

ILLINOIS STATE UNIVERSITY  
INTRODUCTION TO SIX SIGMA METHODOLOGIES

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Enhancing Inventory Control to Prevent Expired Goods Using Six Sigma

**Abstract**

Reducing product expiration is important for food management for social and economic reasons. Consumers who use expired products run the risk of suffering health problems in addition to financial losses. This research paper suggests a methodical strategy for improving pantry operations and lowering the frequency of expired goods by utilizing Six Sigma methodologies. Organizations can attain increased efficiency and effectiveness in pantry management by pinpointing important areas for improvement, putting strong strategies into place, and closely monitoring and controlling procedures. This paper offers practical insights for optimizing pantry processes to reduce or eliminate product expiry through a case study analysis and the application of Six Sigma tools like DMAIC (Define, Measure, Analyze, Improve, Control).

**Introduction**

For many people, school pantries are vital resources, but the presence of expired goods seriously compromises their efficacy and safety. The total effect of this difficulty on the health and well-being of those who depend on these resources is a cause for concern. For supplies and to fill their shelves, school pantries frequently rely on donations from different supermarkets. But, effectively managing and keeping an eye on product expiration dates is made more difficult by the dependence on donations. It is difficult for school pantries to keep track of expiration dates because of the wide variety of products that supermarkets donate. Low-quality inventory management systems, scarce resources, or inadequate staff and volunteer training could be the

cause of these problems. The health and welfare of recipients may be at risk due to ineffective management and monitoring of product expiration dates.

‘School Street Food Pantry’, started in 2018, helps students in the local community with the food, supplies they need. They help students who live in Normal Bloomington. The only requirement is a student ID. The students need to show their identity cards before getting the food. They also have a registration link that opens every Tuesday for students to register themselves and secure a slot on Friday, which is when the pantry is open for the students. The pantry is located at the Church near the Milner Library. It’s a team of one manager and approximately 20 volunteers. Volunteers may change every week depending upon their availability. There are approximately 100 students that come in every week for supplies. New students need to fill in a one-time form to register themselves and then get a bag they can take with them. Once they enter the location, the volunteers then confirm their name and check their identity. Once this is done, they are then sent in for the supplies and are given 10 minutes to get the items.

They get food every Tuesday from different sources, food banks, Midwestern, and funds and sometimes if they are missing anything, they go and buy it from Sams Club. They get all types of food including frozen food, dairy products, vegetables, fruits, personal hygiene, beverages, etc.

### **Problem statement**

"The presence of expired goods in school pantries compromises efficacy and safety, posing risks to the health and well-being of recipients."

There is a serious problem with expired goods in school pantries, which raises questions about the general efficacy and security of these vital supplies. Due to their frequent reliance on gifts from different stores, donors, and funds, school pantries sometimes struggle to keep track of product expiration dates, which puts the receivers' health and wellbeing in danger. In order to create a more secure and long-lasting food distribution system, this issue statement seeks to explore the intricacies of expired foodstuffs in school pantries. It does this by pointing out the underlying causes, consequences, and potential remedies.

### **Discussion**

To improve the current process and minimize expired products, the Six Sigma Methodology will be used. DMAIC process is a quality strategy based on data that is applied to enhance processes. A fundamental component of the Six Sigma methodology, which reduces variability and defects in business processes to improve performance.

### **DEFINE**

Clearly defining the project's objectives, parameters, and deliverables is the first step in determining the essential needs of the company and its clients. By defining the problem statement, project objectives, and customer (internal and external) requirements, this phase lays the groundwork.

