

Packaging Quality in the FMCG Supply Chain: A Case Study of Leaking Non-Dairy Creamer (NDC) Packages at Company XYZ

Vanessa Thomas^{1*} and Nur Budi Mulyono²

^{1,2}School of Business and Management, Institut Teknologi Bandung

Email: vanessa_michelle@sbm-itb.ac.id

Abstract

In Indonesia's highly competitive FMCG market, product quality is critical in maintaining customer loyalty and protecting brand reputation. Company XYZ, a key player in this sector, recently encountered significant challenges due to packaging defects, specifically leaks in its Non-Dairy Creamer (NDC) product line. These defects have led to customer dissatisfaction and threaten the company's relationship with a major client. This study aims to identify the root causes of these packaging failures and propose effective solutions to enhance packaging quality. A qualitative research approach involved semi-structured interviews with key stakeholders and analyzing internal communication records. Root Cause Analysis (RCA) tools, such as Causal Factor Charting and the 5 Whys method, were utilized to uncover the underlying issues. The findings revealed two primary causes: the Quality team's lack of expertise in conducting thorough risk assessments for packaging designs and insufficient knowledge in evaluating the structural integrity of modified packaging. To address these issues, the study recommends implementing standardized risk assessment protocols, conducting comprehensive packaging performance tests, and enhancing training programs for quality management personnel. By adopting these measures, Company XYZ can reduce packaging defects, improve customer satisfaction, and strengthen its competitive position in the dynamic FMCG industry.

Keywords: FMCG Industry; Packaging Defects; Root Cause Analysis; Quality Management; Non-Dairy Creamer

A. INTRODUCTION

The Fast-Moving Consumer Goods (FMCG) industry is a vital sector in Indonesia's economy, contributing significantly to GDP growth and job creation. FMCG products, including food and beverages, personal care items, and household goods, are characterized by high turnover rates and frequent consumer purchases. This sector thrives on Indonesia's growing population, expanding middle class, and rapid urbanization. According to (Salsabila, 2021; Sinurat & Dirgantara, 2021), the Indonesian FMCG market is dynamic and highly competitive, compelling businesses to innovate continually and maintain operational excellence to meet evolving consumer expectations.

The competitive landscape is dominated by multinational corporations such as Unilever, Nestlé, and Coca-Cola, which leverage their robust supply chains, brand equity, and marketing resources to sustain market dominance. However, local companies have increasingly challenged these global giants by focusing on niche markets and tailoring products to local preferences. E-commerce has further intensified this competition, enabling smaller firms to directly reach consumers and foster brand loyalty. This shift has made customer satisfaction and product quality essential for companies of all sizes to remain competitive (Oey & Nofrimurti, 2018).

Product quality is critical in building and maintaining trust in the FMCG sector, where consumer purchases are frequent and often brand-dependent. Attributes such as reliability, consistent availability, and superior quality directly influence customer loyalty, particularly in diverse markets like Indonesia. Any lapse in quality can lead to customer dissatisfaction, negative feedback, and eventual loss of market share. Research indicates that even minor product defects can significantly affect consumer perceptions and erode long-term loyalty (Zacharias, 2022; Omoruyi & Mafini, 2016).

* Corresponding author

Packaging quality, a crucial yet often overlooked component of product quality, plays a pivotal role in preserving product integrity during transportation, storage, and handling. Defective packaging—such as leaks, punctures, or physical damage—can compromise product safety, leading to spoilage, contamination, or other quality issues. These defects diminish customer satisfaction and can trigger costly product recalls and harm a company's reputation. Packaging quality has received limited attention in academic research and industry practice despite its importance. For example, the 2023 case of Conagra Brands, where faulty packaging led to widespread product recalls and customer backlash, highlights the severe consequences of neglecting packaging quality (U.S. Department of Agriculture's Food Safety and Inspection Service, 2023).

Company XYZ, an Indonesian FMCG manufacturer specializing in food and beverage products, faces a similar challenge. Recently, the company encountered packaging defects in its Non-Dairy Creamer (NDC) product line, with leaks reported by a major client, Company ABC. These leaks were detected post-delivery, led to product returns and customer dissatisfaction and raised concerns about the effectiveness of Company XYZ's quality control processes. The incident also jeopardizes the company's relationship with Company ABC, a key client distributing NDC products across Indonesia. The primary research problem in this study is to identify the root causes of these packaging defects and develop effective solutions to mitigate them. Preliminary observations suggest that packaging design and material selection weaknesses may be contributing factors, pointing to potential flaws in Company XYZ's quality management practices and supply chain processes. These issues could lead to long-term reputational damage, strained client relationships, and financial losses if unresolved.

