eFood Hub – cashless online canteen ordering system for APU students & lecturers

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***Abstract*— University Staffs and Students may typically avoid eating their meals due to deadlines and busy schedules, hence implementing a cashless online canteen ordering system will provide them with an alternative method to get their meals without physically being present at the canteen. Asia Pacific University of Innovation & Technology (APU) already has a cashless payment system implemented in-campus, by integrating a food ordering system which utilizes their existing system will enable APU to promote healthier eating habits in-campus and provide stall operators an alternative stream of income. The proposed system's inspiration was derived from popular food ordering systems such as Grab Food but with the goal of developing it as an internal system. The developed system will complement the existing cashless card system by adding more features and providing users with an enhanced experience. Users can track, order and pay for their meals via the system. Stall Operators can keep track of all their orders, update order status and manage their menu for their dedicated stall within the application.**

Keywords—Cashless Food Ordering System, Web Application, Canteen Ordering System.

I. Introduction

In a large and packed modern university such as Asia Pacific University, students are constantly on the move from one class to another or busy rushing to submit their assignments. This can often lead to students not being able to have their lunch or breakfast because they just do not have the time to wait in a queue and order food. This system does not only serve students but also the lecturers, who may sometimes be busy marking assignments or have a busy schedule, this is where a "Cashless Online Canteen Ordering System" comes in and would be the ideal system to implement in a state-of-the-art facility such as Asia Pacific University.

The "Cashless Online Canteen Ordering System" will be a web-based system which allows students and lecturers to order food in advance and be alerted when their food is ready so they can proceed to pick it up. On the other hand, the variety of food stall operators are also able to access the system and make changes to the food they are serving or offering or order statuses.

We are living in a very dynamic and fast-paced era where people are constantly on the move and are rarely willing to spend time on healthy eating habits such as eating at the appropriate time, etc. This specially applies to university students who are constantly busy with their assignments, presentations, exams, etc. [1]. An online food ordering system fulfils the needs of busy individuals such as university students who can order and get their food delivered within a short time frame [2]. Developers from the past have analysed that factors such as trust, satisfaction and loyalty mainly revolved around offline food ordering environment, but developers recently have figured out that an online food ordering system provides a larger opportunity for interactive and personalized marketing [3].

Based on a study done with 1719 adult Malaysians as a sample size, have shown that 51% of them agreed that due to their busy lifestyle and time constraints they are unable to maintain healthy eating habits [4]. In the case of university students and lecturers, if they are unable to maintain healthy eating habits, this will often lead to negative side effects such as weight loss, weak immunity system, etc. but especially reduce their attention and concentration span which causes performance issues within the classroom [1]. Students and lecturers usually spend their day at the campus, they will usually have to enjoy their meals in campus therefore, the university's canteen services play a pivotal role in the eating habits of students and lecturers [1].

The canteen can quite crowd during mealtimes such as breakfast, lunch etc. especially during lunch time, during which empty tables may be scarce and long queues at stalls to purchase a meal. Based on an observation done in a study in China, students are more likely to switch to junk food from the mini mart such as noodles etc., due to long queues at food stalls in the canteen [5]. To support that, based on a questionnaire, it was determined time-management was one of the crucial attributes which influences a customer [6]. This shows influences a customer (Nadzirah et al., 2013). This shows that waiting time plays a huge factor in if students and lecturers are willing to order a meal.

Based on the facts shown above, this shows that students and lecturers are more likely to skip a meal due to their busy lifestyle and not having the time due to higher waiting time especially during lunch hours and on the long run this can often lead to poor mental and educational performance [1].

