

Mario Voice Mamma Mia! That's a Hot Pizza! Some *Knead* to Know Information

Brianna Brown, Annie Ren, Preksha Vaghela, and Vivian Vo

PROCESS FLOW DIAGRAM

Most common path

View cases in...

```
graph TD; Start(( )) --> Order[Order by phone  
1,117]; Order --> Prep[Start preparing pizza  
1,826]; Prep --> Bake[Start baking pizza  
1,826]; Bake --> Ready[Baking pizza ready  
1,783]; Ready --> Plan[Plan route  
1,396]; Plan --> Departure[Departure pizza  
1,396]; Departure --> Customer[Pizza arrives at customer  
1,396]; Customer --> Payment[Payment customer  
1,719]; Payment --> End(( ));
```

Most common path's KPIs

Case count: 347 Activities count: 2,776

Detected Deviations ← 1 - 4 of 7 →

Activity	Deviation Type	Value	Change	Count
Call Customer	In 22% of cases	430 Cases		
Order at the counter (shop)	In 19% of cases	387 Cases	+40	387
Start order website	In 16% of cases	322 Cases	-25	322
Receive order website	In 16% of cases	322 Cases	-25	322

Sorting: Case count | Search by deviation name

Possible root causes for deviation: Call Customer

VARIANT	View cases in...
258 deviations	4, 6, 9

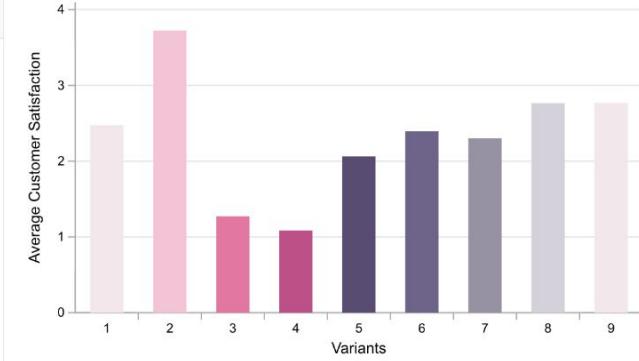
CUSTOMER TYPE	View cases in...
252 deviations	Student, Senior

Mamma Mia's Processes Workspace

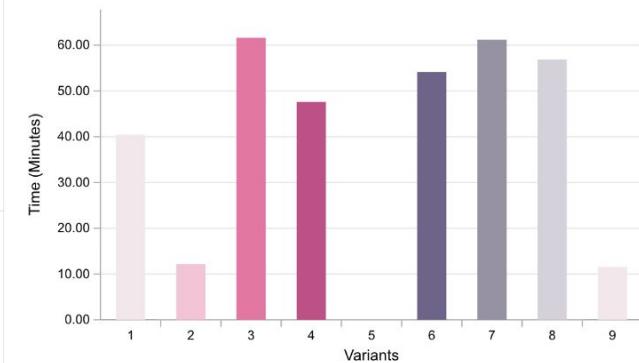
Variant Explorer



Average Customer Satisfaction vs. Variant



Throughput Time vs. Variant



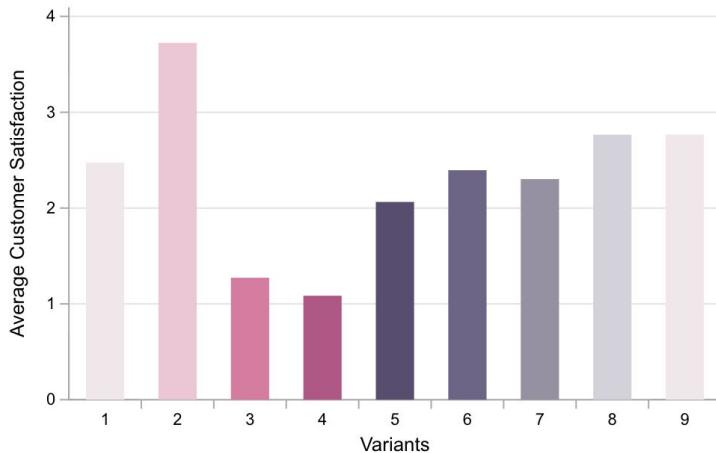
Prioritizing Process Fixtures

To find the root causes of the most inefficient processes, we will look at two factors: **average customer satisfaction** and **throughput time** for each of the variant processes.