To address this, the study employs Root Cause Analysis (RCA) tools, including the 5 Whys technique and Causal Factor Charting, to investigate the underlying factors contributing to the packaging defects. The research focuses on deficiencies in risk assessment protocols and evaluating modified packaging designs. Based on the findings, the study proposes solutions aligned with international ISO standards to improve quality management systems and implement rigorous packaging evaluations. By ensuring product integrity and operational efficiency, this research offers practical insights into the critical role of packaging quality in sustaining customer loyalty and safeguarding brand reputation in the competitive FMCG industry. These measures are designed to reduce defects, enhance customer satisfaction, and strengthen Company XYZ's competitive position in the market.

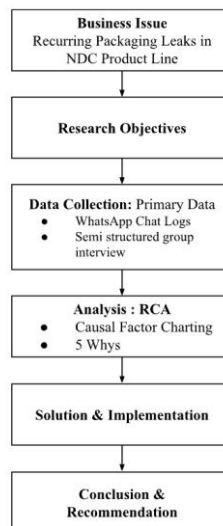
B. RESEARCH METHODS

This study employs a structured Root Cause Analysis (RCA) framework to investigate and address the recurring issue of packaging leaks in Company XYZ's Non-Dairy Creamer (NDC) product line. The methodology follows a systematic approach, beginning with identifying the business issue and progressing through data collection, analysis, and solution development, as illustrated in Figure 1. The research starts by defining the core problem: persistent packaging leaks that have compromised product integrity led to customer dissatisfaction and threatened the company's relationship with a key client. The primary objective is to identify the root causes of these defects and propose actionable solutions to improve packaging quality and operational efficiency.

Data collection is a critical phase of this study and relies on two primary qualitative sources to ensure a comprehensive understanding of the problem. First, WhatsApp chat logs from internal stakeholder groups were analyzed to capture real-time communication patterns, initial responses, and problem-solving approaches related to the NDC packaging process. These logs provide unfiltered insights into daily operations and decision-making dynamics. To maintain confidentiality, all chat data were anonymized before analysis. Thematic analysis was then employed to identify recurring issues and operational gaps. Second, semi-structured group interviews were conducted with key stakeholders, including Quality Control

staff, Quality Managers, Production Staff, and Quality Assurance teams. This qualitative approach allowed for an in-depth exploration of the packaging defects, offering diverse perspectives on the root causes and potential solutions. A purposive sampling method was used to select participants directly involved in the NDC packaging process, ensuring the relevance of the data collected. In total, 10 stakeholders participated in these interviews, providing a comprehensive overview of the problem from multiple angles.

Figure 1. Research Flowchart



Source: Research Data, 2024

Following data collection, the analysis phase began with applying causal factor charting and visually mapping the relationships between events and contributing factors. This method clarified how different elements, from packaging design to production processes, interacted to cause the defects. Subsequently, the 5 Whys analysis was conducted to delve deeper into each causal factor by repeatedly asking "why" until the underlying root causes were uncovered. This systematic approach revealed two primary issues: (1) improperly modifying oversized outer boxes, which compromised structural integrity, and (2) inadequate risk assessment procedures for packaging designs, leading to undetected flaws.

Based on these findings, the solution development phase focused on implementing standardized practices to address the identified root causes. Specifically, the study recommends aligning Company XYZ's packaging processes with internationally recognized ISO standards to enhance quality management. Key measures include standardizing risk assessment protocols, conducting comprehensive packaging performance tests, and enhancing training programs for the Quality team. The relevant standards referenced include ISO 9001:2015 (quality management systems), ISO 6383-1:2015 (tear resistance testing), ISO 3036:2011 (stacking strength assessment), and ISO 780:2015 (handling and storage guidelines). These standards provide a robust framework for improving the structural integrity of packaging and ensuring consistent quality.

To ensure the validity and reliability of the findings, triangulation was employed by cross-referencing insights from WhatsApp communications with the data obtained from interviews. This approach strengthened the credibility of the results by confirming consistency across different data sources. Ethical considerations were also carefully addressed throughout the research process. All participants provided informed consent before participating in interviews, and measures were taken to protect sensitive company information, including anonymizing data and securing internal communications.

