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RESEARCH ON SOLUTIONS TO IMPROVE INVENTORY CONTROL EFFICIENCY AT FMCG COSMETICS COMPANY

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ABSTRACT

In the highly competitive beauty and cosmetics industry, effective demand and supply planning is crucial to ensure profitability and customer satisfaction. One of the major challenges faced by companies in this sector is the accumulation of bad stocks, which not only ties up valuable resources but also leads to financial losses and missed sales opportunities. This paper aims to address this issue by proposing a comprehensive framework to reduce bad stocks in demand and supply planning for beauty and cosmetics companies. The framework presented in this paper integrates both demand and supply-side strategies to optimize inventory management and reduce the occurrence of bad stocks. Furthermore, this paper highlights the significance of integrating planning systems enable companies to make data-driven decisions, enhance demand visibility, and align their supply chain operations with market dynamics to achieve more accurate demand forecasts, optimize inventory levels, and ultimately reduce bad stocks, leading to improved profitability, customer satisfaction, and competitive advantage.

Keywords: Demand And Supply, Inventory Management, Bad Stocks, Forecast.

I. INTRODUCTION

In the intensely competitive beauty and cosmetics sector, successful demand and supply planning plays a vital role in sustaining profitability and satisfying customers. Companies often face the challenge of excess inventory, which not only ties up capital but also leads to increased storage costs and potential product obsolescence. To address these issues, optimizing inventory levels through refined planning processes is essential. This paper explores the application of the DMAIC (Define, Measure, Analyze, Improve, Control) methodology in conjunction with the ABC inventory classification model to enhance demand forecasting and supply chain efficiency.

The DMAIC framework provides a structured approach to problem-solving and process improvement, making it suitable for identifying the root causes of excess inventory. By defining the key issues related to demand variability and supply chain inefficiencies, organizations can measure performance metrics and analyze data to uncover insights. Implementing improvements based on these findings can lead to more accurate demand predictions and streamlined inventory management. A significant goal of applying these methodologies is to improve the Inventory Quality (IQ) rate from 86% to 90%.

The ABC inventory classification model complements these methods by categorizing inventory based on its value and importance to the business. Classifying items into A, B, and C categories allows companies to prioritize high-value and high-demand items, ensuring optimal resource allocation. Combining the ABC model with DMAIC provides a holistic approach to inventory management, enabling businesses to balance costs and service levels effectively.

This paper aims to demonstrate how the synergistic application of DMAIC and the ABC inventory classification model can transform inventory management practices in the beauty and cosmetics sector, leading to reduced costs, improved service levels, and increased customer satisfaction. Through case studies and practical examples, we will illustrate the effectiveness of these methodologies in optimizing demand and supply planning.

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II. LITERATURE REVIEW

Improving inventory and supply chain efficiency has been a key focus in recent research. Methods like DMAIC and ABC classification are widely used to optimize inventory, reduce costs, and enhance operational performance. Their integration offers a robust framework for addressing demand variability and prioritizing inventory management.

DMAIC Approach

The DMAIC (Define, Measure, Analyze, Improve, Control) methodology is a structured, data-driven framework commonly employed in Six Sigma initiatives for process improvement and problem-solving. Its step-by-step approach is particularly effective for addressing inefficiencies and identifying root causes of issues in operations. Liker (2004) emphasizes the value of structured problem-solving in Lean systems, highlighting DMAIC as a foundational tool for quality control and waste reduction [1]. George et al. (2005) further describe how DMAIC supports organizations in streamlining operations, improving accuracy, and enhancing customer satisfaction [2]. Its application in inventory management enables businesses to reduce excess inventory and optimize processes by systematically addressing variability in demand and supply chains. DMAIC and lean six sigma is usefully to reduce defects in manufactturing car parts supplier [3], in which main defects and potiential causes were identified as well as suggested solutions. It enhanced sigma level significantly. There are so many aplications of DMAIC and lean six sigma in the industry. Brian Byrne et al. (2021) applied lean six sigma methodology to a pharmaceutical manufacturing facility to eliminate wates and improve productivity [4]. DMAIC based framework and a fasteners' manufacturer was developed by Kumar et al. (2021) [5]. LSS strategy to improve healthcare performance was implemented by Noronha et al. (2021) [6].

