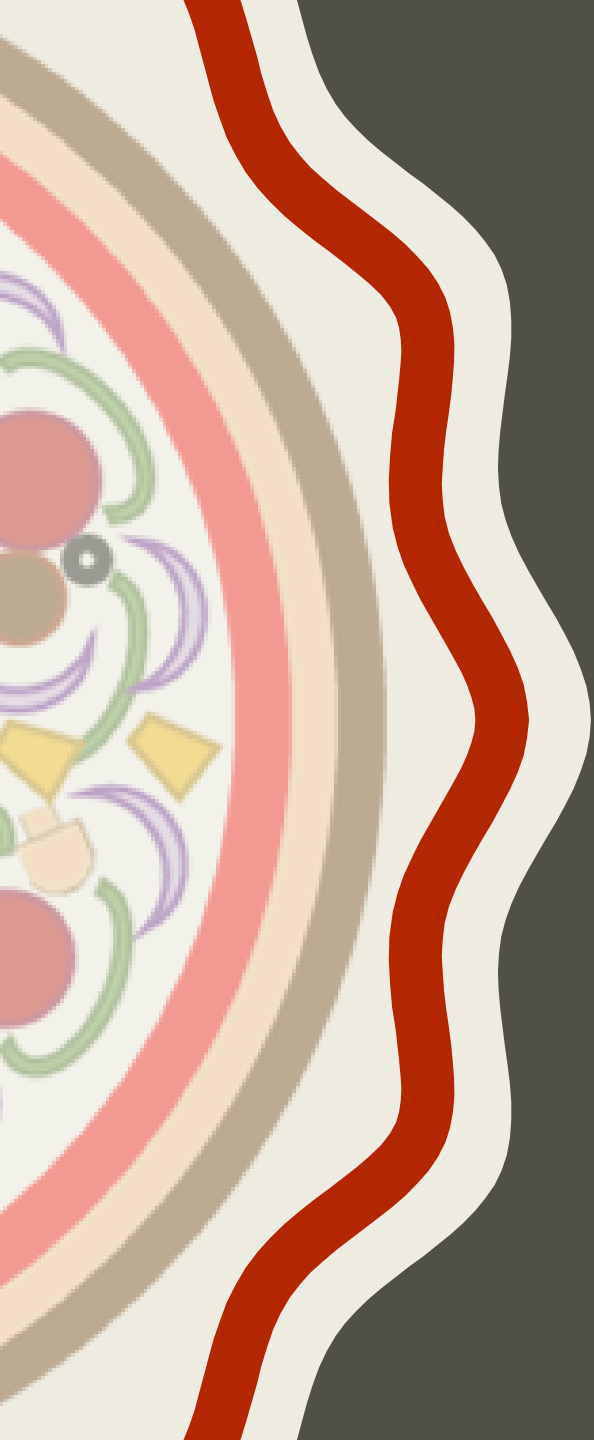# THE LEAN MEAN PIZZA MACHINE

A PROCESS IMPROVEMENT SIMULATION

OBJECTIVES

- Introduction to Lean Thinking with a high-level review of a lean project from opportunity identification, to improvement and lastly sustainment.

  ❑ Understanding the basics of lean thinking

  ❑ Using discovery skills to identify and prioritize potential initiatives

  ❑ Using A3 Thinking to Guide a Project

  ❑ Obtain skills to communicate with stakeholders throughout the lifecycle of a process improvement project

  ❑ Develop tools to sustain the improvement as work transitions to operational stakeholders in their day-to-day process management

R O A D M A P

Sustain & Maintain

Gather Information

Test Improvements

Make a Plan

Analyze Findings

Conduct Measurements

AmyEA Consulting

3

INTRO TO A3 THINKING

A3 THINKING & PROBLEM SOLVING

A3 Thinking = Approach to Problem Solving

Facilitates a deeper understanding of the problem or opportunity

Gives insight into how to address the problem

Facilitates cohesion and alignment within the organization as to the best course of action

THE A3!

Process Improvement:		
1. Background / Problem	**4. Analysis (Determine the Root Cause)**	**6. Implementation**
2. Target/Goal	**5. Proposed Countermeasures/Improvements**	**7. Confirm Results & Process**
3. Current Conditions		**8. Standardize & Sustain**

TODAY'S SIMULATION

Pizzeria Cucina

YOUR MISSION:

You have been retained by the owners of Pizzeria Cucina to conduct an assessment of their operations. They are seeking an analysis that will lead to identifying opportunities for improvement. Once you have completed the assessment you will use the information you gained to make recommendations for improvement and pilot these improvements.

The expectation is that you will walk the Gemba and make observations of the process in action in order to collect data to analyze in order understand the processes that support the Pizzeria Cucina operations. Treat the assessment as the D-M pieces of a DMAIC project or the P of a PDCA Lean Project.

The manager has been able to identify anecdotally that the process for the Kitchen Sink Pizza appear to be broken because they are seeing a lot of errors in accuracy and defects requiring rework which seem to be impacting both business financials and customer satisfaction.

MENU

Cheese Pizza

Pizza with secret recipe crust and sauce topped with 4 cheeses

S $11, M $13, L $15, XL $18

Pepperoni Pizza

Pizza with secret recipe crust and sauce topped with 4 cheeses and pepperoni

S $12, M $14.50, L $17, XL $20.50

Hawaiian Pizza

Pizza with secret recipe crust and sauce topped with 4 cheeses and Canadian bacon with pineapple

S $13, M $16, L $19, XL $23

Vegetarian Pizza

Pizza with secret recipe crust and sauce topped with 4 cheeses and zucchini, red and green bell peppers, onions, olives, mushrooms, artichoke hearts and fresh tomatoes

S $15, M $19, L $23, XL $28

Meat Lovers Pizza

Pizza with secret recipe crust and sauce topped with 4 cheeses and pepperoni, sweet and spicy Italian sausage, ham, meatballs, and bacon

S $16, M $20.50, L $25, XL $30.50

Kitchen Sink Pizza

Pizza with secret recipe crust and sauce topped with 4 cheeses and pepperoni, sausage, mushrooms, olives, green peppers, onions and pineapple

S $18, M $23.50, L $29, XL $35.50

LAYOUT

Pizza Dough

Pepperoni

Sausage

Pizza Saver

Pizza Sauce

Pineapple

Pizza Oven

Peppers

Onions

Pizza Assembly Area

Cheese

Mushrooms

Olives

Pans

Orders

Cashier

Pick Up

Pizza Box Stock

Pizza Boxes

Pizza Delivery

Exit

Enter

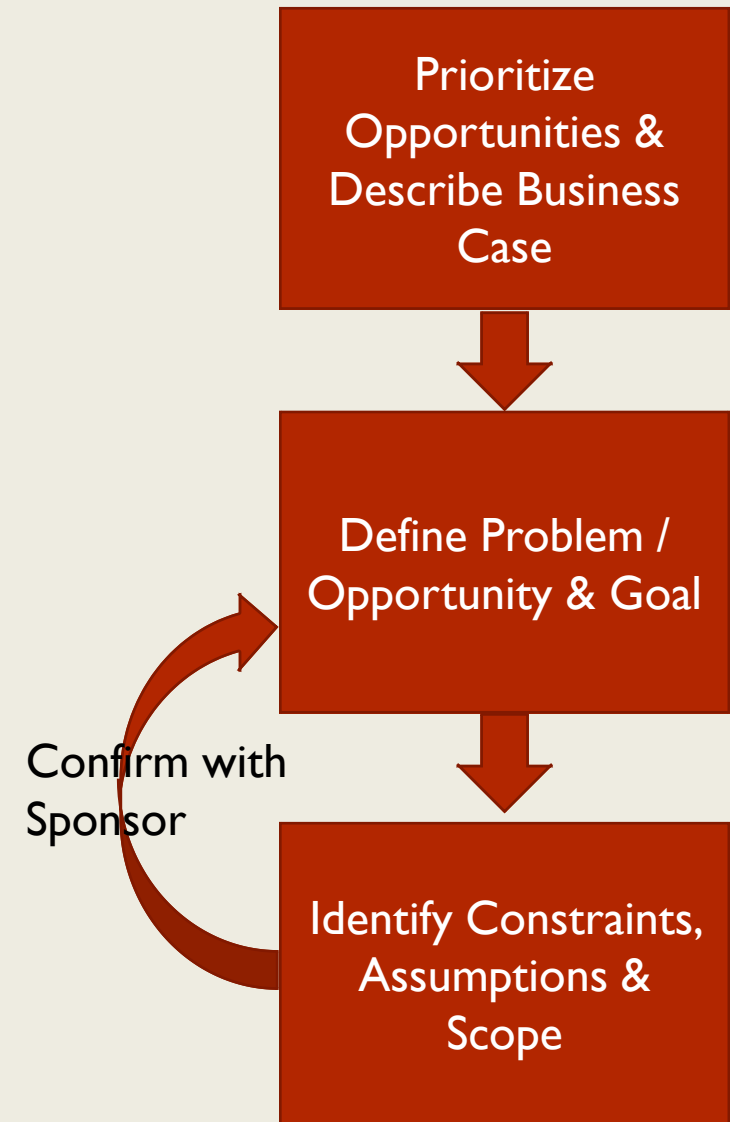# IDENTIFYING & SELECTING A PROJECT

HOW TO WE KNOW WHAT TO WORK ON?

Strategy

Processes

Balanced culture

Customer responsiveness

Leadership

Prioritize Opportunities & Describe Business Case

Define Problem / Opportunity & Goal

Identify Constraints, Assumptions & Scope

Confirm with Sponsor

THE PROBLEM - DECLINING PIZZA SALES

Monthly Pizza Sales

15,283

7,000
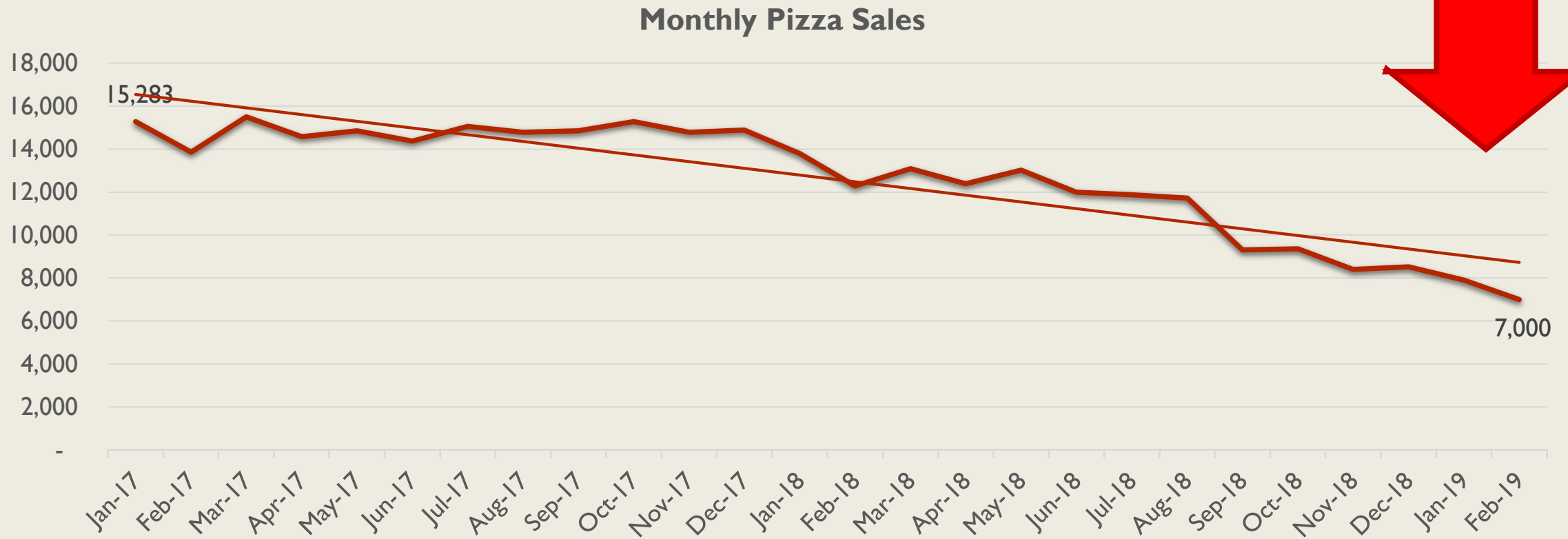
THE PROBLEM - DECLINING REVENUE
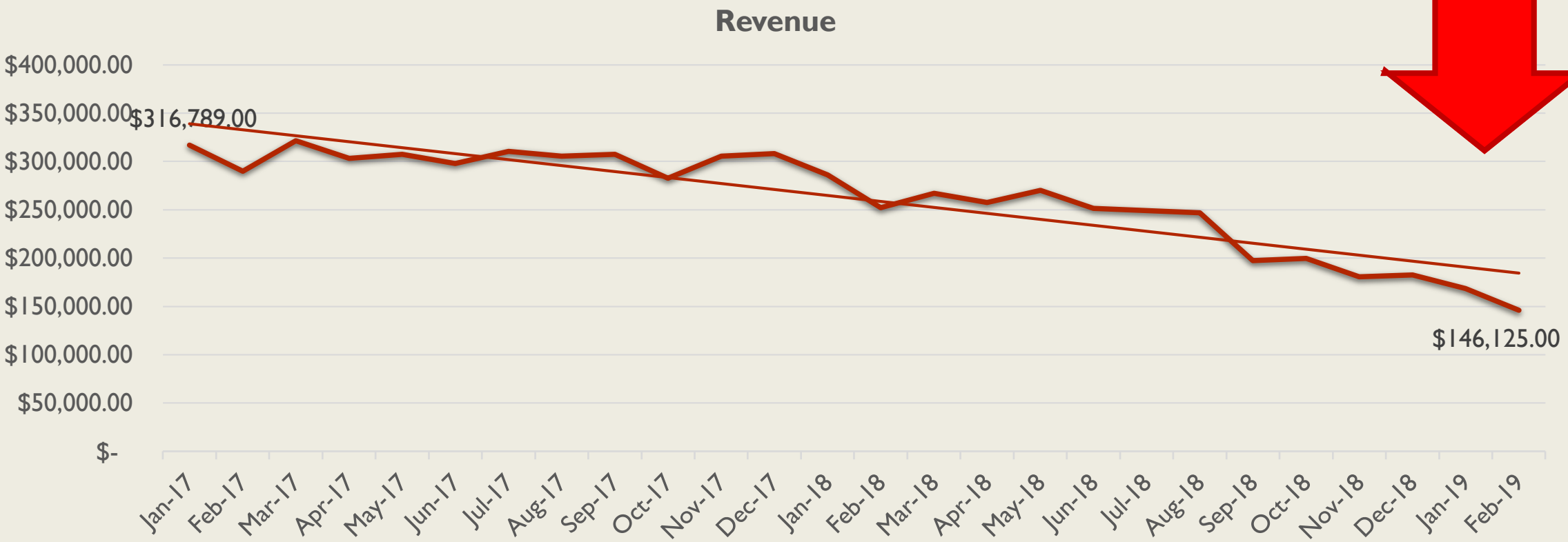
Revenue

