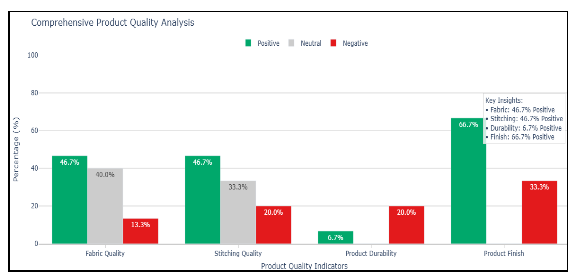



**Figure 11**

**Material Quality**

Customer feedback reveals significant concerns about product quality. In Figure 11, 40% rated fabric quality as fair and 13.33% as poor. Durability is a major issue at 46.67%. Opinions on finish and overall appearance are mixed, with 46.67% suggesting necessary improvements. While some aspects like fabric are acceptable, durability and finish need attention.

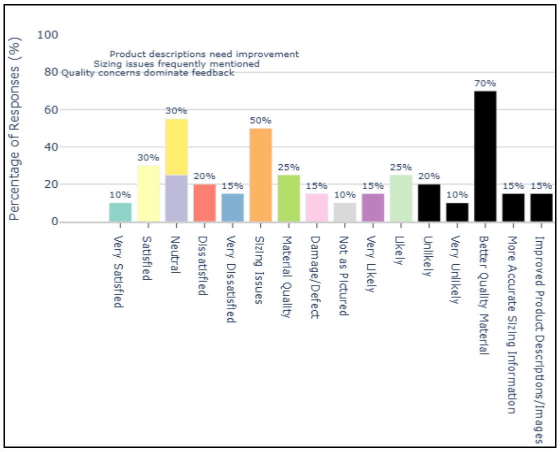



**Figure 12**
**Customer Satisfaction**

A significant 35% of customers are dissatisfied, indicating potential areas for improvement. Figure 12 indicates that only 40% of customers are likely to purchase again, highlighting a need to address dissatisfaction and improve the customer experience to encourage repeat purchases.

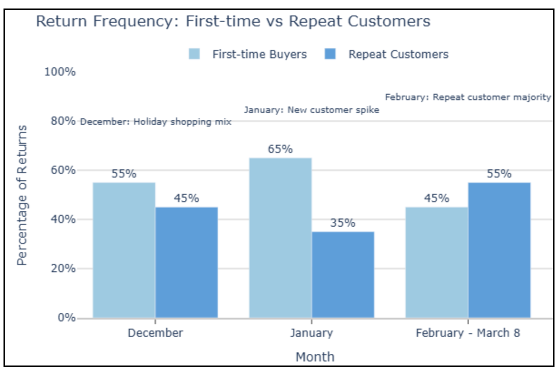



**Figure 13**
**Customer Return Frequency**

Figure 13 shows that in December, first-time buyers were 55% of customers; in January, they rose to 65%, but fell back to 45% in February as repeat customers increased to 55%. High returns from first-time buyers may hurt future sales and brand loyalty.

In December, the store sold 700 items for $21,000 with an 18% return rate. January saw sales of 500 items for $15,000 and a higher return rate of 22%. February maintained sales at 500 items and $15,000 but had a lower return rate of 20%. This suggests that peak season sales are linked to lower return rates compared to post-holiday months.


