Intelligent (I)Mart (NFC Enabled System)

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Abstract*—NFC is one of the emerging & promising technology that provide, means to short range contactless communication for mobile phones & other devices. It is an interactive technology that permits data to be exchanged between devices located a few centimeters apart such as RFID (Radio Frequency Identification) tags & readers. We are introducing our system for hassle-free grocery shopping by empowering the customer to pay bills for the items required in a store by simply using 'NFC enabled Grocery Mobile Application' at the cashier store identify the customer's cart, quickly and securely user can purchase the grocery by making payment via wallet or E-Commerce.

Keywords*—NFC, Smartphone, Tag, RFID, E-Commerce, Cart, Wallet System.

I. INTRODUCTION

A. Background Near Field Communication (NFC) is an upgraded version of the preexisting RFID technology where it combines a smartphone interface and reader on to a single device [1]. The technology works on the principle of wireless connection between the two way communication devices. Also both devices mutually communicated and being able to easily sends data in active mode and receives data in passive mode. It operates within the 4 to 10 cm radius [2].

The integration of NFC technology into mobile devices offers many reliable applications such as payment, ticketing, loyalty services, identification, access control, content distribution, smart advertising, peer-to-peer data/money transfers, and set-up services [3].

With the ease of technology, everything is just a click behind so we thought it would easy and enjoyable experience to users to purchase grocery items through NFC system. The user who frequently visits the store to get grocery on a weekly or monthly basis and they willing to buy grocery while omitting the hassle of preparing cart items and waiting in a long queue of billing, then NFC is the solution. The mobile phone of user integrated with NFC reader will first scan the location of wrack. Each wrack has NFC tag which stores and transfer items information in each wrack. The user can view relevant items, and the offers proposed to add or delete an item to the cart. On, user confirmation the items are prepared by the employee [4].

After purchasing items customers can pay bill through payable Wallet system(pay by cash) or through E-bill to monitor the amount of shopping[5]. Mobile commerce (m-commerce) can be viewed as a subset of e-commerce [6] refers to bank transaction with monetary value that is conducted via a mobile network [7]when user conduct e-commerce such as e-banking or purchase products, they do not need to use a personal computer system. Indeed, they can simply use some mobile handheld devices such as Personal Digital Assistants (PDA) and mobile phones to conduct various e-commerce.

Wallet is a software application on a mobile handset that function as a digital container for payment cards, tickets, loyalty cards, receipts, vouchers and other items that might be found in a conventional wallet. The mobile wallet enables the user to manage a broad portfolio of mobile NFC [Near Field Communication] services from many different companies [8].

Through our application customers save a lots of time they don't have to wait in long queues to pay their bill. This application not only saves time but also avoid the wastage of products which is sometimes made by customers in checking the details of products. In some cases testors(sample of products) are not available in mart so customers tries checking the original products which are for sale which results the wastage of products. While shopping carrying heavy trolleys is much irritating for customers so by using this application customer can get rid of carrying heavy loads [9].

The paper is structured as follows; Section 1 provides Introduction of NFC in Introduction we covered the background of NFC, applications, description of project ,payment by e-commerce or wallet system. Section 2 describes the literature review of the research. Section 3 delivers the system design which includes a system hardware diagram, system software diagram(use case diagram) and application flow chart and billing procedure included in application, the billing process comprises of a digital wallet system or m-commerce/e-bill. Section 4 consists of the methodology which includes system diagram and explains the overall flow and working of the system. Section 5 describes design phase which delivers the dfd diagram of proposed system. In Section 6 implementation has been described in which screen shots of the application are included.

Section 7 Provides the results and findings. Section 8 describes the future scope ,enchancements that can be made to system, problems that can be overcome in future. Section 9 gives the conclusion.

II. LITERATURE REVIEW

NFC is a rather lately emerging technology, research papers on NFC are relatively recent, so that the first NFC related papers are published starting from 2005[10].