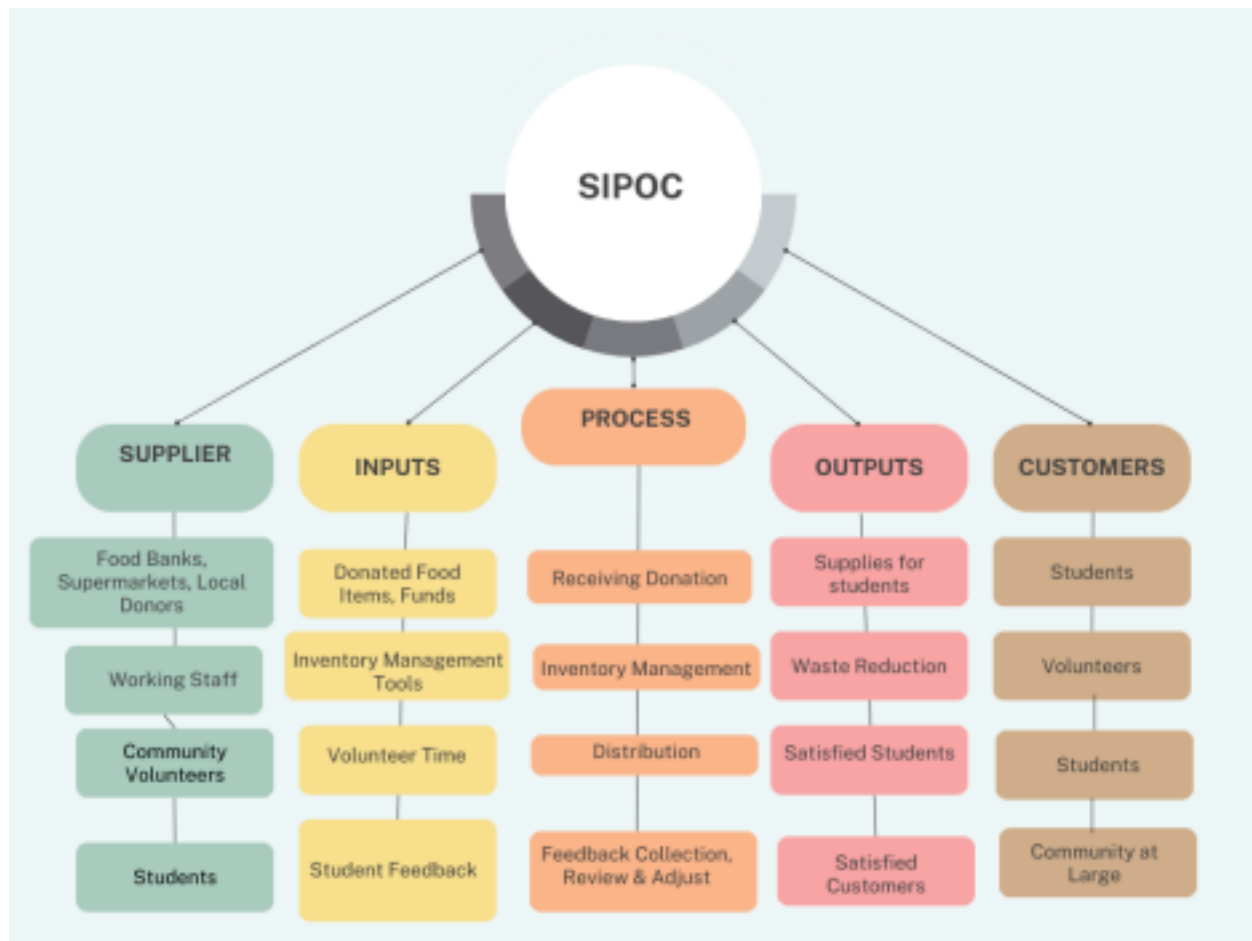
## **Understanding the Problem**

### **Project Charter Creation:**

The main goal of the Define phase of the Six Sigma methodology application to the School Street Food Pantry's operations is made evident: reducing the number of expired foods in the pantry to improve both food safety and operational efficiency should define the project's objectives and problems clearly to provide the groundwork for the endeavor. Approximately 25% of the stocked foods are at risk of expiring before delivery, according to preliminary conversations with pantry managers, volunteers, and recipients. The objective of the pantry is compromised by this large percentage of possible waste, which also poses a risk to the receivers' health by lowering the overall quality and amount of food available for distribution. The scope, goals, and main players are outlined in the project charter that was created during this phase. It emphasizes the need to enhance volunteer training and inventory management procedures. Within a year, a minimum 50% reduction in the rate of expired items is the target. Creating a common understanding of the project's significance among all stakeholders and coordinating the project team's activities with the pantry's strategic objectives depend on this phase.

### **SIPOC for the School Street Food Pantry Project**

The Six Sigma technique uses the SIPOC method, which stands for Suppliers, Inputs, Process, Outputs, and Customers, as a tool to describe the essential components and scope of a process improvement project. This is an example of how you could utilize the SIPOC approach for your project, which aims to decrease the number of outdated foods in the School Street Food Pantry.



## SUPPLIER

**Food Banks:** Supply food in large quantities.

**Midwestern and Sam's Club supermarkets:** Contribute both perishable and non-perishable items.

**Local Donors:** Provide cash and a variety of food items.

**Community Volunteers:** Provide labor for tasks.

## INPUTS

**Donated Food Items:** Contains dairy, fruits, vegetables, frozen food, personal hygiene goods, and beverages.

**Funds:** Monetarily donated funds are utilized to buy more food and supplies. **Volunteer Time:**

**The time and energy that volunteers provide to oversee pantry operations. Inventory Management Tools:** A collection of fundamental instruments and resources for inventory tracking and management.

## PROCESS

**Receiving Donations:** Gather food and financial contributions from different sources. **Evaluation**

**and Recording:** Check donations for expiration and quality, then record them in an inventory

management system.

**Storage & Sorting:** To make rotation easier, arrange things in storage according to kind and expiration date.

**Inventories management:** Keep an eye on stock levels and expiration dates by regularly checking inventories.

**Registration and Scheduling:** Organize student registration links and plan distribution windows.

**Distribution:** Assuring product quality and safety, distributing food supplies to enrolled students.

**Feedback Gathering:** To determine areas that need improvement, get input from volunteers and students.

**Examine and Modify:** To enhance workflows and boost productivity, examine input and inventory information.

## OUTPUTS

**Safe Food Distribution:** Food products are supplied in a safe and appropriate consumption window.

**Reduction of Waste:** Less food that has gone bad.

Enhanced distribution and inventory procedures contribute to increased system efficiency.

**Customers Satisfied:** Recipients expressed more satisfaction with the safety and quality of the meal.

## CUSTOMERS

**Students:** The primary recipients of the pantry's services.

**Volunteers:** Take advantage of a well-run and productive volunteering environment.

**Pantry Managers:** Meet operational targets and uphold standards for the pantry.

**Community at Large:** A less food-insecure student body and a healthier community.

The School Street Food Pantry project may reduce the danger of distributing expired foods and increase overall operational efficiency by focusing on crucial areas that require improvement, such as inventory management and volunteer training, by outlining these features in the SIPOC framework. In addition to helping to ensure a thorough solution to the current problem, this organized approach also helps to align the project's aims with the needs of all stakeholders.

