

Freezer Conversion to Warehouse

Author: Gino J. Ramos Rivera
 Advisor: Carlos Gonzalez, Ph.D.
 Manufacturing Engineering



Abstract

The project expands the pharmaceutical company warehouse due to market product demand. Constructing a new building would be too costly and not cost-effective. The identified problem was that significant renovations were needed for the freezer structure to be suitable. Therefore, it was decided that the facilities should meet the requirements of a warehouse. The DMAIC methodology was employed to execute this process. Furthermore, it clarifies that the conversion of the freezer to the warehouse encompassed architectural layouts, access and emergency exit doors, storage racks system, electrical power, fire protection, BAS (temperature and humidity control), OGP permits, commissioning and qualifications, and new equipment's. Additionally, it clarifies that the existing warehouse's capacity is 2,293 pallet spaces. With the expansion by converting the existing freezer structure into a warehouse, an increase of 328 pallet spaces was achieved, resulting in a total storage capacity of 2,621 pallet spaces.

Key Terms — Architectural layouts, fire protection, HVAC equipment, storage rack system.

Introduction

This study examines a pharmaceutical company's project to expand its warehouse amid growing market demands. Faced with the impracticality of new construction, the company identified a unique opportunity: repurposing a disused freezer structure. However, this endeavor required significant renovations to convert it into a functional warehouse. Leveraging the DMAIC methodology, the project progressed through the Define, Measure, Analyze, Improve, and Control stages, facilitating effective management and implementation. The study offers insights into the challenges, strategies, and outcomes of this transformation.

Background

The pharmaceutical company's innovative solution to storage demands involves converting a disused freezer into a functional warehouse. This strategy capitalizes on the freezer's ample space, sidestepping the expense of constructing a new facility. Key to success is meticulous planning and renovation to ensure the freezer meets warehouse standards and regulations. Efficient project management is crucial for timely completion. Attention to detail in implementing essential functionalities like HVAC systems and fire protection ensures a safe and compliant environment. This approach proves cost-effective and sustainable, signaling the company's commitment to efficiency and environmental responsibility.

Problem

The conversion of the freezer into a warehouse faced a critical challenge due to the deteriorated roof structure, which required extensive repairs. This was crucial as the warehouse served as a vital storage facility for distributing pharmaceutical products. Visual inspections revealed non-compliance with building codes, necessitating additional insulation and membrane replacement. Issues with roof scutters and parapet wall construction further compounded the problem. Addressing these issues is essential to ensure structural integrity, safety, and regulatory compliance, preserving product quality. Additionally, the project involves various requirements, including architectural layouts, HVAC systems, fire protection, and equipment installation. With a strict deadline, timely completion within the 13-month timeframe is imperative.

Methodology

To achieve the project's goals of increasing the existing warehouse's capacity by converting the freezer structure into a warehouse, a systematic approach using the DMAIC (Define, Measure, Analyze, Improve, Control) methodology will be employed. Below is a detailed method with specific tools utilized at each DMAIC phase:

- Project Charter:** The Project Charter outlines the project's objectives, scope, stakeholders, and timelines for converting the freezer into a warehouse. It provides clear direction and alignment for the renovation, detailing goals, scope, key stakeholders, and a timeframe for timely completion.
- SIPOC (Suppliers, Inputs, Processes, Outputs, Customers):** The SIPOC diagram visualizes the flow of materials and information throughout the conversion process, identifying suppliers, processes, and key stakeholders. It maps out the conversion process from material supply to the output of a functional warehouse, ensuring a comprehensive overview of the project.
- Voice of the Customer (VOC):** VOC involves gathering feedback from warehouse operations teams and stakeholders to understand their requirements and expectations for the converted warehouse. Feedback is collected through surveys and interviews to ensure the warehouse meets user needs and optimizes storage capacity.