ABC Classification Model

The ABC inventory classification model categorizes inventory items into three groups—A (high-value, high-priority), B (moderate value and priority), and C (low-value, low-priority)—based on their relative importance. This prioritization enables organizations to allocate resources effectively and focus on critical inventory items. Ramanathan (2006) illustrates the benefits of multi-criteria ABC classification, noting its ability to address diverse business needs in inventory management [7]. The model has gained traction as a practical and straightforward tool for improving inventory accuracy and efficiency, particularly when integrated with data-driven methodologies like DMAIC.

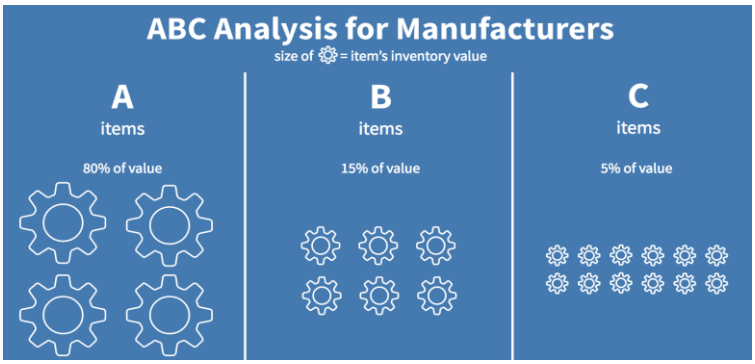

Figure 1. ABC Classification Model

III. METHODOLOGY

The Sales and Operations Planning (S&OP) process represents a comprehensive workflow that integrates demand forecasting, procurement, manufacturing, warehousing, quality control, distribution, and customer satisfaction. Effective inventory management plays a pivotal role throughout this process by ensuring that stock levels align with demand, reducing excess or shortages, and maintaining the smooth flow of goods from production to the end customer. Excess or poor-quality inventory can disrupt this process by tying up capital, increasing storage costs, and risking obsolescence, ultimately delaying the flow of goods from production to customers.

Using the DMAIC approach, the process begins by identifying the problem, targeting a specific line of cosmetic products, and gathering relevant data (Define). The next step involves measuring the impact of errors in

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product quality and inventory management (Measure) and analyzing their root causes (Analyze). Improvements are then implemented based on these insights (Improve), followed by monitoring the effectiveness of the changes to ensure sustained results (Control). The diagram below outlines these steps.

