Feynn Labs

Restaurant Menu Design based on Customer Test Behavior

Acknowledgment

I am Yogeshwar Santosh Manerikar Intern at Feynn Labs.

I built this project on a mountain of incredibly useful ML aspirants. The results of the project are useful for the restaurant business.

Instead of working with a traditional subject, I chose ***Restaurant-Menu-Design-based-on-Customer-Test-Behavior***. I would also like to thank you, dear reader, for reading this report without a big writer name behind it.

I would also like to thank Mr. Sanjay Basumatary (Founder, and CEO of Feynn Labs) for their continued guidance and feedback throughout the course of the project.

In this Mount Everest journey, every member is holding hand in hand to serve the mountains, I would thank to my all references for serving me knowledge.

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PROBLEM STATEMENT:-

Identifying the trend in the sales of food items. So it helps the restaurant to predict the day-by-day food master menu.

Why this field?

A lot of food is being wasted across the country. Restaurants plan its menu according to the test behavior pattern of customers. Restaurants can get max profit with minimum utilization of resources.

All previously bill data is with restaurants. I used that data to build one master menu for a restaurant

Many solutions are being suggested to solve this problem. AI is one among them and I strongly believe that AI can contribute a lot to this field. AI can not only solve problems in this field but it can also optimize the techniques that are being used for decades.

BUSINESS NEED ASSESSMENT:-

- Many local food chains know that their sales follow a certain trend and know what sort of groceries they need to buy and store during which season Weekday and weekends But they do not know it accurately and most of the time they miss one thing or the other.
- Customers are also satisfied with the menu and their test matches with the menu card.
- Customer satisfaction is more important.
- This analysis will cut down their costs and reduce the wastage of food.
- Helps to Grow the restaurant

TARGET SPECIFICATIONS:-

- Customer satisfaction.
- Reduced the cost of food.
- On the basis of popular dish trained they can hire a cook.
- Help treduceed the cost of food and focused more on amenities.

Data sources

1. Restaurants food consumption

Data collection was the hard part of the project. Since the dataset wasn't given readily, we had to explore and find datasets ourselves from various sites like the Indian census website. However, I can find a few datasets on the above sites and Kaggle. I concluded that search because every time we researched we only concluded that this type of data is not a freely available and the most efficient way of getting this type of data is to survey customers directly

Data Pre-processing and Exploratory Data Analysis

Exploratory Data Analysis (EDA) is an approach/philosophy for data analysis that employs a variety of techniques (mostly graphical) to

1. maximize insight into a data set;
2. uncover underlying structure;
3. extract important variables;
4. detect outliers and anomalies;
5. test underlying assumptions;
6. develop parsimonious models; and
7. determine optimal factor settings.

The EDA approach is precisely that--an approach--not a set of techniques, but an attitude/philosophy about how a data analysis should be carried out.

Most EDA techniques are graphical in nature with a few quantitative techniques. The reason for the heavy reliance on graphics is that by its very nature the main role of EDA is to open-mindedly explore, and graphics give the analysts unparalleled power to do so, enticing the data to reveal its structural secrets, and being always ready to gain some new, often unsuspected, insight into the data. In combination with the natural pattern-recognition capabilities that we all possess, graphics provide, of course, unparalleled power to carry this out.

We have carried out an extensive exploration of the available data to get as much understanding of the patterns as possible. For this, we have used libraries like Numpy, Pandas, matplotlib, and plotly. Express.

Firstly we had to check for any missing values from the columns and also do a thorough check on if data values are consistent or not which was our main focus as analysis of inconsistent data is as good as garbage. Below are the steps that were taken to carry out EDA as detailed as possible by us.

Data shape :-

```
In [13]: df
```

Out[13]:

	Shift	Day Type	Day	PartySize	MenuCateogry	MenuItem	ItemPrice	ItemQty	Date	Time
0	Lunch	Weekday	Tuesday	4	Starter	Gobi manchurian	14.00	1	2019-01-01	11:30:00
1	Lunch	Weekday	Tuesday	4	Starter	Tasty flatbread	11.00	1	2019-01-01	11:30:00
2	Lunch	Weekday	Tuesday	4	Vegetable specials	Sarson da saag	15.00	1	2019-01-01	11:30:00
3	Lunch	Weekday	Tuesday	4	Vegetable specials	Paneer vindaloo	16.00	1	2019-01-01	11:30:00
4	Lunch	Weekday	Tuesday	4	Breads	Garlic naan	3.50	2	2019-01-01	11:30:00
...	...	...	...	...	...	...	...	...	...	...
18095	Dinner	Weekend	Sunday	0	Rice specials	Rice	5.00	1	2019-06-30	20:30:00
18096	Dinner	Weekend	Sunday	0	Breads	Tandoori roti	2.75	1	2019-06-30	20:30:00
18097	Dinner	Weekend	Sunday	0	Breads	Naan	2.75	4	2019-06-30	20:30:00
18098	Dinner	Weekend	Sunday	0	Vegetable specials	Kadahi paneer	16.00	2	2019-06-30	20:30:00
18099	Dinner	Weekend	Sunday	0	Breads	Garlic naan	3.50	2	2019-06-30	20:30:00