This structured methodology offers a replicable framework for resolving packaging-related challenges in the FMCG industry and provides valuable insights into quality management and operational

improvement. By integrating RCA tools with ISO standards, the study contributes to the broader understanding of how systematic approaches can reduce defects, enhance customer satisfaction, and protect brand reputation in competitive markets.

C. RESULTS AND ANALYSIS

This study employed Causal Factor Charting and the 5 Whys method to systematically investigate the recurring issue of packaging leaks in Company XYZ's Non-Dairy Creamer (NDC) product line. These tools were selected for their ability to provide both a macro (broad overview of contributing factors) and micro-level (specific root causes) understanding of the issues, offering a practical framework for resolving complex quality control problems in dynamic production environments.

Causal Factor Chart

The Causal Factor Chart (Figure 2) visually represents the events and contributing factors leading to the compromised NDC packaging. This method helped clarify how specific operational weaknesses, from design flaws to packaging modifications, collectively contributed to the problem. The analysis revealed two primary causal factors:

1. Improper Modification of Oversized Outer Boxes: Oversized boxes were manually modified by folding and taping flaps to fit the product dimensions. These modifications compromised the packaging's structural integrity, subjecting the NDC packages to excessive pressure during transit, which resulted in leakage.
2. Sharp Edges on NDC Packaging: A design flaw in the packaging created sharp edges, which led to punctures and tears during handling and transportation. Friction and minor impacts during shipping exacerbated these defects, compromising product integrity.

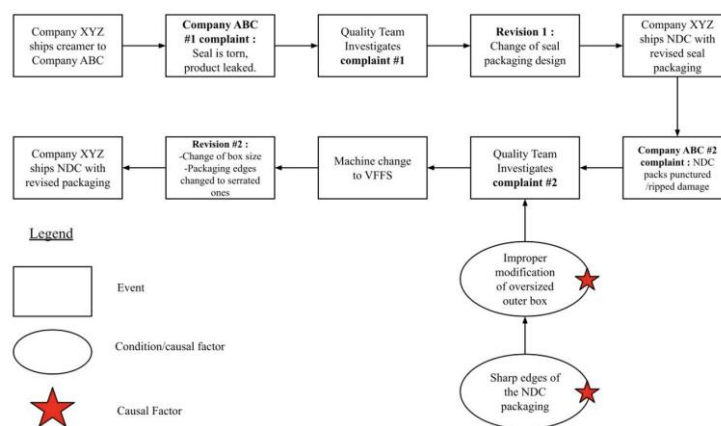


Figure 2. Causal Factor Chart

Source: Research Data, 2024

The chart provided a clear overview of how these issues originated and highlighted the need for targeted interventions focusing on packaging design improvements and handling protocols.

5 Whys Analysis

To further investigate the causes identified in the Causal Factor Chart, the 5 Whys method was applied. This iterative process involved repeatedly asking "why" until the fundamental root causes of each defect were identified.

1. Causal Factor #1: Improper Modification of Oversized Outer Boxes

The 5 Whys analysis (Figure 3) determined that the root cause of this issue was the Quality team's lack of expertise in evaluating the structural integrity of modified packaging. The oversized boxes were altered without proper risk assessments, leading to instability during transit. The absence of standardized procedures for modifying packaging contributed to inconsistent practices, resulting in product damage.

2. Causal Factor #2: Sharp Edges on NDC Packaging

The analysis (Figure 4) revealed the root cause of the Quality team's insufficient knowledge to conduct thorough risk assessments of packaging designs. This lack of expertise led to the approval of packaging designs prone to punctures and tears. Additionally, the absence of rigorous performance testing during the design phase allowed these vulnerabilities undetected until the products were in the supply chain.