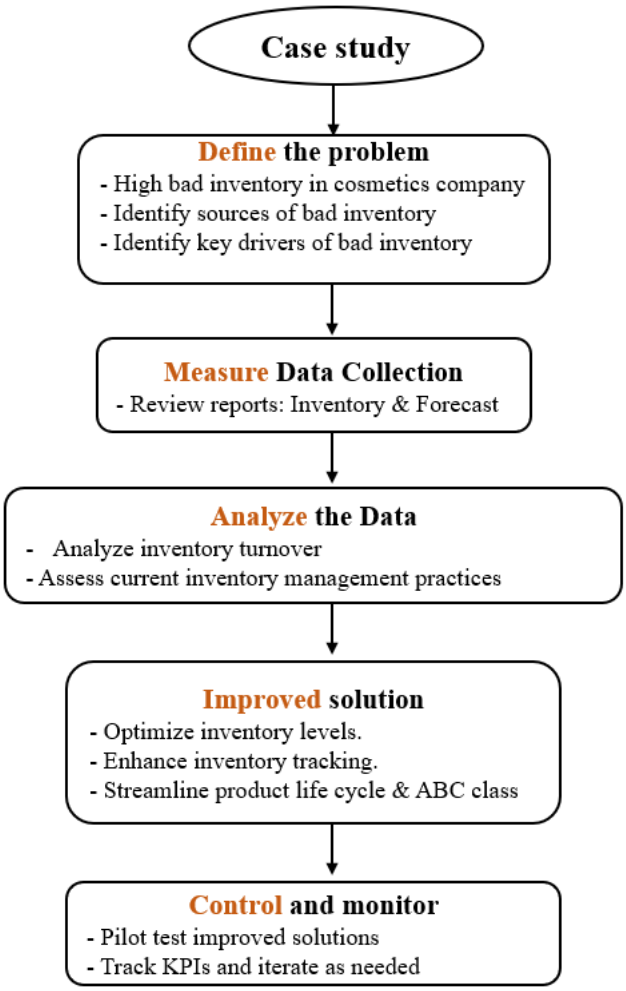

Figure 2. Methodology

IV. MODELING AND ANALYSIS

1. Problem statements and data collection

This case study examines a cosmetics company in Vietnam, where nearly 70% of inventory-related issues stem from recurring problems such as overstocking, understocking, and poor inventory categorization. These issues negatively impact the efficiency of supply chain operations, increase costs, and reduce customer satisfaction, highlighting the need for an improved inventory management approach.

The study applies the DMAIC methodology to address inventory management challenges and optimize stock levels. In the Define phase, key problems related to demand variability, inaccurate forecasting, and inventory mismanagement are identified. The Measure phase evaluates the impact of these issues on storage costs, stockouts, and excess inventory. The Analyze phase determines root causes, such as misaligned production schedules and a lack of prioritization in stock management. The Improve phase introduces targeted solutions, including integrating the ABC inventory classification model to better align inventory with demand and prioritize high-value items. In the Control phase, monitoring mechanisms are implemented to sustain improvements and ensure efficient inventory management.

Data for this study was collected over twelve months from two primary sources: warehouse inventory records and supply chain performance reports. Inventory data includes metrics on stock turnover, storage costs, and inventory accuracy, providing insights into inefficiencies and imbalances. Supply chain performance data

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highlights issues such as delayed order fulfillment and discrepancies between demand and stock levels. The integration of these data sources enables a comprehensive analysis, driving improvements in inventory accuracy, cost efficiency, and customer satisfaction.

2. Define Phase

• Input: import process from foreign factory
• Process: inventory management at warehouse
• Output: Overview of the problem situation, Analysis and improvement to minimize the problem. Provide recommendations to improve bad inventory.

Figure 3. Damaged products

3. Measure Phase

To analyze the extent and composition of bad stock within the inventory, the table below presents a detailed breakdown of obsolete and slow-moving products. It categorizes the inventory into key areas, including discontinued items, products nearing expiration, and those impacted by quality issues or extended storage durations. This comprehensive data serves as the foundation for identifying critical inefficiencies and prioritizing targeted strategies for inventory optimization in the study.

			VALUE (mil)
Bad Stock Breakdown	Obsolete by FC	Discontinued	1,150
	Obsolete by issue	Not Disc. but close to Expiry 12-6 months	1,169
		Not Disc. but close to Expiry 6-3 months	669
		Not Disc. but close to Expiry 2-1 months	6
		Slightly damage	469
		Expired	2
		Critical Damage	181
		Missing	14
	Slow moving	Slow moving 12-18 months of cover	1,030
		Slow moving 18-24 months of cover	1,048
		Slow moving >24 months of cover	1,610
		Total	7,350

Figure 4. Bad stock breakdown

4. Analysis Phase

Based on the current bad inventory data, Fishbone charts will be constructed to analyze the primary causes of inventory inefficiencies. Fishbone charts are widely utilized in scientific analysis to prioritize issues by identifying the key factors contributing to the majority of problems. This dual approach aims to provide a comprehensive understanding of the underlying issues, enabling the prioritization of targeted strategies for improvement.

