Online Reservation System for Restaurants in Ghana

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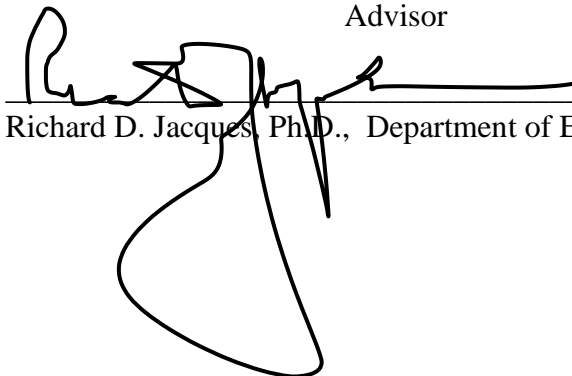Bachelor of Science, School of Engineering

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On my honor as a University Student, I have neither given nor received unauthorized aid on this
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Introduction

Efficiency and effectiveness are the main concerns of every business including restaurants. Restaurant managers and diners go through considerable stress in terms of food ordering and table reservations leading to errors in the processes hence, affecting the entire performance of the restaurant business. There is a need to create an application that would enable people to either order food or reserve a table at a restaurant efficiently and conveniently. I suggested the idea to design and implement an online restaurant reservation system that enables restaurants to manage their food orders and table reservations eliminating long queues before guests are served their meal at the restaurant.

The challenges encountered by the restaurant businesses in Ghana, with a few or no existing systems serve as a major drawback to the realization of efficiency and customer satisfaction. The experience of ordering in most fast-food restaurants is unpleasant for customers due to long queues and not knowing the availability of foods. Customers are dissatisfied when they must join long queues, especially during busy hours or holidays before they get served. There is no system to update the customers on the availability of the menu before their turn to order (Wickramasinghe, 2011, p. 8).

The traditional takeout and dine-in services as well as placing and making reservations via calls are still the major drives in the restaurant industries in Ghana. The current trends according to Ohene-Ntow (2018), "the self-service technology describe how restaurants display their services and menus and allow customers to place their orders themselves and pick up orders, without having a waiter or waitress to serve them" (p. 16). The current technologies used are a good start but need an improvement to make more sales while satisfying the customer

needs. Despite the use of Information Technology (IT) and Point of sale (POS) systems at the restaurants, the orders must be handwritten and entered into the POS system because there are no tools to take the records of customers' orders (Akoto-Lamptey, 2012, p. 2), but the setback of the self-service system is that customers who cannot read, write or use any form of a technological device cannot engage in the food ordering.

However, if the current methods by restaurant persist, then the possibility of problems to occur include the cost that most restaurants incur because of some diners not showing up to take their ordered meals or reserved tables since they have not paid. These diners lose nothing for not coming for their orders and the frustrations that diners go through in joining long queues to place an order and to be served their meal at restaurants. Restaurants of high-quality are so competitive that it compels customers to make their reservations months ahead only to not show up or cancel their reservations (Tse & Poon, 2016, p. 128). These inconveniences in the restaurant industries call for a new system that will address the issues listed.

Literature Review for STS Research

The architecture for developing web applications has shifted from procedural programming to Object Oriented Programming and, from writing one's codes with a particular language to the use of frameworks. The framework refers to a library that provides support by reducing the amount of code and makes a developer's work easier by hiding some complexities of HTTP protocols and useful functions. Spring framework is associated with Java and has the MVC architecture that is a way of organizing the pieces of an application's interface into three major parts: Model (M), View (V), and Controller (C). The MVC is developed to map the traditional input, processing, output roles into the Graphical User Interface (GUI) realm:

Input	→	Processing	→	Output

⇓

Controller	→	Model	→	View
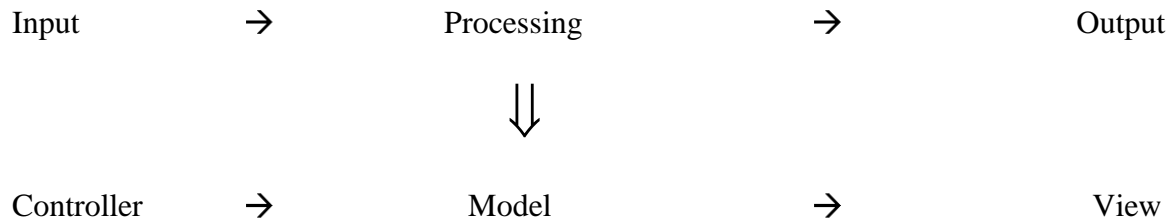
Model

A model part of the MVC architecture is an object representing data and it consists of database tables. It manages the behavior of data in the application domain. The model represents enterprise data and the business logic that responds to requests to retrieve and instructions to edit information about the state. According to Choudary, "The model objects retrieve and store the state of the model in a database. Through this layer, we apply rules to data, which eventually represent the concepts our application manages" (p. 3). Because the application will receive customers' information, there will be a table called Users in the database that will store the details of the customers who visit the web application.

View

The main purpose of the view part of the MVC architecture is to visualize the state of the model. It accesses enterprise data through the model, specifies how the data should be represented, and generates an HTML or PDF output that renders the contents of the model. It receives responses to a request from the model and displays it appropriately to the user via a user interface. According to Choudary, "It displays the data fetched from the model layer by the controller and presents the data to the user whenever asked for. It receives all the information it needs from the controller, and it doesn't need to interact with the business layer directly" (p. 4).

Controller

The controller part of the MVC design architecture is to facilitate changes to the state of the model. It serves as an interface between the model and view. It translates the mouse and keyboard inputs from the user into actions that commands the model and view to change as appropriate. The controller maps the end-user actions to the web application responses. It translates interactions with the view into actions to be executed by the model. According to Choudary, "It receives the user requests from the view layer and processes them, including the necessary validations. The requests are then sent to the model for data processing. Once they are processed, the data are again sent back to the controller and then displayed on the view" (p. 5).
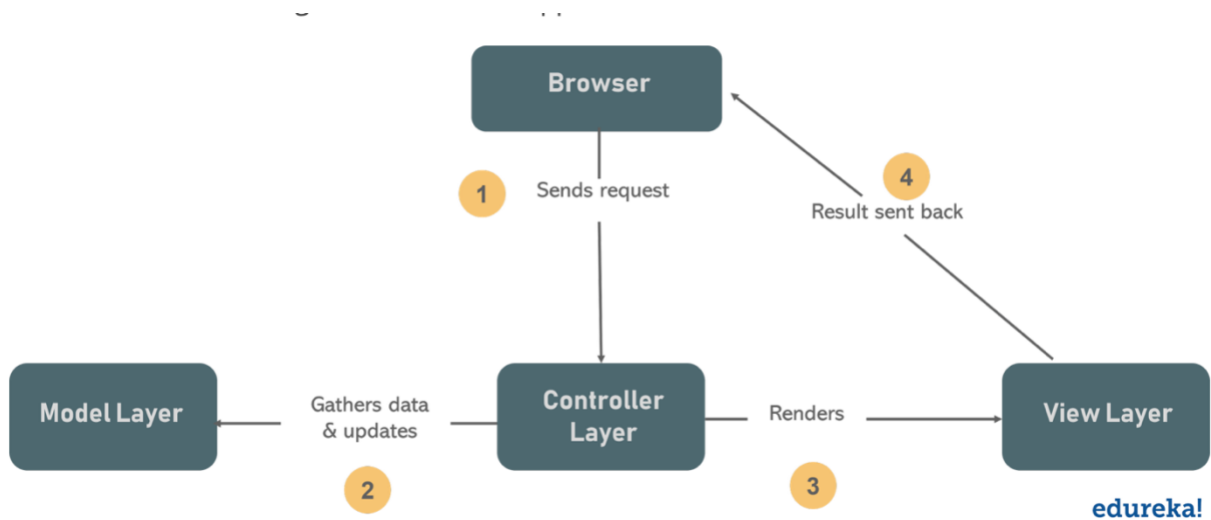

Fig. 1   The MVC architecture pattern

[https://www.edureka.co/blog/mvc-architecture-in-java/, accessed on October 31, 2021]

Highlights Of Similar Implementation from Grubhub

Grubhub Inc. is a mobile and online food ordering company that connects diners and corporate businesses with thousands of takeout restaurants in U.S cities. Grubhub works by allowing the customers to enter their zip code or seek their permission to use their location to search through the database and return a list of restaurants that are near the locality of the customer so they can make their orders. The customers select the time and date for the order and submit the form for further processing. The payment for the order is made online, upon pickup, or pay for the order at delivery.