Near Field Communication is an efficient technology for communications within short ranges, which offers an intuitive and simple way to transfer data between electronic devices [11]

.NFC supports three different modes. The first is card emulation mode where the device is passive. An example of card emulation is opening car doors with an NFC device simulating a key. In the second mode, i.e. reader/writer mode, the device is able to read from and write to a passive tag. The third mode is peer-to-peer where both devices are active, establishing a two way communication [12].

NFC provides user-friendly remote health monitoring, controlling, and tracking systems [13][14][15] and

data capturing services [16].

NFC devices can also be used to exchange data as text, images and URLs simply by holding the device near various smart tags [17].

In recent years, NFC has become an attractive research area for many researchers and practitioners due to its exploding growth and its promising applications and related services. The number of publications in NFC research area is increasing continuously since 2005 [18].

The authors have explained the essence of mobile payment through integrated NFC module on smart-phones. They have highlighted the issues that mobile payment methods face, both generic and some of them specific to NFC [19].

This mobile payment method has been proposed in this paper the process is aimed at reducing the cost and time of generating public key operation and registration process in Mobile payment. They proposed a system that includes three stakeholders namely: The client (customer), the Merchant and the Issuer [20].

It also attempted to gain a better understanding of the determinants of acceptance of mobile payment services by consumers and the reasons why the service has not gained widespread use despite the fact that mobile technology has become so common in today's everyday life [21].

Instead of the technologies that are already available in the market, NFC applied to payments introduces secure elements and stores the credentials for the payment on the device. There were several options potentially applicable before the GSMA (Group Special Mobile Association) opted for the adoption of NFC Subscriber Identity Module (SIM) [22].

As stated by it is important for business and social science researchers to understand new emerging technologies such as RFID, NFC. With the development of more and innovative NFC enabled applications, the need for standards and policies is increased [23].

The idea proposed that it is a secure mobile payment it can be achieved in global markets using NFC enabled mobile wallets. The mechanism behind the protocol floated is that each user has a session dedicated to them [24].

This article discusses the research being done on biometric security for mobile payments. This article is based on the patent, filed in February 2006, registered by Universal Secure Registry. It is their proprietary technology for secure mobile financial transactions. This authentication can be used/ integrated with NFC [25].

III. SYSTEM DESIGN

A. System Hardware Diagram

Fig. 1: System Hardware Diagram

The hardware requirement for shopping system comprises:

- NFC tag.
- NFC Integral Smartphone.

Firstly customer tap the NFC tag with the NFC embedded smartphone and installed Intelligent(I) Mart application specifies the location of products and then further tapping on NFC tag slicked to products shelf signifies the list of items, also shows more classification of related items available in store.

B. System Software Diagram

NFC enables Android based Application is fabricated on Firebase external storage and SQLite android local storage. The designed application comprises three different interfaces with respect to three user characteristics:

- ***Customer/User/Client:*** Sign Up to the downloaded Android Application. After login to the page can add, omit a product or view product details and final selected cart items. On, confirmation and billing user Logouts.
- ***Employee/Cashier*:** Can Log in to the registered Application, to view user and cart details; manages and organizes user cart; generate a bill and logo out.
- ***Admin/Administrator:*** Plays the constructive and operative key role to add or manage the Employee; Customer and Grocery products; and can also view customer and cart details.

