

Intelligent Delivery System with Warehouse Sorting

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ABSTRACT-The paper gives a brief discussion about the conceptual design of a web portal and warehouse management and sorting. The design aims to benefit the merchants who lack the capital and human resource to have their own warehouses. Warehouses with efficient sorting and stocking of goods are needed to store the goods. Geographical location-certain goods are produced only in certain locations-and a lack of brand recognition hinders small scale merchants from reaching a broader consumer base. The solution presented has dual purpose. Firstly, it serves as a platform for merchants who do not have an online presence by providing an avenue to display their products. Secondly, stocking and delivery of products can be implemented for a wider delivery base.

INTRODUCTION

Before the existence of e-commerce, trading of goods took place in a local marketplace. This prevented the merchants from reaching a larger consumer base as cost escalated due to the presence of middlemen*. Internet penetration resulted in a larger consumer base with a decreased cost for the consumer. In the current scenario, small merchants who want to sell their goods online have to overcome hurdles like a lack of capital to set up and maintain an inventory and a warehouse. The merchants do not have a common point of communication with their customers. This increases the cost of products for the end consumer as well as lower profits for the merchant. This leads to the merchants serving a market which they can manage.

If an small scale e-commerce entity or company wants to expand their business, then it must set clear the logistical challenges from its supplier to its customer. This proves tedious to set up and maintain as it has to invest in a warehouse to store all its goods and set up the technologies to sort them according to the destination. The entity needs to select delivery contractors for each of its delivery areas. Thus leads to large overhead which may not be manageable for a small e-commerce entity.

The system aims to overcome these obstacles by providing an approach to mediate between the merchant and the consumer and providing the necessary infrastructure for the same thus removing those bottlenecks.

The system designed consists of two parts. The website onto which the inventory will be presented. And the warehouse storage and sorting mechanism where the products will be sorted based on their categories and destination. In this report, a study in the field of online market, past delivery

systemproduct tracking systems that are present in warehouses for sorting are described.

SYSTEM MODEL

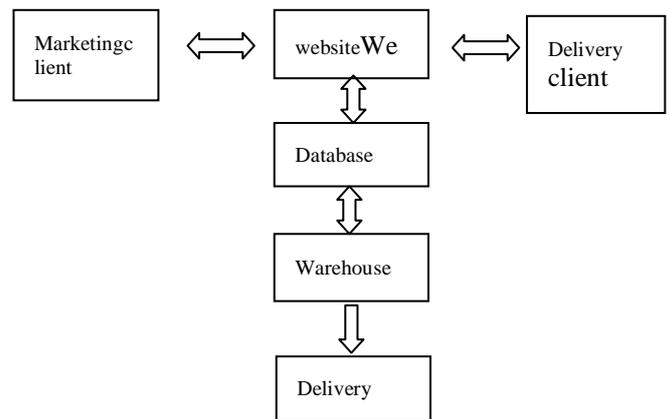


Figure 1. Representative Model

The basic block diagram of the system is given above. This system is made for the e-commerce merchants who have their own product lineups but who do not have their own delivery and sorting systems.

This system would enable these merchants to ship the products to the common warehouse located strategically according to the geographical locations. These would be categorized according to the brand and location and then sent for sorting according to geographical areas.

Three product types and three brands per product are considered as scope for the system described.

The website is the primary point of contact between the customer and the system. The website provides certain features for the merchants which include product advertisements and inventory database management.

Login and Signup options are provided for account management and tracking of shipments. Category based segregation and ability to order with Cash on Delivery are enabled.

Categories of product database consisting of all the products with their respective parameters and specifications.

Databases for Account management, Cart management, etc are provided at the back end.

There are four warehouses considered as a scope - representing four cities- for simplicity. This warehouse model could be scaled to a larger warehouse as well wherein the sorting and stocking of multiple brands and types of products can take place. This representative warehouse will be capable of sorting random packages which are received at that warehouse as well as restocking. Restocking takes place when a merchant provides their products to be stored in that warehouse. Suppose a product is stocked at a particular warehouse then the dispatch of that particular product will take place as and when it is ordered on the website.

The tracking of packages will be carried out through the website. Three phases of tracking will be implemented. Confirmed, dispatched, shipping. The website will be automatically updated after each phase along with the database. NFC tags will be utilized to track the products along with barcodes. Use of NFC leads to secure automatic tracking as manual scanning -like in the case of barcodes- is avoided. Tracking information will be sent to the merchant as well for transparency. SMS based tracking is enabled for the customer.

