PIZZA ORDER ANALYTICS: INSIGHTS INTO CONSUMER BEHAVIOR AND SALES TRENDS

Abstract

This report provides an in-depth analysis of pizza sales performance across the year 2015 using Power Bi. The dashboard goes from my general to detail findings, which provides significant insights. This contributes significantly to business decisions.

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A) Introduction:

Using Power BI, the dashboard presents an analysis of pizza sales transactions for the year 2015. The dataset originates from a pizza manufacturing and distribution company and includes detailed order-level information such as order ID, order time, pizza type, category, size, price and ingredients.

The goal of this analysis is to uncover insights that support strategic decision-making in areas such as product performance, sales patterns, customer preferences and operational efficiency. To be specific, I will digest into these fields:

- Provide key performance indicators (KPIs) to assess overall sales performance.
- Identify trends and anomalies across time (daily, weekly, monthly).
- Highlight product and category performance, including top- and bottom-performing pizzas.
- Evaluate the impact of pizza size and ingredients on sales.
- Explore correlations between revenue, sales volume and pricing.
- Examine order patterns such as frequency, single vs. multi-item orders and time intervals between orders.
- Deliver business recommendations to improve sales, optimize the menu, and enhance customer satisfaction.

B) About Dataset:

1) Main Dataset: Retails Order Full Dataset:

The main Data_pizza.xlsx dataset contains 48620 rows and 10 columns of the full year 2015 in transaction level. The file Data_dictionary.xlsx provides descriptions of fields in the transaction table.

- order_id: Unique identifier for each order.
- date: Date when the order was placed.
- time: Time when the order was placed.
- quantity: Number of pizzas ordered of the same type and size.
- pizza_id: Unique identifier for each pizza (combines type and size).
- size: Size category (S, M, L, XL, XXL).
- price: Unit price of the pizza.
- name: Menu name of the pizza.
- category: Pizza category (Classic, Chicken, Supreme, Veggie).
- ingredients: Comma-delimited list of pizza ingredients.

2) Support Dataset: Calendar and Time Table:

To support for Time series analyst, I have created Calendar and Time Table to manage the data and time stamp of data, which will be shown later in model view.

C) Data Processing:

1) Deciding queries:

These are the categories that I will transform the data into:

- Fact Sales: Contains main sales information such as order id, date and time, pizza id, quantity.
- Dim Calendar: Calendar Dataset.
- Dim Time: Time dataset.
- Dim Menu: Pizza Menu Information.
- Dim Category: Pizza Category.
- Dim Ingredients: Ingredient list.
- Dim Classification: Classify as single or multiple order, followed by calculating time gap between orders.

2) Transforming steps:

a. Error and Blank Check:

To avoid any unnecessary data consumption, Error or Blank Elements must be removed. In this dataset, after checking every column, I found that there was no Error, Blank or NA Rows and Columns. Therefore, I can move on to the next step.

b. Dividing data into atoms:

Some data columns contain more than one atom. These are the columns that I will separate:

- The pizza id (for example thai_ckn_l) contains two components: base id and size. Therefore, I will divide the pizza id to easier connect ingredients and base id for later use.
- The ingredients are displayed as list, so I divide them into atoms before processing it into ingredient data.

c. Creating relationships:

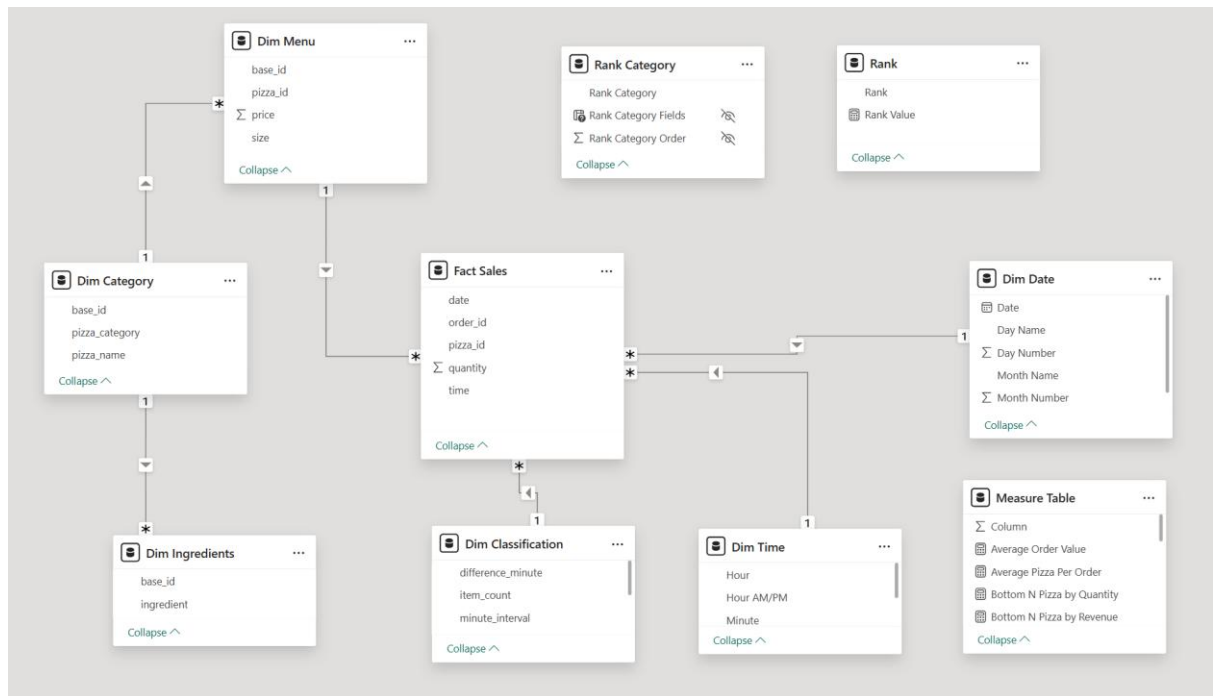Below is my Data Model after configuring relationships:

Figure 1: Data Model View.

D) **Dashboard Demonstration:**

1) **Retail Sales Overview:**

Figure 2: Dashboard 1.

The First Dashboard outlines general outcomes of the business in 2015:

a. KPI Cards:

The KPI cards in the dashboard provide a concise summary of the company's performance in 2015. The total revenue generated was $817.86K, indicating strong annual sales. With 21,000 total orders and 50,000 pizzas sold, the average number of pizzas per order was 2.32. This suggests that customers typically ordered more than one pizza per transaction, which may reflect group purchases or successful upselling strategies. The average order value stood at $38.31, pointing to a moderate basket size and consistent customer spending. Each Pizza contains 6 ingredients in average, indicating an appropriate amount that maintain both benefit and its unique. These KPIs collectively offer a clear snapshot of business health and operational scale.

b. Peak sales periods, patterns and any seasonal trends:

Peak sales periods and seasonal trends are evident in both the hourly and weekday analyses. The combined bar and line chart shows that orders and revenue peak around 12:00 PM and again at 7:00 PM, aligning with lunch and dinner times. This indicates that the business experiences two major surges in customer demand each day. The weekday analysis confirms that Friday consistently generates the highest revenue, reinforcing its role as the most lucrative day of the week. These patterns suggest that customer behaviour is strongly influenced by time-of-day and day-of-week factors, which are crucial for optimizing staffing and inventory. In terms of seasonal trends, while the sales increased most in August and December, the drops were significantly seen in February and October. These seasonal period matches the school holiday and Christmas period, where the demand of fast food goes high for parties and meetings.

c. Sales performance by day of the week and time of day:

Sales performance by day of the week and time of day further supports the identification of high-demand periods. Friday leads in revenue, followed by Thursday and Saturday, while Sunday records the lowest sales. This distribution implies that customers are less inclined to order pizza at the end of the weekend, possibly due to budget constraints or lifestyle choices. Furthermore, Sunday got surcharged of service, which can significantly reduce the need of eating out from customers. The hourly breakdown shows clear peaks at midday and evening, which correspond to typical mealtimes. These insights are valuable for scheduling staff, managing delivery logistics and planning promotional campaigns during slower periods.

d. Sales spikes or drops on specific dates throughout the year:

After confirming the seasonal trends, I moved on to some significant months of highs and drops
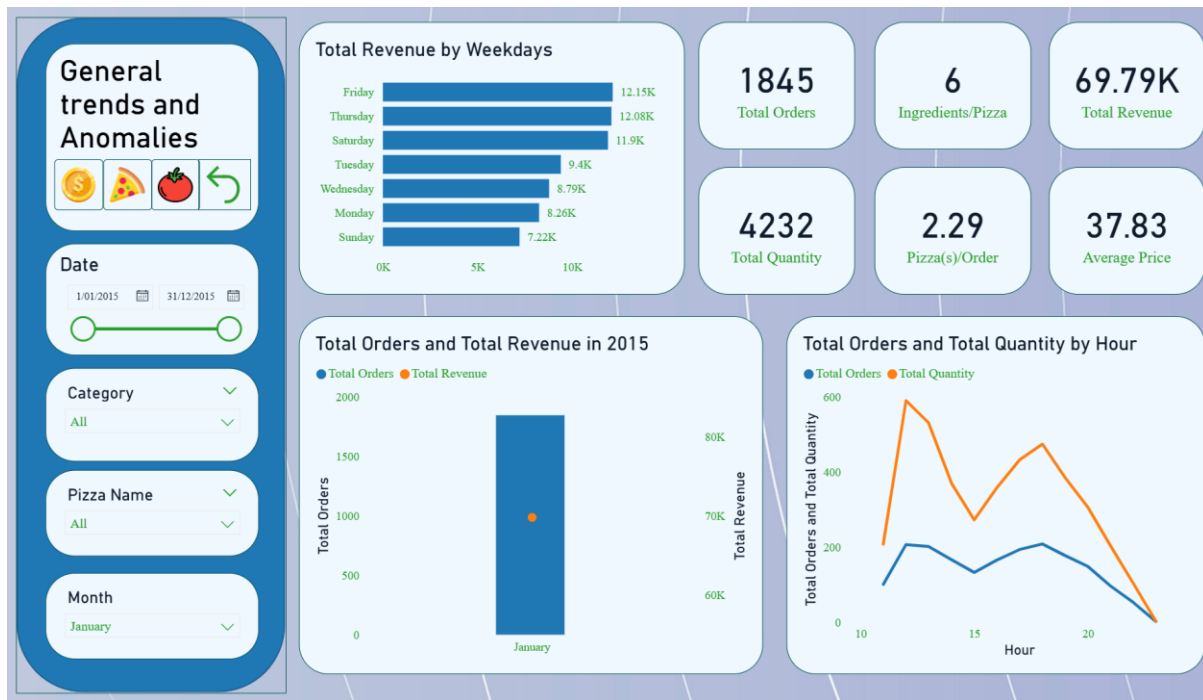
Figure 3: January revenue.