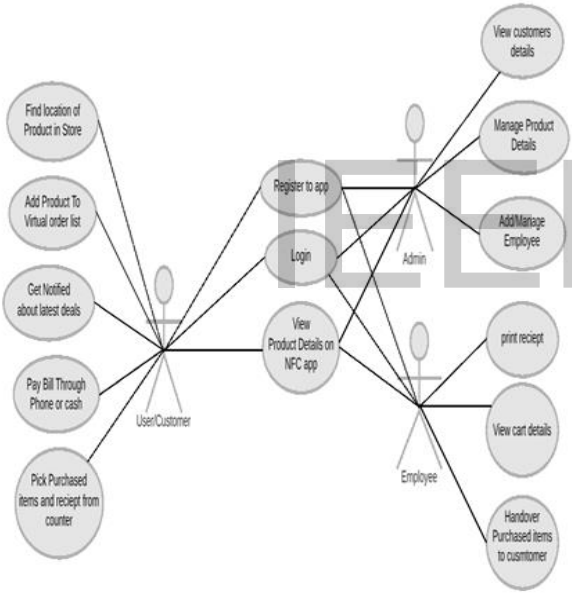

Fig. 2: Use Case Diagram

C. System Flow

Our System has installed in the store where the grocery system purchasing based on the 'NFC Technology' and for this, android application and NFC Tags are the prerequisites. As soon as the customer enters the store, he/she should log in the application with correct/valid username, after login the app, customer will get the product information by placing their phones closer to the desired product as all items or products of the stores will be mark with NFC Tags customer want the selected item then they will just add it to the cart else they can also remove it if not interested to purchase, after the shopping has been done billing will be payoff via payable wallet system, then after a customer can exit from the store with their ease and happy shopping

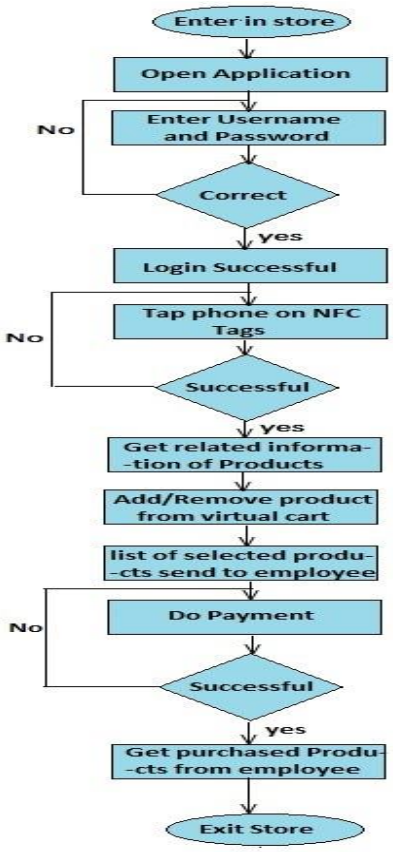

Fig. 3: System Flow Diagram

D. Billing

Versatile-portable gadgets with monetary esteem can be- efficiently be characterized by a Digital-wallet system or M-Commerce/E-bill.

A. Digital Wallet System

The built-in wallet system in the store can potentially permit the user to add cash to the wallet, which will be deducted during checkout. It also facilitates the Adhere-administrative-currency money to view customer transaction details and deduct cash to the customer wallet.

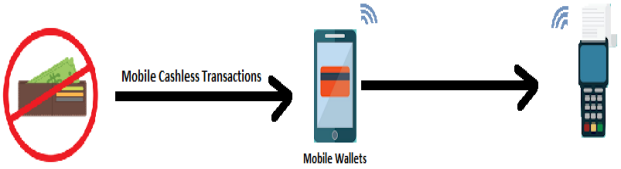

Fig. 4: Cashless Payment

B. M-Commerce/E-Bill

Effective Communication Model between business and consumer commerce and transactions using NFC enabled smartphone.

The transaction can be credited from Bank via Visa or Debit Card. The user is also facilitated to electronically manage bill like bill notification or Refund Request via Email.

For the robust-security implementations; security maintained in a predefined mode such as by paying bill customer gets notification when the cart has been done by employee. After completion of this process customer can pay the bill by wallet or E-Bill system which are highly acquired by strong password security to prevent hacking.

IV. METHODOLOGY

The time -saving issue has got fixed via NFC application rather than other apps, due to its three most beneficial modes which are:

- NFC Tag Emulation.
- NFC Reader (Mobile Phone).
- NFC peer to peer.