Results and Discussion

SIPOC

The SIPOC (Suppliers, Inputs, Process, Outputs, Customers) tool will be utilized as a high-level process map to provide a clear overview of the conversion project from a freezer to a warehouse. This tool helps visualize the flow of materials, information, and activities throughout the project, ensuring a structured approach to achieve the desired outcome efficiently. Refer to Figure 1. [1]

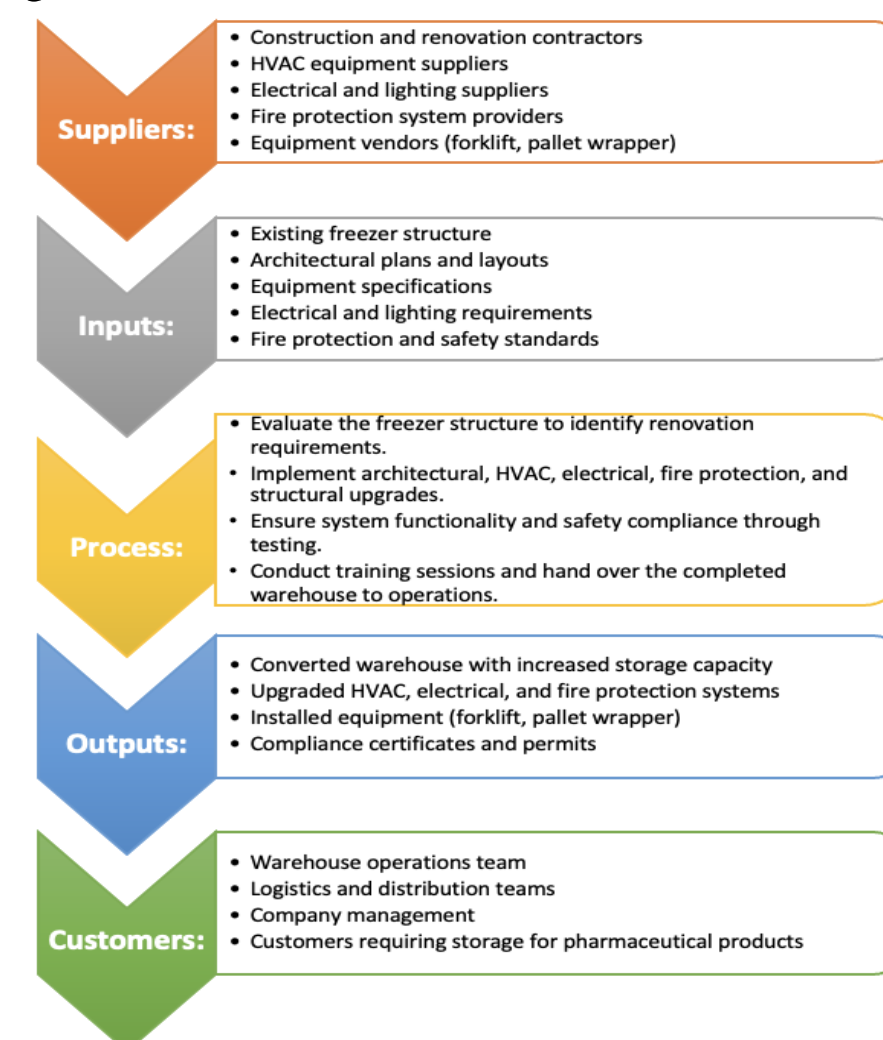


Figure 1
SIPOC

The Project Charter was created to establish the Problem Statement, Objective, and Metric Definition for converting the freezer into a warehouse. Refer to Table 1.

Problem Statement
Due to high product demand and limited storage space, there is a pressing need to expand storage capacity. Converting the existing freezer into a warehouse presents an opportunity to address this challenge effectively and efficiently.
Objective
The freezer conversion to warehouse project aims to increase 14% of storage capacity.
Metric Definition
Percentage of pallets capacity increase.

Table 1
Project Charter

Project Plan

A project plan was developed to guide the conversion of the freezer to a warehouse, outlining the steps, timelines, and resources needed to ensure successful implementation. Refer to Figure 2.