THE PROBLEM- DECLINING CUSTOMER SATISFACTIONS SEEN THROUGH YELP RATINGS

Customer Satisfaction
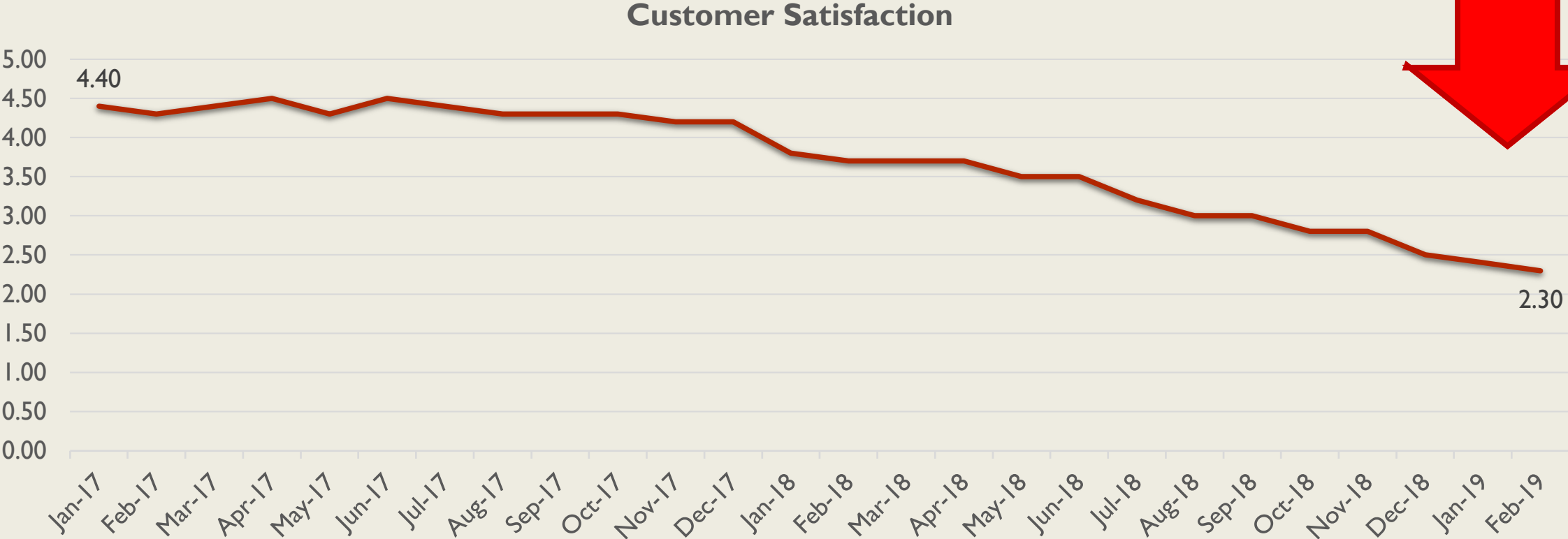
THE PROBLEM- INCREASING COSTS

Cost as a percent of Revenue
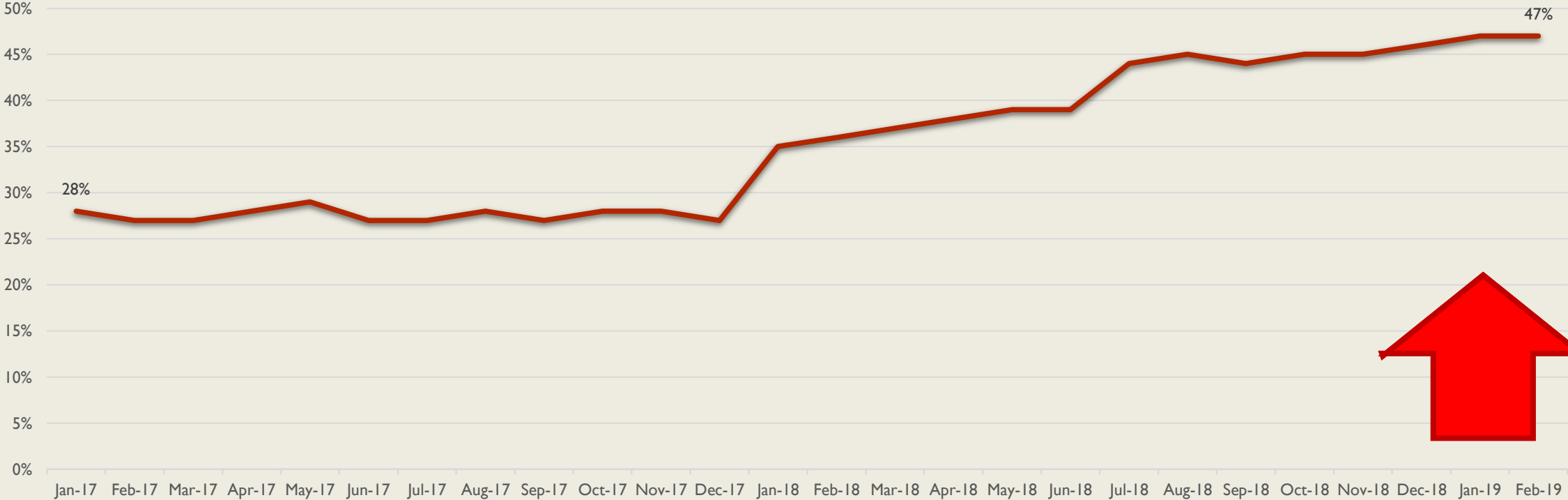
PROJECT SELECTION

- Strategy, goals, direction
  - Desire to expand
  - Company financial health
- Complaints, praise, requests
  - Yelp rating has been on a downward trend
- Complaints focusing on:
  - Time to prepare pizza
  - Pizza accuracy
- Problems, rework, gaps, frustration
  - Customer dissatisfaction has lead to an increase in order rework and compensating with free pizza
- Process management measures & systems
  - Review of issues with site management identified a lack of understanding of current health of processes and monitoring

Kitchen Sink Pizza Process Improvement		
1. Background: Over the last six months the owners of Pizzeria Cucina began to notice that they had a drop in sales, an increase in ingredient costs, and a decline in yelp ratings. They had been receiving a high number of customer complaints about missing toppings on the Kitchen Sink Pizza. The Company policy is to either make a new pizza for the customer or give them their pizza with a refund.	**4. Analysis (Determine the Root Cause):**	**6. Implementation:**
2. Target/Goal:	**5. Proposed Countermeasures/Improvements:**	**7. Confirm Results & Process:**
3. Current Conditions:		**8. Standardize & Sustain:**
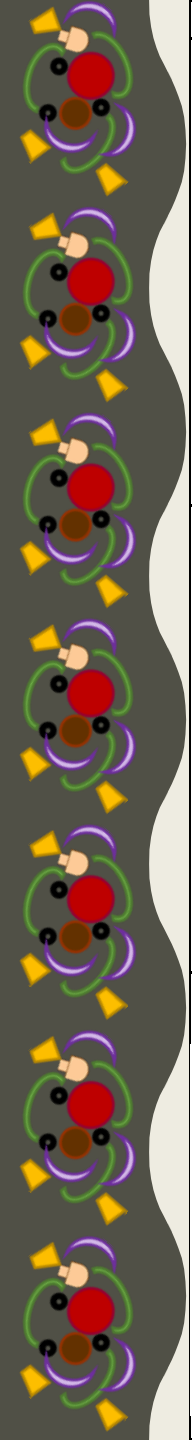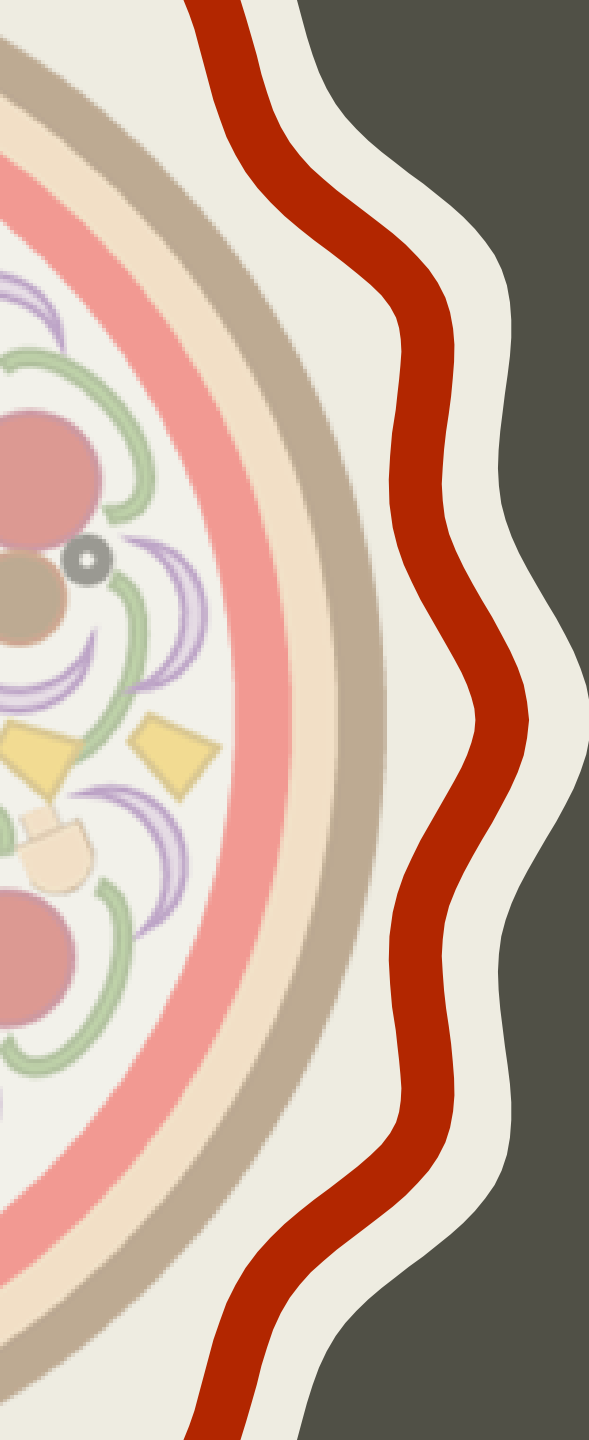
DEFINE PHASE

DEFINE PHASE

- Select specific problem/opportunity
  - An appropriate DMAIC project
  - Meaningful and Manageable

- Create a Project Charter
  - Validated by leadership
  - Identifying key contributors

- Define the process and customer(s)

Define the Problem

CREATING A PROJECT CHARTER

Business Case

- *Broad statement of area of concern or improvement opportunity*
- *Impact (benefit) of potential improvement*
- *Impact (cost or risk) of not improving*
- *Link to strategy, customers, values*

Problem/ Opportunity Statement

- *Describe the issue, gap, or opportunity*
- *Identify the severity of the pain, size of the opportunity*
- *Give specifics as available*

Scope

- *The breadth of problems to be tackled and results sought by the project*
- *The specific boundaries/steps of the process to be included in the DMAIC effort*
- *What is included and excluded*

Goal

- *Use the SMART goal outline to clearly articulate the project goal. SMART goals are:*
- ***S**pecific – **M**easurable – **A**ttainable – **R**elevant - **T**ime bound*

PROBLEM STATEMENT

Developing the Problem Statement	
Where / When is it Occurring?	Pizzeria Cucina
Who/What is Affected?	Pizza Customers
Current State/Gap? & Trend?	High number of customer complaints about missing /inaccurate toppings, increase in number of pizzas being remade or refunded.
Impact / Consequences?	Decreased customer satisfaction, decreased sales / revenue, and increased food costs

Problem Statement: Pizzeria Cucina pizza customers have been experiencing missing /inaccurate toppings which has lead to an increase in the number of pizzas being remade or refunded. The company has been experiencing decreased customer satisfaction, decreased sales / revenue, and increased food costs.

SCOPE

OUT

Building footprint

Pizza Oven

Computer System Changes

Delivery Process

IN

Operational Changes

Layout

Pizza Processes

Ingredient Ordering Practices

Kitchen Supplies

Kitchen Setup

Roles & Responsibilities

Job elimination

Special Orders

Menu Modifications

Menu Prices

Suppliers

Non-pizza processes

SMART GOAL

Developing a SMART Goal		
Specific	What do you want to accomplish?	Increase customer satisfaction, increase sales, and reduce ingredient costs through less potential for error / rework.
Measurable	How will you know when you have accomplished your goal?	Decrease in Monthly Ingredient Costs by XX% Increase in Monthly Sales/Revenues by XX% Increase of Yelp Ratings to a minimum of X Stars
Achievable	How can the goal be accomplished?	Ensure that pizzas are delivered to the customer with their correct toppings with adequate quantities.
Relevant	Is this goal worth working hard to accomplish? Explain why.	In order to revitalize / optimize Pizzeria Cucina and stabilize financial health of the company in order to expand to additional locations to align with organization strategy
Time Bound	By when will the goal be accomplished?	By end of Q4 2019

Goal: By end of Q4 2019 Increase customer satisfaction, increase sales, and reduce ingredient costs through less potential for error / rework by ensuring that pizzas are delivered to the customer with their correct toppings with adequate quantities. In order to revitalize / optimize Pizzeria Cucina and stabilize financial health of the company in order to expand to additional locations to align with organization strategy.