Now shopping becomes more easy and smooth, customer almost within no time can exit from the store once the shopping is done.

A. SYSTEM DIAGRAM

The Customer with NFC enabled mobile phones will log in to the registered application; the integrity of customers checked by the administrator and is allowed entrance to the Mall. The user will tap the detector to locate the shelf or wrack of the item required. The user can view item details and edit, add or delete an item to the cart by just tapping near the product. The employee receives a signal on application to organize the items of a customer's cart, which user receives on an exit, after billing by E-bill or cash is done by the customer. On an exit, the customer will receive the receipt of the bill.:

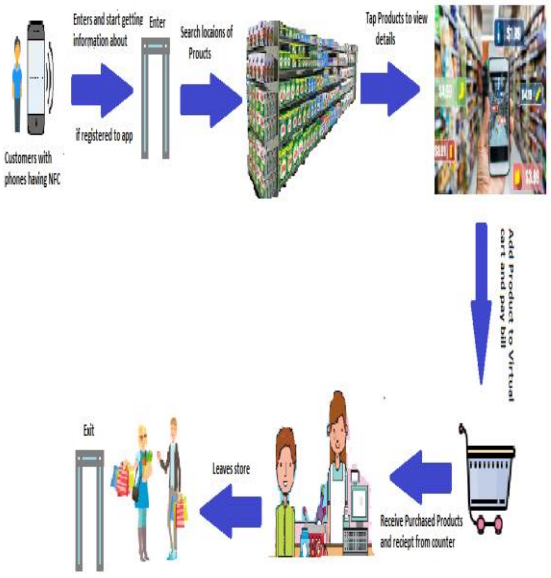

Fig. 5: System Diagram for Imart

V. DESIGN PHASE

The application consists of three major modules:

A. Administrator

Administrator will maintain to store the units maintain store by organizing the store inventory system like add, update and delete item; add, update and delete on going promotion etc. Admin can also manage user details and employee record.

B. User/Customer

Customer can perform different arch tributes such as Authentication, add item into cart, view cart, delete from cart, confirm order and payment via different modes i.e. cash, wallet and credit card.

C. Employee

Employee can obtain the following task regarding authentication in employee's personal information, view user cart detail, view user detail, generate bill and organizing the users cart within no time safe and sound.

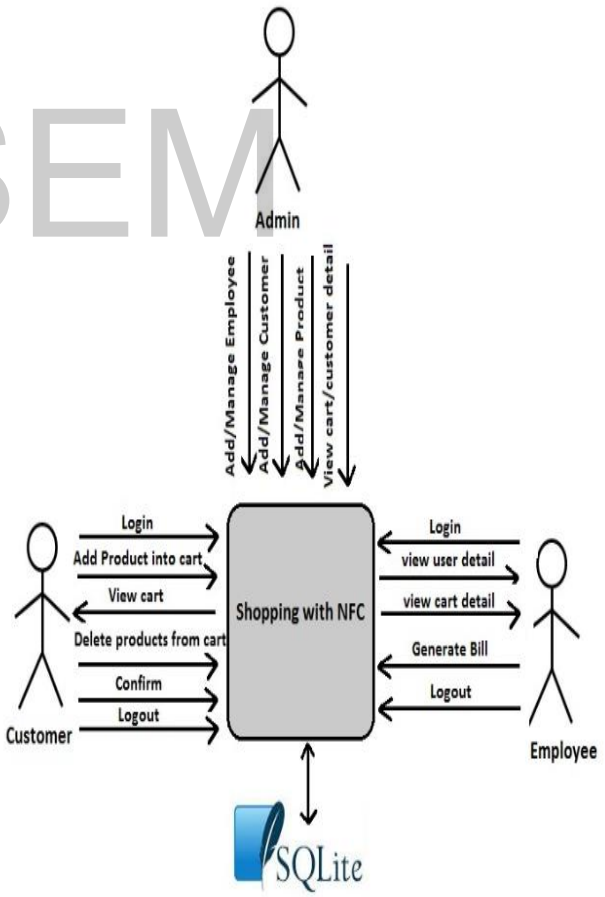

Fig. 6: DFD of Proposed System

VI. IMPLEMENTATION

This application is android based based and its layouts are designed and developed on android studio. The flow of the application is described below:

Fig. 7: Splash screen

The splash screen consists of application name and logo.