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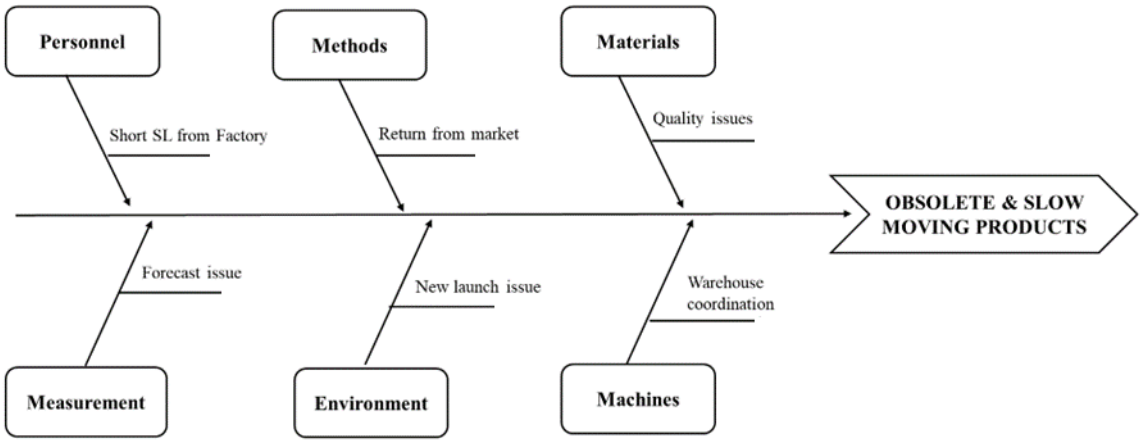

Figure 5. Fishbone chart of Obsolete & Slow-moving products

The fishbone chart highlights six root causes contributing to obsolete and slow-moving inventory: Personnel, Methods, Materials, Machines, Environment, and Measurement. Personnel issues, such as producing items with a short shelf life, and method inefficiencies, like returns from the market due to poor demand or defects, significantly increase bad stock. Material quality problems, including defective raw materials, and machine-related inefficiencies, such as poor warehouse coordination, also play a critical role. Environmental factors, such as mismanaged product launches or seasonal demand shifts, combined with inaccurate forecasting and inventory tracking under Measurement, exacerbate inventory inefficiencies.

To gain deeper insights into the factors contributing to obsolete and slow-moving inventory, a detailed analysis of the six root causes was conducted. The following chart presents specific data on how each of these root causes impacts inventory inefficiencies, highlighting their relative contribution to the overall problem. This quantitative representation provides a clearer perspective on prioritizing corrective.