18100 rows × 10 columns

It contains the data noise .converted well stretchered data .

```
In [13]: df
```

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	Shift	Day Type	Day	PartySize	MenuCateogry	MenuItem	ItemPrice	ItemQty	Date	Time
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Benchmarking

Generally, Benchmarking involves comparing project processes and performance metrics to either industry best standards and practices or successful completed projects. For this there is a need to continuously search for implementation of better techniques which lead to better results or outputs.

Restaurant and the restaurant customer should be satisfied with minimum cost and best test respectively .

Every time restaurant customers feedback matters for this process makes successful.

APPLICABLE REGULATIONS:

- Restaurant customer data will be secure
- Customers feed back data will be secure
- Model is applicable for one region of the customer
- Region-wise change the test so it will help big chain restaurants
- It will help for delivery paternar also like swigi, zomato

BUSINESS OPPORTUNITIES

The target customers here are mainly restaurant chains and Big Hotels that have a good number of customers.

The customer behavior and test depends upon the time. Project give one master menu for the restaurant. If the model is successfully implemented for the previously mentioned targets, the model can be expanded for the Master menu that is in multiple cities.

In these time constraints like week-ends, weekdays are there.

CONCEPT DEVELOPMENT: -

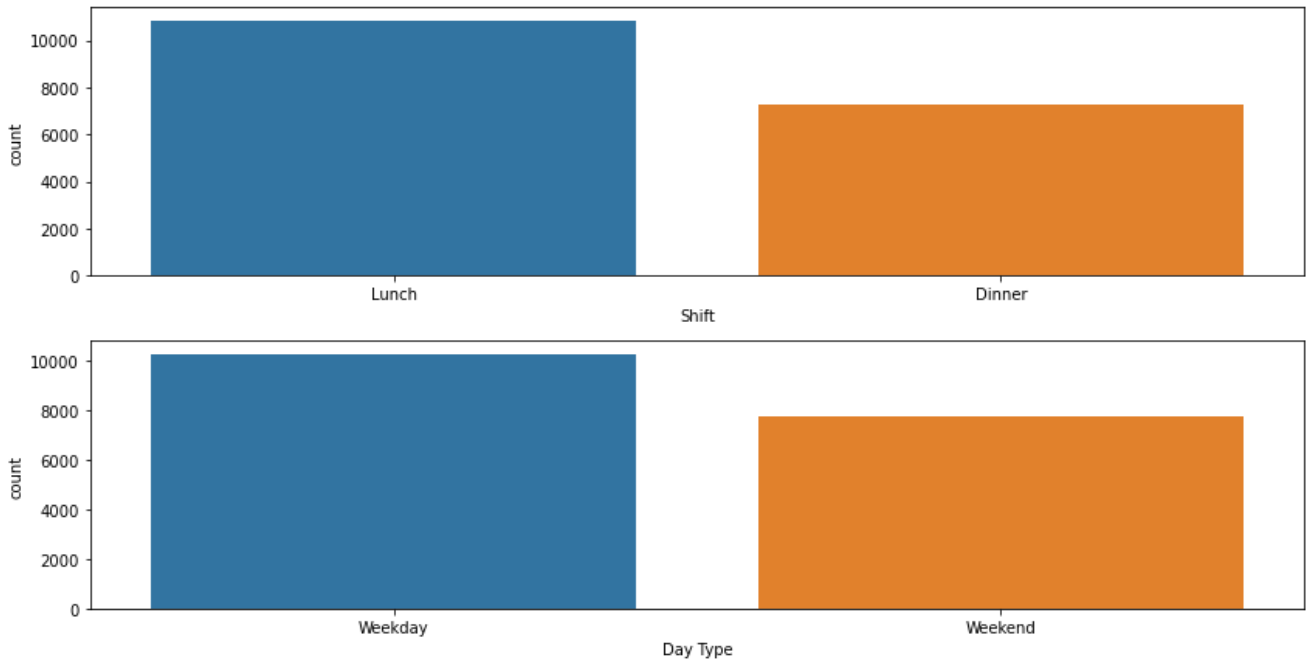
We must first understand the environment before we start working on a model and the type of food, the people in that region like and what are the traditions there. After gaining sufficient knowledge about the environment we have to start collecting data. After collecting the data, we have to perform EDA which is used to identify patterns in the dataset and it will help us zone in on the areas that are leaking money. Visualization will help a lot here. Once we have found the trend and outliers, the next step is to use the basic regression models and time-series models , in which we will fit our training dataset and see what sort of results we will be getting.