The January revenue graph for the pizza manufacturing and distribution company reveals significant daily fluctuations, with a notable spike around the 20th. This surge may be linked to promotional campaigns such as New Year offers, weekend or holiday effects that typically drive higher group orders, or the seasonal return of students and workers after holiday breaks. External factors like weather conditions could also have influenced consumer behaviour, increasing demand for delivery services. Additionally, operational elements such as inventory availability or distribution efficiency may explain abrupt drops or rebounds in sales. A comprehensive understanding of these trends would benefit from cross-referencing calendar events, weather data, and internal promotional or logistical records. In terms of daily, it seems that the environment contributes significantly to changing the eating time, which result in the reduction of gap between hours. Not only did people had eaten more pizzas on Thursday, but they also reschedule to have a middle meal at 3 pm. This indicated that customers went out more on January for special events, which was a perfect chance to increase the revenue.
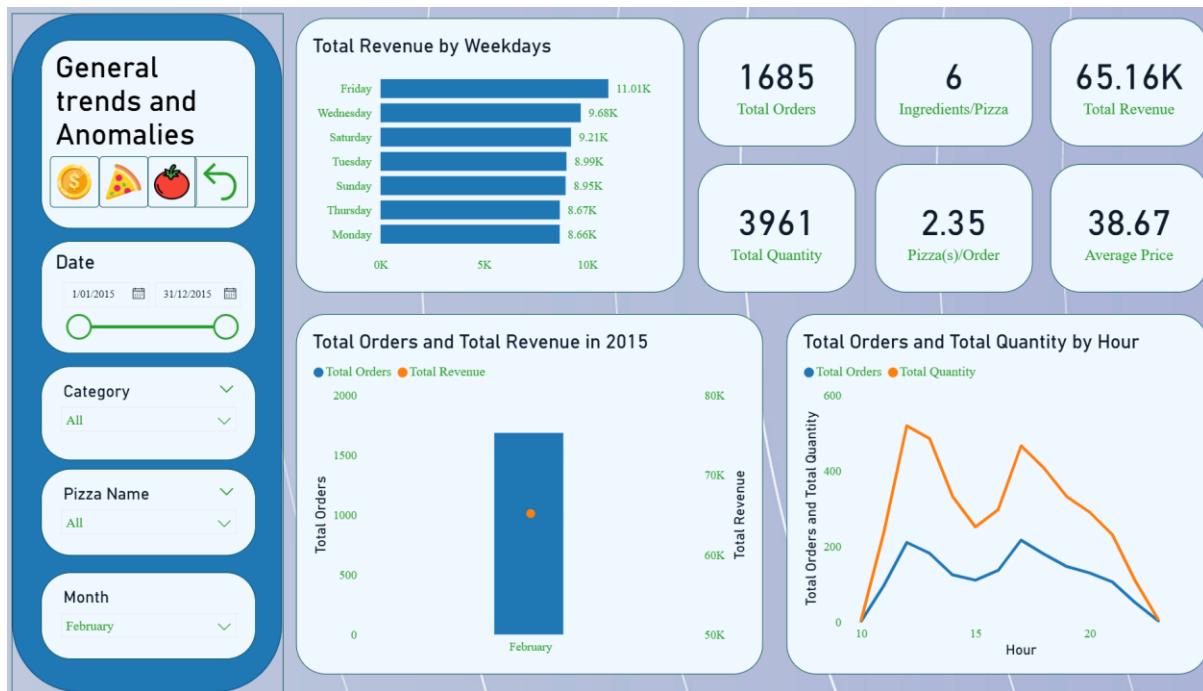
Figure 4: February Revenue

February's revenue graph shows a wider range of fluctuations compared to January, with peaks reaching up to 3,500 and troughs dipping closer to 1,500, indicating greater volatility in daily sales. Unlike January, which had a more stable baseline and a single pronounced spike around the 20th, February displays multiple sharp rises and falls, suggesting inconsistent demand or operational disruptions. This could be due to staggered promotional efforts, irregular weather patterns or supply chain inconsistencies. The higher peak values in February imply stronger individual sales days, possibly tied to events like Valentine's Day or weekend surges, while the deeper troughs may reflect missed opportunities or logistical challenges. Overall, February demonstrates more erratic performance than January, highlighting the need for tighter campaign planning and operational consistency to sustain momentum. There were also significant changes in demands that returns the most sales to Friday while others were almost equal. In addition, the peak demand also recovered back to 12pm and 7pm. This indicates that there were not many events set up during this month. Therefore, I would recommend cutting the cost by some actions such as focusing staffs on peak hour only, followed by utilizing other cost. Furthermore, this was a great time to test out any new ideas that renovating the restaurant, followed by ensuring smoother workflow when it comes to the busy time.
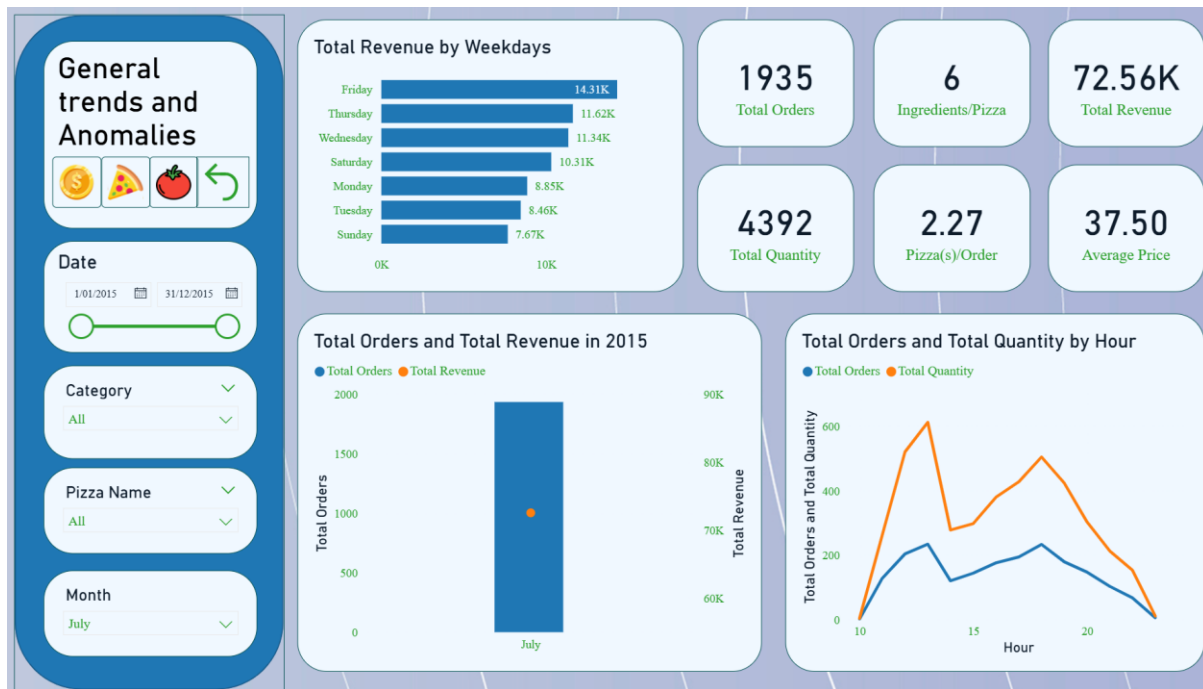
Figure 5: July Revenue.