The following figures show how Grubhub works when a user initiates a food order request.
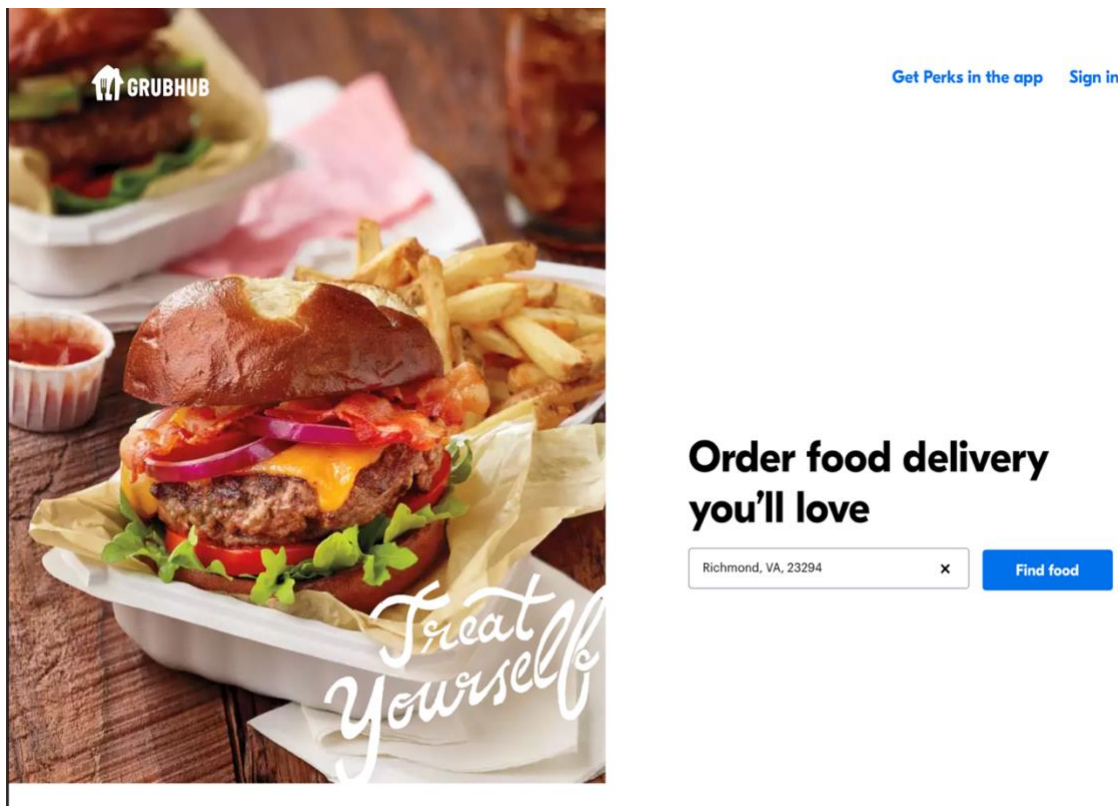