PROJECT CHARTER

PROJECT CHARTER			
Project Name	Process Improvement for Pizzeria Cucina	**Project Sponsor**	Mr. Pizzeria
Department or Process	Home Location / Pizza Making Process	**Project Manager**	P.I. Guru
Current Stage	DMAIC/PDCA	**Project Leader**	P.I. Gurutoo
Version Number & Date	v1 03.23.2019	**Updated On**	03.23.2019
		Updated By	P.I. Guru

Team Members			
Team Type	**Name**	**Title**	**Email**
Lean Team	P.I. Guru	Project Manager	
Lean Team	P.I. Gurutoo	Project Leader	
Lean Team	Ms. Thyme	Time Keeper	
Lean Team	Mr. Move-It	Spaghetti Diagram Documenter	
Lean Team	Ms. Penandpaper	Process Documenter	
Lean Team	Mr. Q	Quality Auditor	

PROJECT CHARTER

Business Case

Over the last six months the owners of Pizzeria Cucina began to notice that they had a drop in sales, an increase in ingredient costs, and a decline in yelp ratings. They had been receiving a high number of customer complaints about missing toppings on the Kitchen Sink Pizza. The Company policy is to either make a new pizza for the customer or give them their pizza with a refund.

Problem/Opportunity Statement

Pizzeria Cucina pizza customers have been experiencing missing /inaccurate toppings which has lead to an increase in the number of pizzas being remade or refunded. The company has been experiencing decreased customer satisfaction, decreased sales / revenue, and increased food costs.

Goal Statement

By end of Q4 2019 Increase customer satisfaction, increase sales, and reduce ingredient costs through less potential for error / rework by ensuring that pizzas are delivered to the customer with their correct toppings with adequate quantities. In order to revitalize / optimize Pizzeria Cucina and stabilize financial health of the company in order to expand to additional locations to align with organization strategy.

Key Performance Indicators (KPI)

KPI 1: Decrease in Monthly Ingredient Costs to or below 28%

KPI 2: Increase in Monthly Sales/Revenues by 30%

KPI 3: Increase of Yelp Ratings to a minimum of 4 Stars

PROJECT CHARTER

In scope	Out scope
Layout	Building footprint
Pizza Processes	Pizza Oven
Ingredient Ordering Practices	Computer System Changes
Kitchen Supplies	Delivery Process
Kitchen Setup	Job elimination
Roles & Responsibilities	Menu Modifications
Operational Changes	Menu Prices
Must adhere to regulatory requirements	Suppliers
The budget must be within the existing allocated annual budget	Non-pizza processes
	Special Orders

Assumptions of the project

* Poor Customer Service is not indicated

Constraints of the project

* Physical space cannot be modified (layout can be modified)

Benefit Description Statement

Cost Reduction
Cost Avoidance
Revenue Increase

Benefits Description

Repeatable increased efficiency and accuracy will improve customer satisfaction and customer retention/recommendations.

S I P O C

High Level view of the end to end process from inputs to outputs.

Identifies key stakeholders:
- Suppliers
- Customers
- Process Players
- Upstream / Downstream

SIPOC						
Process Name: Kitchen Sink Pizza Process				**Date:** 9/1/2017		
Process Owner: Mr. Pizzeria, Jr.				**Created By:** P.I. Guru		
Suppliers	**Inputs**	**Process**	**Process Team Player**	**Outputs**	**Customer**	**Requirements**
Customer	Order	Receive an Order	Order Taker	Order	Pizza Assembler	**Customer Req:** * Accuracy *Timeliness *Quality Food
Vendor	Ingredients	Gather Ingredients	Pizza Assembler	Assembled Pizza	Pizza Oven Operator	
Vendor	Pizza Boxes	Make Pizza	Pizza Assembler	Cooked Pizza	Pizza Box Assembler	**Business Req:** * Meets all health codes & requirements
Supplier	Kitchen Equipment	Bake Pizza in Pizza Oven	Pizza Oven Operator	Ready Pizza	Customer	
		Take Pizza Out of Pizza Oven	Pizza Oven Operator			
		Make Box	Pizza Box Assembler			
		Put Pizza in Box	Pizza Box Assembler			
		Stage Pizza for Pick Up	Pizza Box Assembler			

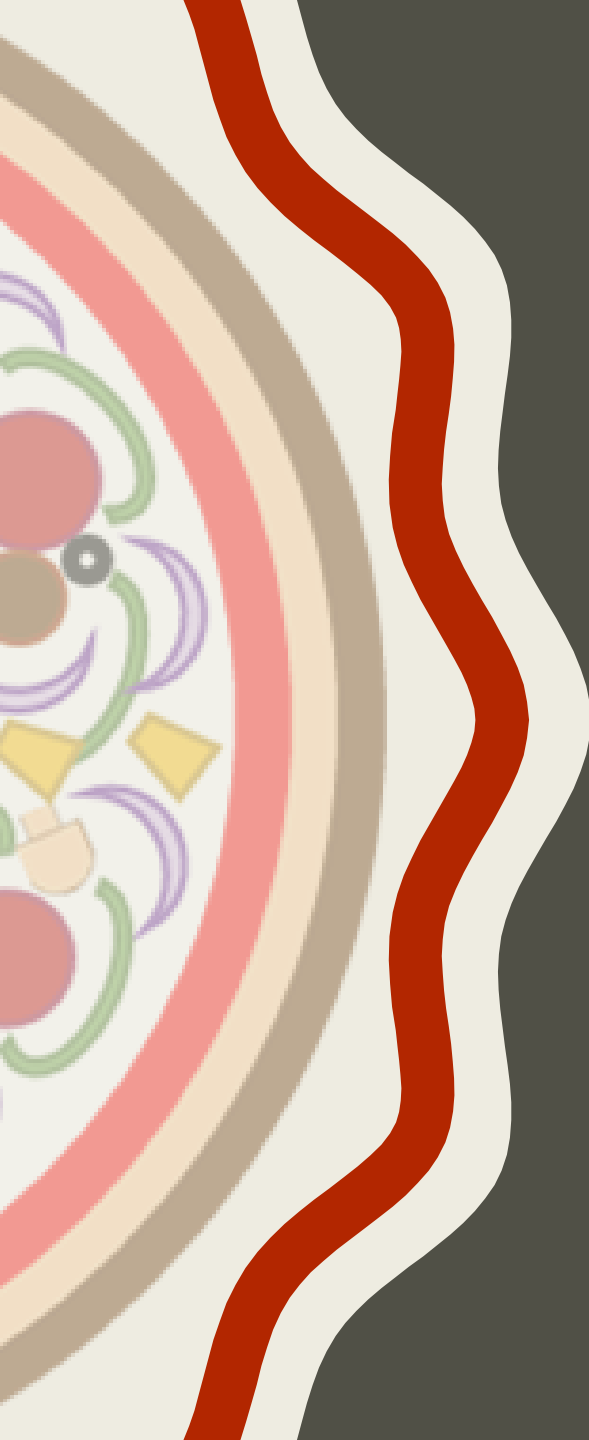| Kitchen Sink Pizza Process Improvement		
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2. Target/Goal: Ensure that all Kitchen Sink Pizzas are delivered to the customer with their correct toppings with adequate quantities. KPI 1: Decrease in Monthly Ingredient Costs by 40% KPI 2: Increase in Monthly Sales/Revenues by 30% KPI 3: Increase of Yelp Ratings to a minimum of 4 Stars	**5. Proposed Countermeasures/Improvements:**	**7. Confirm Results & Process:**
3. Current Conditions:		**8. Standardize & Sustain:**

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MEASURE PHASE

MEASURE PHASE

- Focuses on identifying, collecting and validating data.

- The goal is to establish baseline performance, identify true root cause, and determine gaps between current and future states

- Objectives:
  - Determine what to measure and why
  - Prepare plans to collect data
  - Definitions, sampling, sources
  - Construct forms and test data collection procedures
  - Test and refine measurement "system"
  - Use data to set baseline performance

PROCESS
IN
ACTION

PROCESS MAP

Kitchen Sink Pizza Process

Current State

Order Taker

Start → Customer Places Order → Takes Order → Write order ticket → Takes payment → Gives pizza assembler order ticket → A

Pizza Assembler

A → Receives order ticket → Gets pizza pan → Gets pizza dough → Takes Pan and Dough to Assembly Area → Puts pizza dough onto pizza pan → Gathers toppings → Takes Toppings to Assembly Area → Puts toppings on pizza → Gives pizza and order ticket to Pizza Oven Operator → B

Pizza Oven Operator

B → receives pizza and order ticket from Pizza Assembler → puts the pizza in the pizza oven → 8.5 minutes for the pizza to cook in the pizza oven → takes pizza out of oven → gives pizza and order ticket to the Pizza Box Maker → C

Pizza Box Assembly

C → receives pizza and order ticket → Makes pizza box → Takes pizza off of pizza pan → Puts pizza into pizza box → Closes pizza box → walk pizza and order ticket to order pick up area → places pizza and order ticket in order pick up area → calls number on order ticket → End
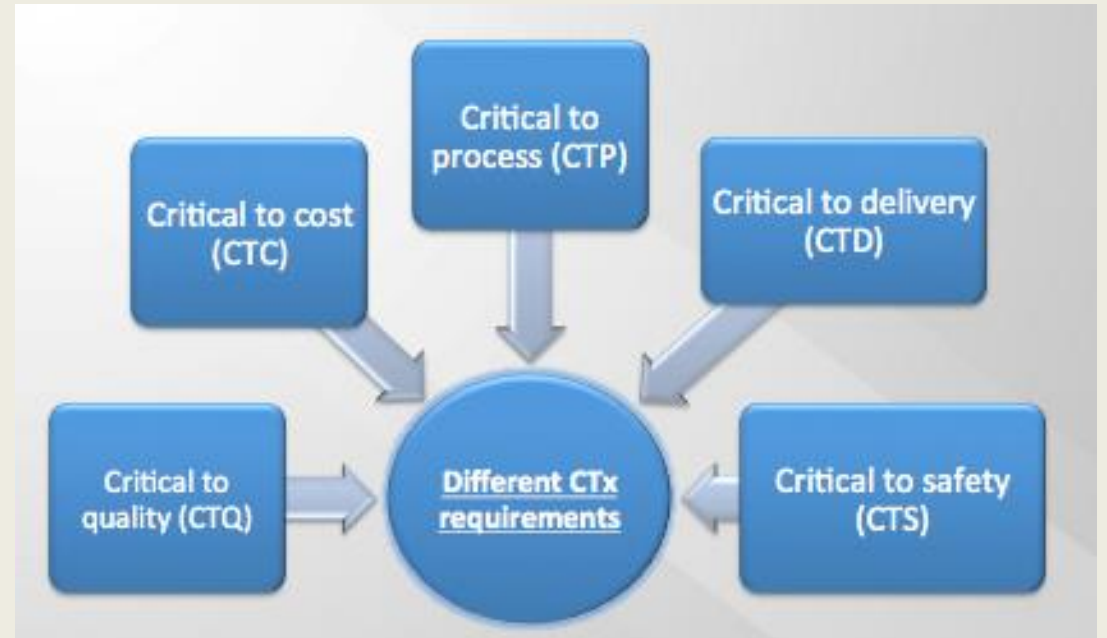
VOICE OF THE CUSTOMER

- Voice of the Customer (VOC) seems obvious.

- We all know that the customer wants. Or do we?

- The customer's perspective has to be at the forefront of the Six Sigma Belt throughout the project cycle.

- Features

- Integrity

- Delivery

- Expense

VOICE OF THE CUSTOMER

Customer Comment (What are they saying?)	Gathering More Understanding (Why are they saying it?)
"Each time I order a Kitchen Sink Pizza there are different amounts of ingredients"	consistency quality Defect free
"If you want to eat the Kitchen Sink Pizza be sure to order it hours in advance because they are super slow."	short wait times
"I ordered the Kitchen Sink Pizza and it was missing 2 of the 7 ingredients the menu described."	consistency quality Defect free
"The Kitchen Sink Pizza is ALWAYS different - I won't be coming back because I can never be sure of what I will get."	consistency quality Defect free
"The staff is great but there is no consistency in pizza ingredients - last time I only got two pieces of pepperoni on an entire pizza!"	consistency quality Defect free

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CRITICAL TO QUALITY

Customer Comment (What are they saying?)	Gathering More Understanding (Why are they saying it?)	CTX	Customer Requirement (What do they want?)
"Each time I order a Kitchen Sink Pizza there are different amounts of ingredients"	consistency quality Defect free	Critical to Quality	Consistency each time they order a pizza; they expect quality and a product that meets description
"If you want to eat the Kitchen Sink Pizza be sure to order it hours in advance because they are super slow."	short wait times	Critical to Delivery	Pizza delivered in a timely manner
"I ordered the Kitchen Sink Pizza and it was missing 2 of the 7 ingredients the menu described."	consistency quality Defect free	Critical to Quality	Consistency each time they order a pizza; they expect quality and a product that meets description
"The Kitchen Sink Pizza is ALWAYS different - I won't be coming back because I can never be sure of what I will get."	consistency quality Defect free	Critical to Quality	Consistency each time they order a pizza; they expect quality and a product that meets description
"The staff is great but there is no consistency in pizza ingredients - last time I only got two pieces of pepperoni on an entire pizza!"	consistency quality Defect free Good Service	Critical to Quality Critical to Delivery	Consistency each time they order a pizza; they expect quality and a product that meets description; Pizza delivered in a timely manner; Good customer service experience

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COLLECTING DATA

Cycle Time

The cycle time of a process is a key to match the supply with the demand in lean manufacturing.

Cycle time is the total time from the beginning to the end of your process, as defined by you and your customer.