II. MATERIALS AND METHODS

To develop the online canteen ordering system, the system must cater to 3 different target users with the following functionalities:

The Cashless Online Canteen Ordering System will allow Students/Lecturers: -

- To login into the platform
- To logout of the platform
- To place an order

- To pay for their order
- To track the order status of pending orders
- To top up their account balance
- To view past orders

The Cashless Online Canteen Ordering System will allow Stall Operators: -

- To login into the platform
- To logout of the platform.
- To add new items to their menu
- To remove items from their menu
- To edit menu item details such as image, name, and price
- To view orders details
- To update pending order statuses

The Cashless Online Canteen Ordering System will allow Admin: -

- To login into the platform
- To logout of the platform
- To view existing stall details
- To register new stalls
- To remove registered stalls
- To view feedback

A. Choice of Programming Language

The choice of programming language is crucial to ensure the success of this project and considering there are a multitude of programming languages out there, the choice of language needs to be something which the developer is familiar with and suits the project to assure and avoid issues with time, resources, and compatibility amongst various languages. The programming aspects of a system development project is split into the following components:

B. Front-End Development

Programming languages chosen for the Front-End Development of this project are HTML 5, CSS 3, and JavaScript version 1.8.5. Majority of the Front-End development will be done using HTML and CSS. HTML or in other words, Hyper Text Mark-up Language, is considered one of the most important programming languages for web development. Initially HTML was intended to be used for defining document structures such as paragraphs, lists and so on, to share information amongst developers but currently, with its wide range of tags and functionalities, it is used to format webpages and overall determine the layout of the site. HTML is a necessity to become an experienced web developer, it helps to create web sites, become a web designer, and understand how the web operates and to also learn other languages [1]. Regarding this project, HTML is the ideal mark-up language to be utilized alongside other languages considering the proposed system is a web-based system hence HTML will play a crucial aspect in terms of the layout of the system.

CSS or in other words, Cascading Style Sheet, is a design language which is required to control the looks and style of web pages in an efficient and effective way [8]. CSS can be used to change elements such as font color, size, spacing etc. CSS works together with HTML and exists for the purpose of styling HTML documents to make it presentable. Along with HTML and CSS incorporated together, it will help define the graphical user interface of the system and create a system which is visually appealing and easy to use for the users.

JavaScript is mainly utilized as a scripting language for webpages and is a lightweight object-oriented language [9]. JavaScript enables developers to create scripts to automate and animate tasks when a webpage is loaded, adding extra functionalities to the webpages such as graphics with animations, slideshows, auto fill for forms, etc. JavaScript alongside HTML and CSS will help develop interactive web pages therefore creating a unique experience for the users of the site. JavaScript will be used in this project to display pop up messages and create interactive forms which provide validation of data such as user credentials while trying to login, this alerts the users if they were to input the wrong details, so they know where they went wrong. These 3 languages will form the basis of the front-end development of this project to overall determine the feel and look of the system.

C. Back-End Development

The programming language of choice for the back-end development of this system is PHP version 7.4.9, which stands for Hypertext Pre-processor. It is a free to use open source server-side scripting language which is commonly used in web development [10]. PHP is commonly utilized together with HTML and databases such as MySQL and is ideal in creating dynamic websites and web applications [11]. Some of the functionalities PHP can accomplish to create dynamic content and to create a pleasing user experience are:

- Interact with files on the server
- Send and receive cookies
- Access and modify data within the database
- Create separate pages based on type of user and authenticate users and redirect to the appropriate page based on the user type [12].

The reason PHP is the ideal language to use for this project is because it is rather easy to use and learn. Furthermore, PHP is quite popular and widely used and it is rather easy to get support and help from experienced programmers online through online forums and groups. PHP is the ideal language to be utilized for this project because of prior experience in the language from past modules and on top of that, PHP works well with languages utilized in the front-end development of this project therefore making it easier to create an integrated system which work together with the all the languages involved therefore avoiding time constraints and resources in order to learn a new language and to debug every time an unknown error appears which can be frustrating and time consuming specially if learning a language which the developer is not familiar.

D. Choice of Interactive Development Environment (IDE)

An IDE is a software application used to build systems by providing a compilation of tools a developer would require to completely build a system by presenting them under a single GUI to simplify the process. An IDE usually consists of a source code editor, compiler, and a debugging tool [13].

The choice of IDE for this project is Visual Studio Enterprise 2019, a software produced by Microsoft which can be used to develop applications, web apps and services [14]. Visual Studio Enterprise 2019 supports a whole range of programming languages but most importantly it supports all the languages involved in this project, which are HTML, CSS, JavaScript, and PHP. Furthermore, for students of APU, Visual Studio Enterprise 2019 can be downloaded for free of charge therefore the developer will be able to utilize all the premium functionalities of the application without any extra charges.