Website and Database Structure

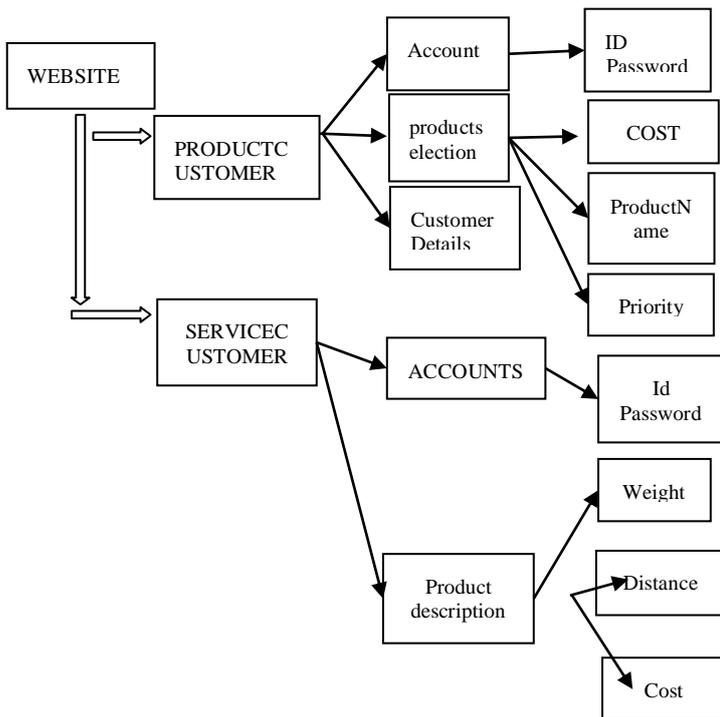


Figure 2. Basic Website Structure

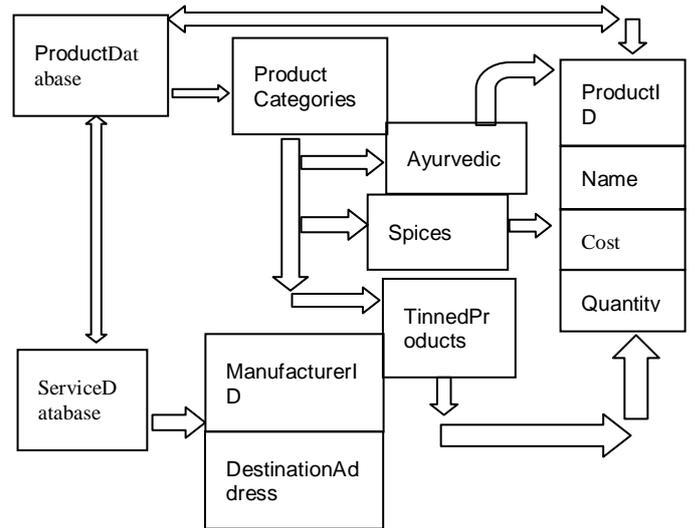


Figure 3. Database Structure

A basic e-commerce website is designed. For this purpose website development languages like HTML5, PHP are utilized. Global hosting and domain registration are carried out. Use of a database system is done to maintain the database of the products and the customers.

Data about the goods to be stored is taken from the manufacturer. That data consists of type of products, manufacturing entity, wholesale cost, and quantity. Different tables are created for different goods.

On buying a product, a customer needs to enter their details which will be stored in the database. A product is assigned in real time and is linked with the customer. Tracking details are sent to the customer.

RESTOCKING AND SORTING MECHANISM

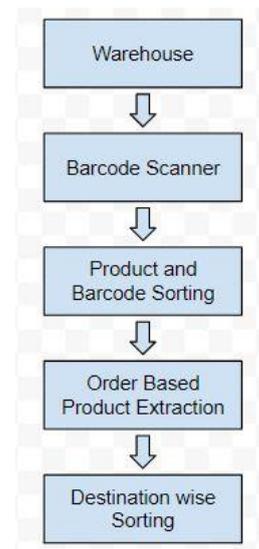


Figure 4. Basic Restocking and Sorting Mechanism

A representational structure and mechanism for sorting is discussed in this section.

The goods sent from four different cities are considered. A trolley based mechanism is used for sorting purpose. Besides the trolley, a Barcode Scanner is utilized to read the barcode on the box. Based on the input of the Barcode Scanner a value is fed into a microcontroller. On the sides of the trolley hall effect sensors are mounted. Alongside the sensors the respective product and brand type stacks for holding the products that would hold the product.

The sensor inputs and the barcode scanner outputs are fed into the microcontroller which in turn would control the trolley. When the product has reached the specific position the trolley would be stopped based on the sensor inputs. Now that the product has reached its specific position and the trolley is stationary the pushing mechanism pushes it into the stack. A programmed NFC tag is attached to it.

In the stacks, an IR sensor would be mounted that will give us the count of products that have fallen into the stack. This can be used to control the number of products that will be contained in the stack. NFC receiver will be placed at the sorting end where it will make contact with the tag and send the respective output to the microcontroller. The microcontroller in turn will send this output serially to MATLAB. The MATLAB will connect to the database and update the tracking column for that particular product. This ensures that the product is tracked at intermediate stages. The

user can thus continuously track the product he buys from the website.

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