CODE IMPLEMENTATION:-

In [24]:
```
def am_or_pm(x):
    if x<12:
        return 'AM'
    return 'PM'
df['AM/PM'] = df['Hour'].apply(am_or_pm)
```

In [25]:
```
non_veg =      ['Masala chicken wings','Cocktail chicken samosas', 'Chicken korma', 'Chicken biryani','Chicken tikka masala',
           'Chicken saag','Kadahi lamb','Coconut chicken curry','Butter chicken','Fish pakora', 'Shrimp strips',
           'Fish korma', 'Fish curry','Tasty sliders : chicken paneer', 'Spicy chicken bites','Tikka rice bowl : paneer | chicken'
          ]
def veg(x):
    if x in non_veg:
        return 'NV'
    return 'V'
df['NV/V'] = df['MenuItem'].apply(veg)
```

Converted the veg and nonveg and lunch or denier . so it visualized better



This is the weekend and week days results . visualization of different parameters. Hourly, monthly,party size order ,order count on day all parameters.

Results from plots:-

From the above plot let's get some inferences

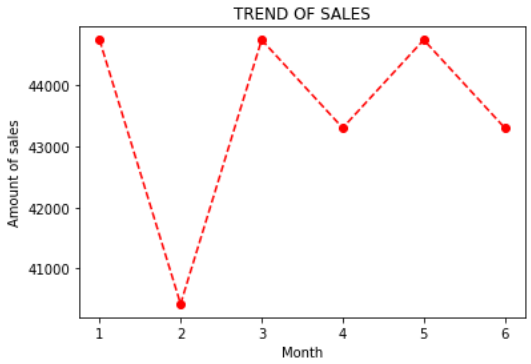
- The customers come to the restaurant mostly during the 'Lunch' shift as evident from the shift count value.
- One would assume that weekend count will be the most but the count for weekday is more. This is because it is the count of 5 weekdays to count of 2 weekend days.
- Sales on all days is almost the same excepts Monday.
- People come to the hotel to party as a group of 5. Based on this the hotel could give some discounts to party size of 5 to bring in more customers.

- Breads is the most preferred food in the MenuCategory.
- People order just one quantity most often.
- Sales on almost all the months is the same.
- Most customers come to eat around 12 which is inline with the higher 'Lunch' count.
- Count for PM is more because the hotel opens around 11 AM.
- Most of the customers go for vegetarian foods. Note that vegetarian includes sweets and snacks as well.

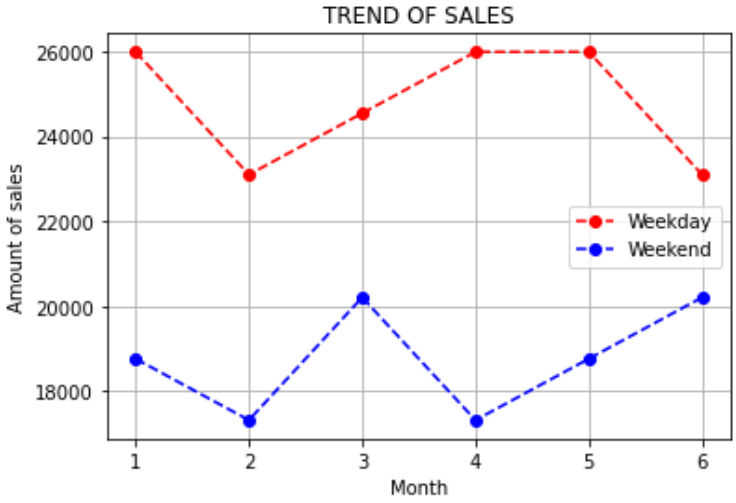
```
len(df['Day Type']=='Weekday')/5,len(df['Day Type']=='Weekend')/2
```

```
(3620.0, 9050.0)
```

