Restaurant Automation

Project Proposal

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Project Team

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Project Website: https://github.com/Mitbits

Team Profile*

Mit Patel has experience with a multiple programming languages including C++ and Java. He has been involved with the full software development life cycle from analysis/design to the presentation and implementation of the application. Furthermore, he also has some experience with the agile process of software development where he's been part of organizing and leading weekly scrum meetings.

Prabhjot Singh has ample experience with web development using Node.js and mongoDB. He is able to learn new technologies quickly. He also has experience in web design and has a keen eye for user interface/user experience. Along with development, Prabhjot also has leadership experience serving on the executive board for his fraternity along with being involved with other organizations on campus.

Nill Patel has experience with object oriented programming such as C++, and has the ability to quickly learn new technical skills. Nill excels at thinking of creative ways to approach a problem and find solutions. Nill also has a strong leadership role by being part executive board of a multicultural club.

Dylan Herman has experience with designing, leading and managing software systems projects. He has experience with both application and systems development. In addition, he can learn and pick up languages quickly.

Raj Patel has knowledge in a variety of object oriented languages including C++, C#, and Java. Moreover, he has experience managing MySQL databases, deploying server based applications via Apache Tomcat. In addition, Raj has experience communicating with customers to translate their software requirements into a stable product.

Moulindra Muchumari has skills in full stack web development in Node.js and Coldfusion, systems development in C and Golang, and application development in Java. He has great enthusiasm in learning new technologies and designing creative and innovative solutions.

***A team leader was not elected because it is not an essential role for this team. The group is divided into teams that have their own responsibilities to integrate the project without the team leader role.*

Proposed Project Description

With the use of our Restaurant Automation application, the restaurant will be able to increase efficiency, streamline resources and improve productivity. These result from the fact that users of the system will be able to receive real-time updates of various activities occurring in the restaurant. This application will further reduce opportunity cost, increase revenue and improve customer satisfaction. This is achieved by allowing the restaurant personnel to effectively track, monitor and gather data to make profitable improvements.

Typical Customers

Our customers will consist of dine-in restaurants, which can range from small businesses to franchises. Both small and large businesses will benefit from our automation software because the software will be adaptable to distinct layouts, menus, and pricing schemes.

Problem Diagnosis and Treatment

1. Customers don’t have a way to express feedback regarding their experience.

Many customers have a bad experience at a restaurant that can lead to a loss of customers. If the restaurant was aware of these bad experiences, negative factors can be fixed to prevent further customer dissatisfaction. Currently, submitting complaints at many restaurants comes at a cost of time to both the manager and the customer. Usually, a customer does not want to go out of their way to waste time submitting a complaint. Moreover, spending time attending to customer complaints comes at an inconvenience to the manager because he or she must temporarily stop overseeing restaurant operations.

Imagine a full time employee at an office decides to take their one-hour lunch break at restaurant XYZ across the street. The customer arrives at the restaurant, waiting to be seated. A waiter unwelcomingly greets the customer. Usually, such an incident would not be worthy of complaining about to the manager. The customer is seated, and the waiter takes the customer's order. The food arrives, but the customer receives the wrong item. The waiter sighs and brings the food back to the kitchen. Fifteen minutes later, the customer’s food finally comes out. After finishing his/her food the customer pays the bill and leaves the restaurant in a hurry because they had to go back to work. The customer was unable to give the restaurant’s manager feedback about the poor service they received and most likely wouldn’t go back there to eat.

In the case where a customer does not complain directly to the restaurant's manager, we can provide them with the option of giving the customer a unique code to enter on a website that submits customer feedback directly to the manager. The customer would also have the option of giving an anonymous response.

2. There is a communication issue between the host and the customer to notify the customer when he or she can be seated.

When customers arrive at a restaurant, they want to spend less time waiting, and more time dining with their friends and/or family. During busy hours, wait times can be as long as one to two hours long, meaning that the lobby will be crowded. In such circumstances, it is difficult for the host/hostess to notify a customer that their table is ready above all the noise and ruckus. Miscommunication errors can lead to inefficiency in the seating system, thus increasing overall wait time and customer unhappiness.

Assume a family of six people visit restaurant XYZ at 6PM on a Friday night to enjoy a family dinner. The family enters the restaurant and the host informs them that the wait time will be one hour and 30 minutes to be seated. The family decides to take advantage of the long wait time by visiting the mall across the street. One hour later, an unexpected amount of tables were vacant, making room for the family of six. Unfortunately, the family was not present at the time they were at the top of the queue. The host spent 5 minutes looking for the family of six, unable to find them. As a result, the host assigned the table to the next customers in line. The family arrived 10 minutes later, only to learn they had to wait an extra hour.