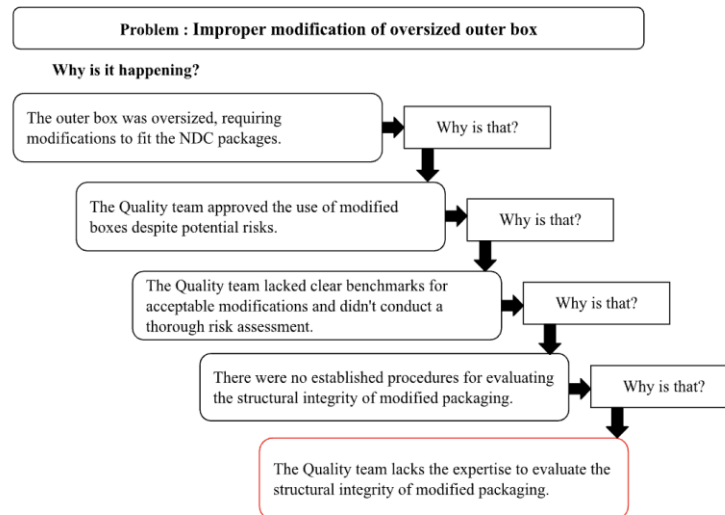


Figure 3. 5 Whys Analysis for Causal Factor #1
 Source: Research Data, 2024

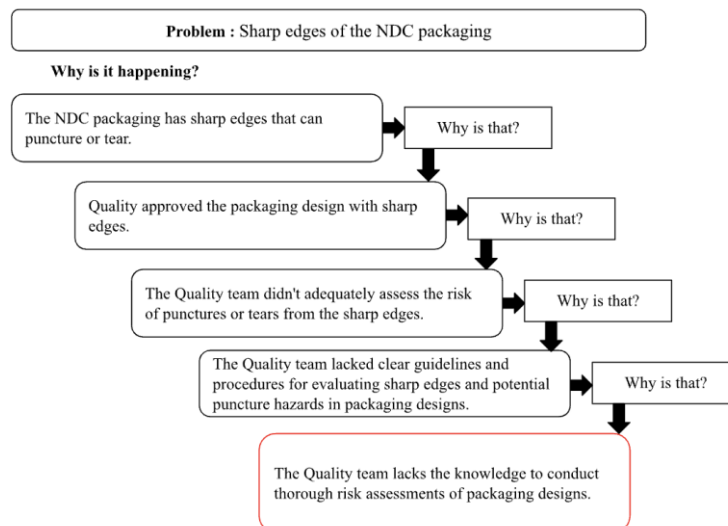


Figure 4. 5 Whys Analysis for Causal Factor #2
 Source: Research Data, 2024

Corrective Actions and Solutions

The identified root causes highlighted critical gaps in Company XYZ's quality management system, particularly in risk assessment protocols and structural evaluation of packaging. The study recommends aligning the company's practices with international ISO standards to address these issues. The proposed solutions aim to standardize risk assessments, improve packaging design processes, and enhance structural integrity, thereby reducing defects and improving customer satisfaction.

Table 1. ISO Standardization

Root Cause	ISO Standard	How the Standard Addresses the Root Cause	Alternative Solutions
The Quality team lacks expertise in evaluating the structural integrity of modified packaging.	ISO 9001:2015	Establishes documented procedures for all processes affecting product quality, including packaging modifications.	Develop SOPs for modifying packaging, define acceptance criteria, and implement personnel training.
	ISO 6383-1:2015	Provides general requirements for transport packaging design, focusing on material strength and protection.	Include edge safety standards in packaging design guidelines and specify acceptable materials to reduce puncture risks.
	ISO 780:2015	Specifies pictorial markings for handling goods to minimize rough handling during transportation.	Apply appropriate handling symbols on NDC packages to ensure careful handling in transit.
The Quality team lacks the knowledge to conduct thorough risk assessments of packaging designs.	ISO 9001:2015	Establishes a Quality Management System (QMS) emphasizing risk-based thinking and continuous improvement.	Implement documented risk assessment procedures and monitoring systems to evaluate risk mitigation effectiveness.
	ISO 6383-1:2015	Outlines design, manufacturing, and testing standards for transport packaging.	Conduct performance tests (e.g., drop, compression) and develop comprehensive packaging guidelines.
	ISO 3036:2011	Provides methods for estimating the stacking strength of packaging materials.	Determine safe stacking heights for NDC packages and incorporate stacking strength considerations into the design.

Source: Research Data, 2024

Implementation Plan

A comprehensive implementation plan was developed to ensure the systematic adoption of the proposed solutions. This plan emphasizes cross-functional collaboration among the Quality, Production, Warehouse, PPIC, and R&D teams. Key steps include:

1. Developing Risk Assessment Procedures aligned with ISO protocols and training personnel to ensure consistent application.
2. Conducting Packaging Performance Tests (e.g., drop and compression tests) to validate design improvements.
3. Redesigning Outer Boxes to appropriate dimensions and integrating safety features, such as serrated edges and reinforced materials.

Specific Implementation Steps:

Root Cause #1: Lack of Knowledge in Evaluating Modified Packaging

- Step 1: Develop Standard Operating Procedures (SOPs) for packaging modifications (ISO 9001:2015).
- Step 2: Implement training programs for structural integrity assessments.
- Step 3: Include edge safety standards in packaging design (ISO 6383-1:2015).
- Step 4: Apply appropriate handling markings to minimize rough handling (ISO 780:2015).