The above values are average sales on a weekday and average sales on a weekend. It clearly indicates that most customers come during the weekend



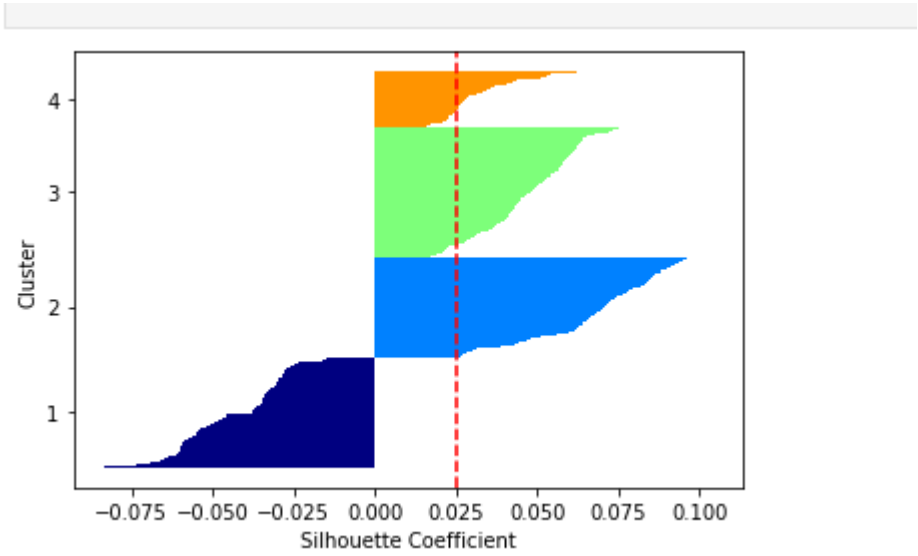
The above plot shows that the revenue the hotel is making is erratic. There is constancy in their sales. This means that they are lacking an effective business model. Based on the above plot let's see the trend for weekends and weekdays



Towards the end the restaurants weekend sales seems to have picked up but the weekday sales has not been increasing.

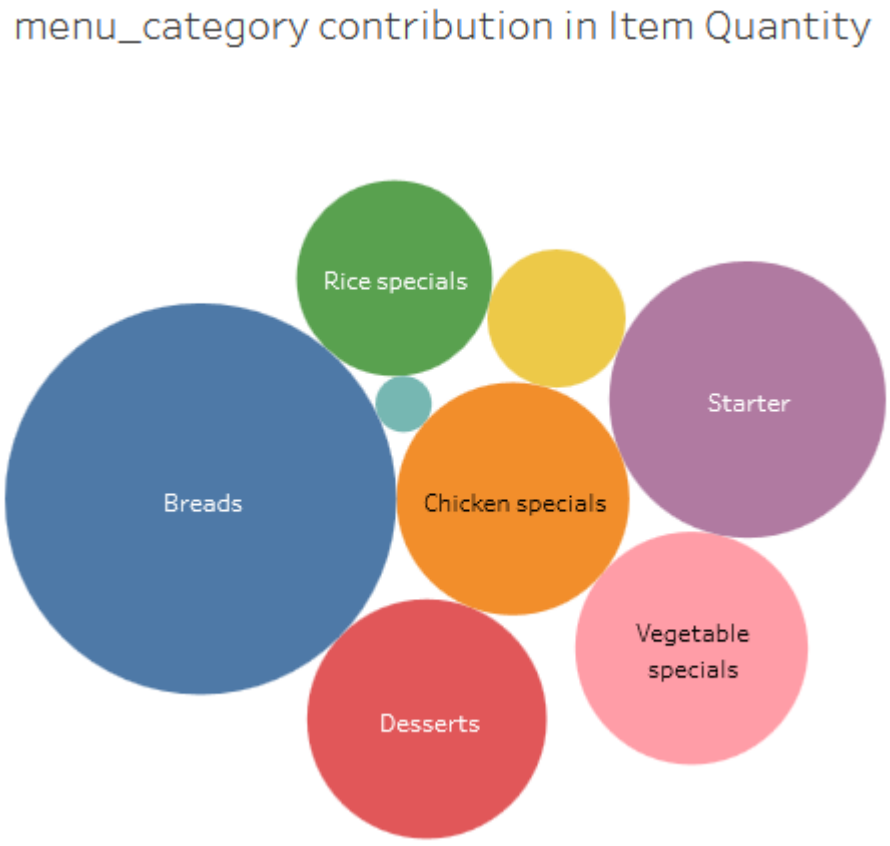
In [82]:

```
plt.plot([2,3,4,5,6,7,8,9,10],sse,marker='o',linestyle='--')
plt.xlabel('Number of clusters')
plt.ylabel('Sum of squared errors')
plt.title('No of clusters v SSE');
```