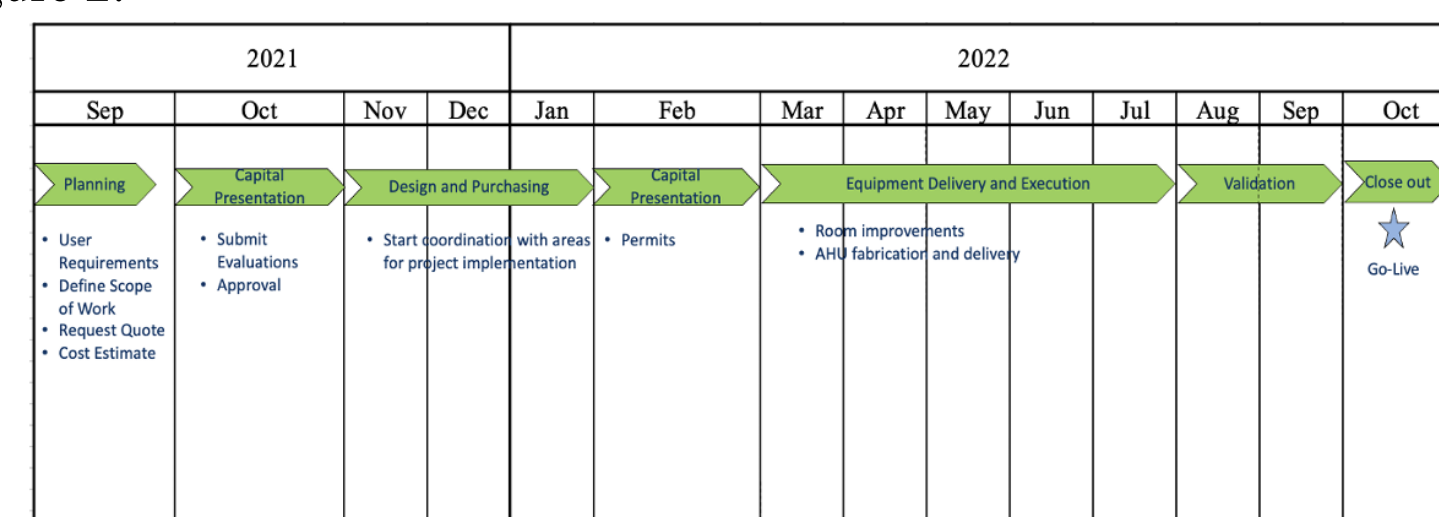


Figure 2
Project Plan

Results and Discussion

Thought Process Map

A Thought Process Map was generated to visually represent the steps involved in the conversion project, from identifying the need to launch the converted warehouse (refer to Figure 3). [2]