## Voice of the Customer (VOC) Analysis:

Based on the Define phase findings, conducting a Voice of the Customer (VOC) Analysis involves detailed engagement with pantry managers, volunteers, and recipients to understand their perspectives on expired products. Below is a synthesis of the VOC analysis:

## **Input from Pantry Managers, Volunteers, and Recipients**

**Pantry Managers:** They have concerns about the inability to efficiently maintain and monitor inventory due to a lack of systematic tracking. The primary concern is minimizing waste while maintaining food safety, and a more dependable system to predict demand and adjust stock levels appropriately is desired.

**Volunteers:** Comments point to a lack of training in expired product identification and inventory management. The implementation of a more user-friendly labeling system for expiration dates is suggested by volunteers, who want clearer standards and easier procedures for sorting and monitoring food items.

**Recipients:** Safety and the quality of the meals they are given are their top priorities. Fresh vegetables and products with a longer shelf life are strongly preferred, although there is concern over receiving expired goods. Transparency in the selection and storage of food supplies is valued by recipients.

## **Key Customer Requirements and Expectations**

- **Reliability:** Assurance that food distributed is safe and within its consumption period.
- **Transparency:** Clear communication about how food items are vetted and handled.
- **Efficiency:** Quick and easy access to food without a massive distribution process.

## **Critical-to-Quality (CTQ) Factors**

- **Safety:** No food safety compromises are allowed, necessitating strict inventory management procedures to keep outdated products out of the system.
- **Accuracy:** Proper product labeling and dating is necessary to guarantee that, at the time of distribution, every item is within its best-before date.
- **Efficiency:** Streamlined inventory control procedures to speed up product rotation and lower the risk of expiration.

The VOC study highlights how important it is to solve these issues by making deliberate adjustments to pantry operations. To meet the crucial needs and expectations stated by the pantry stakeholders, volunteers must receive improved training on handling and managing inventory, that a more comprehensive inventory management system be put in place to precisely track and forecast food item turnover, and that recipients be better informed about food safety practices.

**Current State Assessment:**

Based on the information and findings from the Define phase and Voice of the Customer (VOC) analysis, we proceed with the Current State Assessment and Goal Setting for the School Street Food Pantry:

**Current State Assessment**

- **Donation Management:** Donations to the pantry come from a variety of places, such as community funds, food banks, and retailers. There is currently no established procedure for determining the donated goods' expiration dates upon receipt, which makes it difficult to efficiently manage product life cycles.
- **Inventory Tracking:** There is no advanced inventory management system in the pantry. It is challenging to precisely track the shelf life of stocked commodities because inventory tracking is mostly done by hand with little assistance from technology.
- **Distribution Procedures:** Weekly distribution takes place, and beneficiaries have ten minutes to choose what they want. The danger of dispersing out-of-date goods is increased by the lack of attention paid to stock rotation based on expiration dates.
- **Monitoring and Handling Expired Products:** During restocking, it is customary to casually check items for expiration dates, but there is no formal system in place for organizing or recording these goods. There hasn't been a systematic analysis or recording of the prevalence of expired foods in the pantry.

**Goal Setting:**

- Simplify pantry operations by implementing a digital inventory management system that tracks and notifies users when things are about to expire and standardizing the assessment of expiration dates on incoming donations.
- Aim for 90% usage of perishables before they reach half of their shelf life, and after a year of the new system's deployment, cut the amount of expired commodities in half.

**Key Performance Indicators (KPIs):**

- Expired items Percentage: Every quarter, strive for a consistent decline in the percentage of expired items discovered in the inventory.
- Customer Satisfaction Scores: Based on surveys given to pantry receivers, raise the customer satisfaction score by 20% in a year with relation to food quality and safety.
- Operational Efficiency Metrics: Cut the time from contribution receipt to shelf stocking by 30% to increase the effectiveness of inventory management and donation processing.

These objectives aim for observable changes in line with the requirements and expectations of pantry stakeholders and recipients. They are realistically created, considering the pantry's operational environment and resource restrictions. To achieve these goals, concentrated efforts

must be made to improve procedures, implement technological solutions, and provide ongoing feedback loops with all parties concerned so that plans can be modified and improved as necessary.

The creation of a high-level process map for the School Street Food Pantry will aid in visualizing the operational flow and pinpointing areas for improvement based on data from the goal-setting process and the current state assessment. This map will show how donated products are transported, including contacts with other parties, from the point of receipt to the point of distribution.

### High-Level Process Mapping

1. Donation Assessment: Assess upon receipt from a variety of sources the quality and expiration. Be mindful about receiving things that are about to expire without expedited distribution arrangements.
2. Logging: Provide the system with donation information. Typing by hand can result in mistakes.
3. Storage Sorting: Classify and date items. Make placement decisions based on type and inventory to prevent inefficient space usage and rotation.
4. Inventory Checks: To avoid wastage, regularly check stock levels and expiration dates. Then, choose which things to distribute depending on necessity and shelf life.
5. Distribution Preparation: Assemble and package goods for distribution, trying to work quickly and efficiently.
6. Handout: Give out the goods, making sure the receivers know whether any of them are about to expire.
7. Feedback Loop: After the event, adjust the inventory in light of volunteer and recipient feedback, making necessary process adjustments.
8. Stakeholder Communication: Keep lines of communication open with volunteers and donors to make sure that requirements are satisfied and that operations go without a hitch while upholding food safety regulations.