Auditing

A process audit is an evaluation of the sequential steps and interactions of a process within a system:
Checks conformance against defined requirements
Examines the equipment, materials and people used to work the process
Looks at outputs and the environment
Uses procedures and instructions followed and the measures collected to determine process performance

Spaghetti Diagram

A spaghetti diagram is a visual representation using a continuous flow line tracing the path of an item or activity through a process. The continuous flow line enables process teams to identify redundancies in the work flow and opportunities to expedite process flow.
- Highlight major intersection points within the room.
- Areas where many walk paths overlap are causes of delay to cause waiting or unnecessary motion

CYCLE TIME

| | Process Analysis Cycle Time | | | | | | Process Analysis Cycle Time | | | | |
	Order Taking	Pizza Assembly	Pizza Oven	Pizza Boxing	Total Cycle Time		Order Taking	Pizza Assembly	Pizza Oven	Pizza Boxing	Total Cycle Time
Pizza 1	3	10	8.5	5	26.5	Pizza 1	4	11	8.5	5.5	29
Pizza 2	4	12.5	8.5	4	29	Pizza 2	3	13	8.5	3.5	28
Pizza 3	3	11	8.5	6	28.5	Pizza 3	5	11.5	8.5	4.5	29.5
Pizza 4	2	9	8.5	2	21.5	Pizza 4	4	9.5	8.5	6	28
Pizza 5	5	10	8.5	3	26.5	Pizza 5	5	10	8.5	5	28.5
…	…	…	…	…	…	…	…	…	…	…	…
Pizza 496	4	13	8.5	5.5	31	Pizza 496	3.5	14	8.5	5	31
Pizza 497	3.5	12	8.5	3.5	27.5	Pizza 497	4	10	8.5	4	26.5
Pizza 498	2	10	8.5	4.5	25	Pizza 498	4.5	9	8.5	6	28
Pizza 499	4	9.5	8.5	6	28	Pizza 499	5	9.5	8.5	2	25
Pizza 500	3	11	8.5	5	27.5	Pizza 500	2	10	8.5	3	23.5

AUDITING

Process Analysis Audit Sheet											
	Box	Dough	Sauce	Cheese	Sausage	Pepperoni	Peppers	Onion	Pineapple	Olive	Mushroom
	Y/N	Y/N	Y/N	Y/N	5 = Y <5 = N	5 = Y <5 = N	5 = Y <5 = N	5 = Y <5 = N	5 = Y <5 = N	5 = Y <5 = N	5 = Y <5 = N
Pizza 1	Y	Y	Y	Y	N	Y	N	N	Y	N	Y
Pizza 2	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y
Pizza 3	Y	Y	Y	Y	N	Y	N	N	Y	N	N
Pizza 4	Y	Y	Y	Y	N	Y	N	N	Y	N	N
Pizza 5	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y
...	...	...	...	...	...	...	...	...	...	...	...
Pizza 496	Y	Y	Y	Y	N	Y	Y	Y	N	Y	N
Pizza 497	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y
Pizza 498	Y	Y	Y	Y	Y	N	N	N	N	Y	N
Pizza 499	Y	Y	Y	Y	Y	N	N	N	N	Y	N
Pizza 500	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y

THE SPAGHETTI DIAGRAM
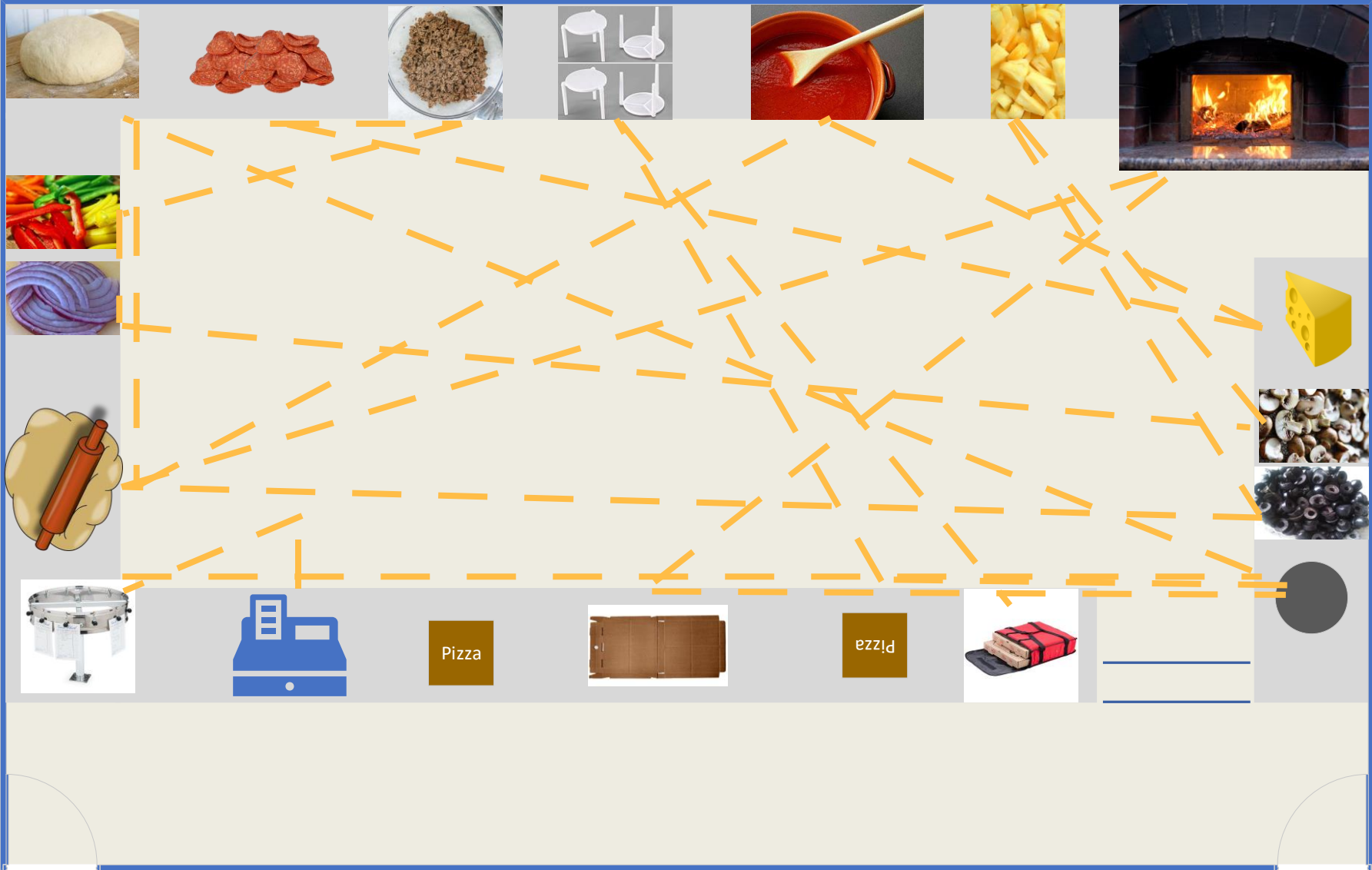
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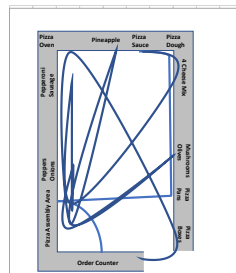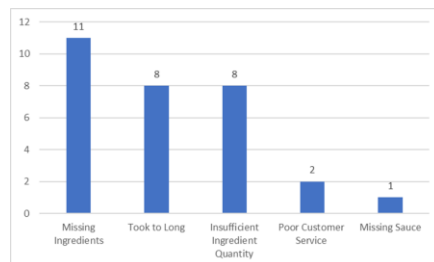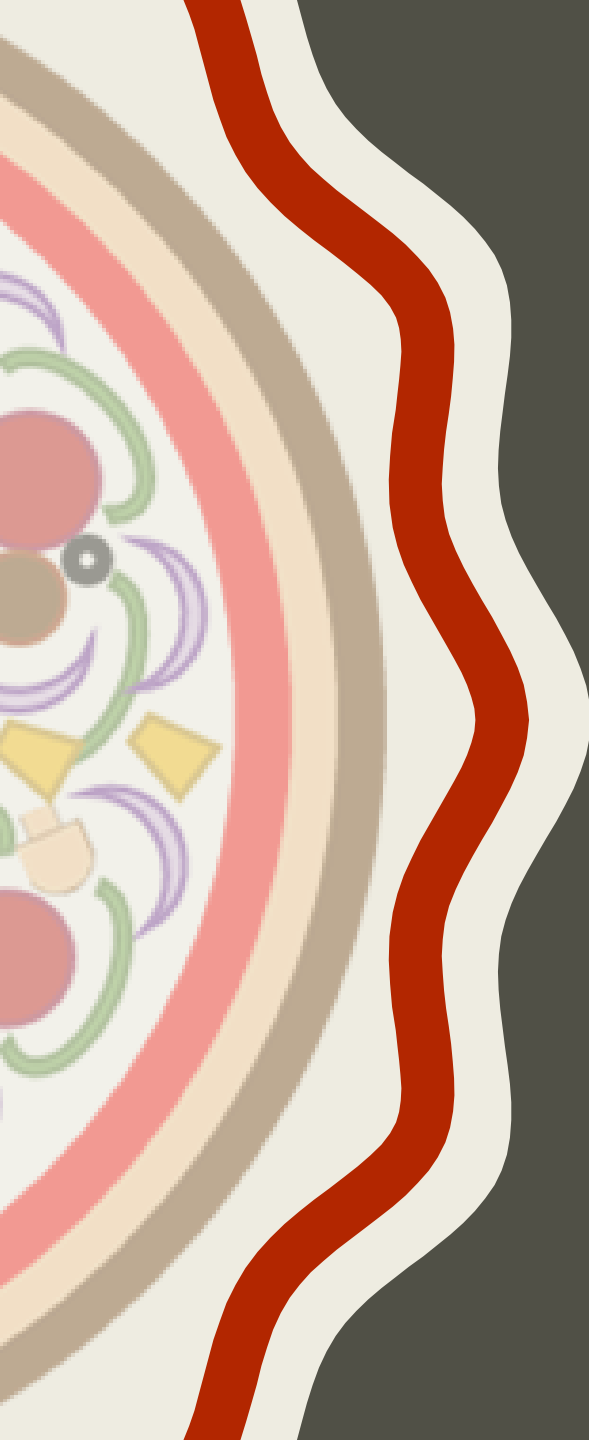| **Kitchen Sink Pizza Process Improvement**		
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3. Current Conditions: Pizzeria Cucina received poor reviews on yelp on the accuracy of toppings on their Kitchen Sink Pizza as well as a drop in sales and an increase in costs.		**8. Standardize & Sustain:**

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ANALYZE PHASE

ANALYZE PHASE

- Analyze: Review inputs & interface capability (X's), clarify assumptions, identify potential solutions

- Value Analysis

- Waste Analysis

- Root Cause Analysis

  - Parteo

  - What was the real cause and eliminate it

  - Fishbone Diagram

  - 5 Whys/Hows

8 WASTES

Time/Waiting — Waiting for people, materials, product, or services to be delivered. (Wait/Idle Time)

Inventory — Having excess supplies or materials than what is needed

Defects — Inspection, correcting errors, addressing customer complaints or repairs.

Overproduction — Producing something at the wrong time or in unnecessary amounts

Motion — Unnecessary movement (too fast/slow) that does not add value. Search/find items

Extra Processing — Unnecessary process steps or operations or doing more than the customer requires

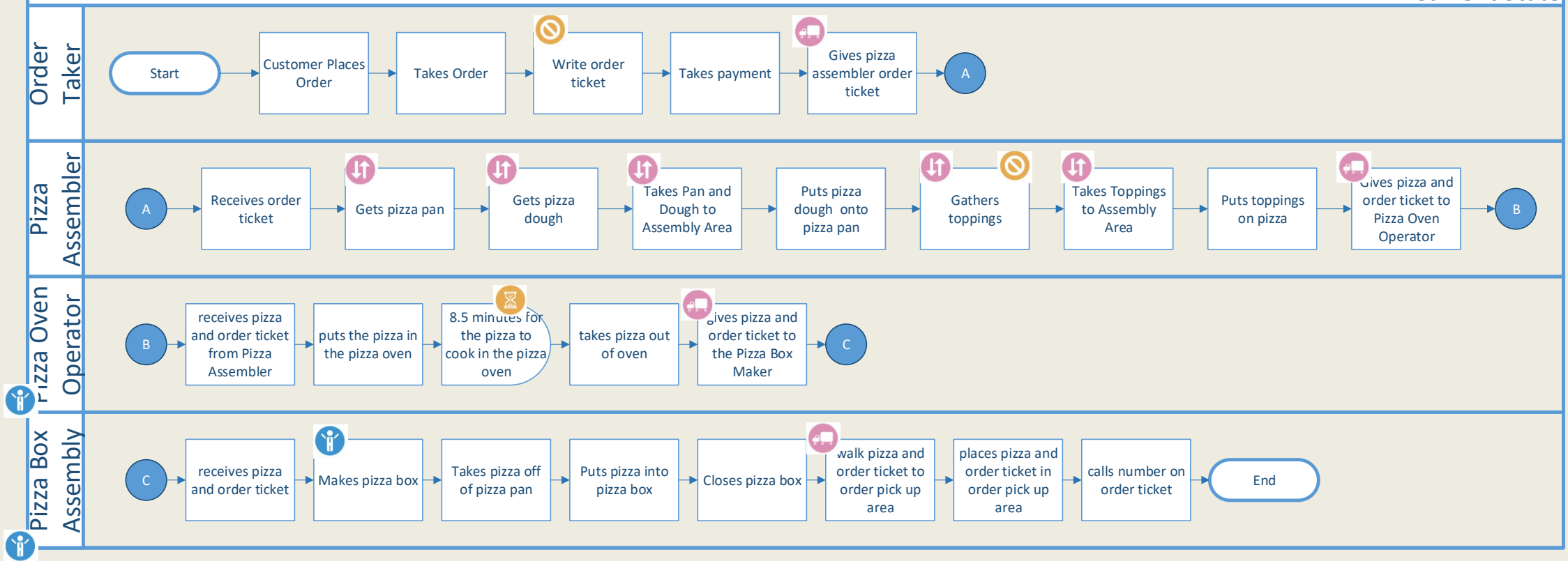**Transportation** — Handoffs or moving unnecessarily

