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Just Walk Out: An innovation towards the fusion of the online and offline markets.

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Abstract: *An ever emerging trend and development of the digital technology has become a prime reason leading to thedrift of the potential users from the offline to the online markets. This paper proposes to bring in a change in theway people shop adding in the advantages of both, an online and an offline market and promoting the 020 business strategy. The users of the system will be able to carry out multiple tasks like adding items to the smart cart, operating the cart manually, mobile payments and a quick bill generation while avoiding the long queues at the billing desk and experiencing a hassle-free shopping. A mobile application along with the use of NFC(Near Field Communication) makes this process handy for the end user. Various modules like the web module, user android application, and physical interaction with the items in the market have been closely discussed to define an interconnectivity and suffice the needs of the user to make it a whole-new experience of a Smart Shopping System for the end-user.*

I. Introduction

Therehas been an exponential growth in the numberof smart phone users over the past few years.Alongside, e-commerce has experienced tremendousresponse due to the increased use of these mobile communication devices thus influencing users toshift to the online market and overcoming thedownsides of shopping in aphysical shop. Thoughe-commerce establishes a shopping environment tothe user at the comfort of his home, itmight tend tocomprise the product quality allowing the users todevelop a false impression and losing theconfidenceto buy products online due to multiple other reasonstoo. While on the other hand, a certain categoryofusers still enjoy experiencing the mall environmentbut might be disappointed due to the time spent onlongbilling queues or carrying cash, plastic money,etc. Since both, the online as well as the offlineplatforms havetheir respective pros and cons, weintend to introduce a fusion of the two bringing achange needed to equip andbuild a smartmarket.Smart shopping market is an environmentthat is defined to bring in the experience of aphysical mall alongwith introducing smart carts andenabling an easy bill pay process making a hassle-free shopping experience for the user. This positionenlightens the use of the NFC technology to helpbuild such a system.

II. Technical Approach

Near Field Communication(NFC) is a technology that defines a wireless connectivity within a radius of short range. It operates at a frequency of 13.56 MHz with a data transfer rate upto 424Kbps. NFC enables connectivity with the interacting device by just a simple movement as a swing or a twist. The NFC reader and the tag are the concepts when put together bring about the incorporation of an NFC environment. The NFC readers are installed in the mobile devices while the tags are attached as a common parameter to identify a rack of similar items. The various components and modules to be dealt with for a successful working of the system are discussed below.

A. NFC Reader

The reader generates radio signals to communicate with NFC tags. The reader is an active device. Android phones have NFC readers installed in the device. The reader just scans the tag to obtain information.

B. NFC Tags

The tag is a device containing antenna and memory. Depending on the tag the memory can be of different types such as read only, re-writable etc. Tag consists on all information related to product. This unique information is useful in identifying specifications of different products. The tag is a passive device.

C. Android Module

The app consists of an account which has user id and password provided to each individual customer. The account has unique information of customer such as name, address, email, phone number, offers applicable etc. Also the app will contain product's information provided by NFC tags. It helps in keeping a track of customer's shopping. It has records of customer update/deletes of items. The final list is then generated and provided to seller to generate bill.

D. Web Module

The web module enables an administrative involvement in order to obtain a correct and verified workflow of theentire system. It takes up the responsibility of manipulating the databases. The web moduleprovides the administrator with an ability to operate and confirm the details regarding the employees in themarket, the users of the system, the product details, alongside adding extra functionalities and roles to be playedby an administrator to ensure the success of the system installed at place.

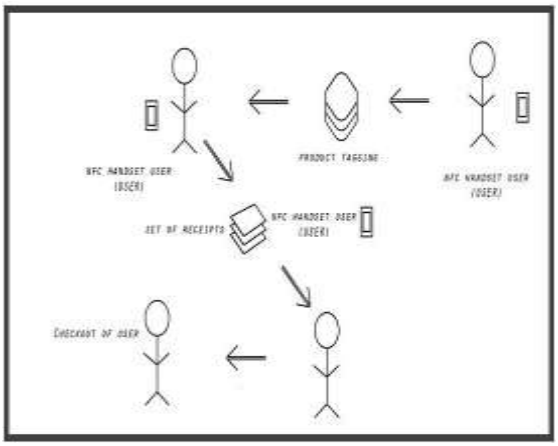
E. Payment Module

There is a variety of payment modes. Cash payment at stores is less feasible than online payment. Sometimes the customer might not have enough money in their wallet at the time of buying products. So customers might end up deleting products from their list. Cashless Transactions are much beneficial. Customers can pay through e-wallets. There are other modes of payment available for customers like Cash on delivery, Net Banking using Credit Card or Debit Card etc.