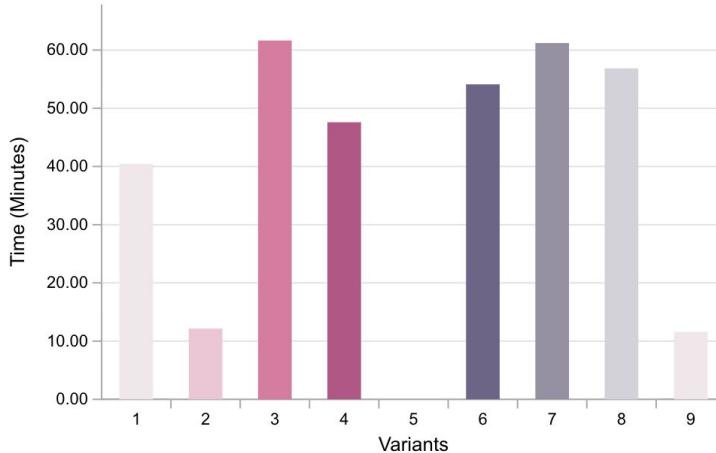
Prioritized variants to fix:

- Variant 3
 - Lowest customer satisfaction
 - Longest throughput time
- Variant 4
 - 2nd lowest customer satisfaction
 - Median throughput time
 - *The difference between the worst throughput times per variant are proportionally smaller than differences in customer satisfaction, therefore we chose variant 4 as the second most pressing variant to address.*

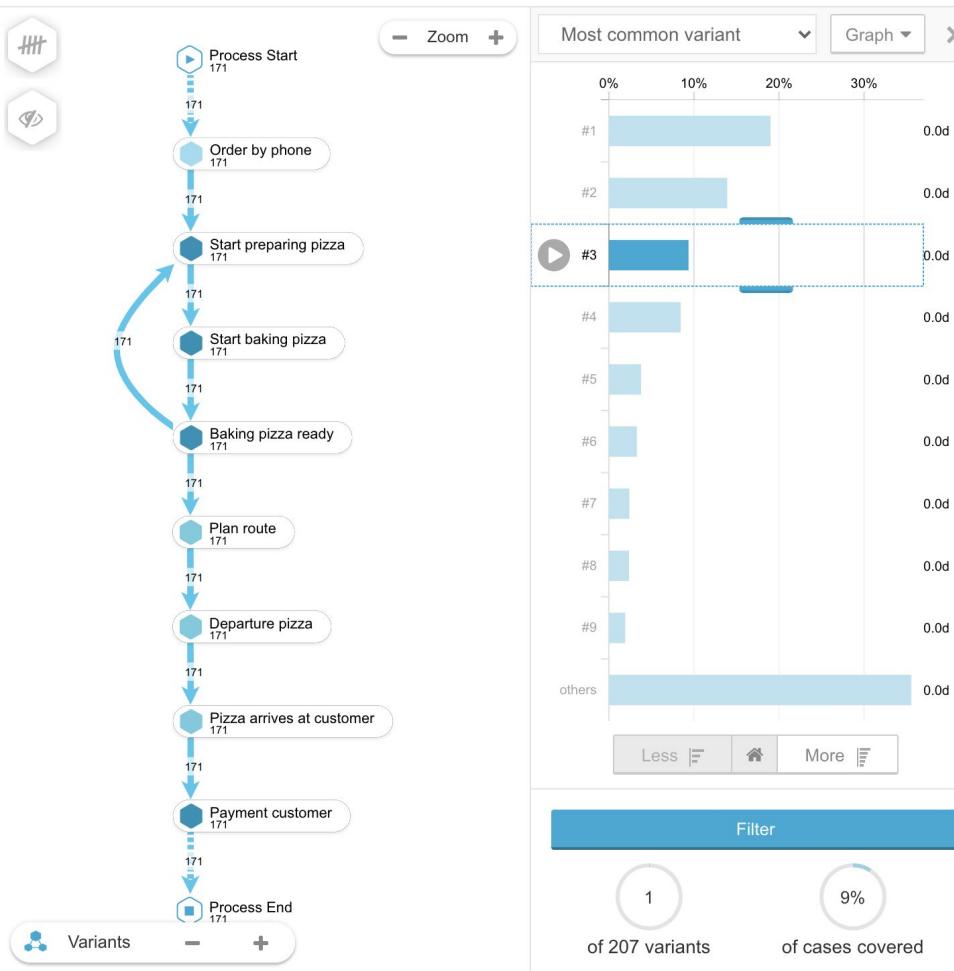
Average Customer Satisfaction vs. Variant



Throughput Time vs. Variant



Variant Explorer



Variant 3

The variant in this case is when after the pizza making process has started and finished, the arrows loop back to restart the pizza making process.