In July, the peak month of the year, the pizza business demonstrated strong weekday performance, with Friday leading in revenue followed by Thursday and Wednesday. However, Saturday typically expected to be a high-demand day ranked surprisingly low and Sunday showed the weakest results, indicating missed opportunities during weekends. The total revenue reached $72.56K from 1,935 orders, with an average order value of $37.50 and an average of 2.27 pizzas per order, reflecting solid customer engagement and consistent spending behaviour. However, to further capitalize on this, upselling strategies such as offering premium toppings, sides or drinks could help lift the average order value, while A/B testing pricing bundles may optimize conversion rates. Hourly trends revealed a clear peak in orders and revenue between 18:00 and 20:00, aligning with dinner hours, suggesting that staffing and kitchen operations should be optimized during this window and pre-peak promotions like "Happy Hour Pizza Deals" from 16:00–18:00 could stimulate earlier demand. The revenue line chart showed fluctuations that may be influenced by external factors such as holidays or weather, warranting a root cause analysis to identify and address low-performing days. Marketing efforts should be aligned with high-performing periods and replicated across weaker ones to stabilize revenue. Overall, while weekday engagement and peak-hour performance are strong, there is significant room to grow by enhancing weekend strategies, refining operational readiness and leveraging data-driven promotions to unlock further revenue potential and elevate customer satisfaction.

Figure 6: October Revenue.