**Figure 14**
**Cost Per Return**

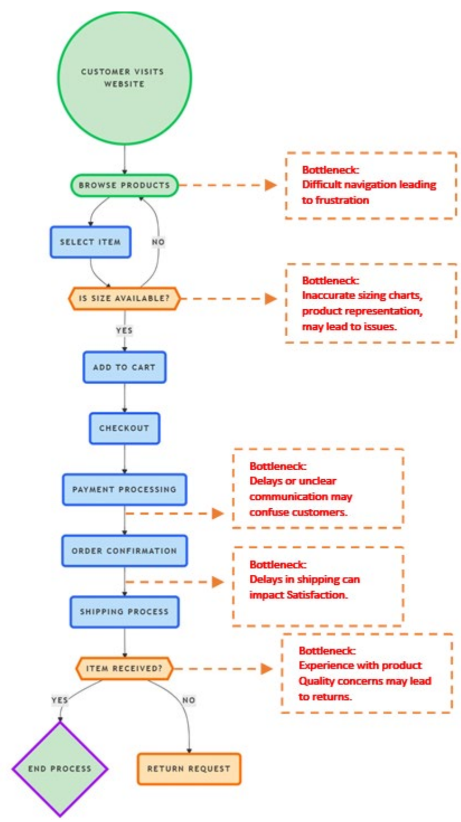



**Figure 15**
**E-commerce Customer Journey Process Flowchart**

## Analyze

The high return rates, particularly for shirts and jeans, are largely due to low quality and sizing defects, which are responsible for about 75% of returns. This has resulted in an average return rate of 20%, negatively affecting customer satisfaction, with 35% of customers reporting dissatisfaction. The financial impact is significant; the costs related to returns increase operational expenses and lead to unsellable products, further hurting profitability. Additionally, these unsold items pose sustainability challenges. Customer feedback reveals that 70% suggest improvements in product quality and sizing accuracy, indicating a vital opportunity for the brand to enhance customer satisfaction and lower return rates.

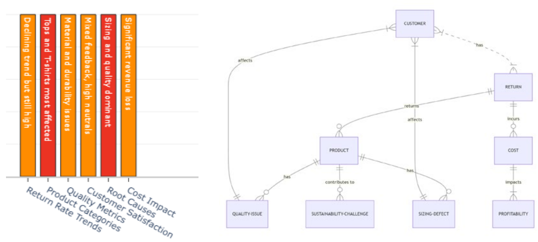



**Figure 16**
**Summary of Finding**

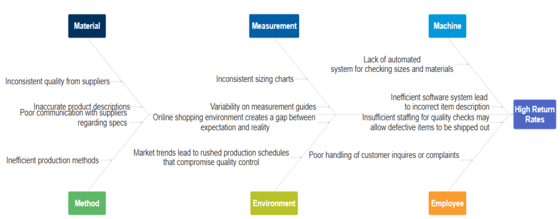



**Figure 17**
**Root Cause Analysis: Fishbone Diagram**

| *5 Whys* |
|---|
| Why are customers returning items?<br>• Because they do not fit properly or the quality is not as expected.<br>Why do the items not fit properly or meet quality expectations?<br>• Because there are inconsistencies in sizing, and the quality does not meet customer expectations due to poor material choices.<br>Why are there inconsistencies in sizing and poor material choices?<br>• Because different suppliers use varying sizing standards, and poor material choices result from inadequate supplier vetting processes.<br>Why do different suppliers use varying sizing standards and why is there inadequate supplier vetting?<br>• Because there is no standardized size chart enforced across all products, and inadequate supplier vetting occurs due to a lack of rigorous quality control protocols during the sourcing process.<br>Why is there no standardized size chart and a lack of rigorous quality control protocols?<br>• Because the company has not prioritized uniformity in its product offerings, and the lack of rigorous quality control protocols stems from insufficient investment in training for employees. |

**Figure 18**
**Root Cause Analysis: 5 Why's**

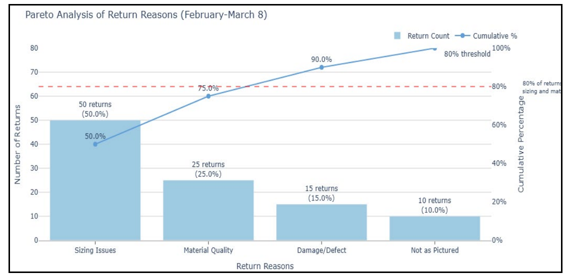



**Figure 19**
**Root Cause Analysis: Pareto Chart**

The Pareto principle suggests that addressing sizing issues may yield the most significant reduction in returns since it accounts for half of all returns.

| *Root Causes* | *Primary Key Factor* | *Consequences* | *Supporting Data* |
|---|---|---|---|
| Inconsistent measurement standards | Sizing issues | Low CSAT, Higher Return costs, Impact on Profitability, Unsellable Items | Sizing problems account for 50% of returns. Highest return reason. |
| Supplier quality variations | Material Quality | | Material quality is the second most common reason for returns (25%), with 46.66% satisfaction and 33.34% citing durability issues. |
| Quality control gaps due to production rush | Manufacturing Defects | | Defects are the third-leading cause of returns (15%), with VOC data indicating issues with durability, fabric quality, and finish. |
| Inaccurate Product Presentation | Not as pictured | | 10% of returns indicate a mismatch between the product and the image, 35% negative feedback |