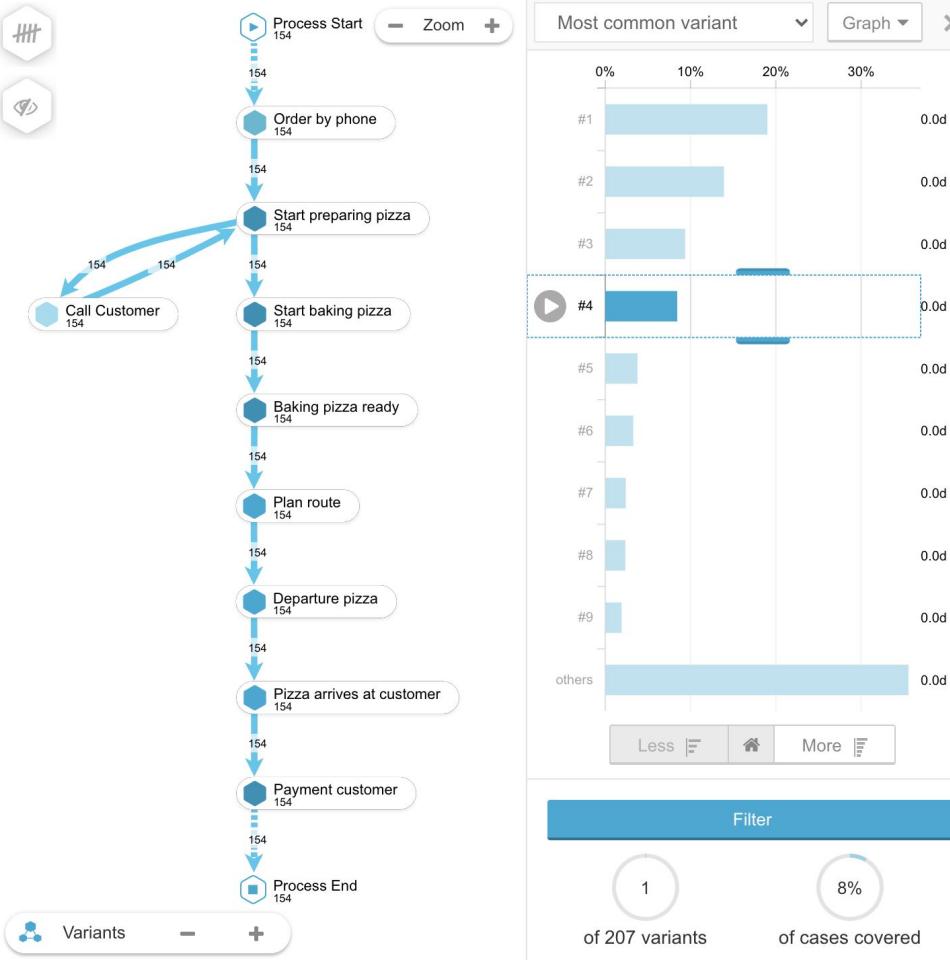
This seems likely to be human error where the employee makes a mistake and has to restart the pizza making process.

To best fix this we can instate an incentive on flawless work and provide rewards to employees that keep up the flawless streak.

The second issue could be that during the pizza making process, the employee realizes the ingredients were no longer good or available. Better management of the inventory can solve this issue.

Solution: Overall, the fixes to these issues will reduce the process cost

Variant Explorer



Variant 4

This second variant occurs most likely when the employee calls back to inform the customer of an issue with the pizza or the customer calls back to change the order. We can minimize the frequency of these occurrences by having the employee confirm the correctness of the order before beginning the pizza making process and make sure the pizza is still available to be made before continuing on with the order.

Solution: This reduces overall working capital by increasing operation efficiency.