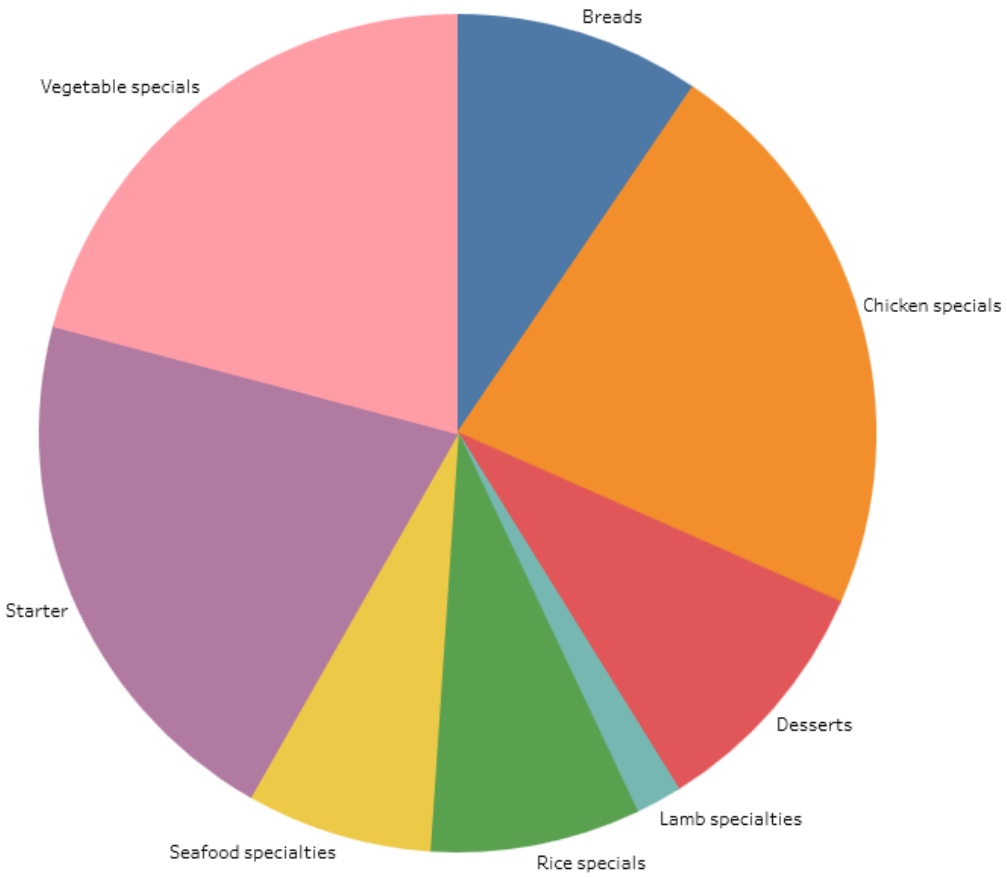


Dashboard :-

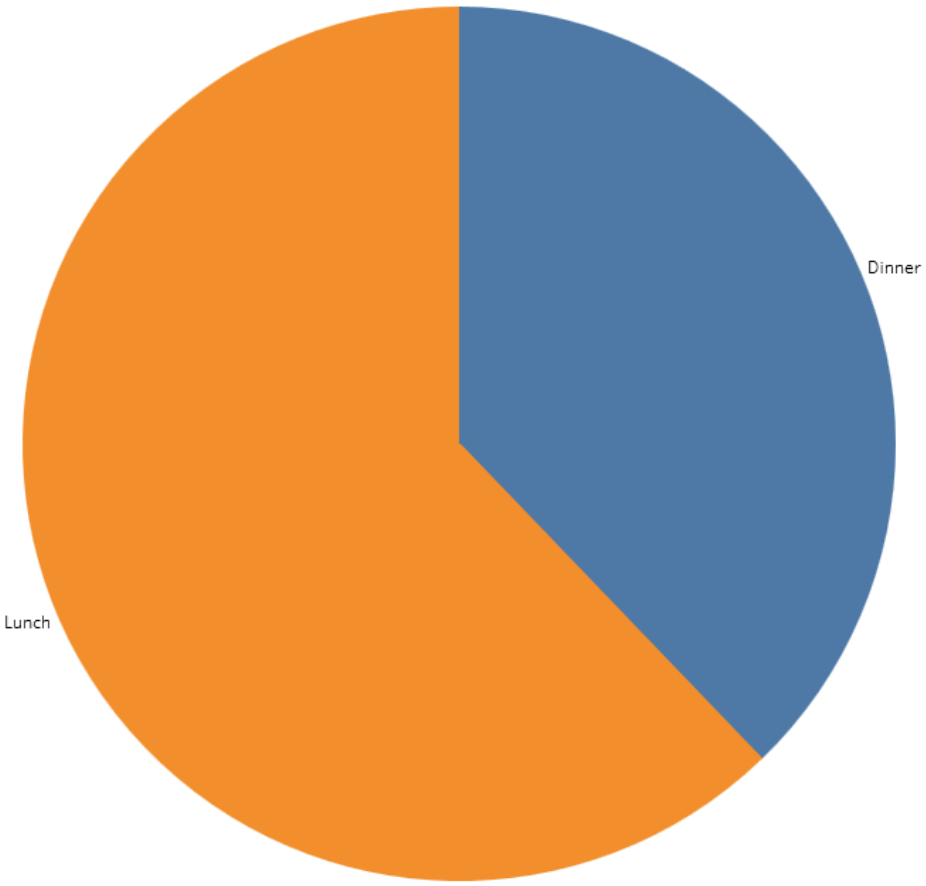
https://public.tableau.com/views/RestaurantMenuDesignbasedonCustomerTestBehavior/menu_categorycontributioninItemQuantity?:language=en-US&:display_count=n&:origin=viz_share_link



menu_category contribution in total Item price



shift contribution in total item price



Conclusion :-

- According to EDA and model Lunch is most important and people qurious about the nan and bred
- For Weekends dinner is having more customer .
- And all others are mentioned in above

BUSINESS MODEL

I'll look at the suggested business model for the proposal offered previously in this section of the report.

There are various business models to choose from, but we believe the 'Consulting Business Model' is the best fit for our concept.

CONSULTING BUSINESS MODEL:

Because each customer (hotel) will have various features, we must advise them depending on those features.

However, before implementing this model, the company's ML engineers must become familiar with the local hotel business, as this approach necessitates the extensive understanding of the sector.

Financial Modeling

It can be directly launched into the retail market. Let's consider our price of product = 3500

Financial Equation: Y = X * (1 + r)t

Y = (X)* (33.2)t

Y = Profit over time, X = Price of our Product, r = growth rate, t = time interval

1+r = 1 + 33.2% = 1.03

PRODUCT DESCRIPTION:

The product combines technology with one-on-one customer connection.

I'll break out the procedure in our product step by step.

1. I meet with the customer (hotel owner or representative) and discuss their requirements.

I need to get the goals for our product on the initial engagement, such as how many months our product should forecast for sales?

Is the product required to maximize the purchase of all goods or a specific group of foods?

