CS491 Senior Design
Project Specification Report

Appeatite

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1. Introduction

The restaurant industry is one of the largest industries in the world. The size of this industry can be explained as it targets one of the most essential needs of mankind: food. With steady development in the field of computer science, applications in the restaurant domain are still scarce.

Through our research and experiences we have observed and learned about the various amount of issues regarding restaurants and their overall customer experience. One major issue is the waiting time many people have to undergo due to popular restaurants being overcrowded with people, at peak times. This results in unsatisfied customers which in some cases can hurt the restaurant's business and reputation. Furthermore, customers face many inconveniences when ordering their food to the waiter. Such issues include social pressures people face when having to order in a limited time frame and learning about unavailable items after having already decided on their order. Updating a restaurant menu is another common issue that restaurants face. Printing out new menus every time there is an update can prove to be rather costly. Furthermore a common practice among restaurants is to stick new price tags on the old menu, which destroys the aesthetics of the menu. Traditional menus at times can also be ambiguous and lacking detail, these issues can be easily solved using current technology. Additionally, fancy restaurants in Turkey usually hire two sets of main workers, which include the waiters, who take the customer's orders, and the bussers, who deliver the food and clear up tables. This results in a large amount of employees that the restaurants' owners have to pay for. These issues seem to be very minor if looked at individually, however, together they create a very inconvenient, unsatisfactory and improvable system. Using the aid of software engineering customs the current system can be ameliorated and benefit all the stakeholders involved in this system.

With the knowledge and experience we have gained throughout our time as computer engineers in Bilkent, we will implement a system that will allow restaurants to conduct

their business in fast, efficient, and effective ways while addressing all the problems they face today as mentioned above.

1.1 Project Description

Appeatite will contain a digital version of restaurants' menus displayed using a mobile application. It will be an interactive process in which both users and restaurant employees will participate. When a customer enters a restaurant that is using our service, they will have to scan a QR code placed on their dining table, using the application's camera. The users will then be prompted to a screen which will display the generic details of that restaurant's menu. The menu will consist of information such as meal names, ingredients, calorie counts, images, proportions and prices. The interface of the application will be simple and abstract, in the sense that information will be shown on user's request. Then, upon selecting the desired items, the restaurant will be notified that an order has been placed and they will be able to detect from which table, as all QR codes will specify to a different table location.

The restaurant will require one employee to manage this using one simple desktop computer. We will create a web application for the restaurant to manage their orders. Furthermore, they will be given an interface allowing them to add relevant information about their food items, and create their initial menu. We have considered the possibility that some old fashioned users may wish to simply speak to someone to order, and therefore we will implement an option to call a worker to come and assist them with their order, answer any questions or take the order manually.

Since many customers have trouble deciding on their order, we will have a simple review system where previous people who have ate at the restaurant can leave a rating and small review on particular dishes.

We will also use machine learning techniques or simple algorithms to determine an expected wait time for each dish. Thus, customers can order food accordingly to the amount of time they have and can have some knowledge on how long they will be expected to wait.

The benefits for the customer include:
- o Conveniences of ordering food
- o Fast service
- o Access to an up-to-date menu
- o Ability to learn more about what they are ordering
- o Ability to remove specified ingredients from a dish
- o Call for assistance at the touch of a button

The benefits for the restaurant include:
- o Minimal hardware required
- o Have a up to date online menu at all times
- o No need to hire extra employees; save costs
- o Attract new customers with this new system

1.2 Constraints

1.2.1 Economic

Economic constraints are one of the primary factors affecting the design of software products. To maintain the economic feasibility we have chosen to build our project on an Android Platform, as this official Integrated Development Environment (IDE) is freely accessible and does not require us to purchase any new hardware since it is able to run on both Linux and Windows Operating systems. In addition, we can run, debug and test our application using our personal android cellphones and will not need to purchase testing devices. With regards to the database we will use Cloud Firestore from Google.

Since this is a Database as a Service (DBaaS) we will eliminate costs related to maintaining the database and operational costs and pay only for the actual data reads and writes to the database. Most importantly, Cloud Firestore offers free quota that equates to 1 GiB of stored data, 50 000 document reads per day, 20 000 document writes per day, 20 000 document deletes per day and Network egress of 10 GiB/Month [1] which is more than enough for the development purposes. Node.js javascript environment, Typescript programming language and VS Code Integrated Development Environment which we are going to use for the database administration and cloud functions deployment are all open-source and free[2] [3] [4].

