

# Appetize Proposal

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## Intro

Appetize is a Vancouver based start-up aiming to digitize the dining experience for customers as well as restaurant owners. Appetize offers a mobile application for customers to be able to use a digitized menu, order food, and pay for it. We track the interaction of users and the application to do data science on top of that and give useful insight to restaurant owners about their restaurants and their customers. This project is about using the data and generate useful visualization for restaurant owners.

## Data and Task

**Task:** We gathered user requirements by writing common use cases of the system. To do so, we wrote the primary goals of the system, talked to restaurant owners to see what kind of insight they need. We have a list of user requirements and we can interpret them as user tasks. Initially, we tried to assign an individual visualization to each task to get a better intuition of how they may look. Subsequently, we tried to aggregate visualization choices by using reduction and interaction between them to create a basic framework of how the ultimate visualization would look.

User requirements can be grouped into certain categories. Each of them may have more details that are not listed here. Our target users in our system are restaurant owners which we try to provide insight for.

- Restaurant owners need information about whether an item is profitable or not.
- Restaurant owners want to reorder the menu based on customers' feedback.
- Restaurant owners need to identify loyal customers to give promotions.
- Restaurant owners need to know when their restaurants get busy to manage their resources.
- Restaurant owners need to compare their restaurants with similar restaurants (based on some defined similarity factors)
- Restaurant owners need to know how empty their food containers are, to effectively manage their inventory.

**Data:** Basically, a fine estimate of different types of data that we have can give us a fair intuition of data both syntactically and semantically.

Hopefully, the data scheme for the proposed system is already defined which means we already know the table names and how data look like in each table. There might be some changes in the data scheme based on some specific requirements. In the data abstraction step, we tried to find out what kind of data is missed to support our suggested list of requirements. After some

potential changes into the database, we would have the final data scheme to start with data synthesis.

To inspect the target dataset a little bit more in detail, we provided a brief explanation of what kind of elements we have in our system. Fundamentally, we gathered these elements:

- Restaurant: Present a restaurant in the system. It contains ID, name, location, website, address, phone, ...
- Menu: Present a menu in the system. It can contain different categories.
- Category: Present a group of items.
- Item: Present a specific food in a restaurant.
- Ingredients: Represents the item's ingredients.
- Order: Present a specific order of food by a certain user at a restaurant in a particular time.

## Proposed Solution, Scenario of Use:

This project would be of interest for restaurant owners in the context of Appetize. The analyze part would give restaurant owners a better insight about their customers, their menu, and their food items to be able to better manage their restaurant. After they signed up for the service, they would have access to the "Analyze" part in the web application under the name of their restaurant.

The autonomy of restaurant owners to change anything related to their restaurant is limited to the food items they have, their menu, their promotions, and their inventory management. I will briefly explain each of them in the below section.

### Items

**Description:** After pressing on "item", we would show them some statistics about their items. We have not figured this part out yet but, the question is "Is that specific item profitable or not?"

### Menu

**Description:** Here, the main question is "Which part of the menu has been clicked more". The answer to this question is very important since the restaurant owners are able to reorder their menu.

**Use case:** Imagine we are halfway into an evening, and we are running out of some of the food items and some of the other food items are left. If restaurant owners know which part of the menu has been clicked more, they can render the Menu to be able to sell their desired food items more.