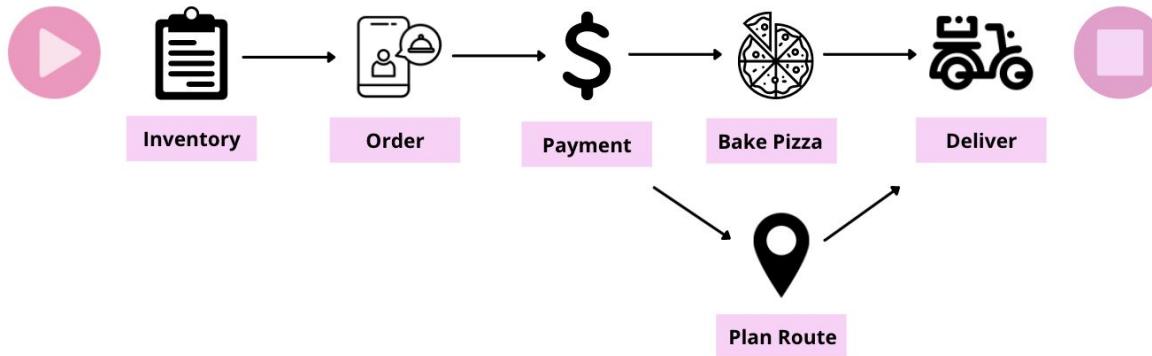
Overall Process Improvements

Current Business Model



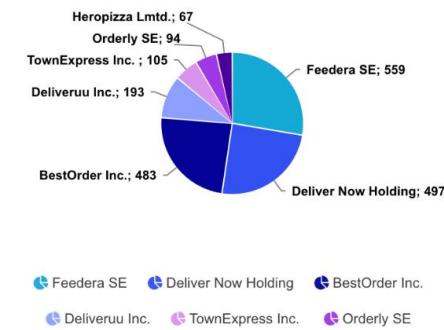
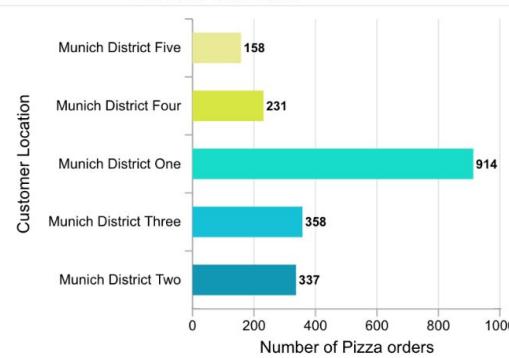
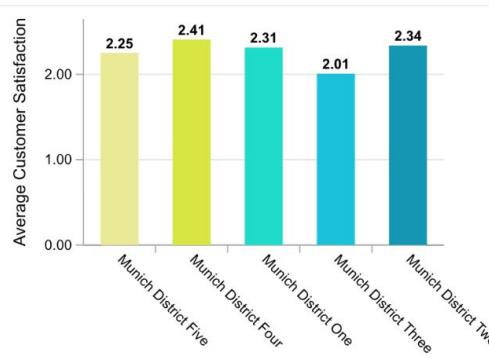
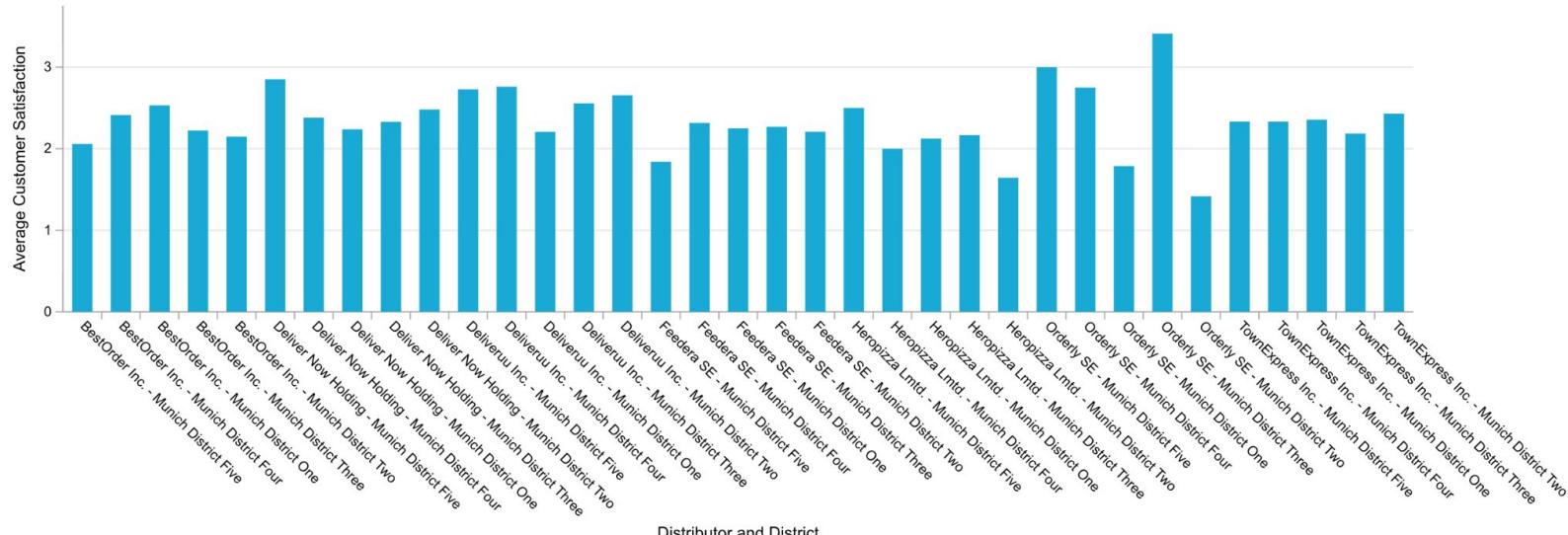
The current business model is based on the most general/ideal process for Mamma Mia. The order step includes online, phone, and counter orders. The bake pizza step includes the preparation and baking of the pizza.