Root Cause #2: Inadequate Risk Assessment for Packaging Designs

- Step 1: Establish comprehensive risk assessment procedures (ISO 9001:2015).

Step 2: Conduct packaging performance tests (ISO 6383-1:2015).

Step 3: Determine safe stacking heights (ISO 3036:2011).

Step 4: Implement a monitoring system to ensure continuous improvement in risk mitigation.

Potential Challenges in Implementation

While the proposed solutions are comprehensive, the implementation process may face certain challenges:

1. Resource Allocation: Implementing ISO standards and conducting performance tests require financial investment and resource allocation, which may strain existing budgets.
2. Staff Training and Resistance to Change: There may be resistance to new protocols from staff accustomed to existing practices. Comprehensive training programs and effective change management strategies will be critical to overcoming this barrier.
3. Supply Chain Adjustments: Modifying packaging materials and processes may necessitate changes in the supply chain, potentially leading to delays or increased costs during the transition phase.

Addressing these challenges proactively through careful planning and stakeholder engagement will be crucial to the success of the implementation process.

Discussion

The findings of this study directly address the research objectives by identifying the root causes of the packaging defects and proposing ISO-aligned corrective actions to prevent their recurrence. The analysis underscores the importance of robust quality management systems and cross-departmental collaboration in addressing complex product quality issues. Company XYZ can significantly enhance packaging quality, reduce customer complaints, and protect its brand reputation by implementing standardized procedures and improving risk assessment protocols.

Beyond addressing the specific challenges faced by Company XYZ, this study contributes to the broader understanding of the critical role of packaging quality in the FMCG industry. In an era where sustainability and automation are reshaping industry practices, aligning packaging processes with international standards improves operational efficiency and helps companies maintain customer satisfaction and gain a competitive edge in dynamic markets. The methodologies and solutions proposed in this study can serve as a model for other FMCG companies facing similar packaging challenges, highlighting the value of systematic analysis and standardized approaches in modern quality management.

D. CONCLUSION

This study sought to identify the root causes of packaging defects in Company XYZ's Non-Dairy Creamer (NDC) product line and propose actionable solutions to address these issues. The research findings revealed two primary root causes: (1) the Quality team's lack of expertise in assessing the structural integrity of modified packaging and (2) the inability to conduct thorough risk assessments during the packaging design process. These deficiencies led to recurring packaging leaks, resulting in product returns, diminished customer satisfaction, and reputational risks for Company XYZ.

The first key finding indicates that improperly modifying oversized outer boxes significantly contributed to the packaging leaks. The adjustments made to fit the packaging, such as folding and taping, compromised the boxes' structural integrity, leaving the products vulnerable during transit. The second finding highlights that sharp edges in the NDC packaging design, a direct consequence of inadequate risk assessment, caused punctures and tears during handling and transportation. Together, these issues underscore the critical role of robust quality management practices in maintaining product integrity, ensuring customer satisfaction, and safeguarding brand reputation. To mitigate these challenges, the study recommends the adoption of internationally recognized ISO standards, including ISO 9001:2015 (quality

management systems), ISO 6383-1:2015 (testing for tear resistance), ISO 3036:2011 (stacking strength assessment), and ISO 780:2015 (handling and storage guidelines). These standards provide a comprehensive framework for improving risk assessment procedures, strengthening structural evaluations, and enhancing packaging design. Implementing these standards is expected to lead to long-term operational efficiency, reduced packaging defects, and improved customer satisfaction.

While this study provides a focused analysis of Company XYZ's packaging challenges, there are opportunities for future research to build on these findings. Future studies could explore integrating advanced packaging technologies, such as smart packaging that monitors product conditions or sustainable materials that reduce environmental impact. Additionally, evaluating the long-term impact of ISO implementation on packaging quality across different FMCG sectors could offer valuable insights into the scalability and adaptability of these standards. Moreover, future research could investigate the role of external factors—such as supply chain logistics, transportation conditions, and third-party handling processes—contributing to packaging defects. Understanding how these variables interact with internal quality management systems can provide a more holistic approach to improving product integrity. By addressing these areas, future studies can contribute to a deeper understanding of how quality management practices influence product integrity and customer loyalty, as well as the operational success and competitive positioning of businesses in the FMCG industry.

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