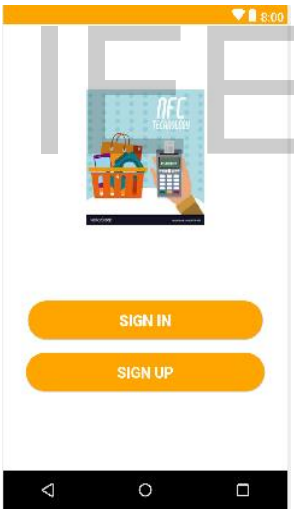

Fig. 8: Sign in/Sign up screen

This screen has two options for the customers sign in and sign up. The Registered customers can simply sign in to the app by sign in button ,the customers who are not registered first have to create an account by clicking sign up button.

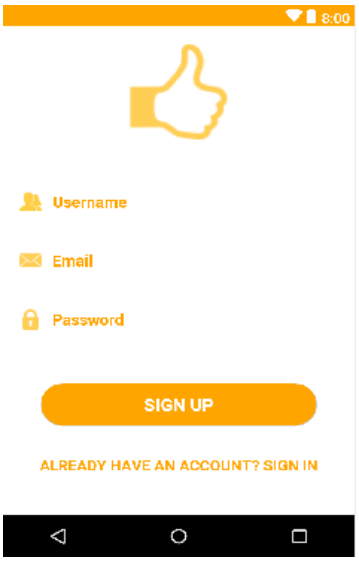

Fig. 9: Sign up screen

The Sign up screen allows to entering customers id, password and username for registering user in application. And it is for one time requirement to get register in application.

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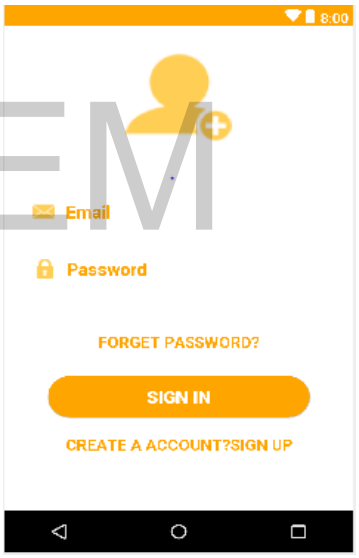

Fig. 10: Sign In screen

Once the the customer/user register to intelligent(I) Mart application then by just sign in it may easily continue further functions in application.

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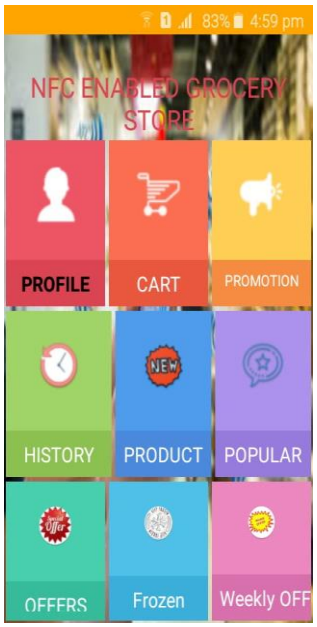

Fig. 11: Dash board

Main menu contains all the functions all the functions such as profile maintains customers profile,history accmolidated automatically once you shopped,promotions also offered for pay in billing,popular products shows for customizing new reliable and upcoming new products, weekly offers/offers facilitates the new sale coming around on an item.