Will it be okay if we consult a competitor hotel at the same time but with a different team?

How long will they require My assistance?

Special dish?

Cook trained in which dishes?

2. After customers have a good understanding of the product from step 1, they should be given a personalized account on our website where they can log in and upload their dataset as well as the requirements for other services.
    - Trends
    - Most demanded dish
3. If the customer is unfamiliar with technology, one of the team members should guide them through it.
4. After receiving the necessary information from the customer, I may begin developing the ML model and working toward the goal established in step 2. Step 2 is crucial since it establishes the model's basis.
5. After we have uploaded the conclusions on their personalized account once again, we have to meet the client. This time we will have to give them the results that they had asked for in step 1

MARKETING PLAN:

For marketing our product, first we should collect the details of well-established to up and coming hotels in the town or city. For each hotel, we must determine the probability of them integrating technology into their business. Depending on the probability and the type of hotel we must approach the hotel owners or representatives and explain to them our product and it’s potential, how their sales will increase by using My product

If they want only the results of or dashboard I am ready to deliver them . Big hotel chains can be have different data depends upon the different regions .

References:-

https://www.ibef.org/industry/real-estate-india/infographic https://www.ibef.org/blogs/india-to-become-the-edtech-capital-of-the-world#:~:text=According%20to%20Tracxn%2C%20a%20data,by%20K%E2%80%9312%20education%20specialists.

https://www.ibef.org/industry/biotechnology-india/infographic

Book:-

Market segmentations by Sara Dolnicar

Hotel blue star data

Tableau :-

Youtube chanals