October's revenue graph reveals a sharp and concentrated spike around the 20th day, reaching close to 4,000, which stands out as the most prominent peak compared to both January and February. This surge suggests a highly successful sales day, potentially driven by a major promotional event, product launch or external factor such as a public holiday or festival. Unlike February's erratic pattern and January's moderate fluctuations, October appears more stable overall, except for this singular peak. The steadier baseline and focused spike may indicate better campaign targeting or improved operational execution. In comparison, October demonstrates stronger control over sales dynamics, with less volatility and a more predictable revenue flow, suggesting that replicating the strategies used during this peak could help stabilize performance in other months. However, the concentration was changed from Friday to Thursday and at 12pm only. This could be the result of outdoor activities and events that was held in this month. Unlike January, there was only peak in the middle of the month, which was a good opportunity to prepare for some huge events like Christmas and make final tunings for any new policy or recipe implemented.
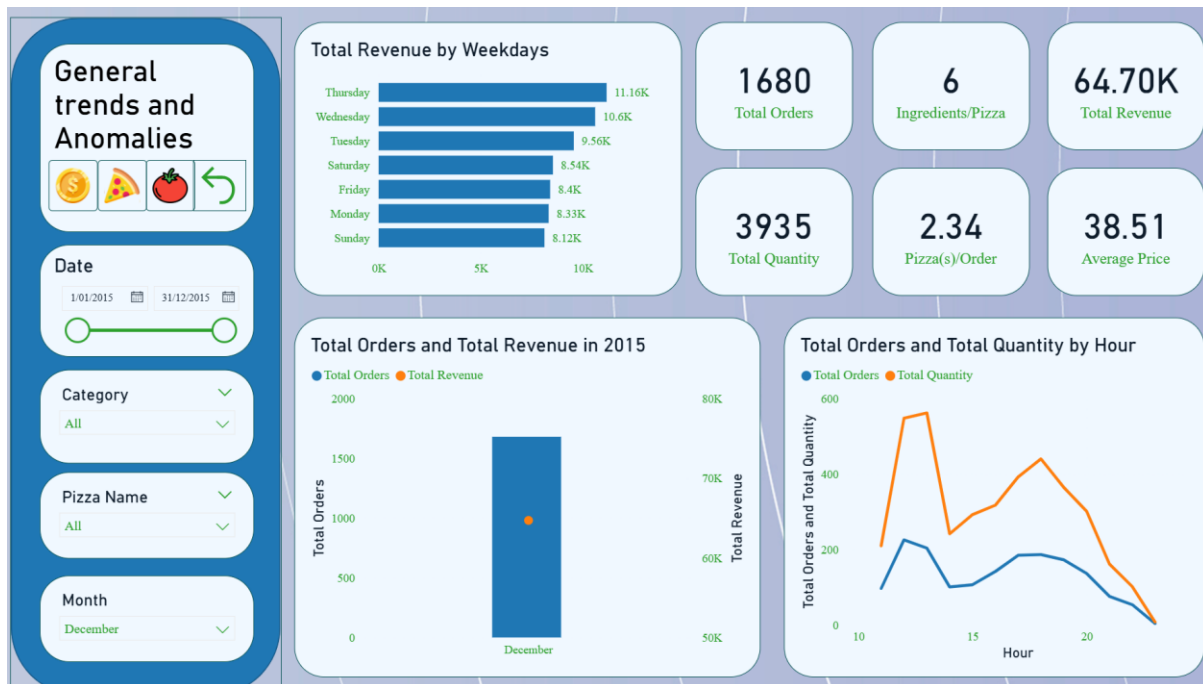
Figure 7: December Revenue

December's performance shows a mix of steady demand and end-of-month acceleration, with total revenue reaching 64.70K and a notable spike in daily revenue near the final days—likely influenced by holiday gatherings, year-end celebrations or bulk ordering behaviour. Weekday analysis reveals Thursday as the top-performing day, followed by Wednesday and Tuesday, suggesting strong midweek engagement possibly driven by workplace orders or promotional targeting. Interestingly, weekends underperform, with Sunday generating the least revenue, which contrasts with typical food service trends and may point to missed opportunities in leisure dining or delivery optimization. Hourly trends highlight 1:00 PM and 5:00 PM as peak times for both orders and revenue, aligning with lunch and dinner rushes. Compared to January's single mid-month spike, February's volatility, and October's early peak, December shows a more structured rhythm with predictable weekday and hourly patterns, culminating in a strong finish. This suggests that while daily fluctuations exist, weekly and hourly consistency can be leveraged for staffing, inventory planning and targeted promotions to maximize profitability.

2) Pizza Menu Performance:

Figure 8: Menu Performance Analyst Dashboard.

a. Ranking Pizza Categories by Quantity, Revenue:

For both Revenue and Quantity, Classic has indicated the most popular category with nearly 15,000 pizzas sold and more than 0.2 million, followed by Supreme with more than 14,000 pizzas sold and nearly 0.2 million. However, the rank had changed between Chicken and Vegie where they swap their position among Revenue and Quantity. It seems that the buyers preferred the easy and repetitive choices, followed by some "Supreme" saved for special occasions. However, I would suggest the restaurant to make some adjustments to the Chicken and Veggie categories to reduce the heavy reliance on Classic and Supreme categories. This could lead to a significant dependence on the availability and buying cost of some specific amount of ingredients.