Underutilizing Talent — Not allowing personnel to contribute to their fullest potential

WASTE ANALYSIS

Kitchen Sink Pizza Process

Current State

Order Taker
Start → Customer Places Order → Takes Order → Write order ticket → Takes payment → Gives pizza assembler order ticket → A

Pizza Assembler
A → Receives order ticket → Gets pizza pan → Gets pizza dough → Takes Pan and Dough to Assembly Area → Puts pizza dough onto pizza pan → Gathers toppings → Takes Toppings to Assembly Area → Puts toppings on pizza → Gives pizza and order ticket to Pizza Oven Operator → B

Pizza Oven Operator
B → receives pizza and order ticket from Pizza Assembler → puts the pizza in the pizza oven → 8.5 minutes for the pizza to cook in the pizza oven → takes pizza out of oven → gives pizza and order ticket to the Pizza Box Maker → C

Pizza Box Assembly
C → receives pizza and order ticket → Makes pizza box → Takes pizza off of pizza pan → Puts pizza into pizza box → Closes pizza box → walk pizza and order ticket to order pick up area → places pizza and order ticket in order pick up area → calls number on order ticket → End
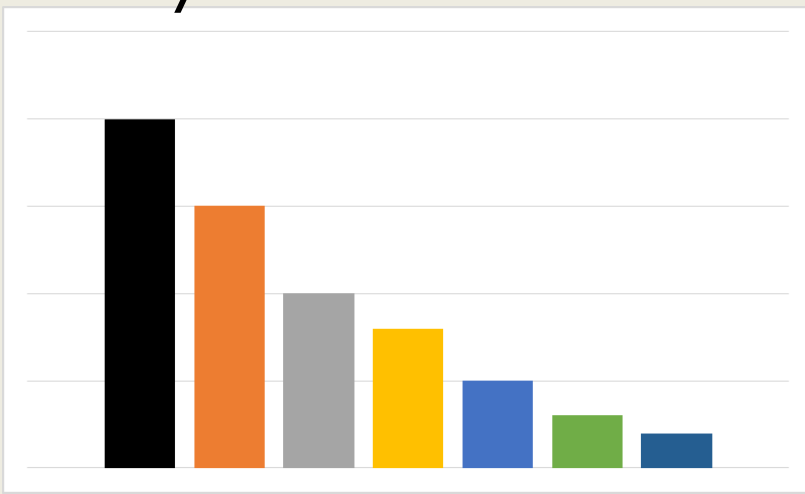
PARETO ANALYSIS

A Pareto Chart is a tool that allows you to identify the most significant or vital effects that should be focused on.

- When analyzing data about the frequency of problems or causes in a process.
- When communicating with others about your data.

1. Decide what categories you will use to group items and the appropriate measurement for frequency, quantity, cost and time.

2. Decide what period of time the Pareto chart will cover: One work cycle? One full day? A week? A month? A fiscal year? A calendar year?

3. Collect the data, recording the category each time.

4. Subtotal the measurements for each category.

5. Construct and label bars for each category. Place the tallest at the far left, then the next tallest to its right and so on.

PARETO ANALYSIS

| Create a pareto chart based on the below data - count of errors by pizza type									
Pizza Type Error Data									
Pizza #	Pizza Type	Pizza #	Pizza Type	Pizza #	Pizza Type	Pizza #	Pizza Type	Pizza #	Pizza Type
1	Kitchen Sink Pizza	7	Meat Lovers Pizza	13	Pepperoni Pizza	19	Meat Lovers Pizza	25	Hawaiian Pizza
2	Vegetarian Pizza	8	Kitchen Sink Pizza	14	Hawaiian Pizza	20	Kitchen Sink Pizza	26	Meat Lovers Pizza
3	Meat Lovers Pizza	9	Kitchen Sink Pizza	15	Kitchen Sink Pizza	21	Meat Lovers Pizza	27	Hawaiian Pizza
4	Vegetarian Pizza	10	Hawaiian Pizza	16	Meat Lovers Pizza	22	Kitchen Sink Pizza	28	Kitchen Sink Pizza
5	Kitchen Sink Pizza	11	Kitchen Sink Pizza	17	Kitchen Sink Pizza	23	Kitchen Sink Pizza	29	Hawaiian Pizza
6	Kitchen Sink Pizza	12	Vegetarian Pizza	18	Hawaiian Pizza	24	Kitchen Sink Pizza	30	Kitchen Sink Pizza
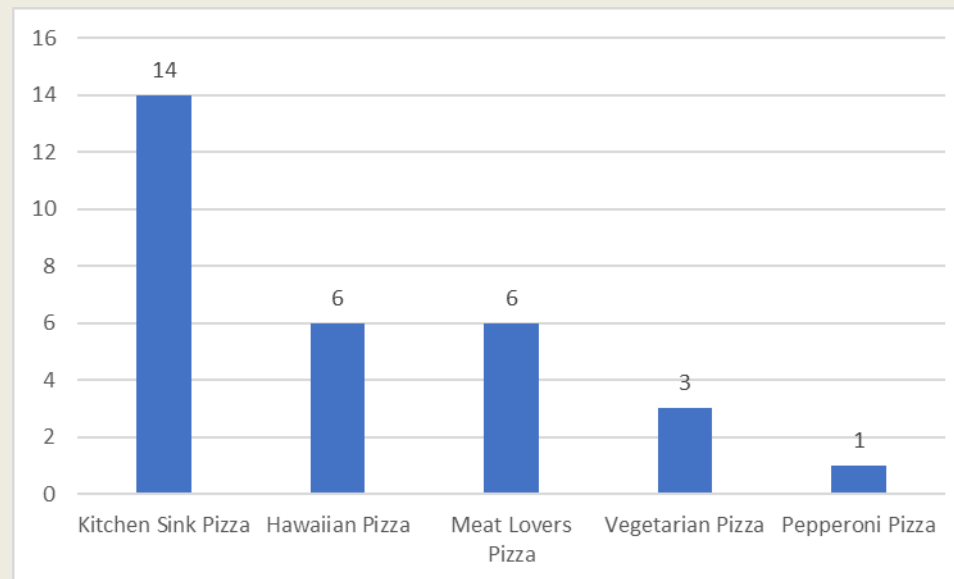
PARETO ANALYSIS

Create a pareto chart based on the below data - customer satisfaction keyword word mining from Yelp Reviews									
Customer Satisfaction Data									
#	Key Word	#	Key Word	#	Key Word	#	Key Word	#	Key Word
1	Missing Ingredients	7	Missing Ingredients	13	Insufficient Ingredient Quantity	19	Missing Ingredients	25	Missing Ingredients
2	Took to Long	8	Insufficient Ingredient Quantity	14	Took to Long	20	Insufficient Ingredient Quantity	26	Poor Customer Service
3	Missing Sauce	9	Took to Long	15	Missing Ingredients	21	Missing Ingredients	27	Insufficient Ingredient Quantity
4	Insufficient Ingredient Quantity	10	Missing Ingredients	16	Took to Long	22	Insufficient Ingredient Quantity	28	Missing Ingredients
5	Poor Customer Service	11	Insufficient Ingredient Quantity	17	Missing Ingredients	23	Took to Long	29	Took to Long
6	Took to Long	12	Missing Ingredients	18	Took to Long	24	Insufficient Ingredient Quantity	30	Missing Ingredients
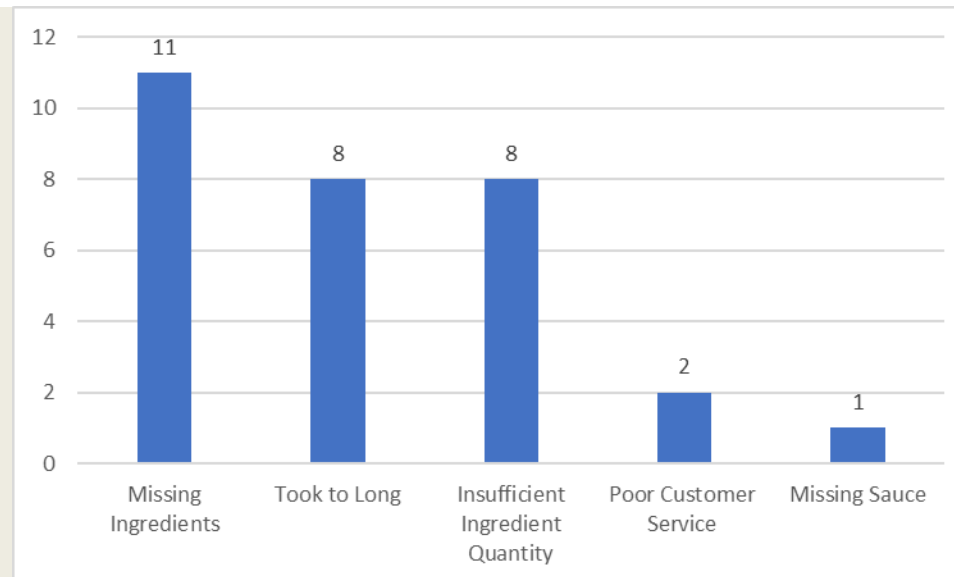
5 WHYS

The five whys are used as a questioning process used to drill down into the details of a problem and peel away the layers of symptoms that the problem is causing. The goal is to ask the right questions to gain clarity and get to the root cause or root solution.

- Write the problem to be explored at the top of the page
- Ask the "Why" question five times and write the answers to each
- You can use each answer from the previous why to start the next why question by asking "why is that"
- It may take less than five times to reach the root cause but try not to go over five whys

5 WHYS

Because all pizza assemblers are trained differently

Why are all pizza assemblers trained differently?

Because there is no kitchen training

Why is there no kitchen training?

Because there are no standard operating procedures

Why are there are no standard operating procedures?

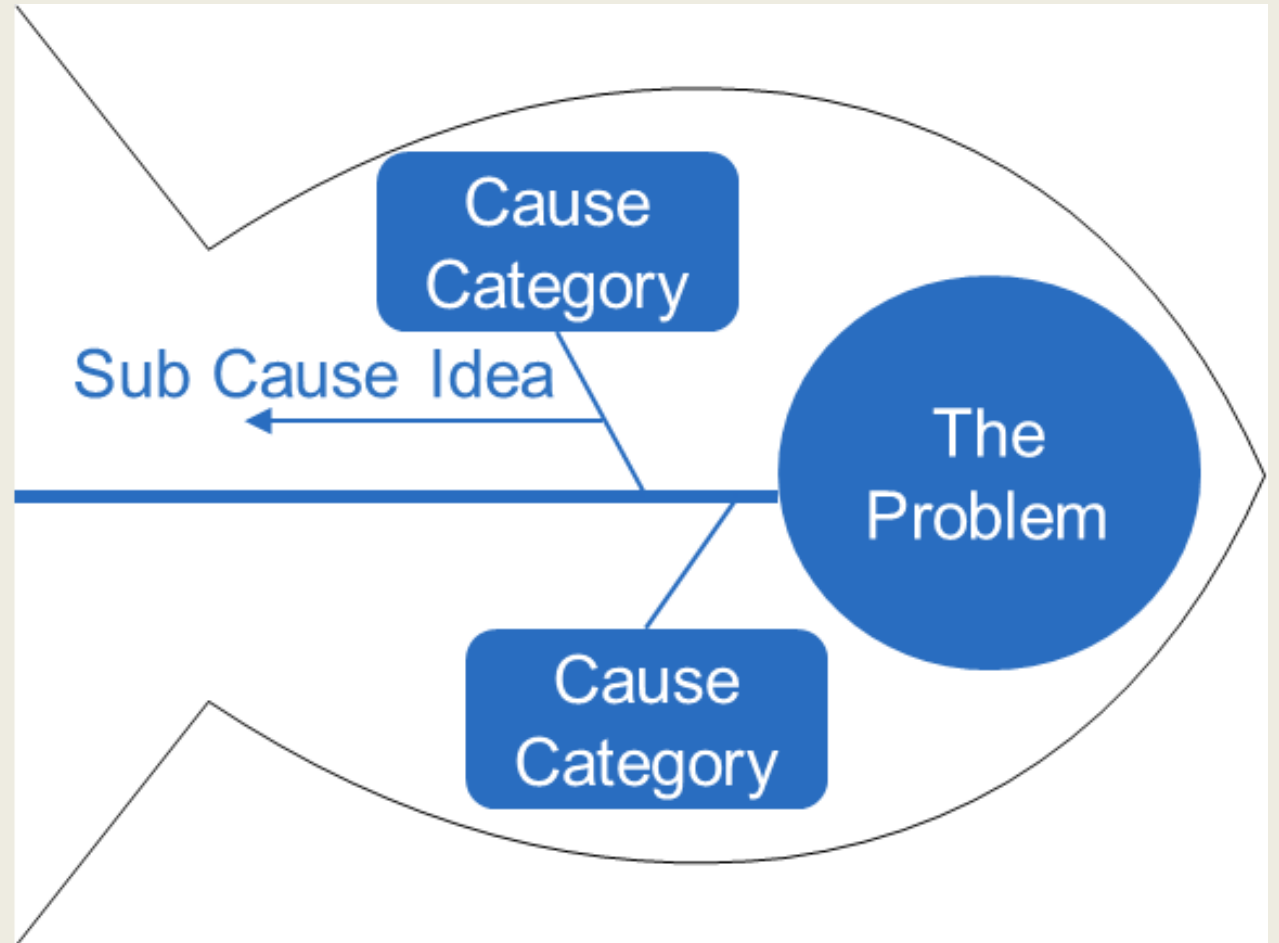Because there are no clear standards

Why are there are no standards?