**Figure 20**
**Reasons for Product Returns and Root Causes**

## Improve

Improvement implementation, as shown in Figure 21, occurred from March 9 to April 9, focusing on quality and sizing in top categories. Enhancements included improved sizing accuracy through revised size charts, better material quality via supplier audits, and strengthened quality control with detailed inspections. Additionally, product photography was upgraded for accurate representation, and employee training was provided for efficient returns handling.

| *Root Causes* | *Primary Key Factor* | *Actions for Improvement* |
|---|---|---|
| Inconsistent measurement standards | Sizing issues | *Improve Sizing Accuracy* by reviewing size charts, improving sizing guidelines, offer virtual try-on |
| Supplier quality variations | Material Quality | *Enhance Material Quality* by improving Supplier relationships conducting more thorough supplier audits and negotiate better quality standards, Implement more rigorous quality checks. |
| Quality control gaps due to production rush | Manufacturing Defects | *Strengthen quality control* by implementing more thorough inspections once supplier shipment arrives and before shipping. |
| Inaccurate Product Presentation | Not as pictured | *Improve Product Photography and Descriptions* by accurately represent product description, use high quality multiple angle shots |

**Figure 21**
**Root Causes and Actions for Improvement**

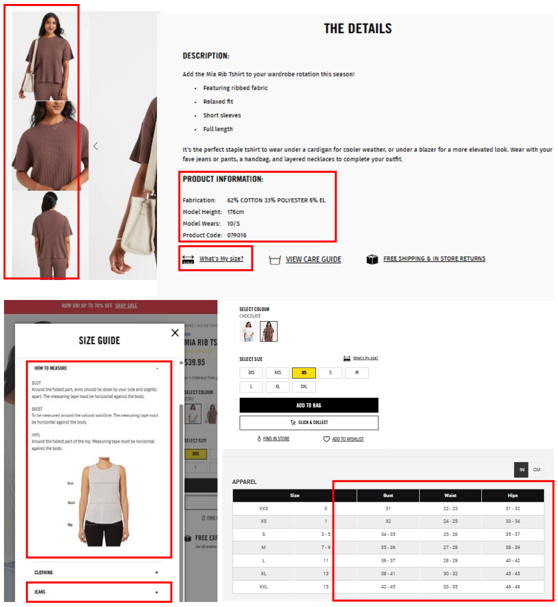



**Figure 22**
**Example of Actions for Improvement**

## Control

At the beginning of the study, a system was put in place to monitor the reasons behind product returns. Following the implementation of improvement measures, a monitoring plan was developed to track not only the reasons for product returns but also the return rates and the effectiveness of these actions over time. As indicated in Figure 23, it was suggested that these reports be regularly compiled by the sales department and communicated to management.

| *Item to be monitored* | *Frequency of monitoring* | *Why?* |
|---|---|---|
| Return Reasons | Monthly | to pinpoint specific issues and take proactive measures to address the concerns. |
| Product-based returns | Monthly | to identify products that consistently underperform or fail to meet customer expectations. |
| Customer feedback loop | Monthly | to identify trends and areas for improvement in product quality and customer satisfaction. |
| Cost Management | Monthly | to ensure that return rates remain manageable. |

**Figure 23**
**Monitoring Plan**

After improvements from March 9 to April 9, the product return rate dropped from 20% to 13%, meeting targets. This decline resulted from fewer sizing and material issues, boosting sales and revenue while reducing return costs. Revenue increased from $15,000 to $16,050, with statistical analysis confirming significance at the 5% level, as shown in figure 27.

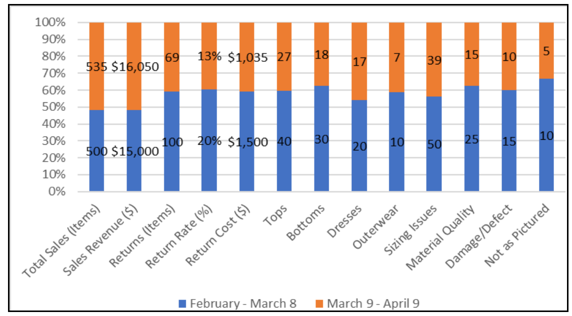
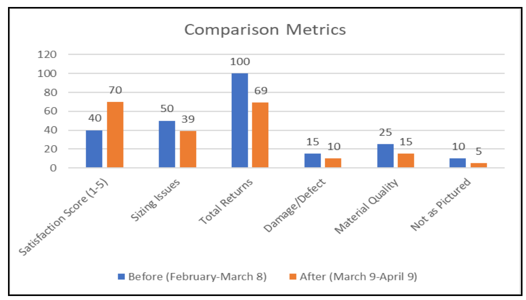