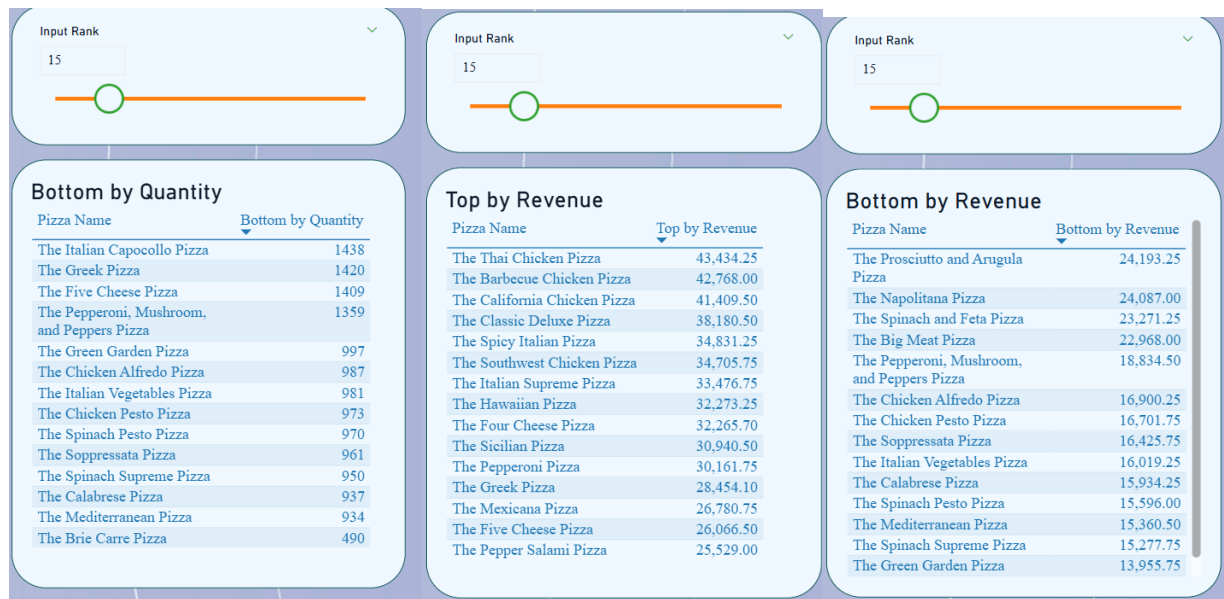## b. Top and Bottom pizzas by Revenue and Category:

Figure 9: Top and Least Pizzas by Revenue and Quantity.

In the top 5 most popular pizza, The Classic Deluxe Pizza keeps the most famous choice, which is aligned with Classic Category. Furthermore, there were two types of chicken pizza also stays on top with Hawaiian and Pepperoni Pizza. This indicated that among those ingredients, the customers favoured classic ingredients like pepperoni and chicken, which might be caused by lower price and familiar taste. However, when moving on to the top Revenue, the Thai Chicken Pizza earned the most while The Classic Deluxe Pizza dropped to the third place. Furthermore, there were several new pizzas like Barbecue Chicken and California Chicken. This strengthened the fact that Chicken contributed most to the income of the restaurant. In terms of bottom 5, surprisingly, it was demonstrated that the pizzas on the list did not change much in the pizza names and most of these were in Supreme and Veggie category (although Supreme devoted the second place in both Revenue and Quantity). Except for the Thai chicken pizza, most of other top pizzas were commonly formula in many pizzas' restaurant. This had shown that the rare recipes like The Spinach Supreme pizza were not quite attractive to the customer. In addition, leaning heavily on those popular formula will reduce the uniqueness of the restaurant, making customers easier to go on other pizza brands with lower price or tastier in their opinions.

3) Size and Ingredient Insights:

a. Size and volume relationship (Refer to Figure 7):

Figure 10: Special Case for XL and XXL size.

Among the categories, the Classic followed the proper order where the Small had taken the most account in quantity, followed by Medium and Large. In addition, in Figure 9, it can be seen that there was only The Greed Pizza that was available in XL and XXL size with the least contribution into the figure. However, looking at the number of quantities, they still hold some impressive number of sales. Unlike Classic, other categories preferred Large size, followed by medium and small, which indicated the amount of pizza per meal for each customer. This can be probably caused by the fact that most of the consumers were workers who needed the fast and easy to fulfill, saving the lunch break for other activities.

b. Ingredient Contribution Insights:

Figure 11: Ingredients Dashboard.