Because management has never established clear standards for all processes

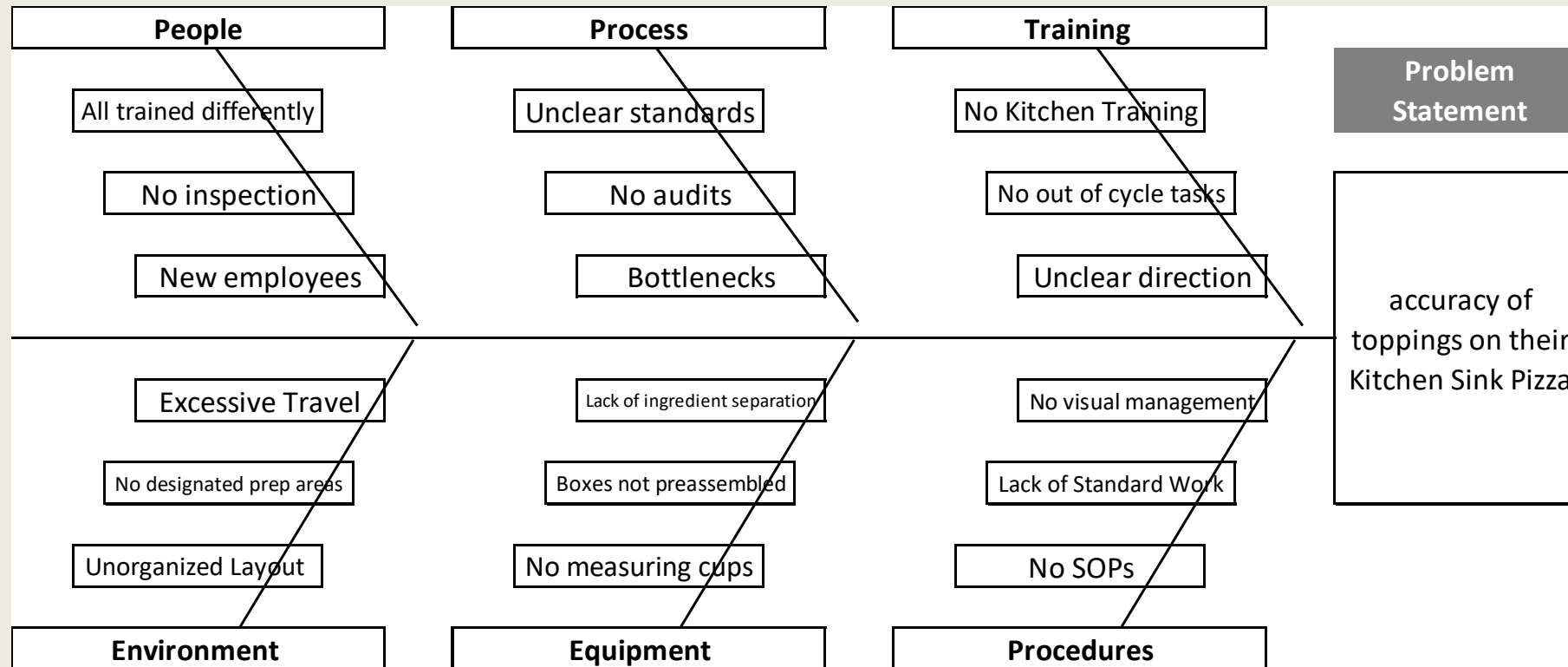Why has management has never established clear standards for all processes?

Because management has never determined customer critical to quality requirements

FISHBONE DIAGRAM

- The Cause and Effect Diagram (or Fishbone Diagram) is a problem solving tool to help you and your team identify and discuss all potential causes of an effect.

- The cause & effect diagram identifies many possible causes for an effect or problem. It can be used to structure a brainstorming session. It immediately sorts ideas into useful categories.
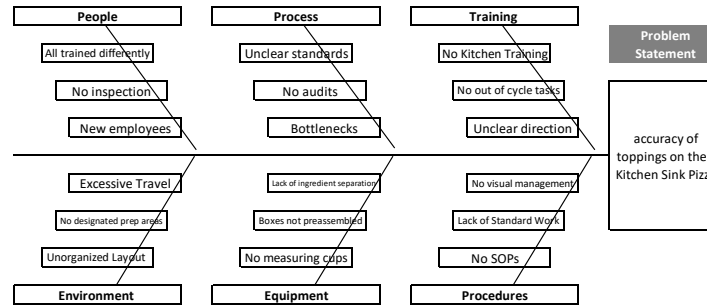
FISHBONE DIAGRAM

People	Process	Training	
All trained differently	Unclear standards	No Kitchen Training	**Problem Statement**
No inspection	No audits	No out of cycle tasks	
New employees	Bottlenecks	Unclear direction	accuracy of toppings on their Kitchen Sink Pizza
Excessive Travel	Lack of ingredient separation	No visual management	
No designated prep areas	Boxes not preassembled	Lack of Standard Work	
Unorganized Layout	No measuring cups	No SOPs	
Environment	**Equipment**	**Procedures**	

Kitchen Sink Pizza Process Improvement

1. Background:

Over the last six months the owners of Pizzeria Cucina began to notice that they had a drop in sales, an increase in ingredient costs, and a decline in yelp ratings. They had been receiving a high number of customer complaints about missing toppings on the Kitchen Sink Pizza. The Company policy is to either make a new pizza for the customer or give them their pizza with a refund.

4. Analysis (Determine the Root Cause):

People	Process	Training
All trained differently	Unclear standards	No Kitchen Training
No inspection	No audits	No out of cycle tasks
New employees	Bottlenecks	Unclear direction

Problem Statement

accuracy of toppings on their Kitchen Sink Pizza

Excessive Travel	Lack of ingredient separation	No visual management
No designated prep areas	Boxes not preassembled	Lack of Standard Work
Unorganized Layout	No measuring cups	No SOPs
Environment	Equipment	Procedures

6. Implementation:

2. Target/Goal:

Ensure that all Kitchen Sink Pizzas are delivered to the customer with their correct toppings with adequate quantities.

KPI 1: Decrease in Monthly Ingredient Costs by 40%
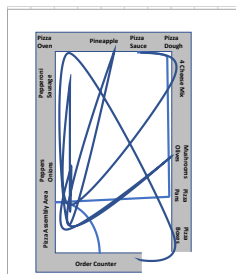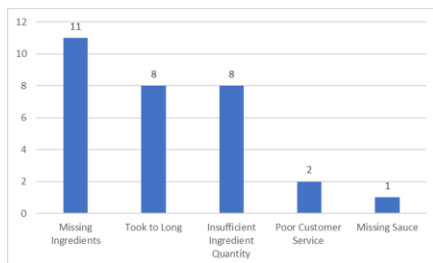KPI 2: Increase in Monthly Sales/Revenues by 30%
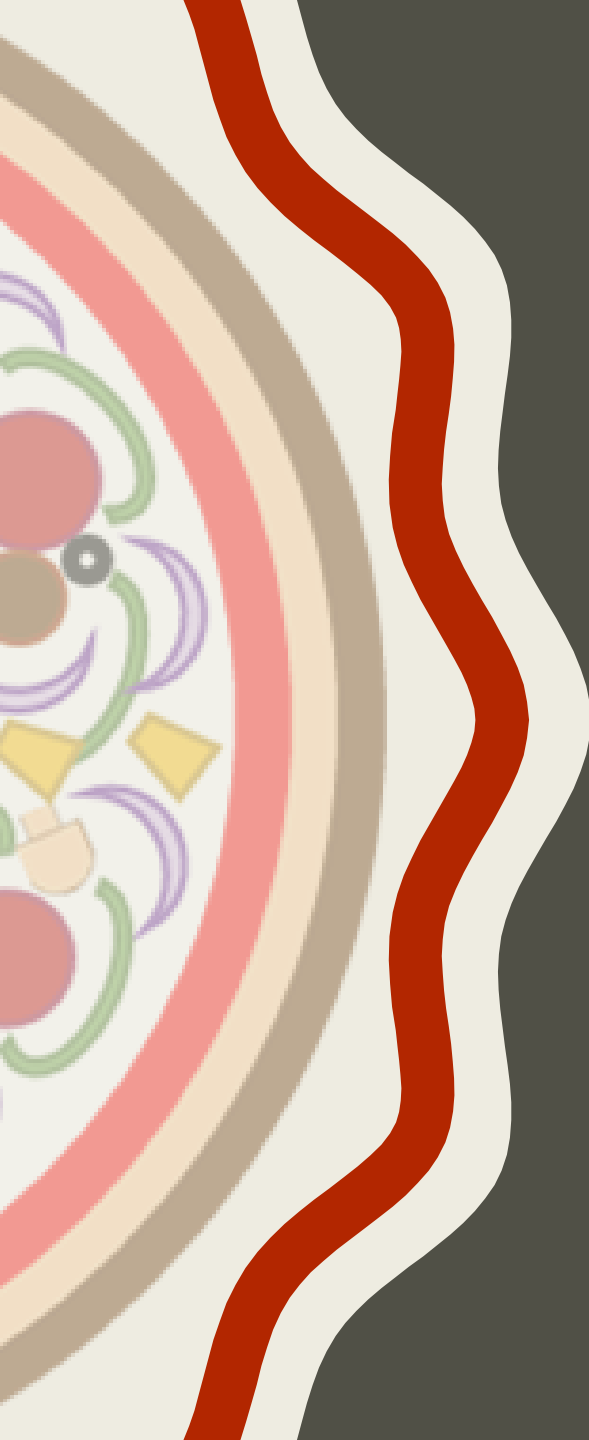KPI 3: Increase of Yelp Ratings to a minimum of 4 Stars

5. Proposed Countermeasures/Improvements:

7. Confirm Results & Process:

3. Current Conditions:

Pizzeria Cucina received poor reviews on yelp on the accuracy of toppings on their Kitchen Sink Pizza as well as a drop in sales and an increase in costs.

8. Standardize & Sustain:

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IMPROVE PHASE

IMPROVE PHASE

- Generate Solution Ideas

- Narrow Ideas & Determine optimal improvements

- Integrate future state improvements that strikes the balances between:

  - Cost – Service – Speed – Quality - Control

- Implement best practices for process workflow

- Develop a pilot plan

- Test to confirm effect of improvements

- Define implementation strategies

CREATING AN IMPROVEMENT

Poke Yoke or Mistake Proofing:
Mistake proofing is the use of automation that either makes it impossible for an error to occur or makes the error immediately obvious once it has occurred.

Error Proofing:
- Easy to do correctly, hard or impossible to do wrong
- Respect for people and the value they provide, which includes the concept that people can think and solve problems
- Machines are used to help people

Ways to Make Error Impossible to Occur:

Eliminate the Step that Causes the Error	Replace the step with an error-proof step	Make the correct action easier to do than the error

Detect the error and minimize its effects:

Inspection	Physical Attributes	Signals
• Inspection done in next step of process by next person • Self-inspection • Source inspection before the process step takes place to make sure equipment and conditions are correct	• Checks a physical characteristic • Check that process steps are done in order • Ensure completeness • Information available	• Warnings such as alerts or signals • Color coding • Alert that prevents the process to proceed until the error is corrected

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CREATING AN IMPROVEMENT

Looking for Flow:

- Look for ways to reduce or eliminate waiting or batching
- Can any steps be combined or run concurrently?
- Try to prevent items from waiting in queue
- Smaller batches
- Do we have the right resources at the right time?
- Heijunka looks for ways to smooth the work flow.
- Kanban is a trigger to do something or go get something.
- Right items at the right place at the right quantities.

"Should Be" Mapping: What will the process "look like" based on the following factors:

- Changing tasks and steps to fit your solution
- Adjusting "upstream" activities based on new requirements
- Updating "downstream" activities in anticipation of the solution
- New roles, materials, data, support needed to ensure the solution works

VISUAL MANAGEMENT

Visual management:

- Visual management is the ability to visually see what is happening within a physical work area merely by looking at it. The goal is to be able to establish an environment where you can easily expose defects or problems early.

- It is a company-wide "nervous system" that allows all employees to understand how they affect overall company performance.

- Includes:
  - Signs
  - Lines
  - Labels
  - Color Coding

Visual Layout

- Workplace organization
- 6S: Sort, Simplify, Shine/Sweep, Standardize, Sustain, Safety
- Organized inventory and materials

Visual Displays

- Visual instructions to assist process standardization near to where work is being done
- Visuals to aid in understanding process steps

Visual Controls

- Visual controls as a form of error proofing
- Signals to alert when something in the process is not functioning properly
- Indicators to alert what work is next

Visual Metrics

- Performance Management Boards are used to track metrics (actual vs. expected)
- Use to record issues that may arise and cause gaps in process performance

CREATING AN IMPROVEMENT

6S is a strategy to keep a workplace safe and organized:

6S promotes safety, quality, and reliability within the workplace.

1. Sort
2. Simplify
3. Shine / Sweep
4. Standardize
5. Sustain/Self-Discipline
6. Safety

Maintain 6S standards through training, commitment, and ongoing communication with recognition.

Process of separating necessary items from unnecessary ones. Discard unnecessary items.

Create a place for everything that is needed so that everything has a place and is readily available to use
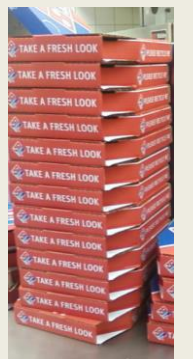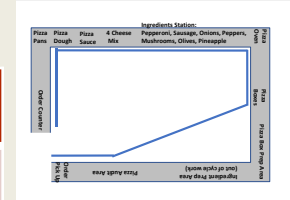
Create standards and agreements to communicate desired outcomes for 6S and ensure maintenance.

Be sure where everything is where it belongs. Visually confirm everything needed is in its place.