### Key Insights from Process Mapping

- Efficiency Opportunities: Using automation and improved inventory management software, the contribution appraisal, inventory reporting, and distribution preparation procedures can be streamlined.
- Waste Reduction: Putting in place a stricter system of stock rotation and having a well-defined



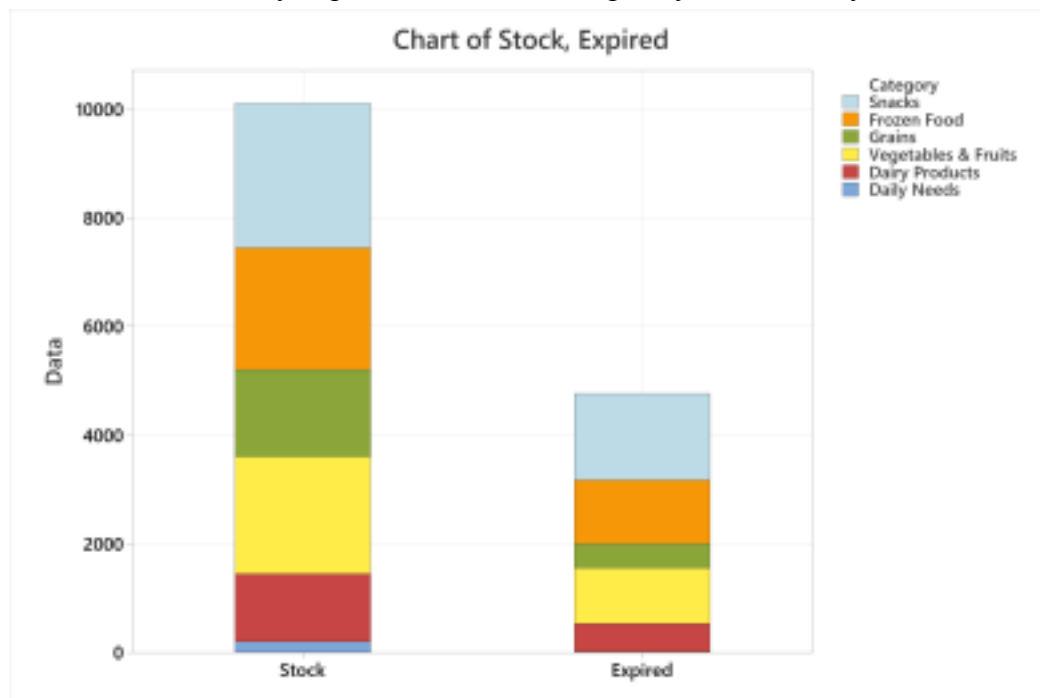
plan for handling products that are about to expire, including exclusive sales or collaborations with food rescue groups.

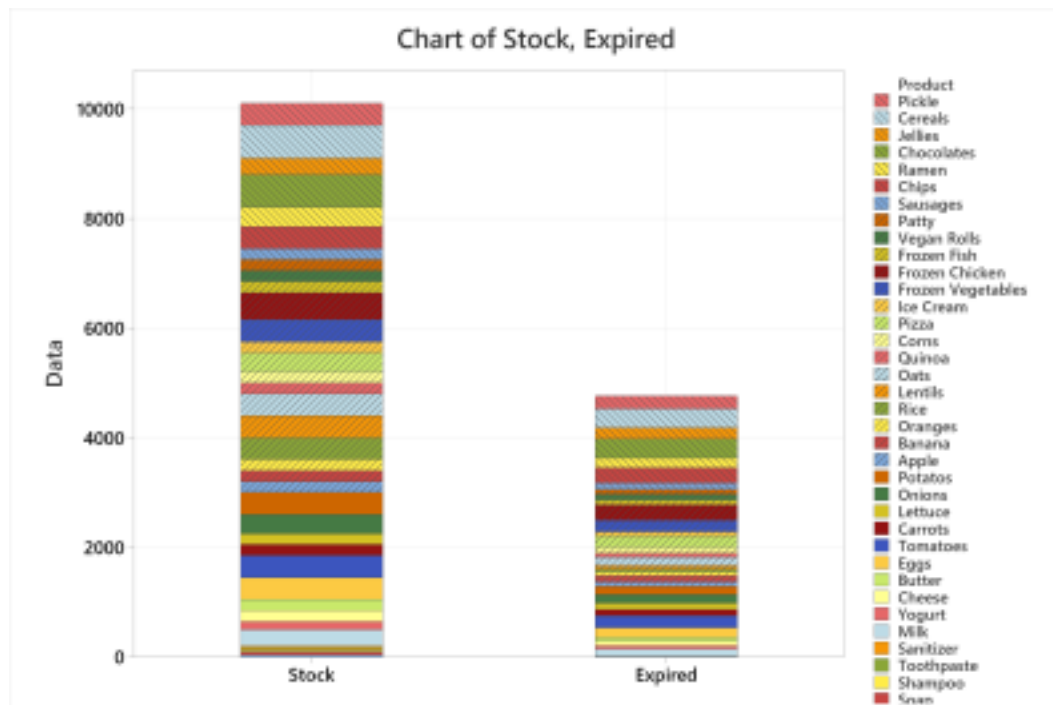
- Stakeholder Engagement: Improving communication with beneficiaries to better understand their needs and input, and with donors to impact the kind and caliber of donations. This high-level process map is a starting point for determining where Six Sigma techniques should be applied, especially when it comes to cutting waste inefficiencies, making the most use of available resources, and improving the general efficiency of pantry operations.