Overall, the most and fundamental ingredient in pizzas was Garlic within nearly 27,000 pizzas over the year. Surprisingly, even though Mozzarella Cheese was also an irreplaceable topping in Italian pizzas, it only took the fourth place behind Tomatoes and Red Onions. However, when digesting deeper into categories, it was shown that the Pepper were the most contribution and least combined with Pesto Sause. However, in Classic, while the Pepperoni was the most preferable ingredient; green pepers were at the bottom of this category. It seems that the most selling ingredients went to the affordable and mostly available instead of exorbitant and harder to prepare. Interestingly, this statement can be further supported by the last two categories by garlic. There were also rare adds on such as Plum Tomatoes, Brie, Thyme, etc were used in these types of pizzas.

4) Order and Ingredients deeper Analyze:

a. Correlation between total revenue and total quantity (Refer to Figure 10):

Based on the Ingredient Dashboard, the presence of a positive correlation indicates that, generally, ingredients sold in higher quantities tend to contribute more to revenue. Using two average segments, the graph was divided into four quadrants for deeper analysis.

In general, the most types of ingredients focused mostly on the bottom left. The higher the Revenue and Quantity, the less dense the ingredient appeared. To be specific, Garlic, Red Onions, Tomatoes and Red Peppers stood out significantly than others. At the cross of average lines, Bacon, Feta Cheese and Pineapple had appeared as these are the common and cheap ingredients. However, there were unique ingredients that created a huge dense at the bottom left such as Thai Sweet Chilli Sauce, Ricotta Cheese, Beef Chuck Roast, etc. Although there are some brand-new ingredients that blew a modern trend in pizzas, there were also expensive ingredients that the owner should find replacement in case of raising prices or unavailable such as Smoked Gouda Cheese, Zucchini, Soppressata Salami, etc.

b. Correlation between average pizza prices and total sales volume:

The scatter plot reveals a negative correlation between average pizza prices and total sales volume across categories. While the Supreme category has the highest price and revenue, the overall trend line slopes downward, indicating that as prices increase, total revenue tends to decrease. This suggests that higher prices may suppress demand, and moderately priced categories like Classic and Veggie generate strong revenue due to higher sales volume.

5) Order Frequency and Timing:

a. Frequency of Single Item vs Multi Item:

Multi-item orders dominate the order landscape, accounting for 61.59% compared to 38.41% (8K orders) for single-item orders. This indicates that most customers prefer purchasing bulk number of items, possibly due to personal consumption habits or pricing sensitivity. The hourly breakdown also shows that multi-item orders consistently outpace single-item orders throughout the day, reinforcing their prevalence.

b. Average time Interval between Orders:

The average time interval between orders is nearly identical for both single-item and multi-item orders, 10.90 minutes for single and 10.85 minutes for multi. This minimal difference suggests that order timing is relatively consistent regardless of order type, implying a steady flow of customer activity throughout the day without significant clustering based on order size.

E)   Conclusion:

In conclusions, the pizza restaurant had a fine performance with huge attraction during popular events like School Holiday and Christmas. Normally, to avoid surcharge, customer tends to eat out on near weekends like Thursday and Friday, which also aligned well to this restaurant. However, when digest deeper into the menu, I found that although the pizza categories hold harmonious rank, the least type of pizzas in Chicken category had led to low quantity. This suggested that the owner should increase the diversity between categories and make sure that there will be no categories that had been left too far behind. Similarly with size, the XL and XXL only appeared in the Greek pizza, which has huge potential when implementing with other kind of popular pizzas like The Classic Deluxe Pizza. In the ingredients, most of the toppings were either rare or hard to produce ingredients. This raised a concern about heavy reliance on these newly created pizzas. Instead, these unique ingredients can be applied to some common pizzas to increase its characteristics among other competitors in different pizza brands. In addition, some decisions should be made to find alternative ingredients that increases the average revenue and quantity. Furthermore, it was impressive that the ratio of multiple items orders the restaurant had made. The average time interval was also kept in proper amount to ensure the stability of staff's workload, especially in preparing for the following days. As a result, despite some minor hinderance, the restaurant still in favour of an enormous amount of customer. It would be more attractive if more promotions or adjustments are made to fascinate more customers during the normal months instead of drawing heavily on a few months like July or December.