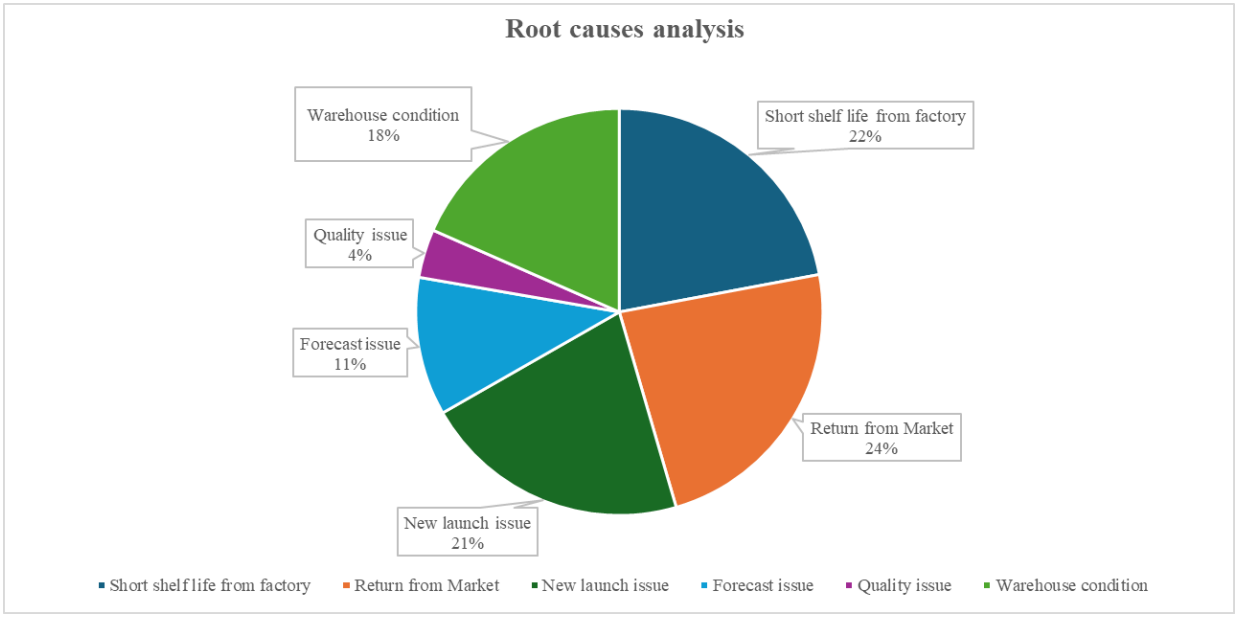

Figure 6. Root causes analysis

V. IMPROVE PHASE

5.1 Forecast issue – New launch issue – Return from market.

To reduce bad inventory from these causes, determining the ABC classification for the product is an important step to optimize the supply and demand plan.

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For example, analyzing product sales data for twelve months to classify by ABC class, for SKUs contributing 80% of revenue will be classified as A, accounting for 15% of revenue will be classified as B and the remaining 5% of SKUs will be classified as C.

Using this classification, a specific Target Working Inventory (TWI) can be calculated to ensure optimal inventory levels. For high priority "A" class, such as the best-selling foundation line, the safety stock can be set at 60 days of safety stock to ensure rapid replenishment when there are changes in demand. For "B" class, such as mid-range lipsticks, the safety stock might be set at 45 days, while "C" class, such as low-demand eyeshadows, might have a safety stock of 30 days to balance lower sales with higher inventory availability.

Class	Contribution (%)	Safety stock (day)	Leadtime (day)	Total TWI (day)
A	80%	60	160	220
B	15%	45	160	205
C	5%	30	160	190

Figure 7. Target TWI based on ABC class

This categorization not only helps prioritize resource allocation, but also provides a clear framework for aligning production and procurement with actual demand. For example, by applying these TWI targets, the company can reduce 30 days of excess inventory of "C" class while ensuring inventory availability for "A" class, thereby reducing overall holding costs by 15% and improving supply chain responsiveness. Integrating ABC categorization with TWI targets allows for more accurate demand forecasting and supply planning, ultimately leading to reduced waste, improved customer satisfaction, and increased operational efficiency.

5.2 Quality issue – Improve warehouse condition.

In managing inventory for perishable cosmetics, it is critical to optimize the use of cold storage facilities to ensure product quality while controlling costs. Certain cosmetics, such as eye creams and facial masks, are highly sensitive to temperature fluctuations and prone to issues like separation, evaporation, or leakage when stored at room temperature. Based on twelve months of inventory and quality data, these items account for 25% of the total product portfolio but contribute to 40% of product returns due to degradation during storage. To address this, a targeted approach is required to define which products necessitate cold storage.

Figure 8. Cool warehouse

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By analyzing product composition, shelf life, and temperature sensitivity, high-risk items can be identified and prioritized for cold storage, while less sensitive products, such as powders or oil-based products, remain in standard storage conditions. This strategy ensures the preservation of quality for critical items while minimizing unnecessary energy and infrastructure costs. By integrating this selective approach into inventory planning, the company can strike a balance between cost efficiency and product quality, enhancing customer satisfaction and reducing operational inefficiencies.

