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Design and Development of E-Commerce Web Application for Cooperative Store

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Abstract - *E-Commerce web application, Cooperative Store Management System is the platform where customers can shop online without having to visit the store physically. It aimed at reducing the workload of the salesperson and minimize the manual errors by automating the record entry. Customers can hugely minimize the cost incurred and time being wasted by the use of a system. Moreover, customers can get better services and the shopping can be done at one's convenience as the services can be availed from their home. This will not only help to attract new customers but also retain regular customers which ultimately helps the business to grow in a long run. Interview, brainstorming and team meeting were done to get the complete requirement of data for a system. Frontend interface can be used by the customers to view the items and place order as per their needs. Backend interface can be used by the staff working in the store to perform Create, Read, Update and Delete (CRUD) operations. The paper is going to provide the information of the processes involved during the development of the application. It will also present the design process, methodology and overall working of the system.*

***Key Words*: E-Commerce, Web Application, Cooperative Store, College of Science and Technology, Online Shopping**

1. INTRODUCTION

With the advancement in information and communication technology (ICT) all over the globe, Bhutan has also experienced rapid growth [1] in ICT throughout the country. Since then, Bhutan's development in the sector has become remarkable. The economy of the country has grown positively, and people are now living much easier life with most of the services just a single click away. One such development tool is the E-commerce technology in particular [2], the online shopping habits. ICT and e-commerce are a potential "game-changer" for Bhutanese social and economic development. Online shopping is a new market in Bhutan and many Bhutanese are now continuously embracing this trend. According to [3], "shopkeepers in the capital are beginning to feel the heat from online shopping, which has grown by leaps and bounds in the past few years and threatens to swallow conventional shopping". Since, online shopping is convenient and provides various choices in terms of goods and price, people are unknowingly driven by and tends to shop more and more. In addition, the youths and mostly the students are warmhearted about online shopping. Therefore, the research aims to automate the conventional store to an online service.

CST cooperative store, shop was introduced in the college by Gross National Happiness Education (GNHE) club as one of its services to the people residing within the campus. The store was opened in 2014 under the initiative of former club coordinator Mr. Tshering [4, 5]. The club mainly works for the happiness and well-being of the students as well as college. Therefore, the purpose of opening the store is to sell items at a minimum possible cost [5]. The income generated were used for the GNHE club and contributes a certain amount to college, so the money stays within and benefits everyone [4]. This way, students can buy the required goods from the store available in campus rather than travelling to town just to buy a few books and some edibles. It helps them to save time as well as cost [6]. The shop is being operated by the students, member of the club. With that, it helps them to gain the retailing experiences and certificates of social services are issued at the end of their tenure [5]. Currently, everything has to be done manually including the record-keeping of stock, items sold, and expenses incurred. It is tiresome and time-consuming for salesperson or employee working there to maintain those records in a register [7]. Residents have to visit the shop to buy things and sometimes they find it closed or the item is out of stock [8]. The store timing also changes very frequently and every time the concerned person has to circulate the emails regarding the opening and closing time of the store [7]. However, students hardly check emails and remain uninformed. Moreover, they face issues with students not turning up to pay credits on time [9].

2. RELATED WORK

E-Commerce platform is the cheapest means of doing business and helps to reduce the cost of promoting the products and services [10]. The main objectives of developing the application by [10] is to attract more customers so as to increase the sale. [11] has developed speech recognition system-based e-commerce web application to leverage accessibility for visually impaired users. This can help differently abled users to use the application through the voice command. Moreover, SRS enabled application can enhance the usability for all users and customers can also make request using natural language

[11]. E-commerce web application using MERNstack technology was developed by [12], which comprises of MongoDB, Express.JS framework, React.JS library, Node.JS platform. Besides, different views for user and admin, the application is integrated with payment gateway for checkout [12]. [13] has developed price-sensitive recommendation engine to improve the accuracy and business performance of e-commerce application. It was learned that the proper modeling of recommendation engine helps to improve the business performance [13]. Amid COVID-19 across the globe, online shopping and home delivery in Bhutan has become prevalent as people are not allowed to go for shopping physically [14, 2]. More than 20 retailers in Thimphu city were authorized to cater and provide services including the delivery of groceries and food [14, 15]. According to [16], Bhutanese platform named Bhutanbuy were launched to allow all the Bhutanese living across the world to buy Bhutanese product online.

3. PROBLEM STATEMENT

Every year, the cooperative store brings some new stocks to sell which is useful for the students [7]. The number of items to sell increases depending on what students demand and suggest. However, because of the smaller number of employees working there and a greater number of students enrolled in college every year, it is hectic for them to provide the services [9]. They have to work heavily in store and also have to study later after the shop is closed. In conversation with the club president and salespersons, it was learned that sometimes they land up making errors in record-keeping or calculations thereby leading to inaccurate record of expenses and income [7]. Student and residents in the college campus depend on shop as and when they are in need of something. They found it annoying if the item they wanted is not available or the store is closed after they have arrived at the store [8]. This is due to no prior information got by the customers. Moreover, during the peak hours when there are more customers, they are forced to wait in a queue to avail the services. In that way, their time is being wasted which otherwise can be used to do something fruitful [6]. Thus, developing of E-Commerce web application can solve the aforementioned problems.