Fig 2.   Homepage of Grubhub where users enter their zip code or use their location. [https://www.grubhub.com, accessed on October 31, 2021]
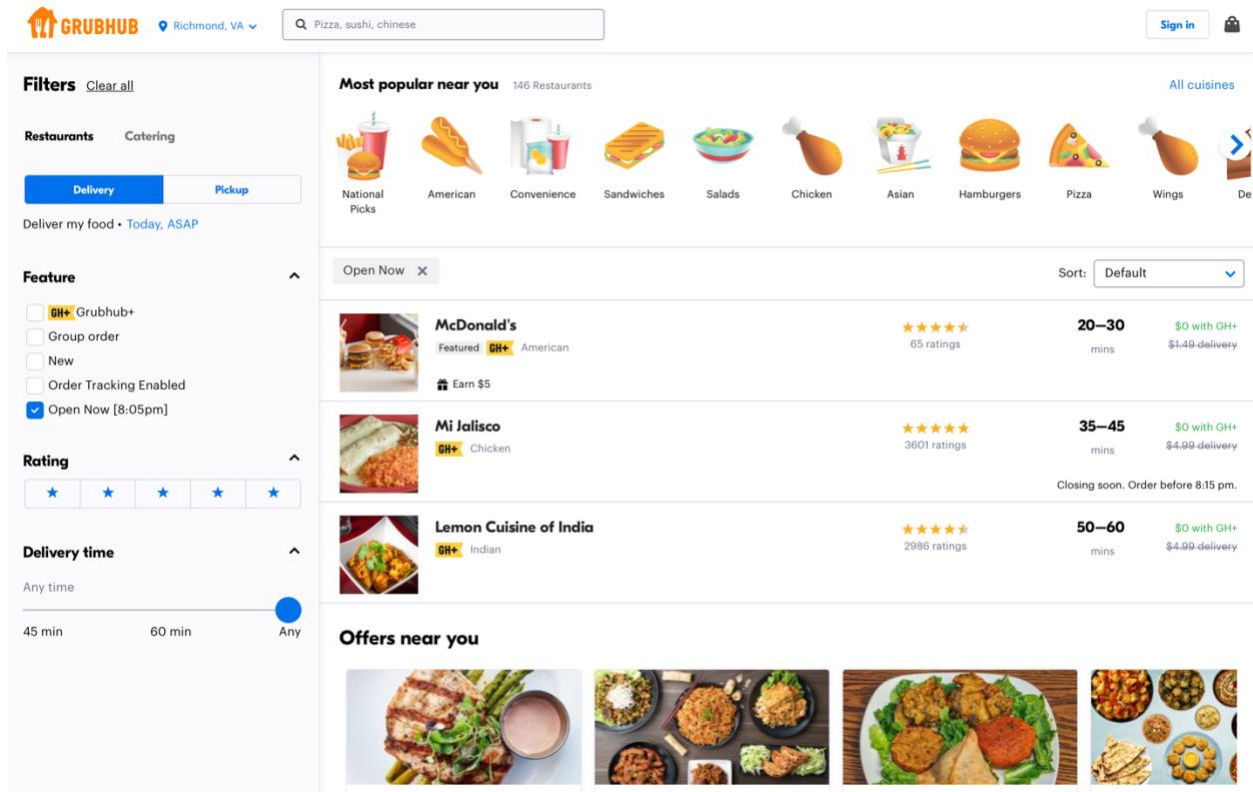
Fig 3.   Lists of all restaurants available at Grubhub based on user location entered.

[https://www.grubhub.com, accessed on October 31, 2021]

Methodology for STS Research

Due to the constant change in demand and requirements by customers, I will use the agile method with an incremental software process model to develop this web application. Incremental development is a development process model whereby software engineers develop software as a series of versions, exposing it to user criticism, comments and adjusting the system to suit the needs of the user. Agile Method is employed when the user requirements are not completely specified due to the changing business environment. The restaurant reservation application will be released in an incremental order to our stakeholders, implement new ideas

from their comments and suggestions and release subsequent versions until the stakeholder (user) approves the final version. The benefit of using an incremental development is that the cost of accommodating and implementing the changing customer demands is less expensive. It avoids rework since the stakeholder or end-user is engaged in the release of each version, which allows for their changing demands to be added until the full system is developed and accepted by the stakeholders. In another model of development like Waterfall, a new system will have to be made if the stakeholders reject the application.

System Analysis and Design

System analysis is the act of collecting factual data, understanding the processes, identifying problems, and making feasible suggestions for improving system functioning. System design is a phase where the new system is designed based on user requirements and the detailed analysis of the existing system. It is the most crucial phase in the development of a system since the logical system design arrived because the system analysis is converted into a physical system design. There are two major system requirements (i.e., functional and nonfunctional requirements) used in developing the web application and the purpose of these requirements are to specify what the software will do and how it will be expected to function. The functional requirement involves the user interface and describes each possible user input action and the system's response actions. Functional requirements, therefore, specify the results of a system, and it drives the application architecture of a system. The functional requirements for the reservation system are outlined below:

- An administrator will be able to log in and customize the system to the needs of the restaurant.