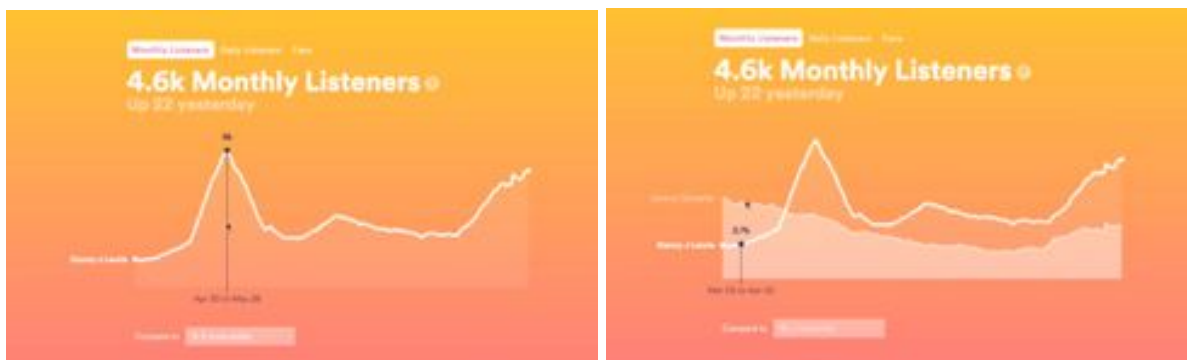
**Solution:** Our solution is a heat map representation on the menu with diverging colormap (Red and Green would be the main colours with having White as the neutral colour)

## Customer/Promotion

**Description:** Having a more interactive relationship with customers is very important and plays a crucial role for any business to flourish and succeed. The main questions in this section are “Q1, Which customers are loyal and which ones are not?”, “Q2, Which customers should be given promotions”, “Q3, What time is the busiest time for the restaurant?”.

**Use case:** The main use case for Q1 is to find the least loyal customers and try to encourage them to come to the restaurant more often. Another use case could be to give some rewards to the most loyal customers. The motivation for Q2 is to motivate/reward different customers based on their history in the restaurant. Q3 can lead to happy hour suggestion and food suggestion

**Solution:** The first solution would be to show the number of customers/average of orders/number of orders for a time slot, for example, the last 3 weeks (left figure).



We should be able to compare each restaurant with an average of similar restaurants as well (right figure). The question that has not been figured out yet is “How should we define some restaurants as similar?”.

The solution to having an interactive relationship with customers would be as follows:



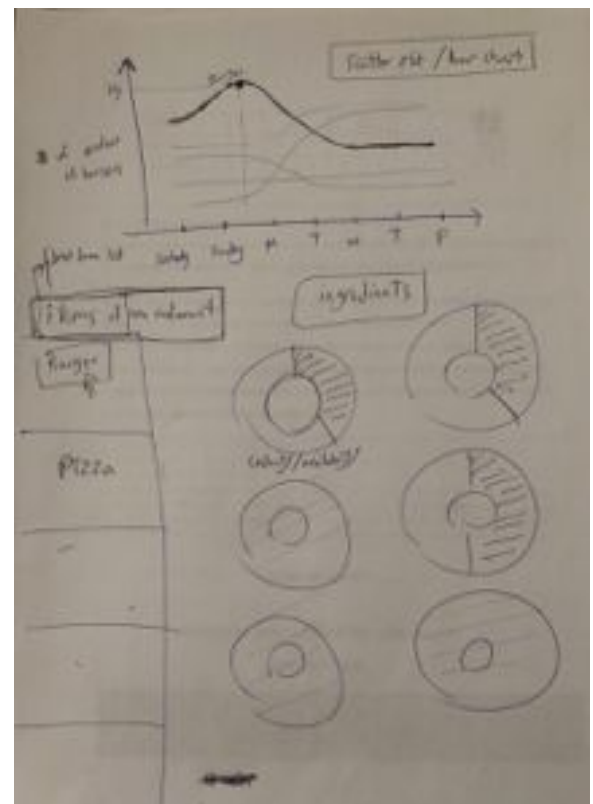
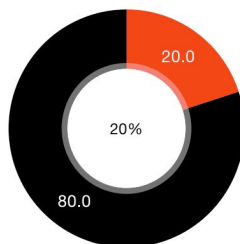
In this solution, the X-axis would be the loyalty of customers (which would be defined by a formula) and the X-axis would be the average of purchase. Each point represents a customer that would be located on this graph based on their loyalty and the average of their purchases. The points would be colour coded and the restaurant owner can select one or a group of them to offer some promotions to them.