**Figure 24**
**Metrics Before & After Study**

| *Question* | *Response Options* | *Percentage (%)* |
|---|---|---|
| How satisfied are you with the quality of our products? | Very Satisfied | 10 |
| | Satisfied | 30 |
| | Neutral | 25 |
| | Dissatisfied | 20 |
| | Very Dissatisfied | 15 |
| How likely are you to purchase from us again? | Very Likely | 15 |
| | Likely | 25 |
| | Neutral | 30 |
| | Unlikely | 20 |
| | Very Unlikely | 10 |

**Figure 25**
**Post Implementation VoC Survey**

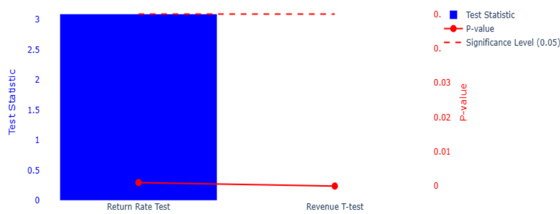



| AVERAGING HYPOTHESIS TESTING | | | |
|---|---|---|---|
| CLIENT SATISFACTION | | | |
| Hypothesis | | | |
| Ho: µ a | EQUALS TO | µ b | |
| Select one<br>1 = YES | MORE THAN | LESS THAN<br>1 | NOT EQUAL |
| H1: µ a | LESS THAN | µ b | |
| Test with Known Variance (Normal Distribution) | | | |
| Hypotheis Test Results | BEFORE | AFTER | |
| Miu | 3.00 | 3.00 | |
| Sigma | 1.22 | 1.1 | |
| X Bar | 3.00 | 3.75 | |
| N | 100 | 100 | |
| Z exp | -4.57 | | |
| Pvalue | 0.000 | | |
| Alpha | 0.05 | | |
| *Miu A is less than Miu B* | | | |
| The average before is lower than the average after, or satisfaction increased significantly. | | | |

| AVERAGING HYPOTHESIS TESTING | | | |
|---|---|---|---|
| WILLING TO BUY PRODUCT | | | |
| Hypothesis | | | |
| Ho: µ a | EQUALS TO | µ b | |
| Select one<br>1 = YES | MORE THAN | LESS THAN<br>1 | NOT EQUAL |
| H1: µ a | LESS THAN | µ b | |
| Test with Known Variance (Normal Distribution) | | | |
| Hypotheis Test Results | BEFORE | AFTER | |
| Miu | 3.00 | 3.00 | |
| Sigma | 1.20 | 1.1 | |
| X Bar | 3.15 | 3.80 | |
| N | 100 | 100 | |
| Z exp | -3.95 | | |
| Pvalue | 0.000 | | |
| Alpha | 0.05 | | |
| *Miu A is less than Miu B* | | | |

**Figure 26**
**Comparison Metrics and Hypothesis Testing**

After one month: New Return Rate = 13%. Return Reasons show a decrease in fit -related returns to 39 and quality-related returns down to 25. CSAT increased to 70%. Cost per return decreases due to fewer returns processed.




| Metric | Test Statistic | P-value | Significant at 5% | Interpretation |
|---|---|---|---|---|
| Return Rate Test | 3.089 | 0.001 | TRUE | Return rate significantly decreased |
| Revenue T-test | | 0 | TRUE | Revenue significantly changed |

**Figure 27**
**Statistical Analysis**

## Conclusions

The research indicated that the high return rate of 20% for a fast fashion online store was primarily attributed to low quality and sizing inaccuracy. By utilizing Lean Six Sigma techniques, issues such as inadequate quality control and inconsistent sizing were pinpointed. Following the implementation of targeted LSS strategies, the return rate dropped to 13% within a month, resulting in improved customer satisfaction and higher sales. Hypothesis testing confirmed significant increases in both customer satisfaction and purchase frequency.

### Research Limitations

While the research showed positive results, it has limitations. The one-month duration may not reflect long-term trends in customer behavior or product performance. Additionally, focusing solely on top returning categories may overlook other factors affecting return rates, such as production cycle time, shipping process and inventory management.

### Future Research

Future research should investigate additional factors affecting return rates beyond quality and sizing, and extend the duration of studies to better understand long-term impacts on return rates and customer satisfaction.

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