Our system will be able to notify a customer when their table is ready. The system will also give an option to keep or cancel the reservation after a certain period of time to create a faster queue time for other customers. The notification will occur through a texting system in which the customer gives their phone number after given a reservation.

3. Managing customer checks both efficiently and in an organized manner.
Using the old fashioned system to generate bills and keep records is cumbersome, inefficient, and unorganized. The system requires a waiter to manually calculate subtotals for a customer’s bill, which can be time consuming and prone to errors. Moreover, keeping records of all checks for future references requires extra work and responsibility for the manager.

Imagine a party of 15 walks into restaurant XYZ. They ordered lots of food and it has come time for the bill. The waiter has to start manually adding up each order to get the total for the bill. This can take quite some time because the waiter has to make sure the bill accurate. After the bill is paid, the waiter adds the bill to the daily stack of bills which will need to be logged.

We will offer a system which will take out manual addition of getting the total of the bills. This decreases the room for error significantly. Our system will also allow logging to be much easier, when the bill gets paid, it will automatically be added into the database. This way the manager does not have to take out extra time to manually put in each bill.

4. Inefficiency with table management & cleaning

A common problem in most restaurants is the inability to keep track of unoccupied or dirty tables, which leads to inefficiencies in seating customers. This creates a loss in potential revenue, longer wait times and decrease in customer satisfaction.

A typical customer scenario in this case would be, the customer(s) would come approach the host to be seated. The host would have to look at the whiteboard and see which tables are available and seat the customer(s) accordingly. At busy times in the restaurant, the customer may have to wait a significant amount of time for a table to become vacant. However, the wait time is longer than it should be because the whiteboard doesn't get updated instantly when the busboy cleans the table.

So in our application, we'll have an interface with the floor plans of the dining area. The application will display when the tables are vacant, occupied or dirty using different colors and patterns to distinguish between the three statuses. This will allow instantaneous updates to the status of the table and decrease wait time and increase customer satisfaction, when compared to following the traditional whiteboard method.

5. Splitting checks & generate bills

When parties finish their meal there are instances where they forget to mention splitting checks in the beginning and inform the waiter of splitting checks at the end as it gets closer to paying their bills. In such a case, the waiter would have to ensure the orders of each individual and split the checks accordingly. In such a situation the waiter would have to go back to the cashier and inform them to print individual checks for each customer. Situations like these usually become a hassle for both the waiter as well as the customers. This leads to customer dissatisfaction, adds to the wait time of the customer(s) which in turn makes that table unavailable for a longer period time for the next customer(s).

In response to this problem, our solution will consist of a way to individually and efficiently add each person's order for their respective table. By default all the order will be entered in the system as split checks. This way if the customers ask for split checks they can just be printed individually otherwise the waiter will have the option of also printing a check for the full table. This will help decrease the amount of time and confusion over splitting checks at the end of the customer's meal leading to lowering inefficiencies in the business overall.

6. Wasted time in relaying the order to the kitchen

At the restaurant described in the description, the waiter will have a notepad where he/she will jot down the order and take a copy to the kitchen and a copy for the cashier. This is very inefficient in the sense that the waiter will have to make multiple trips between the table, kitchen and the cashier. Doing so for multiple tables, takes away time from serving the customer's needs. The kitchen notifies the waiter when the order is ready by ringing a bell, but the waiter is not going to know whether the bell was rung for his order or a different one. Therefore leading to a wasted trip if he goes to check and the order is not there. Keeping a paper copy for archiving/cashier is not very safe as they can be easily lost and damaged.

A solution to this problem would be, having each waiter input each customer's order, which would automatically show up to the kitchen for the chef. The waiter will get a notification from the kitchen when his/her specific order is ready so he/she can go get the order for their customer. This decreases the amount of trips the waiter has to make and allows them to use their time effectively.

7. Prioritizing and managing the flow of orders in the kitchen

The kitchen can be a chaotic place in a restaurant. Most of chaos results from keeping track of all the orders and which waiters they can from. However, not only do orders have to be served in a first-in first-out fashion, but the time of delivery made needs to dynamically change based on multiple factors such as: fairness (did one table get both their appetizers and entrees, while another table who arrived at the same time got nothing?), is the restaurant having a slow day and they want to keep as many customers in the restaurant as possible to appear "busy", does a customer want their food to be held until they finish their appetizer?, and etc. Thus managing the kitchen is much more complex than simply queueing up orders as they come. That's why adding automation creates order in the kitchen.

A solution to this problem is to create a system that keeps track of all the orders and queues them up. However not necessarily in FIFO order. Multiple queues can be set up to push out appetizers before entrees and delegate tasks in a fair manner to all the cooks. Orders sent back can be pushed behind orders that have not been delivered yet.