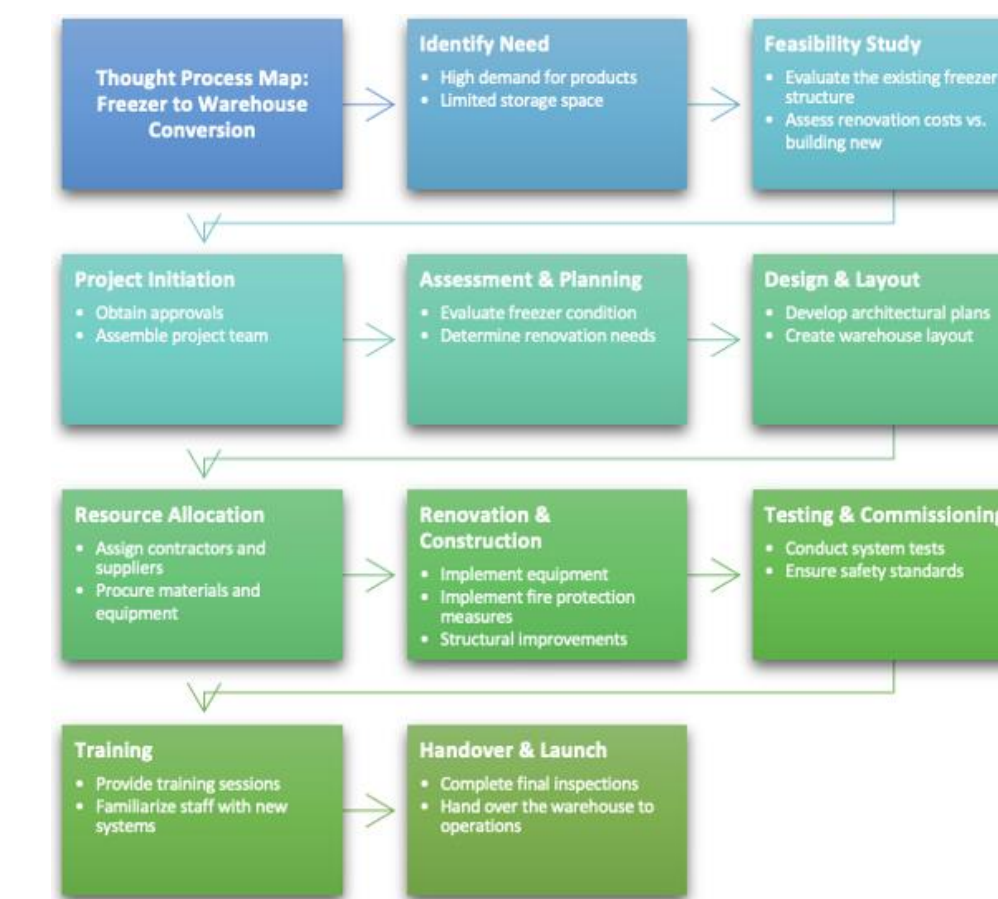


Figure 3
Thought Process Map

The following action log represents the most critical action items and due dates for the Freezer to Warehouse Conversion Project. Refer to Table 2.

Action Item	Responsible Party	Completion Date
Obtain Approvals	Project Manager	29-Sep-2021
Develop Architectural Plans	Architect	22-Dec-2021
Assign Contractors	Project Manager	27-Feb-2022
Purchase equipment and implement	HVAC Contractor	27-Jul-2022
Validate Equipment's	Engineering	10-Oct-2022
Hand over Warehouse	Project Manager	25-Oct-2022

Table 2
Action Log

Voice of the Customer (VOC) for Freezer to Warehouse Conversion Project

The Voice of the Customer (VOC) is presented next to capture and understand the customer's requirements, preferences, and expectations regarding the freezer conversion to warehouse project. This tool is critical in aligning the project's objectives with customer needs, ensuring that the final warehouse design and functionality align with the market demands.

- Customer Needs:**
 - Increased Storage Capacity: Demand for more storage due to product growth.
 - Efficient Product Retrieval: Quick access to products for timely order fulfillment.
- Customer Expectations:**
 - Timely Completion: Project completion within the specified timeline.
 - Quality Assurance: Maintaining or exceeding quality standards.

Pareto Analysis

The Pareto analysis reveals that 70% of the total cost is attributed to two key categories: Storage Capacity and Space (40%) and Infrastructure and Renovations (30%). These categories are prioritized due to their significant impact on addressing space limitations and enhancing the freezer's structure, particularly with HVAC and fire protection improvements. The remaining 30% of the cost is divided between Equipment (20%) and Regulatory Compliance and Safety (10%), highlighting their minor yet crucial roles in the project's success. (Refer to Figure 4). [3]