Fig. 1. Visual studio banner

Visual Studio Enterprise 2019 provides features and tools for all the phases involved to develop a system, using its 'IntelliSense' developers can reduce the number of errors in their source by assisting developers to type variables quickly as possible and correctly. Furthermore, 'CodeLens' helps developers find the changes made to the code, the effects of said changes and determine if they have been unit tested. Visual Studio Enterprise 2019 also provides advanced debugging and testing tools to ensure the source code is working as intended and are tested vigorously prior to deployment of the application [15].

E. Choice of Database Management System

A Database Management System (DBMS) is a form of technology used to enhance databases by providing a solution which helps to manage and store data [16]. A DBMS helps to structure, validate, and manipulate data within a database and are commonly used together with query languages such as Structured Query Language (SQL), which enables the user to manipulate and interact with the data within the database [17].

Fig. 2. MySQL logo

The developer chose MySQL version 8.0.2.1 as the choice of DBMS for the project. MySQL is an open source is a relational DBMS based around SQL developed by Oracle. MySQL is incorporated with multiple types of applications, but it is commonly used as a web database. MySQL, with the help of SQL, can add, drop, insert, and update data within the database. MySQL is quite popularly used together with PHP due to the fact MySQL commands can be directly inputted into the PHP source code of the website, enabling parts of or complete webpages to be loaded from the data or information from the database. This makes MySQL a popular choice when it comes to choose of database used in a web development project [18].

The justification by the developer for MySQL as the choice of DBMS for the project is due to the developer's familiarity with the software and how well it incorporates with the choice programming language chosen for the project, PHP. Together, the chosen programming language and the chosen DBMS, are ideal for the developer's project to create a secure web-based system.

F. Choice of Operating System

An Operating System (OS) is a software program which enables a computer to communicate with the hardware of the system and provides a platform to run other programs supported by the OS. An OS consists of compilations of important files required by the computer to start and work accordingly. Every form of device consists of an OS to make it functional such as mobile devices, tablets, laptops, and computers etc. [19].

Fig. 3. Windows 10 Logo

As for the choice of OS the developer has gone with for this project is Windows 10 version 2004. Windows is a collection of operating system developed by Microsoft for desktops and laptops. As of July 2020, 77.74% of operating systems installed in a desktop are Windows OS and is the most popular OS currently [20]. Windows 10 is the latest variant of the Windows OS which was released on the July 29, 2015 [21]. Since its release there has been constant security and quality of life updates for windows 10 to ensure the best experience for its end users. The latest version of windows 10 is version 2004, which was a major feature update released on the 27th of May 2020 [22].

As for the justification on why the developer chose Windows 10 version 2004 as the choice of operating system for the project is because the developer is comfortable and familiar with the operating system and has been using the windows line of OS since the beginning. As the developer's computer has already been updated to latest version 2004, it will be the version the developer has decided to use. If the developer were to decide to use an OS such as MacOS or Linux, it may affect the project schedule as time will be required to learn to use the new platform which will increase the time required to complete the project. Therefore windows 10 version 2004 will be the ideal OS to be used throughout the span of this project.

G. System Development Methodology

Software development methodology is a conceptual model used to plan and develop a software. It helps to design, plan, and manage the various processes involved within a software

development project [23]. Software methodologies are used meet the client's needs such as business needs, design and even deployment of the software There are varieties of different software development methodologies which currently exist, each with their own advantages and disadvantages. The most common methodologies are agile and waterfall methodology.