Sort

Simplify

Sustain
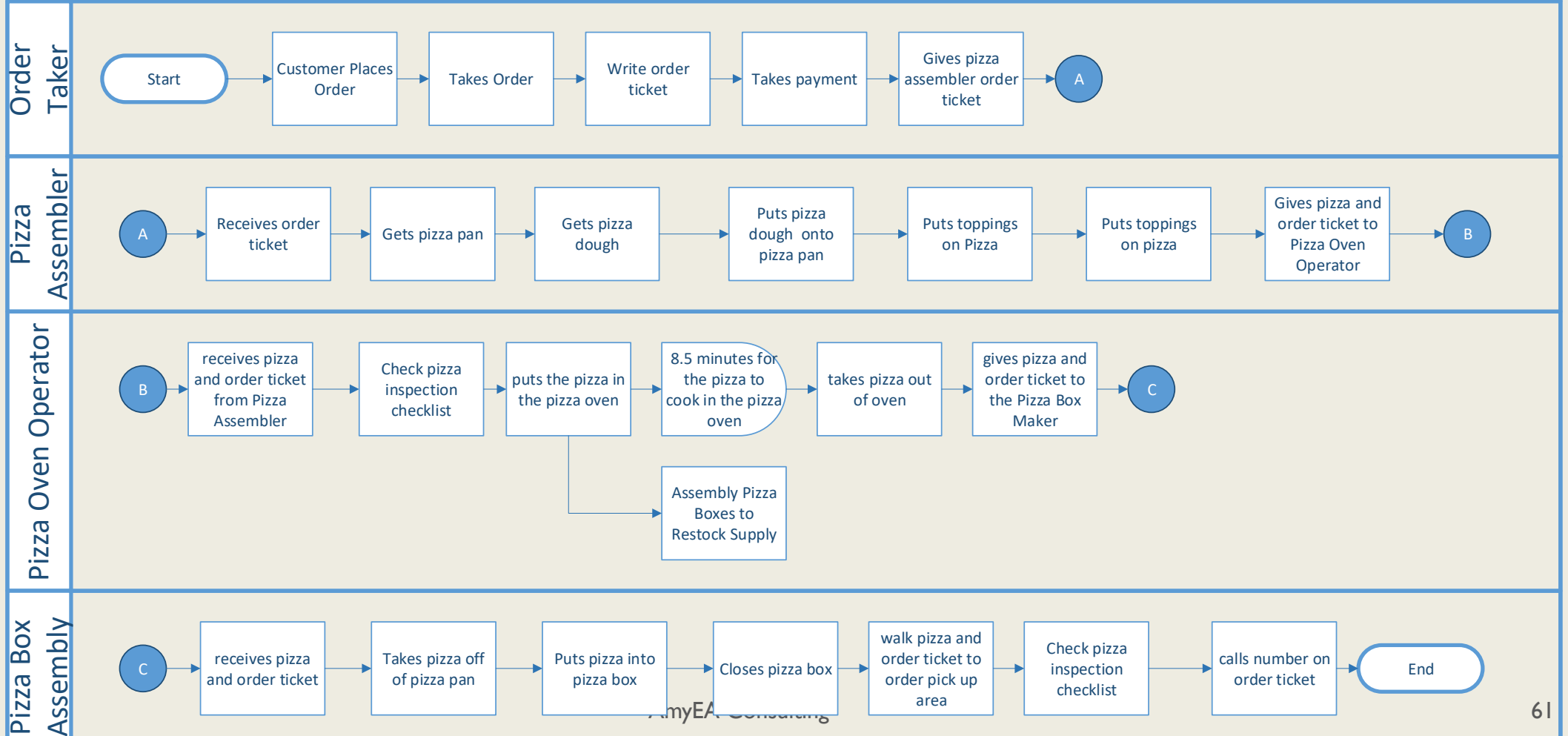
Safety

Standardize

Shine / Sweep

IMPROVE IMPLEMENTATION

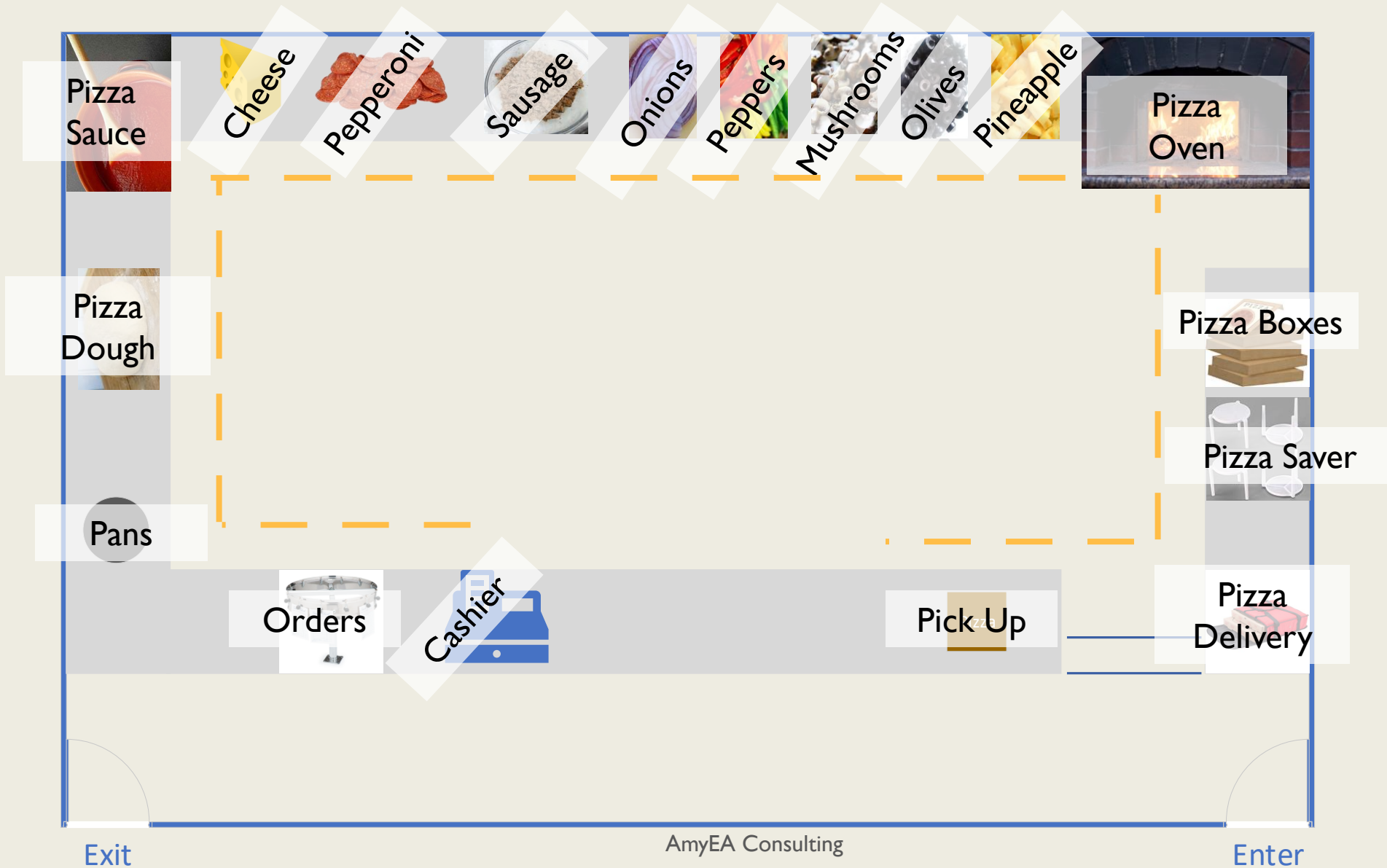| Improvement	Implementation	Improvement Type
Reorganize Kitchen Layout	Pilot a new layout by rearranging station to increase flow and accessibility; decrease excessive travel & motion.	Improvement Flow 6S
Pre-Package Topping Amounts	Pre-measure and package all ingredients at each station based on specifications.	6S Error Proofing
Create Standard Assembly Sheets	Create & pilot standard work visual assembly sheets for each pizza type at the ingredient station.	Mistake Proofing
Create SOPs	Create & pilot standard operating procedures with training for pilot group.	Mistake Proofing
Standardize Out of Cycle Work	Pilot out of cycle work including assembling pizza boxes & prepping ingredients.	Cross-Training Utilizing Talent
Create Inspection Sheets	Pilot inspection checkpoints at pizza oven and at order pick up area	Quality Assurance

LOOKING FOR FLOW

Kitchen Sink Pizza Process — Future State process flow diagram

Kitchen Sink Pizza Process

Future State

Order Taker: Start → Customer Places Order → Takes Order → Write order ticket → Takes payment → Gives pizza assembler order ticket → A

Pizza Assembler: A → Receives order ticket → Gets pizza pan → Gets pizza dough → Puts pizza dough onto pizza pan → Puts toppings on Pizza → Puts toppings on pizza → Gives pizza and order ticket to Pizza Oven Operator → B

Pizza Oven Operator: B → receives pizza and order ticket from Pizza Assembler → Check pizza inspection checklist → puts the pizza in the pizza oven → 8.5 minutes for the pizza to cook in the pizza oven → takes pizza out of oven → gives pizza and order ticket to the Pizza Box Maker → C

Assembly Pizza Boxes to Restock Supply

Pizza Box Assembly: C → receives pizza and order ticket → Takes pizza off of pizza pan → Puts pizza into pizza box → Closes pizza box → walk pizza and order ticket to order pick up area → Check pizza inspection checklist → calls number on order ticket → End

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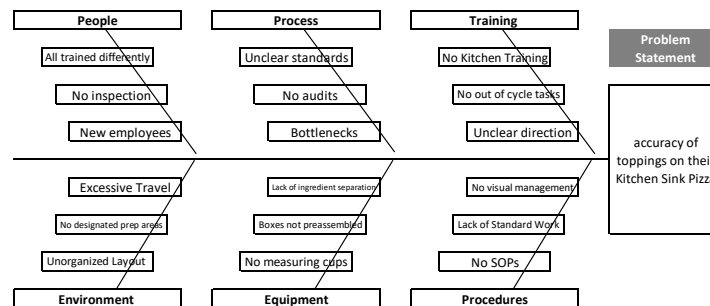
61

LOOKING FOR FLOW
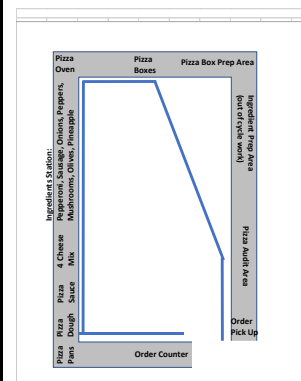
Kitchen Sink Pizza Process Improvement

1. Background:

Over the last six months the owners of Pizzeria Cucina began to notice that they had a drop in sales, an increase in ingredient costs, and a decline in yelp ratings. They had been receiving a high number of customer complaints about missing toppings on the Kitchen Sink Pizza. The Company policy is to either make a new pizza for the customer or give them their pizza with a refund.

2. Target/Goal:

Ensure that all Kitchen Sink Pizzas are delivered to the customer with their correct toppings with adequate quantities.

KPI 1: Decrease in Monthly Ingredient Costs by 40%
KPI 2: Increase in Monthly Sales/Revenues by 30%
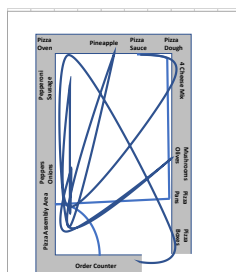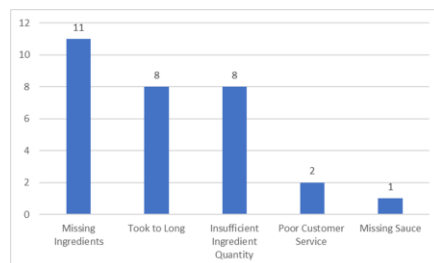KPI 3: Increase of Yelp Ratings to a minimum of 4 Stars

3. Current Conditions:

Pizzeria Cucina received poor reviews on yelp on the accuracy of toppings on their Kitchen Sink Pizza as well as a drop in sales and an increase in costs.

4. Analysis (Determine the Root Cause):

Fishbone diagram categories: People (All trained differently, No inspection, New employees, Excessive Travel), Process (Unclear standards, No audits, Bottlenecks, Lack of ingredient separation), Training (No Kitchen Training, No out of cycle tasks, Unclear direction, No visual management), Environment (No designated prep areas, Unorganized Layout), Equipment (Boxes not preassembled, No measuring cups), Procedures (Lack of Standard Work, No SOPs)

Problem Statement: accuracy of toppings on their Kitchen Sink Pizza

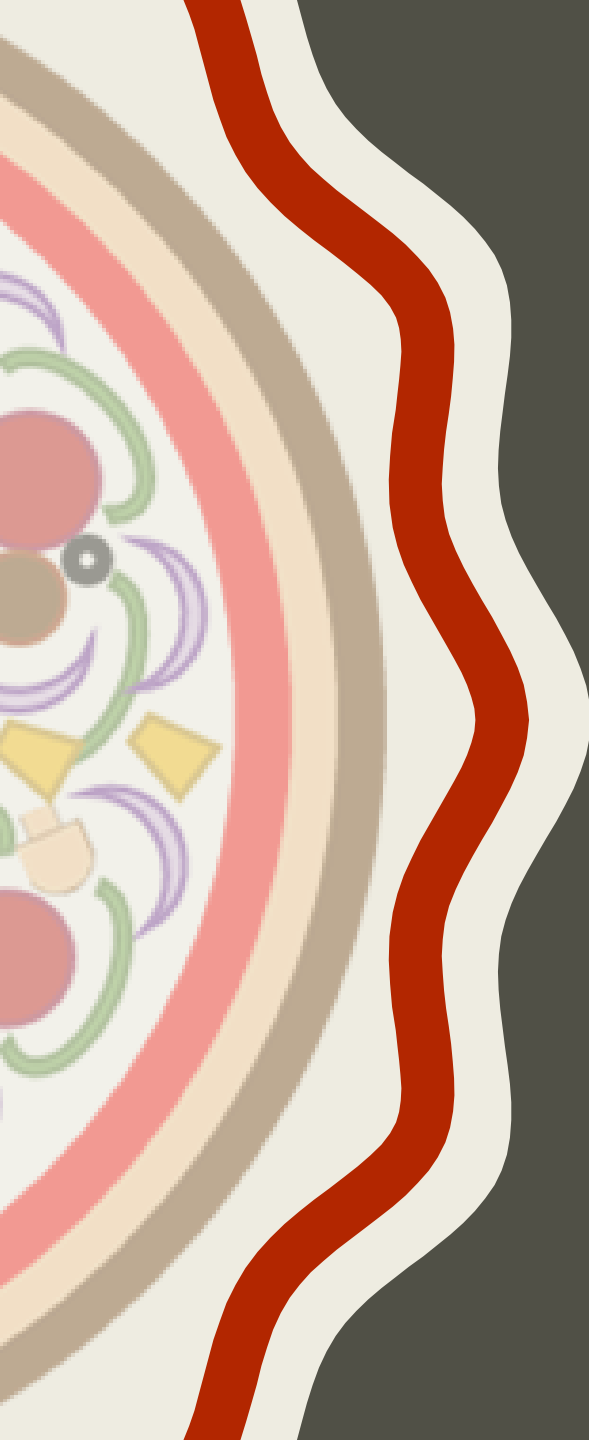## 5. Proposed Countermeasures/Improvements:

Improvement	Implementation
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Create Inspection Checkpoints	Pilot inspection checkpoints at pizza oven and at order pick up area.