- The administrator can also input menu details on the site

- Diners will be able to create an online account with the restaurant to log in to their portal.

- Diners will be able to place orders.

- Diners can reserve tables online using an interactive Graphical User Interface

- Diners can also pay online before their orders are placed successfully

- Customers will receive an SMS and Email confirmations.

- Through the administrator's panel, the system allows the manager to generate reports, see daily schedules, delete menus, and approve menus among others

Non-functional requirements essentially specify how a system should behave or work and are a constraint upon the system's behavior. They specify criteria that users or clients can use to judge the operation of a system rather than specific behaviors. The nonfunctional requirements for the reservation system are outlined below:

- Performance

The system will have lower latency, hence there will be no delays involved in a user making a request and retrieving the information needed.

- Reliability

The reservation system will always be reliable to perform according to its specifications to allow users to always reserve and order meals.

- Maintainability

The system will evolve to meet the changing needs of the customer and vendor will have the privilege to customize the application according to their desires.

- Ease of use

The system will ensure ease with little training time will be sufficient to know how to use the system.

- Scalability

The system will not be disturbed by the growth in the size of the demands in the market by users.

- Security and Safety

The system will be able to always withstand external attacks on user information. It will also ensure the security of user information during the communication between the application and the server.

Results and Discussion

Technology touches every facet of our lives as it always has but with the emergence of mobile devices and cloud computing making more of an impact than ever, you will be hard-pressed to go anywhere and not find a high-technology piece of hardware or software around. These advances have made an impact everywhere, and a place we are seeing more and more technology is in the food and restaurant industry. This development is the reason for the online food ordering and reservation system, which will be of great benefit both restaurant businesses

and customers. As technology keeps advancing in all aspects of our lives, the current

generation's lifestyle depends heavily on technological products leading to an addiction to them.

People spend long hours on mobile devices surfing the Internet that is reducing the rate at which

people are to call restaurants to make reservations. Customers prefer to make reservations and

place their order online or use artificial intelligence-assisted devices to place the order to call the

restaurant repeatedly or to be on hold before it gets to the person's turn. The convenience of

online services is unmatched and preferred compared to the stress and frustration a customer is to

face with restaurant services via a phone call (Crooks, 2019, p. 1).

Implementing an online reservation system will increase customer satisfaction by

speeding up the food ordering processes that will reduce or eliminate long queues. The

restaurants will be able to stand out from competitors by automating daily operations that will

allow food service providers to increase sales. It will help reduce restaurants' food waste and

increase the efficiency of the restaurants' staff by enabling them to know the food orders placed

in advance. Food reservations and ordering in advance help to reduce wait time, level demands,

and boost the capacity to improve customer experience and sales (Thompson & Kwortnik, 2008,

p.3).

The overall aim of this project is to design and implement an online restaurant reservation

system that would enable diners to order food and reserve tables at restaurants to optimize food

ordering and table reservation. This design will reduce and eliminate all forms of delays at the

restaurant side (i.e., food not ready on time) and customer side (i.e., long queues). The project

will involve the development of a purely web-based online application whose main programming

language will be Java and it will include a server-side that enables a restaurant administrator to

create an account and customize the software to the needs of the business. The administrator will then be able to perform basic managerial functions such as daily scheduling, approving orders, deleting menus, generating reports among others.

The client-side of this software will enable customers after creating an account with the restaurant to log in and order food or reserve a table. The software will include a payment system to enable customers to pay before their orders are placed successfully. In this way, the restaurant will not run at a loss when a diner fails to show up. This software application is not going to be a mobile application, but then it will be optimized to be responsive on multiple displays such as portable devices with internet access. Thus, customers can order or reserve tables on their phones without using the laptop or personal computer on the web.

Conclusion

The research paper introduces us to the proposed system I wish to develop for the restaurants' industry in Ghana. I have looked at the general objective as well as the specific objectives expected to be accomplished at the end of the project. I have also looked at the scope that talked about the inclusions and exclusions of the proposed system, especially in its functionalities, which makes it unique. I looked at the general system architecture of the proposed system and the Spring framework and reviewed the implementations from Grubhub. I adopted the agile methodology with an incremental software process model to develop the application. The approach is suitable for development because it made development much easier and helped us to meet the various user and system requirements.

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