New Business Model



Distribution Process Improvement: Workspace

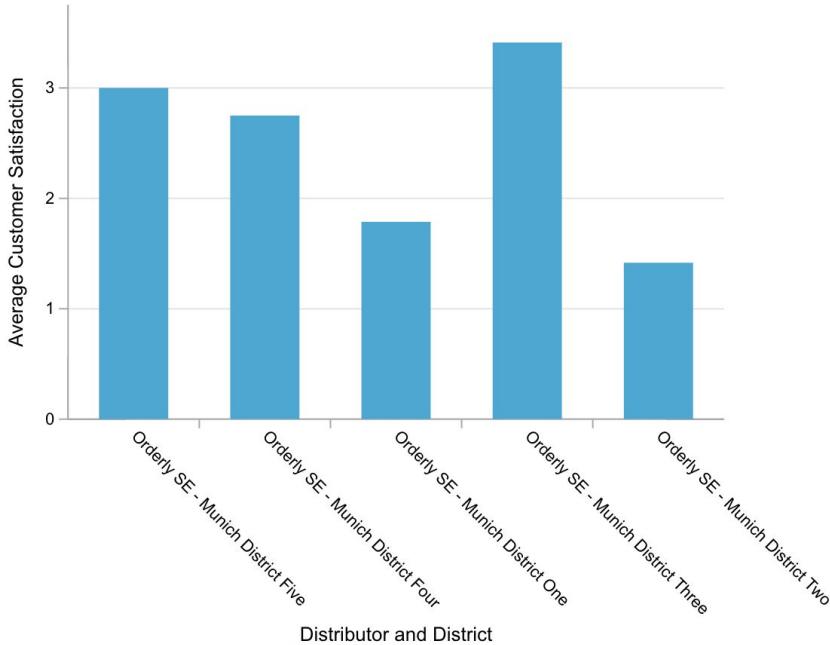
Average Customer Satisfaction vs Distributor and District of Customer



● Feedera SE ● Deliver Now Holding ● BestOrder Inc.
● Deliveruu Inc. ● TownExpress Inc. ● Orderly SE

Distribution Data Analysis: Specific Distributor/District

Average Customer Satisfaction vs Distributor and District of Customer



Let's take a closer look at Customer Satisfaction vs the Distributor and District of the Customer.

On the left, we look specifically at Orderly SE's distribution.