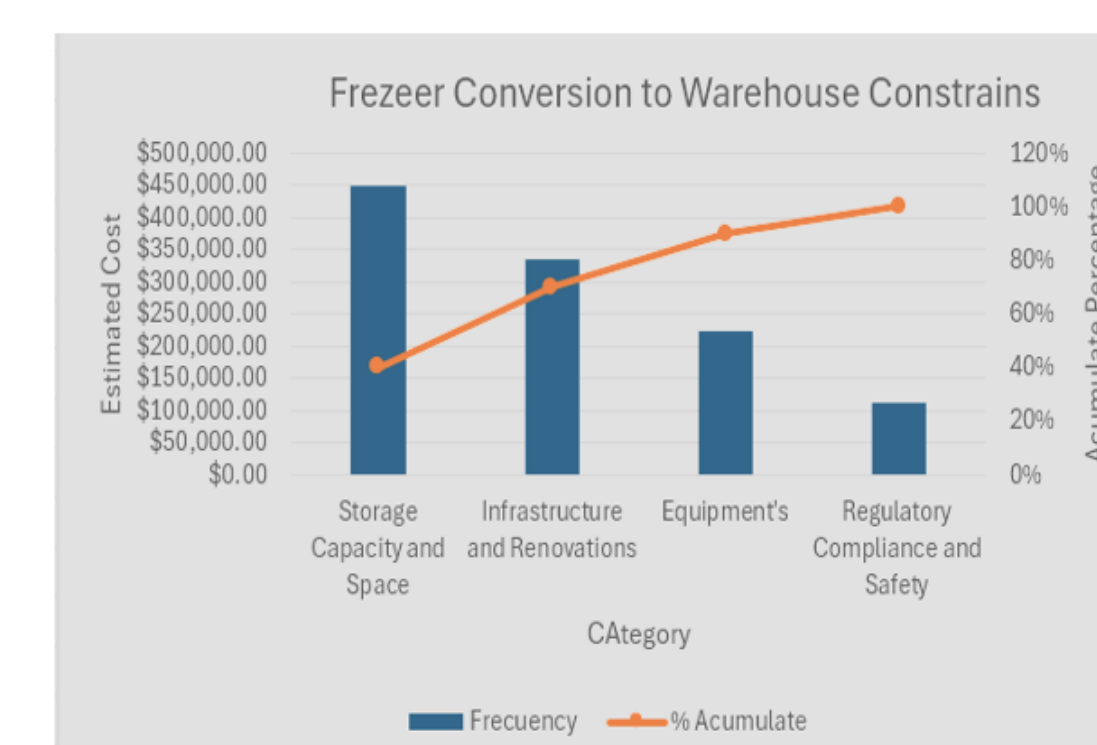


Figure 4
Pareto Analysis

Results and Discussion

A Fishbone diagram was used to visually map out and analyze the various factors contributing to the challenges faced during the freezer conversion to a warehouse. This method helped categorize and understand the root causes behind the storage and operational issues, providing a structured approach to problem-solving and decision-making. Refer to Figure 5.