5.3 Short shelf-life from Factory.

Ensuring optimal shelf-life for cosmetics inventory is a critical component of effective supply chain management, particularly when dealing with perishable products prone to quality degradation over time. Analysis of twelve months of inventory data reveals that 18% of products received from the factory had a short shelf-life of less than 12 months, significantly contributing to bad stock due to near-expiry or expired items. To address this issue, it is necessary to renegotiate supplier contracts to establish a minimum acceptable shelf-life of 22 months at the time of shipment. This standard ensures that products have sufficient time to move through the supply chain and reach end customers without risking obsolescence.

By implementing this policy, the company can reduce the proportion of near-expiry items by 60%, minimizing waste and associated storage costs. Including shelf-life requirements in supplier agreements incentivizes better production planning and quality control at the factory level, ensuring a more reliable supply chain. This approach not only improves inventory turnover but also strengthens supplier relationships and enhances long-term operational efficiency.

VI. CONTROL PHASE

The goal is to sustain the improvements made in the previous stages of cosmetic inventory management by addressing the key root causes identified during the analysis. Controls will focus on optimizing warehouse conditions, enforcing supplier compliance, and increasing inventory rotation. First, warehouse temperatures must be maintained at 15 degrees Celsius to prevent product degradation, such as separation or leakage in sensitive items such as eye creams and facial masks.

Suppliers maintain adhere to a minimum shelf life standard of 22 months for all shipments, as short-lived products are a major cause of poor inventory. Quality assurance procedures will include batch testing, with certifications verifying compliance before acceptance into inventory. Additionally, inventory turnover will be managed using the Target Working Inventory (TWI) standard based on the ABC class mentioned above to calculate the appropriate amount of safety stock to avoid excess inventory. This approach will ensure faster inventory turnover, reduce the accumulation of slow-moving or obsolete items, and maintain long-term operational efficiency while addressing critical issues such as inaccurate forecasting and supplier inconsistencies.

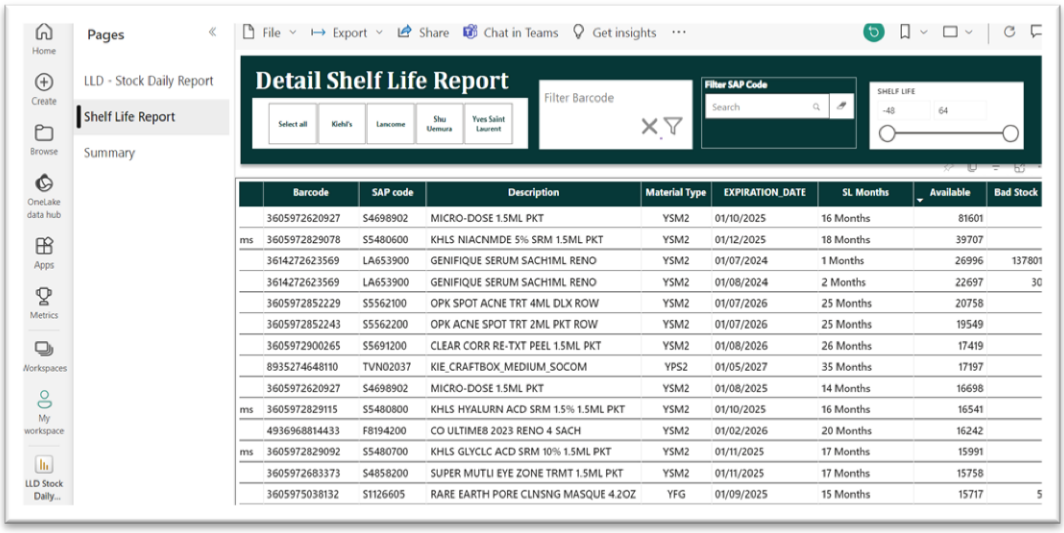

Figure 9. Detail shelf life report

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VII. RESULTS AND DISCUSSION

The study's results demonstrate significant improvements in both product quality and material storage conditions, specifically within the framework of optimizing demand and supply planning in a beauty and cosmetics company. By applying the DMAIC methodology alongside ABC inventory classification model, enhancements were made to production processes and storage facilities. As a result, the Inventory Quality (IQ) rate increased from 86% to 90%, while the volume of excess inventory (SLOB) was substantially reduced from $7.35 billion to $5.25 billion.