## Inventory management

**Description:** Inventory management is a very hard task for restaurant owners and it has been done manually most of the time. We want to show the restaurant owners how much of their ingredients are left and whether they need to order anything soon or not.

**Use case:** The use case would be for restaurant owners to order their ingredients more wisely.

**Solution:** After clicking on a specific food such as burger from the left side menu, the relevant ingredients become flashy on the right side section as well as the related line for a burger in the above graph. The above graph shows the distribution of the orders of that specific food during the week. Therefore, if restaurant owners click on a burger and see that they are almost running out of the relevant ingredients of that food and based on the above graph they realize that people tend to order a burger a lot in the next couple of days, they would order some ingredients to be able to serve their customers. Each ingredient is represented by a pie chart which shows the capacity and the availability of each ingredient.



## Proposed Implementation Approach

The prerequisite for the basic implementation of our proposed system is to synthesize data. Although we already know the data scheme, we have to mock the real data to use them for visualizing, testing and enhancement of our implementation. For this purpose, we created a copy of the current database, which has all the tables and a few numbers of sample data. Therefore, the most important task for data synthesis is to find the best and complete set of insert queries in order to represent different real-world scenarios. To do so, we will code a script to take data format as the input and gives insert queries as the output. Then we plan to execute insert queries on our database to have the database populated. Now we can interpret this database as the input of our visualization solution. Eventually, we would replace the synthesized data with the real data we gather from the real world.

To implement our visualization solution we are considering two approaches:

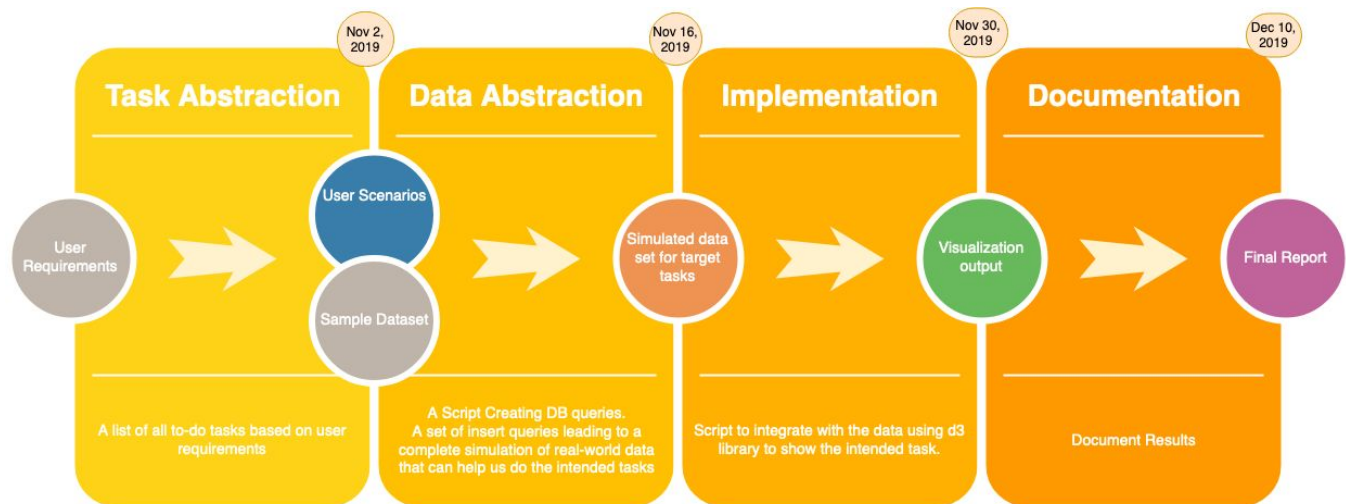
First, writing a script to work with the data using D3, a well-known Javascript library for manipulating arbitrary data documents for visualization. The advantage of this approach is that we can integrate our js script into the final application code which is in python with no additional cost. Moreover, D3 gives us more choices for how to visualize data.