6. Implementation:

Standard Assembly Instructions

7. Confirm Results & Process:

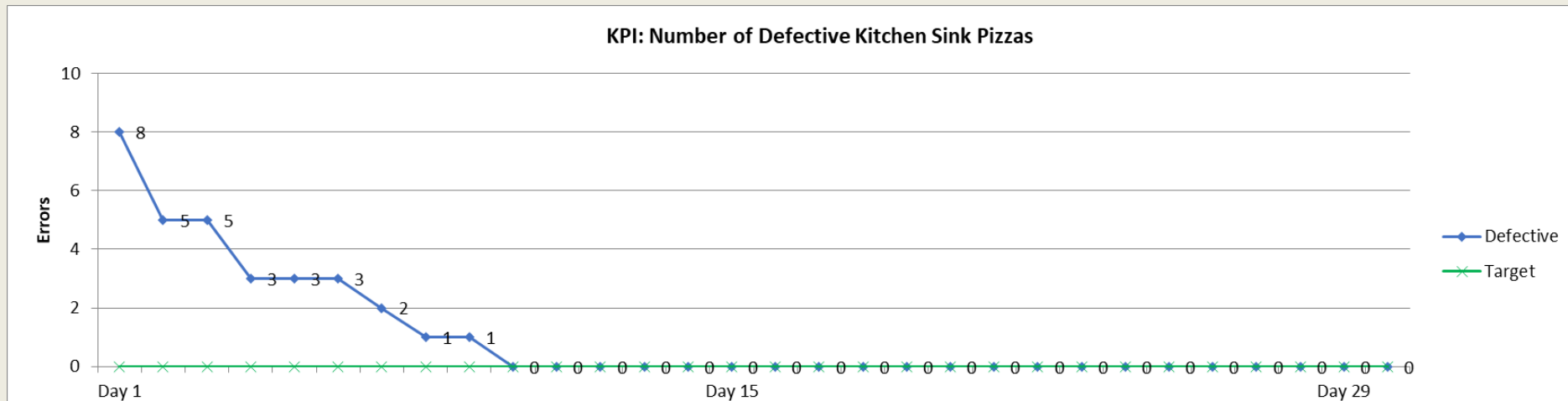## 8. Standardize & Sustain:

AmyEA Consulting

CONTROL PHASE

CONTROL PHASE

- Keep track of the process and results

- Record new ways of working, lessons learned

- Prepare to respond proactively as needed

- Ensure long-term success of the DMAIC project

- Translate opportunities across the organization

- Plan Ongoing Measurement

- Develop Documentation

- Prepare Revision & Response Plan

- Maintain & Expand the Gain

CONFIRM RESULTS

Process Analysis Audit Sheet										
	Box	**Dough**	**Sauce**	**Cheese**	**Sausage**	**Pepperoni**	**Peppers**	**Onion**	**Pineapple**	**Olive**	**Mushroom**
	Y/N	Y/N	Y/N	Y/N	5 = Y <5 = N	5 = Y <5 = N	5 = Y <5 = N	5 = Y <5 = N	5 = Y <5 = N	5 = Y <5 = N	5 = Y <5 = N
Pizza 1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pizza 2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pizza 3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pizza 4	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pizza 5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

KPI: Number of Defective Kitchen Sink Pizzas

CONTROL PLAN

KPI	Description	Targets	Lower Specification Limit	Upper Specification Limit	Unit	Frequency	Responsibility	Weekly Indicator Achievements 2019								Status
								March 3 - 9, 2019	March 10 - 16, 2019	March 17 - 23, 2019	March 24 - 31, 2019	April 1 - 6, 2019	April 7 - 13, 2019	April 14 - 20, 2019	April 21 - 27, 2019	
KPI 1	Ingredient Costs	28%	26%	39%	Dollar	Weekly	Mr. Finance									
KPI 2	Sales	14.8K	13,521.00	16,163.00	Dollar	Weekly	Mr. Finance									
KPI 3	Revenue	$300K	272,694.00	336,646.00	Dollar	Weekly	Mr. Finance									
KPI 4	Yelp Ratings	4.3	4	4.6	Stars	Weekly	Mr. Q									
KPI 5	Cycle Time	20	15	25	Minutes	Weekly	Ms. Thyme									

CONTROL CHART

Process Management Chart				
Process: Kitchen Sink Pizza Process				
Process Map Step	**Monitoring**		**Response Plan**	
	Measure	**Data Collection**	**Immediate Control / Fix**	**Process Improvement**
Order taker writes order ticket	Y/N	Accuracy Audit	Retraining of order taker & training audit	Redesign of order ticket or new order entry system
Pizza Oven Operator checks pizza inspection checklist	Y/N by defect opportunity	Quality Audit	Feedback of audit results	Review pre-packaged pre-measured ingredient accuracy
Pizza Box Assembler checks pizza inspection checklist	Y/N by defect opportunity	Quality Audit	Feedback of audit results	Review pre-packaged pre-measured ingredient accuracy

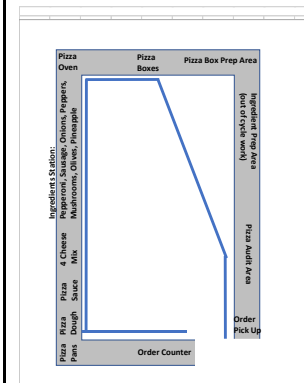# Kitchen Sink Pizza Process Improvement

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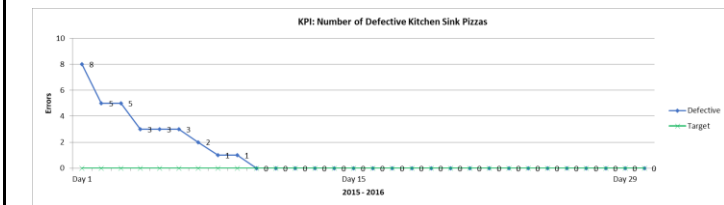KPI 2: Increase in Monthly Sales/Revenues by 30%
KPI 3: Increase of Yelp Ratings to a minimum of 4 Stars

3. Current Conditions:

Pizzeria Cucina received poor reviews on yelp on the accuracy of toppings on their Kitchen Sink Pizza as well as a drop in sales and an increase in costs.

4. Analysis (Determine the Root Cause):

People
- All trained differently
- No inspection
- New employees

Process
- Unclear standards
- No audits
- Bottlenecks

Training
- No Kitchen Training
- No out of cycle tasks
- Unclear direction

Environment
- Excessive Travel
- No designated prep areas
- Unorganized Layout

Equipment
- Lack of ingredient separation
- Boxes not preassembled
- No measuring cups

Procedures
- No visual management
- Lack of Standard Work
- No SOPs

Problem Statement: accuracy of toppings on their Kitchen Sink Pizza

5. Proposed Countermeasures/Improvements:

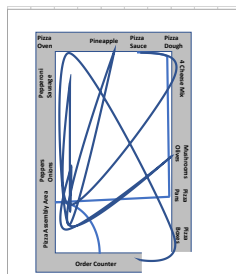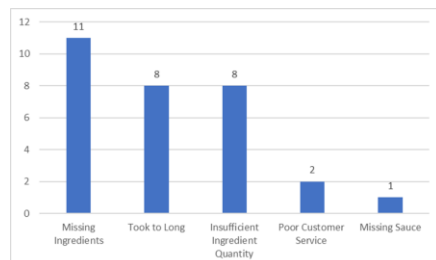| Improvement	Implementation
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	Box	Dough	Sauce	Cheese	Sausage	Pepperoni	Peppers	Onion	Pineapple	Olive	Mushroom
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Pizza 2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pizza 3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pizza 4	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pizza 5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

KPI: Number of Defective Kitchen Sink Pizzas

8. Standardize & Sustain:

Improvement	Sustainment
Reorganize Kitchen Layout	Make new layout permanent with visual management, update SOPs, and documentation.
Create Standard Assembly Sheets	Update documentation and visual management.
Create SOPs	Update documentation and conduct training to all of staff.
Standardize Out of Cycle Work	Implement tasks associated with roles and responsibilities to include out of cycle work including assembling pizza boxes and prepping ingredients.
Create Inspection Checkpoints	Standardize inspection checkpoints by updating documentation, audit sheets, tasks, roles & responsibilities, and process.

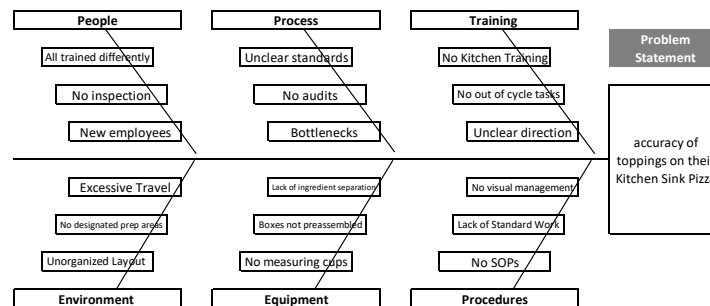Implement control plan and charts - continue to monitor in sustainment to ensure improvements are effective.

LET'S LOOK AT OUR A3
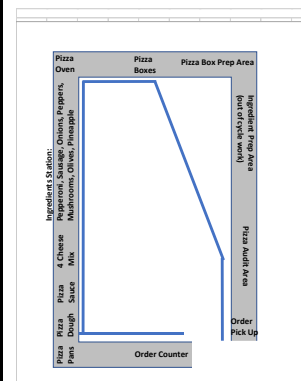
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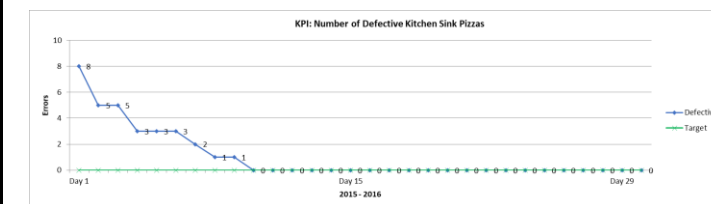KPI 2: Increase in Monthly Sales/Revenues by 30%
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Fishbone diagram categories:
- **People**: All trained differently; No inspection; New employees
- **Process**: Unclear standards; No audits; Bottlenecks
- **Training**: No Kitchen Training; No out of cycle tasks; Unclear direction
- **Environment**: Excessive Travel; No designated prep areas; Unorganized Layout
- **Equipment**: Lack of ingredient separation; Boxes not preassembled; No measuring cups
- **Procedures**: No visual management; Lack of Standard Work; No SOPs

Problem Statement: accuracy of toppings on their Kitchen Sink Pizza

5. Proposed Countermeasures/Improvements:

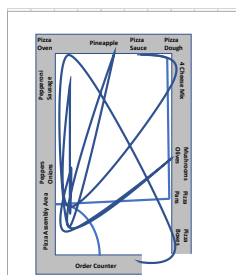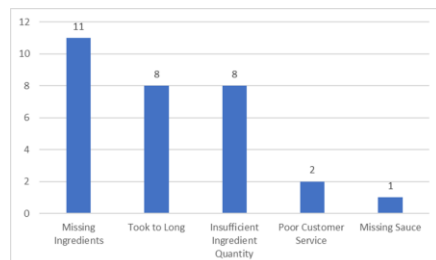| Improvement	Implementation
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Create Inspection Checkpoints	Pilot inspection checkpoints at pizza oven and at order pick up area.

6. Implementation:

Standard Assembly Instructions

7. Confirm Results & Process:

Process Analysis Audit Sheet

	Box	Dough	Sauce	Cheese	Sausage	Pepperoni	Peppers	Onion	Pineapple	Olive	Mushroom
	Y/N	Y/N	Y/N	Y/N	5 = Y <5 = N	5 = Y <5 = N	5 = Y <5 = N	5 = Y <5 = N	5 = Y <5 = N	5 = Y <5 = N	5 = Y <5 = N
Pizza 1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pizza 2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pizza 3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pizza 4	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pizza 5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

KPI: Number of Defective Kitchen Sink Pizzas

8. Standardize & Sustain:

Improvement	Sustainment
Reorganize Kitchen Layout	Make new layout permanent with visual management, update SOPs, and documentation.
Create Standard Assembly Sheets	Update documentation and visual management.
Create SOPs	Update documentation and conduct training to all of staff.
Standardize Out of Cycle Work	Implement tasks associated with roles and responsibilities to include out of cycle work including assembling pizza boxes and prepping ingredients.
Create Inspection Checkpoints	Standardize inspection checkpoints by updating documentation, audit sheets, tasks, roles & responsibilities, and process.

Implement control plan and charts - continue to monitor in sustainment to ensure improvements are effective.

OBJECTIVES

- Introduction to Lean Thinking with a high-level review of a lean project from opportunity identification, to improvement and lastly sustainment.

    ✓ Understanding the basics of lean thinking

    ✓ Using discovery skills to identify and prioritize potential initiatives

    ✓ Using A3 Thinking to Guide a Project

    ✓ Obtain skills to communicate with stakeholders throughout the lifecycle of a process improvement project

    ✓ Develop tools to sustain the improvement as work transitions to operational stakeholders in their day-to-day process management

QUESTIONS
COMMENTS
FINAL THOUGHTS

THANK YOU!

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