1. The user of the system having a NFC reader enableddevice enters the market along with an android application installed to operate the items he/she adds to the cart. The user activates the android application as soon as he enters the smart market and taps on the respective tags associated with the items that he wishes to purchase. This module forms the android application wherein the user has the liberty to perform actions like manually adding/deleting the items in the cart before the bill generation process, to learn the details regarding the product he wishes to purchase, make mobile payment after shopping, etc.
2. After the user finishes tagging all the products hewishes to purchase, he can confirm the cart details through his android application thus generating a bill.
3. The user has different modes to make the payment as discussed earlier, thus making the whole process hassle-free.
4. On bill confirmation, the products will be eitherdelivered to the registered user address or will be directly taken by the user, as per his choices. Thus, this application software presents a user-friendly atmosphere ensuring that the user has flexible choices on demand.
5. A database comprising the registered user, userpurchase details, payments made, successful deliveries, product availability, employee details, etc is maintained at the administrative end, forms the web module.
6. Thus, through the deployment of NFC enabled tagsand readers along with the mobile and web applications, a market place can be transformed into an Smart shopping market for the end users.Needless to say, users have to just walk out while still enjoying the physical market and using the benefits of an online store.

III. System Structure

Shopping system will be built using various hardware components. Customer needs to use Android phones having NFC technology enabled NFC readers. Products will have NFC tags with its information. The shopping process begins with tapping NFC readers on NFC tags. Products can be added or deleted as per user needs. Further bill payment has to be done through e-banking. Customer needs to just walk out of the store after shopping.



A. Application on Customer's Side work as:

Customer has to enter the store and open the android app in their NFC enabled smart phones. The app will have user account. Customers have to insert login id and password and start their shopping. Customers can scan the NFC tags and add items to their virtual list. Once done with shopping the bill payment can be done online through e banking as shown in the Fig.2.

B. Application on Admin's Side work as:

As Admin keeps the records of each Customer on their database it will help to track list of ordered items from different customers. The admin has all the required information of customer. Thus, items to be delivered are packed and then set out for delivery(as depicted in Fig.3). A brief demonstration of the system can be presented in the following steps:

1. The user of the system having a NFC reader enableddevice enters the market along with an androidapplication installed to operate the items he/she adds to the cart. The user activates the android application as soon as he enters the smart market and taps on the respective tags associated with the items that he wishes to purchase. This module forms the android application wherein the user has the liberty to perform actions like manually adding/deleting the items in the cart before the bill generation process, to learn the details regarding the product he wishes to purchase, make mobile payment after shopping, etc.
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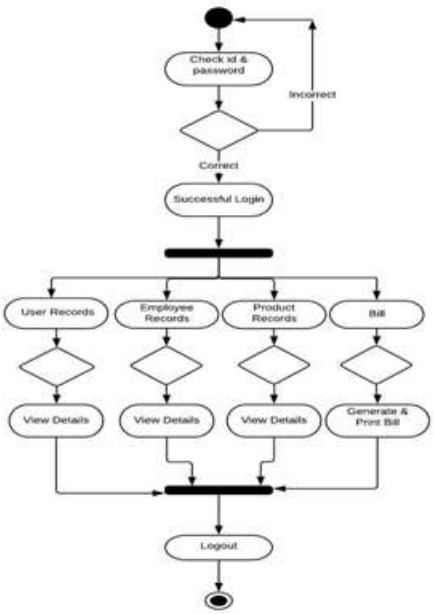
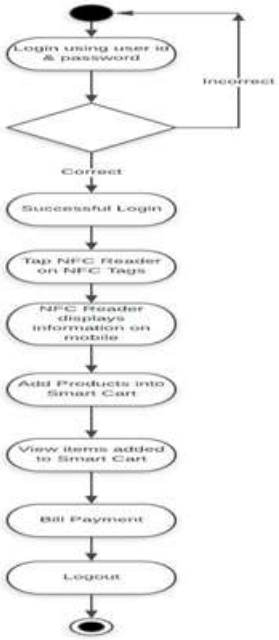
C. Uml Diagrams

Admin side:

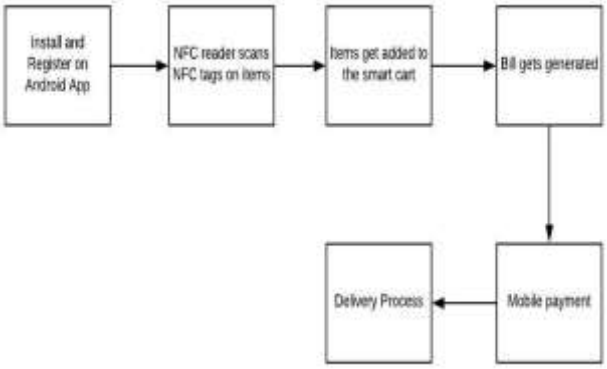


Client side:



Block Diagram:

The following diagram represents the workflow of the proposed system-



IV. Literature Survey

1. "Mall shopping using NFC" by Mr.Jayesh B Mahajan, Mr. Bhagwat Kakde, Mr. Anurag Rishishwar.

The paper focuses on enhancing the shopping environment in the malls through the mobile communication applications. More emphasis has been put on the mobile payment module stating NFC as an important technology behind it.OR codes have been used to tag items in the mall to make the scanning process easy, with a view that QR codes provide more information compared to NFC and Barcode. The proposed work suggests scanning of the products to be done using QR codes whereas NFC is put to use for the bill generation and payment process. [1].

2. "IoT based retail shopping system using NFC" by Bansi Jani, Prof.Divyang Shah.

Emphasis has been made on the retails shops to improve its capability of giving a more closer look to the products along with providing its customers with multiple options. NFC and RFID(Radio-Frequency Identification) concepts have been put to work to make shopping easier. The android, NFC reader enabled mobile phones are attached to the trolley such that they can easily keep track of the items, with the NFC tags attached. This introduces an IOT concept where billing process is automated.

The cart is designed in a way to make use of LCD, RFID readers and EEPROM to support the working framework. Payment options have been made flexible, allowing users to make the choice for the mode of payment. [2]

3. "IoT Applications on Secure Smart Shopping System" by Ruinian Li, Tianyi Song, Nicholas Capurso, jiguo Yu, Jason Coutuk and Xiuzhencheng.

The proposed system aims to present the use of RFID tags on the items in the Shopping system.Theshopping cart is enabled with RFID readers to make a list of products added to the cart and easily generate the corresponding bill. The paper mainly focuses on the security of the proposed system. With respect to the attacks made on the wireless communication among the various inter-connected servers, smart carts and items, security and privacy of such a system has been given due importance. Thus light weighted cryptographic system has been utilized tp prevent an attacker from eavesdropping or modifying data between the carts and the servers. [3].

4. "Smart Shopping system Android Application" by Mansi Mhaske, Mayuri Sawant, Ekta Bhattad,Amruta Gaikwad, ManojMulik.

The problems with the existing system have been solved through the NFC reader enabled android phone and an android application to make a user- friendly interface. NFC tags are attached to the products instead of barcode, to avoid the manual scanning procedure. The server and the mobile application are connected via WiFi for the purpose of inventory management. [4]

5. "Shopping M-commerce using NFC tags"[6] by Erum Khan, SaadiyaKazi, Priyanka Bisth, Nida Aibani, Prof SonaliSuryawanshi.

This paper presents a peculiar method to make shopping comfortable using an android based M-commerce application. The system is designed to ease the work of the customers who shop on a regular basis. The paper aims to discuss the future scopes that can be incorporated in the proposed system. Three points covered where –

- Prediction : Through the installation of expert systems for user guidance.
- Billing : A direct connection established between the merchant and the user mobile wallets to enhance the bill payment involving the use of NFC technology.
- Security : Since NFC alone cannot ensure the security of the entire system. The higher layer cryptographic protocols might be required by the application involving payments, to overcome threats like- eavesdropping, Data modification, replay attack, lost property.

V. Conclusion

This paper, thus, proposes a smart shopping space incorporating the emerging NFC technology. Each of the modules ie. Web, android application and the NFC enabled environment introduces an efficient inter-connectivity in the system to ensure smooth processing of data among them. The system aims to achieve high reliability, real time interaction, high efficiency, easy maintainance of the system, comparatively low initial investment, convenience of installation and efficient system management. Thus, a system enabling an easy flow of data and involving the fusion of the online and the offline trends in shopping makes that system a smart place to be in.

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