1.2.2 Environmental

Our application's environment will consist of eateries. The design of the product makes it very easy to integrate to the mentioned surroundings. With regards to the constraints, placement, and aesthetics of the QR code badges must be considered. A restaurant theme is important to the owner and customers thus the QR codes must be placed in such a way that they do not disrupt the restaurant's theme and are easily accessible for the customers. Another consideration must be made regarding the computer terminal which will be used by the restaurant to manage Appeatite, considering current restaurant designs and based on our personal experience most restaurants today already possess at least one computer at site.

1.2.3 Social

Integrating Appeatite system into restaurants can cause users to miss out on the one-to-one conversation with the waiters. Some users may desire this conventional one-to-one experience or simply may need some assistance. Taking into account these constraints, the system will include a call button on the user application so that if the user wants assistance they can immediately call one of the restaurant's staff member.

1.2.4 Political

The fixed and variable costs for the eating places will be decreased since our application aims to decrease the number of waiters in the given restaurant. Therefore,

the employees whose jobs will be replaced by this system will lose their hypothetical income.

1.2.5 Ethical

Ethical constraints can be defined by IEEE Code of Ethics. We as developers of Appeatite, "in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members, and the communities we serve, do hereby commit ourselves to the highest ethical and professional conduct and agree" not to violate the IEEE Code of Ethics[5].

1.2.6 Health and Safety

The product that we are aiming to build does not pose any explicit self-hazards, since it requires the hardware that the customers already possess and are familiar with. Furthermore to ensure the user information safety, personalized data will not be shared with any other third party.

1.2.7 Manufacturability

If we can ensure that the product we are building can be manufactured with relative ease at minimum cost and maximum reliability we can ensure good manufacturability. In our case after we build Appeatite, we can sell the product to many eating places where additional cost will only be additional data reads and writes to the database. The marginal benefit from every new restaurant will only increase while the fixed costs will stay the same.

1.2.8 Sustainability

Sustainability refers to the ability of an engineering design to perform under normal conditions for a given length of time. The use of Cloud Firestore and Cloud Functions enables us to focus on the actual logic of the database and functions while maintenance is delegated to Google Company that has extremely good reputation in cloud services.

1.3 Professional and Ethical Issues

1.3.1 Rise in unemployment

Appeatite's motive is defined by a waiter-less restaurant service, and therefore the need for employing workers will decrease. Restaurants may have to let go of some employees and will increase the unemployment rate, which can therefore be identified as an ethical issue.

1.3.2 Immoral Behavior

This new service may increase the rates of 'Dine n Dash' incidences which is a form of theft by fraud, where people leave the restaurant without paying for the food they consumed. With this application, since the number of waiters will decrease there will be less people to monitor the customers to ensure they pay their bills.

1.3.3 Fake Reviews

Our review system provided for the customers can easily be exploited. Customers may leave negative reviews intentionally if they have some personal issues with the restaurant and their workers. Similarly, other restaurants may leave bad reviews for their competitors in order to favor them and manipulate customers into eating at their place.

2. Requirements

2.1 Functional Requirements

- o Users should be able to read the QR Code within the restaurant using their mobile phone's camera

- Users should be able to view the restaurants' menu
- Users should be able to order menu item they wish to from the application
- Users should be able to call the first available restaurant staff from the application for   consultation purposes
- Users should be able to see additional food information and description such as calories, meal ingredients and pictures if the restaurant representatives supply such information
- Users should be able to see reviews left by other people for the menu items.
- Users should be able to see expected delivery time of the food
- Users should be able to request cancelling their order
- Users should be able to remove ingredients from the meal if the restaurant permits such an operation
- Users should be able to view their order history
- Restaurants should be able to print the generated QR code using the client application developed for the restaurants.
- Restaurants should be able to supply the menu information using the client application.
- Restaurants should be able to supply additional food information such as calories, meal ingredients and pictures
- Restaurants should be able to mark the currently unavailable items from the menu.
- Restaurants should be able to change the prices for menu items provided that there are no pending orders for those menu items.

2.2 Non-functional Requirements

- Google Cloud Firestore will be used as a database of Appeatite.
- Google Cloud Functions will be used to deploy the cloud functions of Appetite

- Administration environment for cloud functions and database manipulation code will be written in Typescript using Node.js environment.
- The application will be implemented in English first, later on more language options may be made available
- To maximize user domain, after the android implementation and keeping time constraints in check an IOS version may also be developed
- Frontend application for restaurant customers will be written in Java an Kotlin programming languages
- Frontend application for restaurant staff will be written in Javascript
- Average execution of cloud functions should be in order of milliseconds

3. References

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