- Highest satisfaction for District 3
- Lowest satisfaction for District 1

Inefficiencies may come from the scattered distributing system. To solve this, we can reassign where distributors need to deliver pizza, which could combat Mamma Mia's poor customer satisfaction ratings

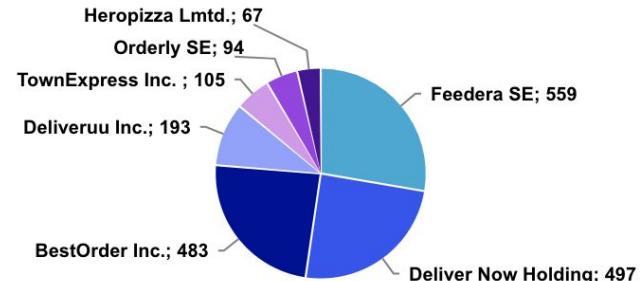
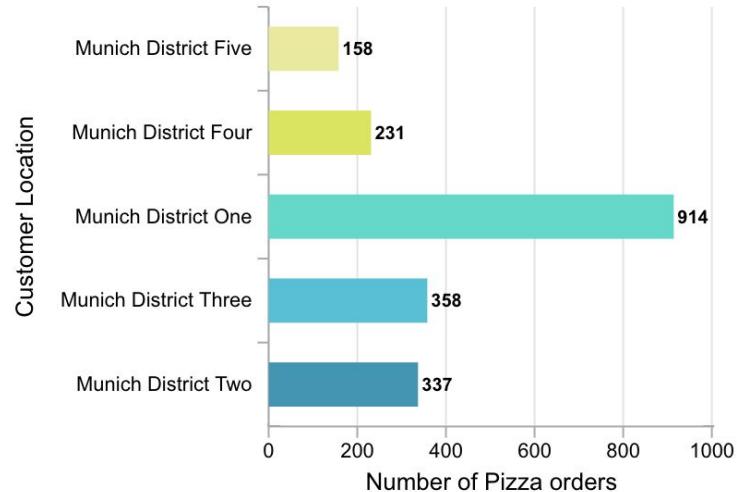
Distribution Data Analysis: Resource Allocation

To reassign which districts distributors deliver pizza to, we want distributors that have high customer satisfaction rates in certain districts to deliver pizza there. However, we need to look at which districts need the most distributors (column chart) and how many delivery workers from each distributor are available to utilize (pie chart.)

Utilizing weighted Gale-Shapley logic, we found distributor reassessments that could overall increase customer satisfaction:

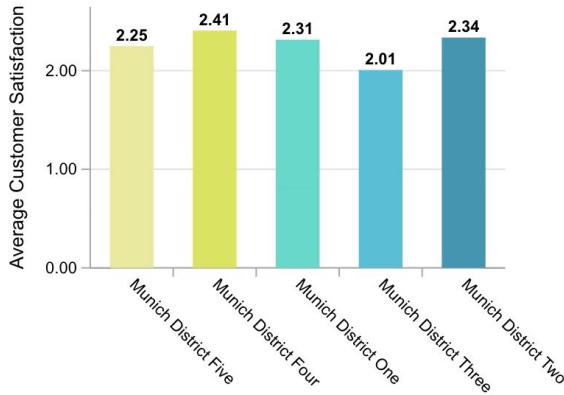
- **District 1:** 328 Feedera, 483 BestOrder, 103 TownExpress
- **District 2:** 193 Deliveruu, 144 Deliver Now Holding
- **District 3:** 94 Orderly, 262 Deliver Now Holding, 2 TownExpress
- **District 4:** 231 Feedera
- **District 5:** 67 Heropizza, 91 Deliver Now Holding

The breakdown above shows a more optimal breakdown of how many deliveries each distributor should make in specific districts. The number of pizza orders delivered by each distributor is assumed to stay constant (even after reassessments) because data on distributor's number of workers and efficiency is not available.



Distribution Solution: Cost-Benefit Analysis

Current Distribution System



Current System: Average Customer Satisfaction

- District 1: 2.31
- District 2: 2.34
- District 3: 2.01
- District 4: 2.41
- District 5: 2.25

New Distribution System

New System: Average Customer Satisfaction

- District 1: 2.41
- District 2: 2.58
- District 3: 2.55
- District 4: 2.32
- District 5: 2.40

CORRESPONDING CALCULATIONS

$$\begin{aligned} &= (328/914)*2.25 + (483/914)*2.53 + (103/914)*2.35 = 2.41 \\ &= (193/337)*2.66 + (144/337)*2.48 = 2.58 \\ &= (94/358)*3.41 + (262/358)*2.24 + (2/358)*2.19 = 2.55 \\ &= (231/231)*2.32 = 2.32 \\ &= (67/158)*2.50 + (91/158)*2.33 = 2.40 \end{aligned}$$