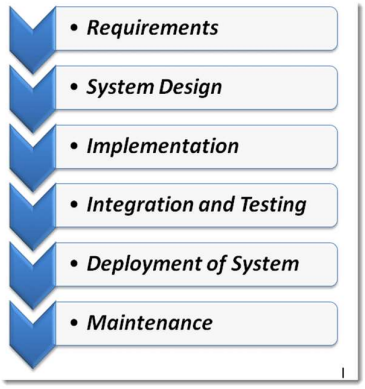

Fig. 4. Waterfall methodology phases

To develop this system, the developer has decided to choose waterfall model as the preferred choice of software development methodology as the requirements are already defined by the developer and considering it is a simple project which does not involve any team; therefore, it is important that each phase is concluded successfully prior to moving to the next phase as there are no rooms for errors afterwards and as a sole developer, it will be frustrating to debug. Waterfall methodology will be the ideal choice of methodology for this project, and these are tasks that the developer will be accomplish during each phase of the methodology:

1) Requirements: for this project, during this phase the developer will document and define all the requirements to complete the project.

2) System Design: The developer will analyse the requirements from the previous phase and create design document which would include technical specification, testing criteria and diagrams such as database structure, use case, activity, etc.

3) Implementation: During this phase, the developer will start programming all the individual functions one by one and eventually integrate them. Each function will be tested separately prior to integration.

4) Integration and Testing: During this phase, the developer will test the system and check for faults and errors.

5) Deployment : The system will be deployed into a live environment and tested to ensure it works as intended.

6) Maintenance: After the deployment of the system, the system will be maintained regularly and provide support to the client in case of any bugs or errors.

III. RESULTS AND DISCUSSION

The prototype of the system was completed according to the deliverables promised by the developer and the results will be displayed and explained in this section.

A. User Interface for Admin

The admin home page is a single page dashboard which utilizes a circle navigation to manage stalls and view visitor feedbacks as shown in Fig. 5.

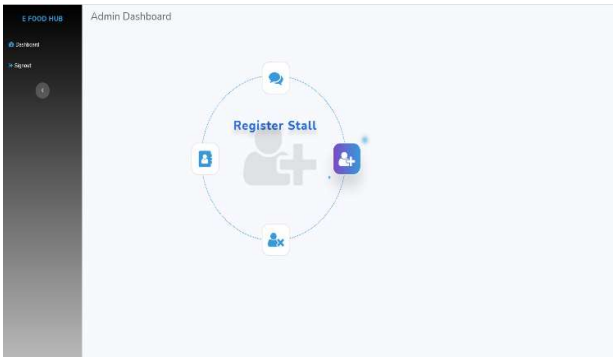

Fig. 5. Admin Home UI

The admin can register a stall by clicking the add user icon in the circle navigation which will display a form as shown in Fig. 6.

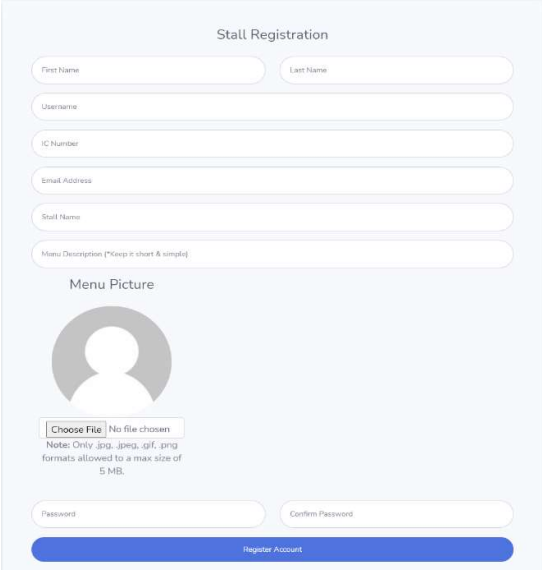

Fig. 6. Stall Registration Form

To view all the registered stalls, the admin needs to click the contact book icon which will display a table as shown in Fig. 7.

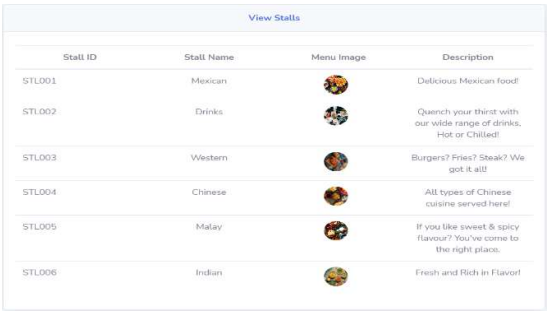

Fig. 7. View registered stalls

If the admin needs to remove a registered stall, they can simple do so by clicking the "remove user" icon in the circle navigation which will display a table as shown in Fig. 8, the admin can then click the remove stall button which will display a confirmation message. Once the message has been confirmed, the stall will be deleted.