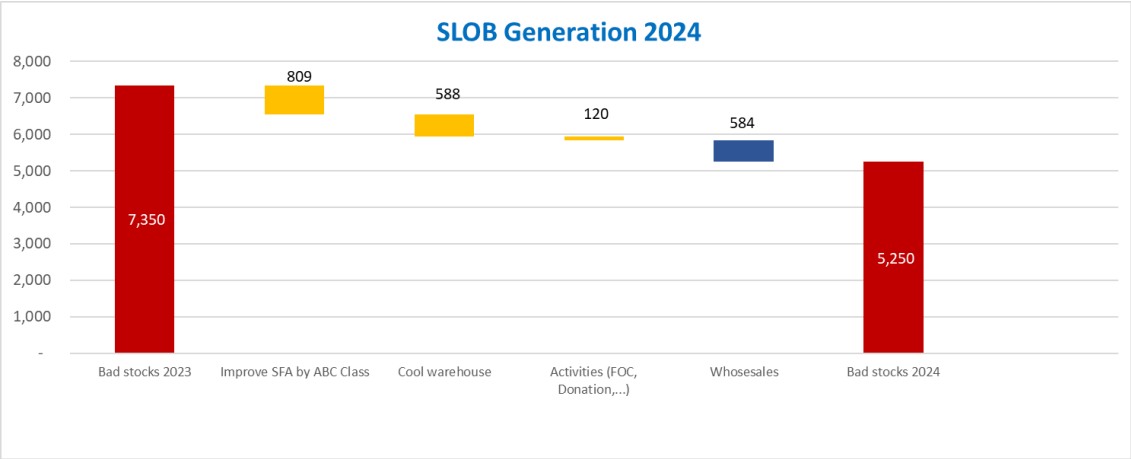

Figure 10. SLOB generation 2024

Figure 11. IQ by month 2024

The implementation of the DMAIC approach facilitated the identification and resolution of critical defect causes, thereby improving production efficiency. Additionally, improvements extended to the material storage environment, where was utilized to establish standards for temperature, humidity, and load capacity. This not only protected the quality of materials but also ensured product reliability throughout the production process.

These advancements have yielded considerable benefits for the company, including reductions in costs and production times, as well as an enhanced reputation and reliability in the marketplace. By minimizing product defects and optimizing storage conditions, the company has achieved greater operational efficiency, ensured consistent quality, and maintained long-term product stability. This represents a vital step in reinforcing the company's commitment to delivering high-quality products while sustaining a strong competitive position in the market.

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VIII. CONCLUSION

In conclusion, the implementation of the DMAIC approach and the ABC inventory classification model has led to substantial improvements in both product quality and inventory management within the beauty and cosmetics company. The increase in Inventory Quality (IQ) signifies a marked enhancement in the overall reliability of products, while the significant reduction of excess inventory demonstrates improved efficiency in resource utilization.

These advancements not only contribute to lower production costs and shortened lead times but also bolster the company's reputation in a highly competitive market. By systematically identifying and addressing the root causes of defects, the organization has enhanced production efficiency and ensured the integrity of material storage conditions. The establishment of rigorous standards for temperature, humidity, and load capacity further safeguards material quality, ensuring consistent product performance.

Overall, these strategic improvements reflect the company's commitment to delivering high-quality products and maintaining robust operational practices. As the company continues to optimize its processes, it is well-positioned to sustain its competitive advantage and meet the evolving demands of consumers in the beauty and cosmetics industry.

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