## MEASURE:

The goal of this phase is to gather pertinent data to quantify the performance of the current process. The goal is to ascertain the process's capability "as-is" and create a plan for gathering data. Process mapping, flowcharts, and data collection methods are a few examples of measurement instruments.

We are measuring and evaluating the current state of the problem as part of the Measure step of our Six Sigma project to help schools deal with the problem of old food in their pantry. In this step, you'll collect data to set a baseline for product expiration rates, figure out what the key measures are, and find out how bad the problem is. By doing a full analysis, we hope to learn more about how many expired items are in the pantry and find ways to make things better.





### Data Collection:

To get a good idea of how common it is for food at the School Street Food Pantry to be out of date, we take information on the following:

**Inventory Records:** Look over old inventory records to find out what goods have expired and how many of them there are.

**Physical Inventory Counts:** Count the old food in the pantry by hand to make sure that the inventory records are correct.

**Information from Suppliers:** Get information from suppliers about when donated things will be delivered and when they go bad.

**Pantry Operations Logs:** Look at records and logs about managing inventory, distributing goods, and handling products to find trends or problems.

**Recipient Feedback:** Ask people who use the kitchen what they think about the quality and freshness of the food they get, including whether they've ever received expired food.

## **Key Metrics:**

We focus on the following key performance indicators (KPIs) to figure out how big the problem is and set standard metrics:

**Expired Items Percentage:** Figuring out what percentage of all items have gone bad within a certain amount of time, like every three months or once a year.

Inventory turnover rate is the rate at which things are added to and taken away from stock, with a focus on items that go bad quickly.

**Metrics for Reducing Waste:** Tracking how much trash is made when goods go bad and looking for ways to lower that trash is important.

**Distribution Efficiency:** Looking at how well the distribution process works, such as how long it takes from getting gifts to get goods to people who need them.

## **Data Analysis:**

Once we have all the information we need, we will look it over to see how quickly products go bad in the pantry. As part of this research,

**Quantitative analysis:** includes finding trends over time, figuring out what percentage of items are out of date compared to the total number of items in stock, and comparing different types of products.

**Root Cause Analysis:** Looking into the real reasons why products go bad, like bad inventory management, inconsistent information from suppliers, or inefficient marketing processes.

**Discrepancy Identification:** Finding any differences between the records of inventory and the actual counts, as well as differences between the expiration dates given by the supplier and the real dates.

**Recipient Feedback Analysis:** Looking at feedback from recipients to find patterns or problems that keep happening with old goods and how they affect customer satisfaction.

By doing a full measurement analysis, we hope to get a good picture of how quickly food is going bad in the kitchen right now and find ways to make things better in later steps of the DMAIC process.

## ANALYZE

The Analyze stage is crucial in determining the underlying causes of high product expiration rates when employing the Six Sigma DMAIC methodology to address the problem of expired products in pantries. In order to determine the cause of the issue, this entails methodically going over the information acquired during the Measure stage and using analytical tools.

### Data Review and Validation:

When analyzing pantry management, we will pay close attention to certain inventory categories, such as frozen foods and snacks, which have greater expiration rates than other categories like fruits, vegetables, and grains. Every month, about 52% of frozen food and 60% of snacks expire before they are consumed by students. To determine the underlying causes of these higher expiry rates, a deeper analysis and review of the data collected during the Measure stage are the main objectives of this phase of our study.

### 5 WHY TECHNIQUE:

Understanding the underlying causes of high expiration rates is crucial to minimizing expired products in a pantry setting. To delve deeper into the causes of this issue during the Analyze stage, the Five Whys method can be a useful tool.

First: Why do the products expire before they are delivered to the students? These goods frequently approach their expiration dates while still in stock. Second: Why are these products, still in stock, approaching their expiration dates? The items are being stocked and bought too long ahead of the real demand from students. Third: What is the reason behind buying and stocking the items too far in advance?

The ordering schedule is based on an antiquated knowledge of student needs and consumption patterns, not actual consumption rates.

Fourth: What makes the ordering schedule based on an antiquated knowledge of patterns of consumption?