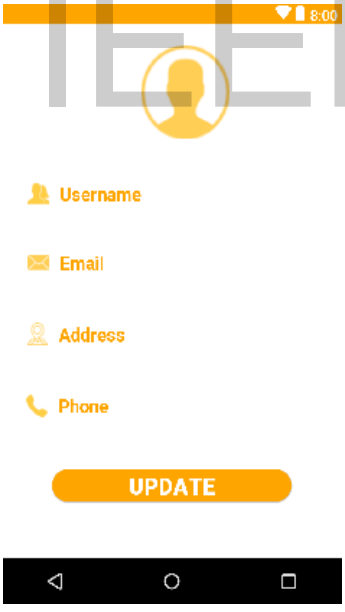

Fig. 12: Profile Screen

By clicking profile button user is directed to the profile screen,which contains information of producs user had purchased.

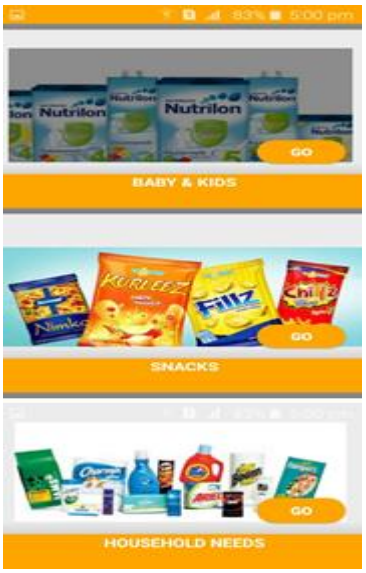

Fig. 13: List screen

By clicking on product button customer gets list view of the products.from the list of products customer can add or delete products to their cart.

Customer has to registered to the Application for using NFC Enable Shopping. After Registering to app customer can tap their phone to products having NFC tags and can view product, buy product and can pay bill through the application.

VII. RESULT

The proposed system is within the city implemented in a well-reputed store within the city, it has been notice that the time consumption on grocery has been drastically reduced. By using proposed Application Figure A depicts the time consumption by user without usage of application. After the implementation few bugs example system hanging and NFC Tags were reported but they are materialized.