What we have to do first for the implementation is to find a set of query formats that can be used to carry out each task. Then we would code a software program that fetches proper data from the database. Then, our goal is to use D3 to transform extracted data into the type of visualization that would work the best.

Second, finding a prominent interactive data visualization software, which is ready to use as a flawless product. We are considering Tableau and Grafana as our final choices. This method requires less coding practices which give us more time to design better visualizations. Although we are considering both options, we are more inclined to the former choice due to the fact that our final goal is to integrate the visualization output to the web application which is already designed for Appetize.

## Milestones and Schedules

We started with task abstraction and we plan to gather all basic tasks of the system in one week which means by Nov second. After we gathered tasks, we try to figure out more interactive solutions. We would go through data abstraction and we hope to finish this step in two weeks by Nov 16th. Data abstraction also includes finding proper queries for data synthesis. It means by Nov 16th, we have all our dataset ready and we can start working with it using D3. Also in this milestone, we would figure out what query formats are needed to implement each task. We would devote 2 weeks for the implementation to be completed. That implies by Nov 30th we would have our js scripts written that can be integrated properly into the web application. After Nov 30th, we would devote one week for documentation and creating a report for the project, by Dec 10th.



## Previous Works

There have been some products that are currently working on customers' dining experience. The most famous one is Google Map that lets users explore different restaurants on the map and see pictures and the menu of each restaurant. However, Google Map does not give a fully interactive and smart solution for dining out. Moreover, it does not provide any insight for restaurant owners. Yelp is a more relevant product that targets helping both customers and restaurant owners. It is the most widely used restaurant information software across the US. Nevertheless, it does not provide restaurant owners with productive visualization solutions. Besides, It has fewer detailed features about restaurants, which implies having less choice for visualizing. Fukuhara has worked on improving service processes based on visualization of human-behavior in one chapter in his book[1]. This work tries to enhance the efficiency of indoor services in restaurants. Anil Bilgihan has analyzed online customer reviews for restaurants[2] and there are some other works in this area specifically[3][4][5][6]. But generally speaking, researchers were more focused on the tourism and hotel industry, and there is little analysis directly for visualizing information for restaurants.

[1]: Improving Service Processes Based on Visualization of Human-Behavior and POS Data: A Case Study in a Japanese Restaurant; Tomohiro Fukuhara, Ryuhei Tenmoku, Takashi Okuma, Ryoko Ueoka, Masanori Takehara, Takeshi Kurata, 2014.

[2]: Anil Bilgihan, Soobin Seo & Jihee Choi (2018) Identifying restaurant satisfiers and dissatisfiers: Suggestions from online reviews, *Journal of Hospitality Marketing & Management*, 27:5, 601-625.

[3]: Jurui Zhang. (2019) [Listening to the Consumer: Exploring Review Topics on Airbnb and Their Impact on Listing Performance](#). *Journal of Marketing Theory and Practice* 27:4, pages 371-389.

[4]: Ricardo Godinho Bilro, Sandra Maria Correia Loureiro, João Guerreiro. (2019) [Exploring online customer engagement with hospitality products and its relationship with involvement, emotional states, experience and brand advocacy](#). *Journal of Hospitality Marketing & Management* 28:2, pages 147-171.

[5]: Tao Zhang, Junyu Chen, Baoliang Hu. (2019) Authenticity, Quality, and Loyalty: Local Food and Sustainable Tourism Experience. *Sustainability* 11:12, pages 3437.

[6]: C.M. Sashi, Gina Brynildsen, Anil Bilgihan. (2019) Social media, customer engagement and advocacy. *International Journal of Contemporary Hospitality Management* 31:3, pages 1247-1272.