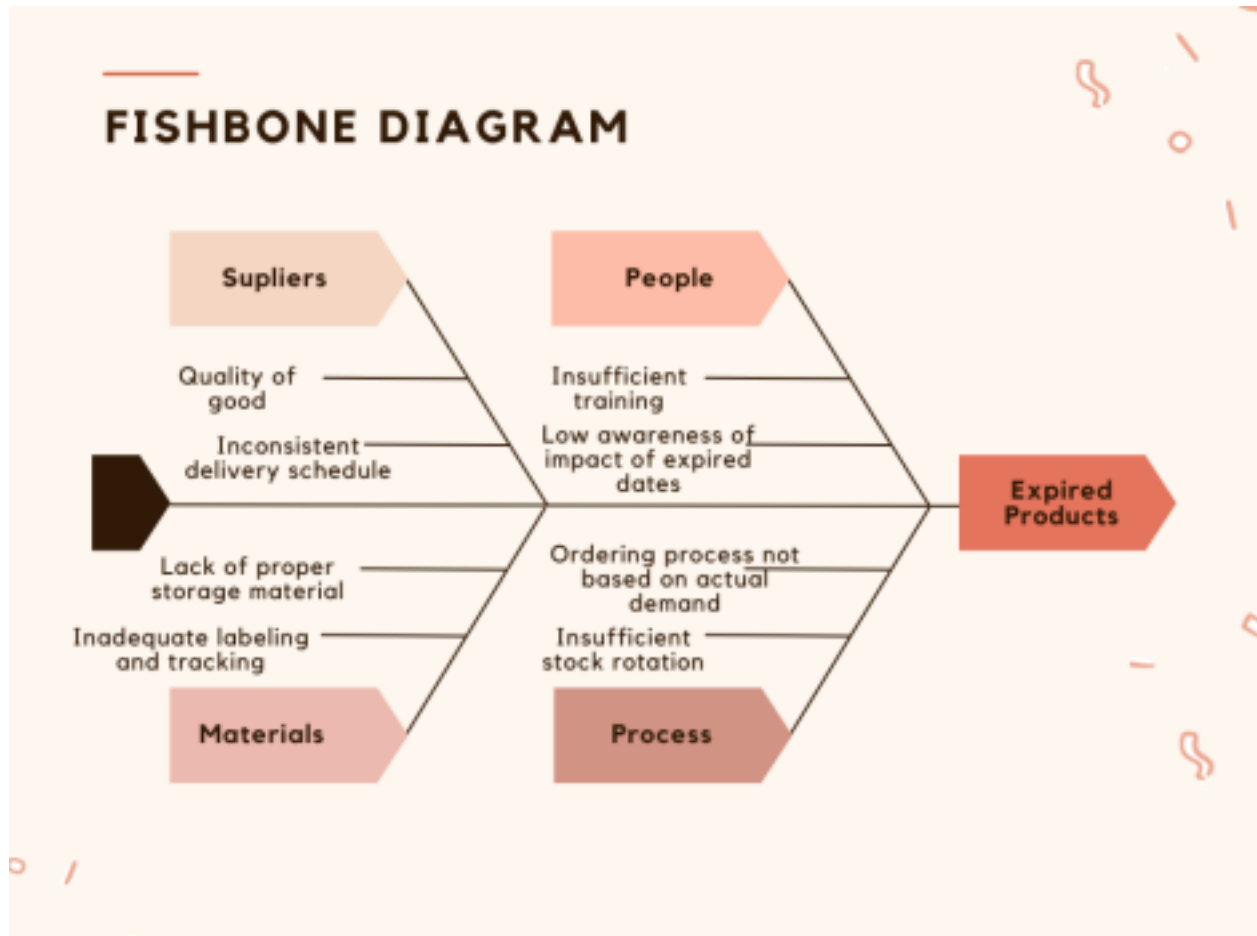
The purchase patterns have not been routinely reviewed or modified due to evolving student preferences and real usage data.

Fifth: Why haven't buying patterns been routinely reviewed or altered?

The lack of a systematic procedure for gathering and analyzing data on student consumption patterns and inventory turnover rates is the pantry management's shortcoming. Let's assume they can use the FIFO method, but they are not stocking the products in a systematic manner.

## FISHBONE DIAGRAM

A Fishbone Diagram, sometimes referred to as an Ishikawa or cause-and-effect diagram, is a potent visual aid that is utilized to discover, investigate, and present potential causes of a particular issue during the Six Sigma DMAIC methodology's Analyze phase. When it comes to decreasing the amount of expired goods in a pantry, the Fishbone Diagram is a useful tool for methodically organizing the factors influencing the problem.



Suppliers:

Quality of goods: Receiving goods that are already close to expiring or that have a shorter shelf life because of previous storage circumstances can shorten their useful lives once they get to the pantry.

Inconsistent delivery schedules: When items are not delivered on time or regularly, the pantry may become overstocked or must hold items longer than necessary, raising the risk of expiration.

### People:

Insufficient training: Staff members may not have received enough instruction on inventory management best practices, which could cause errors in handling and storing goods and hasten their expiration.

Low awareness of the impact of expired products: Staff members might not take the required precautions to avoid expired products if they are unaware of the financial and health risks involved.

### Materials:

Lack of proper storage materials or containers: Food products may be exposed to unsuitable conditions that accelerate their deterioration if they are packaged or stored in improper or inadequate ways.

Inadequate labeling and tracking of expiration dates: It can be challenging to manage inventory to prevent expirations if products are not clearly labeled with expiration dates or if there is not an effective system to track these dates.

### Process:

Ordering process not based on actual demand: This can result in excess stock that expires before it is used if new stock is ordered without consideration for current inventory levels and usage rates.

Inefficient stock rotation practices: If stock is not rotated according to the "first-in, first-out" (FIFO) principle, older items may be pushed to the back and eventually expire.

## **IMPROVE STAGE**

This phase entails creating and implementing solutions targeted at removing the root causes of defects by using the 5S Methodology and FMEA. We intend to improve on the defects by redesigning the process and eliminating steps that add no value. In the Improve stage of our project, we're putting the strategies outlined in our research paper into action. Our goal is to implement changes that will effectively reduce the frequency of expired products in the school pantry. We're leveraging Six Sigma methodologies, specifically the DMAIC (Define, Measure, Analyze, Improve, Control) framework, to guide our improvement efforts.