A. Traditional way of grocery shopping

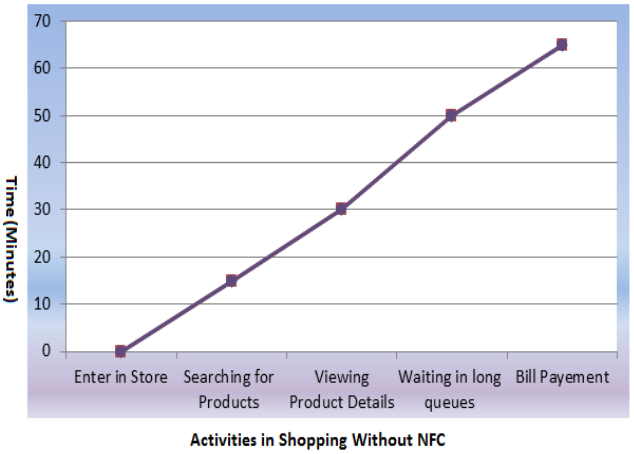

Fig. 14: Grocery Shopping without NFC graph

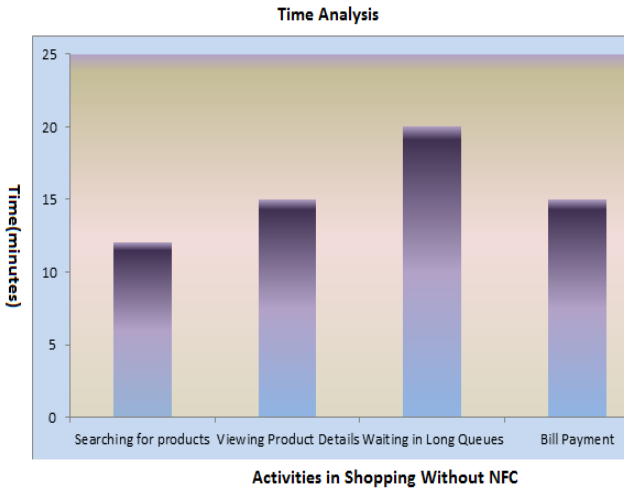

Fig. 15: Grocery Shopping without NFC bar graph

B. NFC Enabled grocery shopping

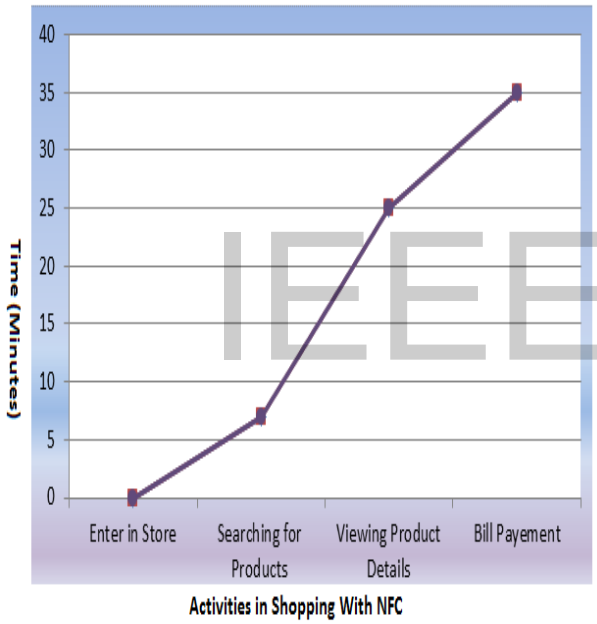

Fig. 16: Grocery Shopping with NFC graph

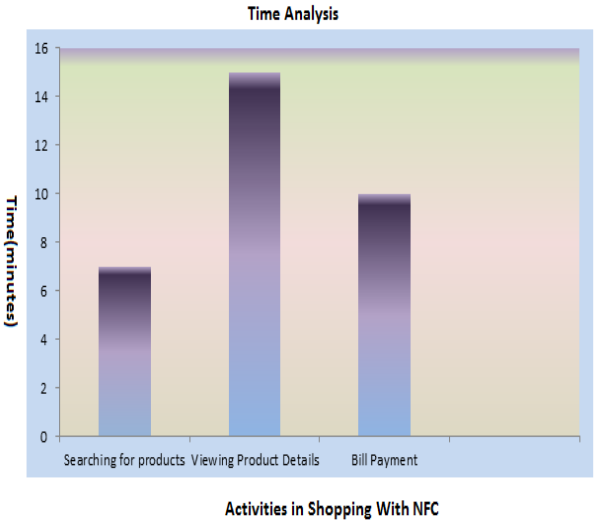

Fig. 17: Grocery Shopping with NFC bar graph

From these graphs it is clearly observed that much time can reduced in grocery shopping through the imart (NFC Enabled System).

VIII. FUTURE SCOPE

In future different features can be added to the application such as:

- The concept of data mining can be combined with an application so we can use the user's personal information and provide them offer's related to their information. If the user has any health issues so it will show the offers of products which user has to buy according to their health issue.
- Security is an important thing to consider in any project. The proposed System might currently face some security issue i.e. theft of product. But in the future, we will try to enhance the security system to make our system more convenient. We will secure our system by using sensors to monitor theft, To make store environment more secure and making grocery purchase more reliable.
- We can implement the detectors in store for thief protection in future.

IX. CONCLUSION

The application is fabricated for NFC enabled Mobile phone users, to scans the NFC Tag in a peer-to-peer communication mode by tapping the tags attached to the grocery item. The application is intended to materialize the bother-free transactions and abandons the physical stress to roll the cart. The User delivery request; at the time of order placement is facilitated by the payment methods that are available in the application i.e. E-bill/Wallet System/M-Commerce.

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