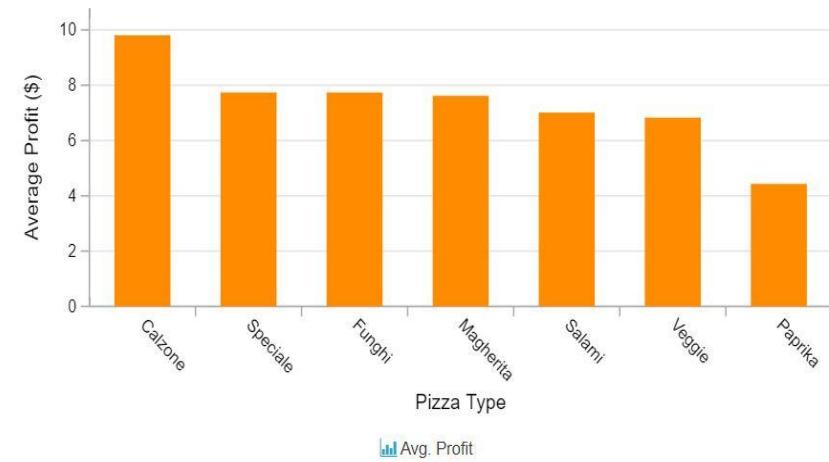
Overall Improvement

- Current System: Average Customer Satisfaction = **2.27**
 - $(158/1998)*2.25 + (231/1998)*2.41 + (914/1998)*2.31 + (358/1998)*2.01 + (337/1998)*2.34 = 2.27$
- New System: Average Customer Satisfaction = **2.45**
 - $(158/1998)*2.40 + (231/1998)*2.32 + (914/1998)*2.41 + (358/1998)*2.55 + (337/1998)*2.58 = 2.45$

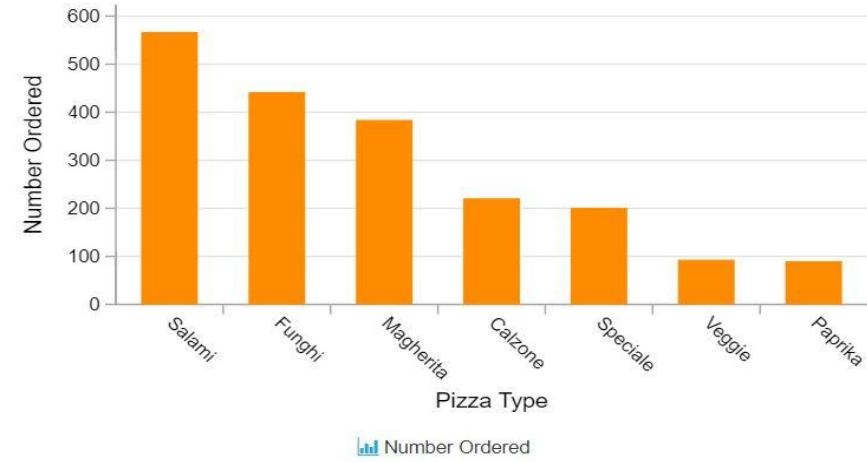
Over 8% increase in average customer satisfaction, just from distributor reassignment. This is an underestimate of the benefits of this solution since it does not account for other savings such as time (less distance traveled by deliverers and planning routes) and money (cost of gas).

Interesting Finding: Profitable Pizza Types

Profit vs. Pizza Type



Pizzas Ordered Per Type



On average, the calzone is the most profitable pizza. However, it is ordered almost 3 times less than the most popular pizza.

Solution: Advertise the calzone more to increase profits.

Questions & Answers

1. How many diff process variants exist? **207**
2. How many cases are covered by the first variant? **347**
3. How many cases covered by the first 3 variants? **772**
4. What is the total number of pizza orders (cases)? **1998**
5. What is the average throughput of all variants? **41 minutes**
6. What is the average throughput time of the first 4 variants? **39 minutes**
7. How many percent of cases are conformant? **33%**
8. Consider the violation resulting from calling the customer. Which customer type has the highest number of violations for this activity? **students**