Firstly, based on the findings from our analysis, we've identified key areas within pantry operations that contribute to the occurrence of expired goods. These include issues such as inventory management, ordering processes, storage conditions, and communication channels. The

absence of a systematic procedure for routinely updating and evaluating inventory data and trends in student consumption has been found to be the main root cause. Due to this, ordering schedules have become out of alignment and do not appropriately reflect the needs or consumption patterns of students today. As a result, there are more expired products on the market, especially in categories like snacks and frozen food. To address these issues, we're developing a set of targeted improvement strategies as outlined below.

**Stakeholder Engagement** – we are working closely with stakeholders, including pantry staff, school administrators, and suppliers, to brainstorm potential solutions and prioritize them based on their potential impact and feasibility for implementation. Once we've identified our improvement strategies, we're developing a comprehensive implementation plan. This plan outlines the steps, resources, and timelines required to execute the changes effectively. We're assigning roles and responsibilities to team members and establishing clear communication channels to ensure that everyone is informed and aligned.

**Training-** We're providing training and capacity-building opportunities for pantry staff and volunteers to ensure they have the necessary skills and knowledge to implement the new processes effectively. We plan to educate pantry employees on the value of making decisions based on data and the new procedures to guarantee efficiency and compliance. We also plan to offer workshops, seminars, and online training modules covering topics such as inventory management best practices and effective communication strategies. In parallel, we're conducting pilot tests of our improvement initiatives in the selected school pantry. This allows us to assess their effectiveness in a controlled environment and make any necessary adjustments before rolling them out on a larger scale.

**Establishment of a Robust Mechanism for Regularly Gathering Data on Student Preferences and Real Consumption Rates to Implement a Data Collection System.** Throughout the implementation process, we're closely monitoring our progress and evaluating the impact of our changes. We're collecting data on key performance indicators, such as inventory turnover and waste reduction, to assess the effectiveness of our improvement efforts.

**Create a dynamic ordering system -** Establish an ordering system that closely matches inventory levels to demand in real time by adjusting automatically based on the most recent consumption data and trend analysis.

**Fostering a culture of continuous improvement-** We are encouraging ongoing feedback, innovation, and collaboration among staff and stakeholders to identify further opportunities for optimization and refinement. **Constant Enhancement:** Establish recurring evaluations of inventory and consumption data to continuously improve ordering procedures and cut down on waste.

### **The 5S Methodology**

<b>Sort</b>	<ul style="list-style-type: none"><li>❑ Conduct a thorough inventory audit to identify all items in the pantry.</li><li>❑ Remove any expired, damaged, or unusable items from the inventory immediately.</li><li>❑ Establish clear criteria for determining which items should be kept and which should be discarded.</li><li>❑ Regularly review and update the inventory to ensure ongoing compliance with sorting criteria.</li></ul>
<b>Set in Order</b>	<ul style="list-style-type: none"><li>❑ Organize the remaining inventory in a systematic and logical manner.</li><li>❑ Group similar items together and assign specific locations for each category.</li><li>❑ Use labels and signage to clearly identify different sections of the pantry and the items stored within them.<ul style="list-style-type: none"><li>❑ Ensure that frequently used items are easily accessible, while less frequently used items are stored in less accessible areas.</li></ul></li></ul>
<b>Shine</b>	<ul style="list-style-type: none"><li>❑ Implement a regular cleaning schedule to maintain cleanliness and orderliness in the pantry.</li><li>❑ Encourage volunteers to clean and organize the pantry during downtime.</li><li>❑ Inspect inventory regularly for any signs of damage, spoilage, or expiration.</li><li>❑ Address any issues promptly to prevent them from escalating and causing further waste.</li></ul>
<b>Standardize</b>	<ul style="list-style-type: none"><li>❑ Develop standardized procedures for inventory management, including regular audits and checks for expiration dates. ❑ Trained volunteers on proper sorting, organizing, and cleaning techniques.</li><li>❑ Establish guidelines for receiving and storing donated items to ensure that only fresh and usable products are accepted.</li></ul>
	<ul style="list-style-type: none"><li>❑ Document all procedures and make them easily accessible to all pantry staff and volunteers.</li></ul>



<b>Sustain</b>	<input type="checkbox"/> Foster a culture of continuous improvement and waste reduction within the pantry. <input type="checkbox"/> Regularly review performance metrics and identify areas for further improvement. <input type="checkbox"/> Encourage feedback from volunteers and pantry users to identify any issues or concerns. <input type="checkbox"/> Recognize and reward efforts to reduce waste and improve efficiency in the pantry.
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By implementing the 5S methodology within the Six Sigma framework, we can effectively reduce the number of waste products in the school pantry while ensuring the efficacy and safety of the resources provided to those who depend on them.