4. METHODOLOGY

A sequence of steps as depicted in the *Figure-1* were followed for this study [17]. The research was started with the literature review and after which the rough idea to work on the topic were understood. For the requirement gathering purposes, researchers have brainstormed among themselves, interviewed stakeholders and consumers so as to collect full and complete requirement. The raw data gathered were analyzed and checked more than once to see if the complete requirement as per the scope were gathered. Further, unnecessary and ambiguous requirement were pruned to be not included in the finalized requirement. After the requirements were finalized, successive database design as given under *section 4* was done and also the interface design which can be implemented were made into final. On completion of design stage, application development was done using Laravel. Before the deployment, system was fully tested to ensure the application developed were bug free.

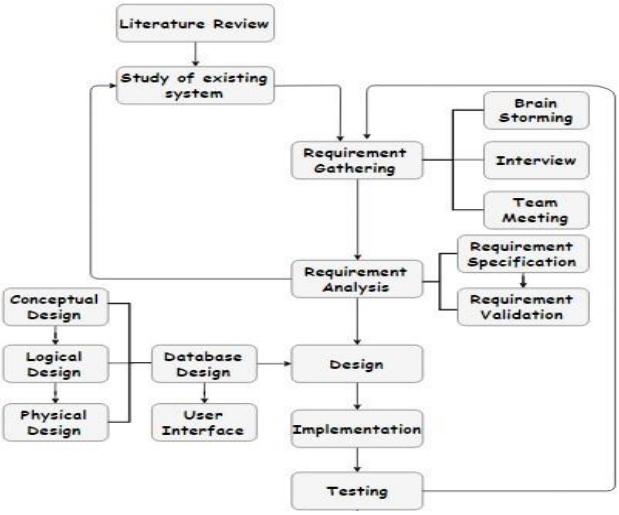

Fig -1: Methodology

5. DESIGN

Taking the final requirements into consideration, standard processes were followed to design the database.

5.1 Conceptual Design

Requirements collected were categorized as entities represented in rectangular shape, ellipse for attributes and diamond to represent relationship between the entities [18] as show in *Figure-2*. Also called as entity relationship model (E-R) is mainly used for communication between the database designers and end users. It is a representation of the structure and constraints of a database [18].

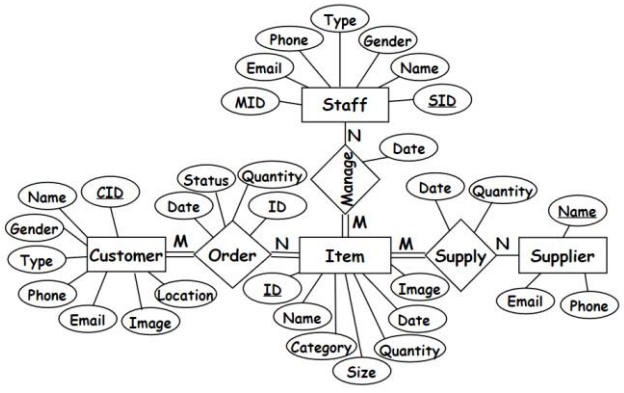

Fig -2: Conceptual Design

5.2 Logical Design

ER diagrams are transformed to Relational schema using relational data model. The researchers have followed the

standard ER-Relational mapping algorithm set by [18]. As shown in *Figure-3* were the output of ER to relational mapping. The pointed arrow in the figure depicts the referential integrity constraints.

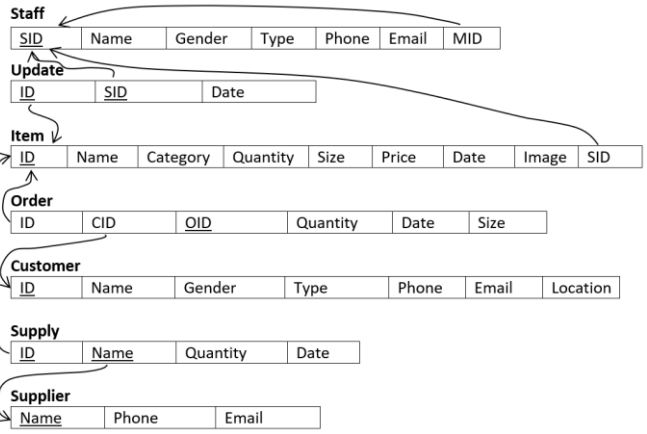

Fig -3: Logical Design

5.3 System Overview

The data flow diagram (DFD) as shown in *Figure-4* shows the interaction [17] between users and web application of the Cooperative Store. The users are staff, suppliers, and customers. Staffs include managers and salesperson. The input to the system is shown by incoming arrow and output data is indicated by an outgoing arrow.