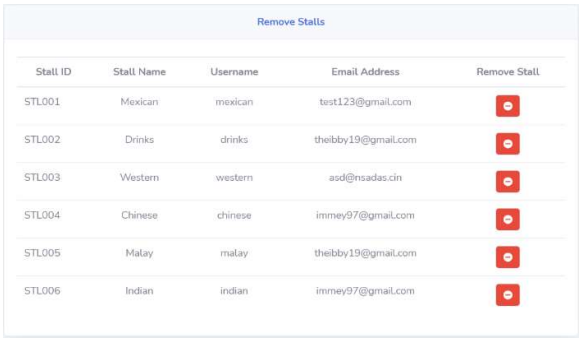

Fig. 8. Remove stalls

Lastly, admin can view all the feedbacks received by visitors by clicking the comments icon in the circle navigation, which will display a table as shown in Fig. 9.

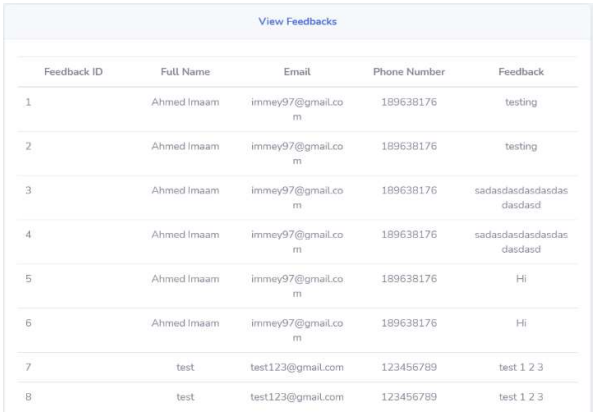

Fig. 9. View visitor feedbacks

B. User Interface for Stall Operators

Once a stall operator login into the system the stall dashboard will be displayed as shown in Fig. 10. The stall operator can view their total number of pending orders and account balance in the dashboard.

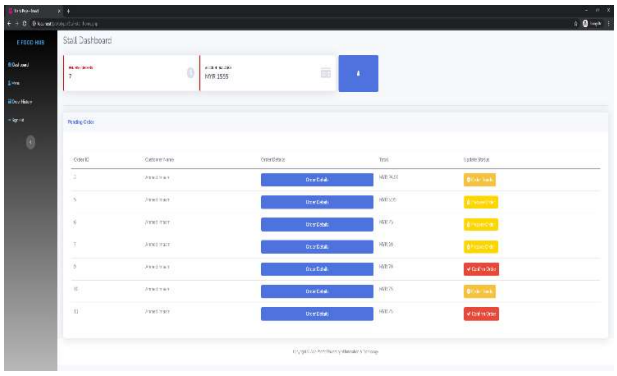

Fig. 10. Stall operator home UI

The stall operator can edit their profile by clicking the "user" icon in the dashboard which will display the profile details as shown in Fig. 11. This section enables stall operator to edit/view their profile details.

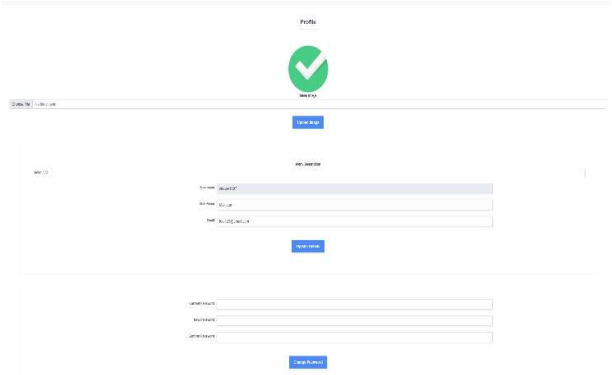

Fig. 11. Manage profile details

All pending orders will appear in the stall dashboard in a table format as shown in Fig. 12, the stall operator can update the status for each individual order by clicking the button under order status and a new button will appear based on the order status or if the order is completed, the order will no longer appear in the table.