### **FMEA METHODOLOGY**

<b>Process or Product Name</b>	<b>Reducing expired products in the ISU School Pantry</b>	<b>Prepared by-Faith</b>	<b>Page 1 of 2</b>
<b>Person Responsible</b>	<b>Faith</b>	<b>Date (Orig)_4/08/2024_ Revised_4/29/2024</b>	

Proces Step	Key Process Input	Potential Failure Mode	Potential Failure Effect	S E V	Potential Causes	O C C	Curre nt Controls	D E T	R P N	Actions Needed	S E V	O C C	D E T	R P N
Reducti on of expired product s in ISU pantry	Man age men t	Inadequa te Invent ory Manag em ent	Increased likelihood of expired goods remaining in the pantry	3	Lack of automat ed inventor y tracking system	3	Out d ate d	4	3 6	Implement a manual inventory tracking system	3	3	4	3 6
		Poor Storage Condition s	Accelerated expiration	6	Improper stacking or placeme	3	Few shelv es	5	9 0	Install proper shelving units	6	3	5	9 0

					nt of items									
		Ineffectiv e Rotatio n Practic es	Increased waste and	3	Staff unawareness of the	2	None	4	2 4	Train staff	3	2	4	2 4

			expired products		importanc <sub>e</sub> of rotation									
		Lack of Visibility on Expiratio n Dates	Health risk to pantry users	3	Inadequat <sub>e</sub> labeling or signage of expirati on dates	5	Dim	6	9 0	Conduct periodic sweeps	3	5	6	9 0
		Inadequa te Training on Food Safety	Mishandlin g or improper storage of goods	5	Misinform ation or outdated practices regarding food safety	2	No Traini ng	3	3 0	compreh ensive training	5	2	3	3 0
		Supplier Issues	Increased waste of resources	6	Poor communic ation between suppliers and the school pantry	2	Incon sisten t	5	6 0	Communica te	6	2	5	6 0
		Insuffi cient Revie w Proce sses	Compromis ed effective ness s and safety of the pantry	5	Inadeq uate frequen cy of stock checks and audits	4	Outd <sub>a</sub> ted stock keepi ng syste m	5	1 0 0	regular reviews	5	4	5	100

Sev - Severity of the failure (what impact will it have on our process?)    Occ – How likely is the event to occur (probability of occurrence)

Det – How likely can the event be detected in time to do something about it    RPN – Risk Priority Number (multiply Sev, Occ, and Det)

## **CONTROL**

The last stage makes sure that the gains are maintained over time. Control systems must be put in place to keep an eye on the process and steer it in the right direction. Control charts, statistical process control (SPC), and other monitoring instruments are employed to guarantee that deviations are addressed before they give rise to defects. To preserve the new status quo, standard operating procedures and training may also need to be updated during this phase.

### **Implementation Plan for the Control Stage**

#### **1. SOPs, or standard operating procedures**

- Inventory Management: Clearly defined procedures for handling expired goods, checking expiration dates, and rotating stocks (FIFO).
- Donation Assessment: A set of rules for evaluating donations and determining which goods are about to expire.
- Distribution: Safe distribution and adherence to food safety regulations are ensured by these procedures.

#### **2. Constant Tracking and Information Gathering**

- Inventory Audits: Consistent weekly or monthly inspections to confirm stock levels and expiry dates.
- Control Charts: Monitor important indicators like inventory turnover and expired items using statistical process control (SPC).
- Customer Feedback: Frequent questionnaires to assess recipient contentment and identify problems with past-due merchandise.

#### **3. Corrective Action Plan**

- Deviations Handling: A methodical procedure for identifying and resolving departures from standard operating procedures or control limitations.
- Cause and Effect Analysis: Perform an analysis of the root cause, identifying notable variations to stop recurrence.

#### **4. Continuous Instruction and Interaction**

- Training Programs: Volunteers and pantry employees participate in frequent sessions to review SOPs and best practices.
- Lines of Communication: Ensure that all parties involved are communicating clearly to facilitate ongoing input.

#### **5. Performance Reviews**

- KPIs Review: Regular evaluations to guarantee ongoing progress and deal with any new problems.
- Stakeholder Meetings: Consistent conversations with stakeholders to develop future improvements and promote cooperation.

By following this control plan, the School Street Food Pantry can ensure that the gains achieved in reducing expired products are sustained over time. This approach promotes a culture of continuous improvement and provides a framework for addressing issues before they lead to defects or customer dissatisfaction, which is achieved by implementing standard operating procedures, continuous monitoring with regular audits, addressing deviations with corrective actions, providing ongoing training, and regularly reviewing key performance indicators to ensure continuous improvement.

### **Conclusion:**

The effectiveness of applying Six Sigma approaches to address the issue of expired products in the School Street Food Pantry has been proved by this research. We have pinpointed important areas for pantry operations improvement by using the DMAIC paradigm, with a particular emphasis on inventory control, volunteer training, and effective stock rotation. Deep insights into the underlying causes of food expiration have been made possible by the application of Six Sigma techniques, such as SIPOC diagrams and Voice of the Customer analyses. These insights have guided the development of focused plans to improve both operational effectiveness and food safety.

By defining the issue and the parameters of the project, the Define phase laid the groundwork. Measure and Analyze phases identified supply chain inefficiencies and inventory practices as the problem's primary sources and assessed its scope. During the Improve phase, the emphasis was on strategic interventions that were tested through pilot programs, such as enhanced inventory systems and streamlined ordering procedures. The Control phase described how to maintain gains with ongoing observation and regular operating procedures.

Overall, this project improved operational efficiency and recipient satisfaction while lowering the percentage of expired goods in the pantry. These results highlight how crucial it is to incorporate organized approaches to problem-solving into charitable food distribution initiatives to increase their efficacy and dependability. This initiative's success advocates for a methodical approach to enhancing food security and safety in community assistance networks by providing a model for similar institutions that are confronted with expired foodstuffs.