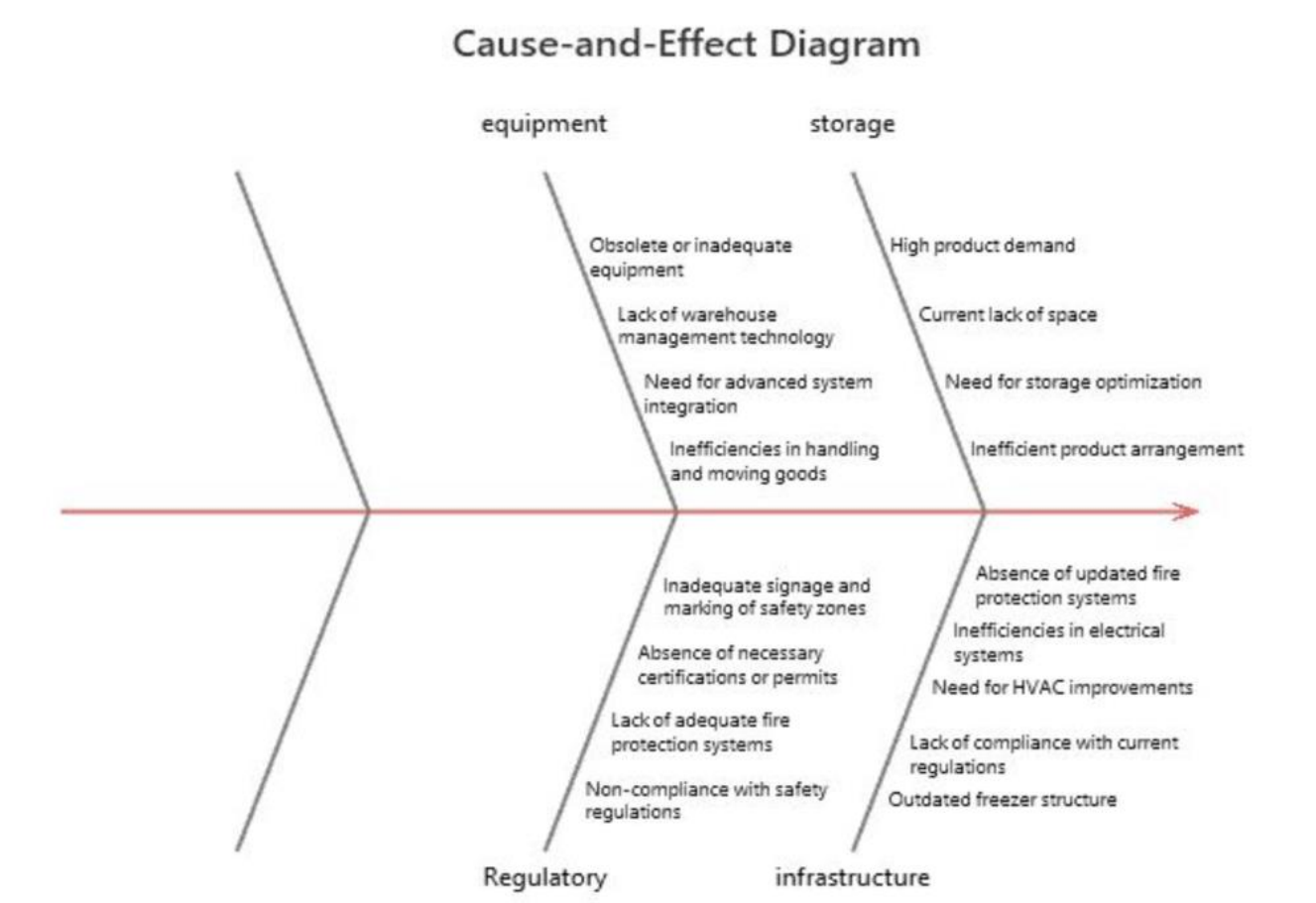


Figure 5
Fishbone Diagram

5'Whys Questions Analysis

A 5 Whys analysis was conducted to identify the root causes behind the challenges in converting the freezer to a warehouse. This method delved into the issues, tracing them back to their origins to ensure a thorough understanding and effective resolution of the storage and operational challenges. Refer to Table 3.

Why Question	Why Question	Answer
1 Why is there a limited storage area?	The existing warehouse has insufficient storage capacity due to the high volume demand of the product.	The freezer structure was chosen and was no longer needed for its original purpose.
2 Why is the freezer not of use?	The freezer structure was chosen and was no longer needed for its original purpose.	The roof of our freezer structure was not suitable for storing conditions after prolonged disease, and there is already another freezer with greater capacity available. Converting the roof of our freezer to a warehouse extension is a more cost-effective and practical solution than constructing a new warehouse.
3 Why repurpose the roof of our freezer instead of building a new warehouse?	The roof of our freezer structure was not suitable for storing conditions after prolonged disease, and there is already another freezer with greater capacity available. Converting the roof of our freezer to a warehouse extension is a more cost-effective and practical solution than constructing a new warehouse.	To meet the increased demand for storage space without incurring the high costs of building a new warehouse.
4 Why choose to convert the freezer into a warehouse extension?	To meet the increased demand for storage space without incurring the high costs of building a new warehouse.	To accommodate the high demand for the product and enhance operational efficiency without significant capital expenditure.
5 Why is there a need to optimize storage in the existing warehouse?	To accommodate the high demand for the product and enhance operational efficiency without significant capital expenditure.	

Conclusions

In conclusion, the Freezer to Warehouse Conversion project has not only effectively tackled our organization's storage challenges but has also demonstrated our commitment to innovation, cost-efficiency, and operational excellence. Through strategic repurposing and meticulous execution, we've achieved substantial cost savings, expanded storage capacity, and enhanced operational efficiency. Our team's ability to navigate complexities and meet tight deadlines underscores our capability to manage and deliver successful outcomes. Furthermore, by ensuring compliance with safety regulations and optimizing storage conditions, we've fostered a safer and more productive work environment. Overall, this project has not only addressed immediate needs but has also positioned us for sustainable growth, reflecting our dedication to driving value and remaining competitive in the market.

Acknowledgements

Acknowledgment is extended to the project team for their tremendous effort in achieving the required objectives for the successful conversion of the freezer to the warehouse. Their dedication ensured the project was completed within the timelines set by management to meet the high product demand and provide controlled storage space.

References

- Georgina, G. (2022, January 05). A comprehensive guide to creating your first SIPOC diagram | Nulab. (n.d.). [Online] Available: <https://nulab.com/learn/project-management/comprehensive-guide-creating-first-sipoc-diagram/>
- Staff, I. (2023, April 8). How Thought Process Mapping Can Help You Achieve Your Goals [Online] Available: <https://www.isixsigma.com/dictionary/thought-process-map-tm-p/>
- Waida, M. (2022, February 22). How To Conduct Pareto Analysis Using Pareto Charts. Wrike Blog > Project Management. [Online] Available: <https://www.wrike.com/blog/pareto-analysis-using-pareto-charts/>
- Boogaard, K. (2021, February 3). Introducing the 5 Whys Technique of Problem Solving. [Online] Blog Wrike. Available: <https://www.wrike.com/blog/the-five-whys-technique-problem-solving/>