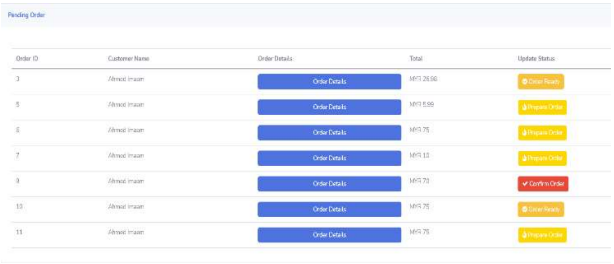

Fig. 12. Manage pending orders

The stall menu, which can be accessed by the side navigation bar, allows stall operators to manage their menu items, as shown in Fig. 13. This page is used to display all the existing items in the menu, add new items, edit existing item details, and delete items from the menu.

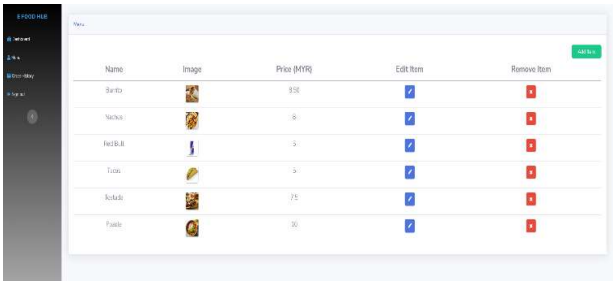

Fig. 13. Manage menu items

Stall operators can access the order history page by accessing it via the navigation bar as shown in Fig. 14, this page displays completed orders along with the details of the order such as the order id, customer name, order details, total and the order date/time as shown in Fig.14.

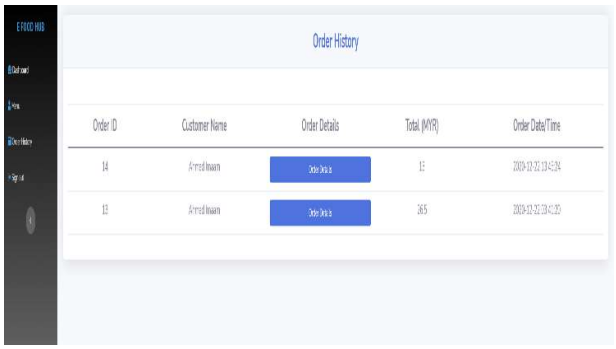

Fig. 14. Stall order history

C. User Interface for Students/Lecturers

Once the user logins into the system they will be redirected to the user home page as shown in Fig. 15. The user home page features an image slide which will automatically slide to another image every few seconds. Below the slider, all the stalls registered in the system will be displayed in a card layout.

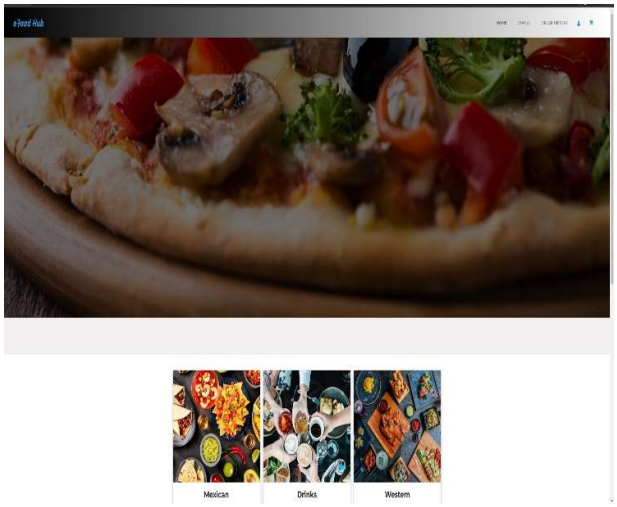

Fig. 15. User home UI

The number of stalls appearing on the page will be determined by how many stalls have been registered in the system as shown in Fig. 16 below. The user will be directed to the menu page once they click the menu button under one of the available stalls.