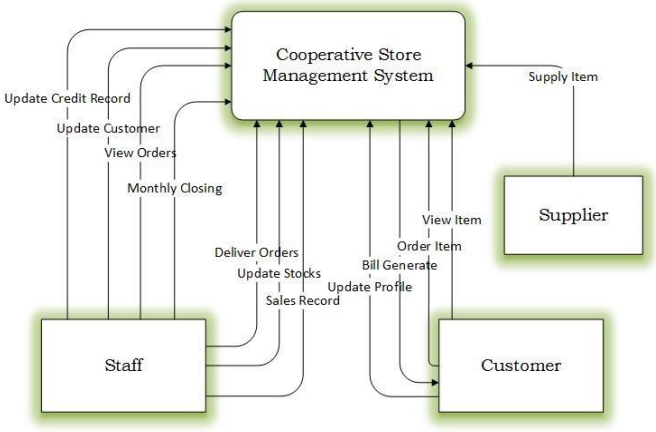

Fig -4: Data Flow Diagram

6. APPLICATION DEVELOPMENT

There are many technologies to choose from while developing the application. However, researcher has chosen to work in PHP framework, Laravel. It is simple, less error due to code reuse and ensures stability of the development with better security than manually coded projects [19]. It streamlines the web development by following Rapid Application Development (RAD) software development model. The Model-View-Controller (MVC) is the architectural pattern used by the framework, separates an application into three main logical components: the model, the view, and the controller [19, 20]. Each of these components are built to handle specific development aspects of an application and thus, isolates business logic from user interface (UI) and makes maintenance of application easier [20]. It is one of the most frequently used industry-standard web development framework to create scalable and extensible projects [19].

6.1 Front-end Interface

The interface can be accessed by the customers (both guest users and the registered users). Though both type of users are given the liberty to view the available items posted online from a system, guest users cannot place order. If one need to make an order, one must register themselves in a system. On contrary, registered users can place orders anytime and their items will be delivered to their location within 2-3 working days. Registered users will also be able to manage their profiles, view the credit records and receive notifications related to their orders. With such service available, customers need not have to stay in queue nor encounter problems like the unavailability of items after visiting the store. For now, delivery location is restricted to only within the college campus. However, delivery outside the college campus will be considered only on special circumstances. As payment gateway is not integrated in a proposed system, payment can be made on cash upon receiving the ordered items.

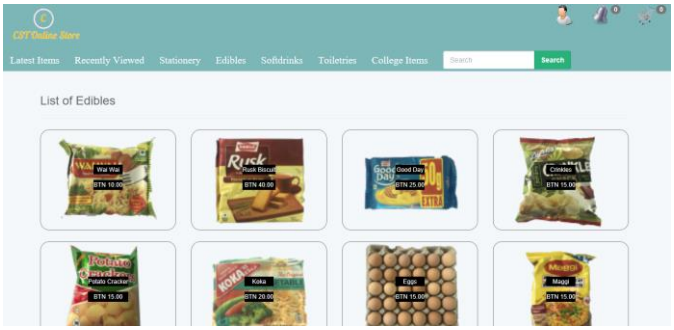

Fig -5: Front-end Interface

6.2 Back-end Interface

The interface is mainly for the administrators and staff working in the store to manage the system. However, full permission is granted only to administrators to perform CRUD operations. Staff of the store can be able to make stock entry, view orders of the customers and record sales and expenses. Reports can be generated either monthly or annually using the system by the staff. With the help of notification feature in a system, staff will be notified when the items in stock reach the bench mark set by the administrators. And also, notification will be pop up as the customers place new orders.

Fig -6: Back-end Interface

7. LIMITATION AND FUTURE SCOPE

The future scope of this project is to develop and integrate e-payment system and barcode reader with the Cooperative Store Management System. If there is a barcode reader it would be very easy to register sales in Point of Sale (POS) without having to type names of items and associated price. E-payment system is a necessary component for every e-commerce application. So, it would be more convenient and useful for all customers if it is incorporated.

8. CONCLUSIONS

Cooperative Store Management System is an e-commerce web application that is developed to make the existing service more convenient, reliable and effective for people residing within the college campus. The only way to sustain and attract more customers is by keeping them satisfied and happy through reliable and convenient shopping method.

It has two components, the frontend, and the backend. From frontend, users can view items available in store, make orders and manage their profile. At the backend, the system keeps track of sales made and orders received from the customers. It manages home delivery service for all customers who resides within the campus. The system also keeps a record of expenses and purchases brought from various supplies. It can generate a total amount of sales and purchases and identify the items mostly sold and least sold. So, this will help the service providers to get an instant statistic while performing a cost-benefit analysis of their business and thus, reduces their workload.

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