8. Managing and keeping track of all the raw materials in the kitchen

With the amount of food restaurants make a day and the amount changes that customers request to their dishes, restaurants can quickly run out of materials. In addition, it can be hard to keep track of this while attempting to make as much food as possible. Normally keeping lists is how it is done, however, it can be hard to sync those lists up with how many materials are being used

throughout the day. In addition, someone of authority needs to be notified immediately if the kitchen has run out of any important materials.

A solution is to create an automated system that deducts materials whenever food is delivered to customers, has ingredients added, or is made. This system will be able to notify a person of authority immediately if certain ingredients are low.

9. Planning the menu and activities for the day

Many restaurants plan activities the night before to streamline cooking for the next day. This allows them to serve more customers and reduce the waiting time for customers to receive their food. A lot of restaurants do not plan these activities properly or allocate enough time to finish them the night before. Hence, this reduces productivity next day and increases stress and unhappiness in the kitchen. Moreover, this might directly affect the revenue of the restaurant and decrease customer satisfaction.

A solution is to combine the planning activities with the cooking activities, so that planning for the next day happens concurrently with serving customers. This solution might work because the planning activities can be completed when the restaurant might not be busy. Also, this simplifies managing the kitchen for the Chef by allowing one system to assign activities for the cooks.

10. Cleaning dishes

Busboys in restuarants perform two main tasks: cleaning tables and cleaning dishes. They have be in both the kitchen and the dining area and it causes a lot of running around. It is also hard for the chef to find a busboy to clean dishes. This decreases the efficiency of the chef because he needs to be in the kitchen to manage the cooks. Some restaurants mitigate this problem by having some busboys stay in the kitchen as dishwashers. However, this is an inefficient solution because the dishwashers are not needed when there are no dishes to be washed and the busboys don’t need to be in the dining area when there are no dirty tables. Moreover, this requires the restuarant to hire more people for this solution.

A solution would be to notify the busboys that someone is needed to clean the dishes. The notification will be sent to all busboys and any one of them can respond to the call. This drastically reduces the number of busboys needed in the restaurant because the busboys will be dynamically moving between the kitchen and the dining area as required without running around.

Functional Features

1. Customer Feedback System
    - Online survey allowing the customers to give feedback on their restaurant experience
2. Customer Notification System
    - Notifies customers when their table is ready
3. Electronic Order Archive
    - Archive of all the orders for the day
4. Liveview Floor Plan
    - Live floor plan customized to each restaurant showing the vacant, dirty, or occupied tables and more details about them
5. Electronic Billing
    - Automatic bill generation and splitting checks
6. Waiter-Kitchen Communication System
    - Seamless interactions between the waiter and the kitchen staff
7. Managing priority of meal orders
    - Kitchen interface that will show the queue of orders
8. Real-time Inventory System
    - Automatically keeps track of the inventory and notifies the manager when the levels fall below the threshold
9. Food Management and Prediction System
    - Allows the chefs to prepare for the day early based on the previous trends
10. Dishwasher Notifications
    - Sends notifications to the busboy's when dishes need to be cleaned.

Plan of work and product ownership

To make sure that our team is productive and efficient we divided up into 3 groups of two. Our plan over the course of the the next few weeks is to set up a structure for our design. To accomplish this task, we will use a black box approach to find each of the subcomponents and see how they inter-connect. For each of the subcomponents we will start the process of finding the different structures and methodologies that are required to design each subcomponent.

Teams:

Dylan Herman and **Moulindra Muchumari** plan to work on the following over the next few weeks:

- Design system that take as inputs each of the orders pushed out or food made and subtracts the food ingredients from the total supply.
- Create a notification system that tells manager that certain materials are low in supply.
- Build a system that help decide what the best food to prepare for the day is and assign the task of cooking to each of the chefs.
- Utilizing data from the previous day, build a system that can suggest what food to make for the day.
- Allow chefs to notify the busboys to clean dishes.
- Design an intelligent algorithm that combines food items in various orders to efficiently cook and deliver items on time.

Mit Patel and **Prabhjot Singh** plan to accomplish the following in the next few weeks:

- Build an interactive floor plan for the restaurant detailing all the tables and their statuses. Allowing for easy managing of the restaurant floor
- Build an integrated ordering system allow for clear communication between the waiter and the kitchen, such as entering an order, notifying of order priority etc.
- Create an algorithm to prioritize the orders in the queue so all the customer's needs are met and minimize the wait time. It doesn't only depend on the time and it takes into account the appetizers coming out first and entrees after that.

Nill Patel and **Raj Patel** will work on the following tasks over the course of the next few weeks:

- Build a system to allow customers to submit a survey to conveniently provide feedback regarding their restaurant experience.
- Create a notification system to notify customers when their table is available.
- Replace the pen and paper billing system with an electronic system that supports splitting checks and automatic archiving.
- Create an alert system that tells the busboy the dishes need to be cleaned