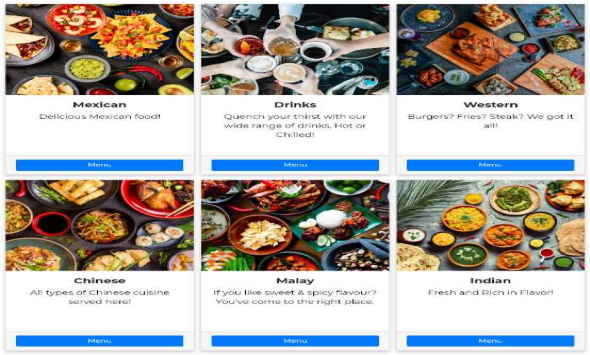

Fig. 16. Available Stalls

The menu page will display all the items the specific stall has in their menu as shown in Fig. 17. Each item will be displayed in a card layout with their details such as their price, name, and an option to choose the quantity. Users can add multiple items to the cart but are restricted from adding items from another stall to the cart when the cart is already being used by a different stall.

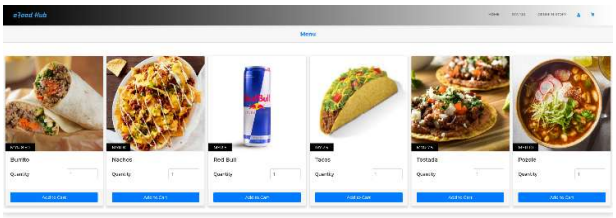

Fig. 17. Menu Items

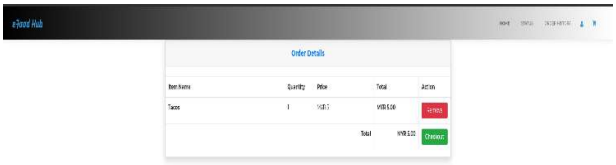

Fig. 18. Checkout

If the user wishes to check out, they may proceed to the checkout page by clicking the cart icon in the navigation menu, which will redirect them to the checkout page as shown in Fig. 18. The checkout page will list all the items added to the cart by the user. The user can review their order prior to placing their order.

IV. CONCLUSION

Overall, the developer has managed to meet all the deliverables in the fully functional prototype of eFood Hub as promised in this documentation and the developer was able to complete the system and the documentation to meet the success criteria. This project was completed with the focus of being able to solve the problems that brought the need for this system and has managed to meet the criteria as per the documentation.

The developer was able to gain valuable skills from his experience completing this documentation. The developer was able to learn to manage time better to be able to complete the research on time. Furthermore, another important skill that was improved on during this phase was, research skills, which the developer was able to improve to meet all the requirements of the documentation. Furthermore, the developer was able to improve his analytical skills to successfully do thorough analysis of the questionnaire responses. During the completion of this documentation, the developer was able vastly improve his knowledge on various fields and develop multiple skills which proved to be useful for the second leg of this project.

During the second leg of this project, the developer was able to pick up various lessons during the implementation phase of the project when the prototype was being developed, as it required research regarding the programming languages to implement the functionalities to get the system working. Furthermore, time management was a crucial skill to be factored during this phase as the prototype needs to be

completed and documented thoroughly, the developer has learned to manage time much better to complete the project in time. The developer was also able enhance his problem-solving skills as it plays an important role in debugging the system to ensure it is bug-free.

Despite the facts, the developer was able to complete the system according to the requirements, there are limitations to the system due lack of knowledge in programming such as data fetched from the database is not in real time and will require end-users to refresh the page to see any new data from within database, this can hinder or slow the order confirmation as the stall operators will be required to refresh to see any new pending orders. Furthermore, the account balance reload function does not have any payment integration so currently, the end-user will be able to reload their account balance without paying.

If the project were to be repeated, the developer's focus of the project would be to start working on the implementation phase much earlier to allow space to add additional functionalities and to implement additional functionalities to further enhance the system to create a better user experience. Features such as real-time notification alert, multiple payment methods, loyalty point system, could be implemented within the system to develop a much more complete system. Furthermore, more time will be spent to improve the design of the system to match the theme of the intended purpose of the project.

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