

# Improving Customer Satisfaction through Smart Shopping: A Prototype

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**Abstract-** *This paper aims to form an application for providers in able to analyze the buying habits of their customers. At the same time, in able to provide a usable and time able information of the products/items for the customer so that they will be satisfied in their shopping. Moreover, the following problems will be solved once the application is formed, (1) How can providers analyze the buying pattern/ behavior of a specific customer? (2) How can provider be able to send an up to date information to the customer?, (3) The system has to be tested based from the timeliness and its usability.*

**Keywords-** *Customer Satisfaction, Near Field Communication (NFC), Smart Phones*

## I. INTRODUCTION

### A. Background of the Study

People have wants and needs in their daily lives. They may be interested in different ways like in food, clothes, shoes accessories, gadgets etc. The only way in able to get it is by means of Shopping. Shopping is a term that the customer used, to purchase their commodities from a provider for instance, a boutique in the mall. These boutiques can sell from small to a wide variety of products from where a customer can choose his needs based on his interests. To shop these products at ease, one may choose to go to the mall and look a specific boutique or others prefer to buy online. When people go to a boutique, they can look for their specific product in different stores, depending on what they need to buy. They choose wisely on what boutique to buy the item from depending on the quality, the price, and the brand.

Providers always think of ways on how to make their items sell. They do everything to increase their customer's satisfaction especially to their frequent buyers. Customer satisfaction defines on how they can give up to date information towards to their respective customers. But still, problems are arising to prevent them from meeting their goals. In times, providers cannot analyze the buying habits from their customers. In effect with that, customers are not getting all the information they need on the item they want to buy in a boutique. Another problem occur is that how can a provider be able to send and receive information to their customer. This is all about the recommended items of the customer based from their respective transactions in the boutique.

Those difficulties can result to the customer not being satisfied and will decide not to buy on that boutique anymore. That will be a major profit loss to the business.

Such problems caused the researcher to come upon the idea of resolving these difficulties through technology by constructing a system (web and mobile application) that

can help the providers to satisfy the needs of their customer in terms of shopping. In connection with this, it will be helpful to apply the concept of Business Intelligence and Customer Relationship Management wherein it can create a system that analyze and access bulk of information to improve the customer's satisfaction in aspect of shopping. In creating this system it will be timely and usable for the customer. It can lessen the difficulty in buying and selling an item to a specific buyer with no problems at all with the help of latest technology like the NFC (Near Field Communication).

It will be helpful in a system combining technology to revitalize the lifestyle and relieving of all the unwanted issue related to shopping. Using this system, the customer's satisfaction will be improved in terms of their shopping by the provider by just simply using this with the help of NFC.

### B. Statement of the Problem

The main objective of the study is to develop a system in able to improve customer's satisfaction by Smart Shopping. Specifically,

1. To create a system wherein it will analyze the buying habits of a customer.
2. To develop a mobile application wherein it can send and receive information to the customer through the use of NFC.
3. To evaluate the timeliness and usability of the system.

### C. Significance of the Study

The results of this study will benefit the people as follows:

1. Customer – The success of this study will help improve customer's satisfaction in shopping by making it easy to find what item they're looking for and in what store to look for the item. It will help them also to have a better communication with the providers who have the items they are searching for.
2. Provider (Boutique Owners) – They can find prospective customers easily with the help of the system by finding people with the same interests in item with what they are selling and easily communicate with them on how the process of their transaction would become with the achievements of this study. They can increase the profit of their whole establishment. They can establish and identify their loyal customers.
3. Future Researchers – This study about increasing the customer's satisfaction with smart shopping can help future researchers by studying about the responses of customers in the present status of the process of shopping. They can also study the technologies used in creating the system (mobile and web application) with the help of this study.

4. IT Professionals- This study can help them to discover the new use and purpose of the emerging technology which is NFC that can be helpful in their field.

#### D. Scope and Limitations

The scope of this study is to improve customer's satisfaction by creating and developing a system (mobile and web application) that will be tested in one boutique at a certain mall located at Aurora Boulevard, Cubao, Quezon City. The system will analyze a Frequent Customer only. The technology that will be used here will be only NFC (Near-Field Communication) that is embedded in a Smartphone only.

However, this study does not cover the payment, security and privacy of this application. It will be running in a Windows Operating system only (web application) while the mobile application of the system can be installed in a smart phone powered by an Android Operating System only. It can be only used in Online Transaction. Hence, internet connection will be dependent on the service provider. The items that will be used for the purpose of study (pseudo data) are all about clothing, accessories and shoes both for men and women.

## II. CONCEPTUAL FRAMEWORK

### A. Review of Related Literature and Studies

#### 1. Related Literature

##### a. Business Intelligence

Business Intelligence is an example of developed technology for businesses. It is a set of theories, methodologies, architectures, and technologies that transform raw data into meaningful and useful information for business analysis purposes. BI can handle enormous amounts of unstructured data to help identify, develop and otherwise create new strategic business opportunities. BI allows for the easy interpretation of volumes of data. Identifying new opportunities and implementing an effective strategy can provide a competitive market advantage and long-term stability. According to experts business intelligence solutions can help companies be more efficient, spot areas for cost savings and identify new business opportunities.

Below are the benefits of Business Intelligence software

- Get faster answers to your business questions
- Get key business metrics reports when and where you need them
- Get insight into customer behavior
- Identify cross-selling and up-selling opportunities
- Learn how to streamline operations
- Improve efficiency
- Learn what your true manufacturing costs are
- Manage inventory better
- See where your business has been, where it is now and where it is going

According to Hamza Amor (2014), below are the criterias for evaluating Business Intelligence software,

- 1.)Flexibility
- 2.)Security
- 3.)Learnability

#### 4.)Mobility

#### 5.)Evolvement

According to Adam Crigger (2014), the Five Criteria for Selecting the Best Business Intelligence Software Package are the following:

- 1.)Ease of Use
- 2.)Standardization
- 3.) Performance
- 4.)Empower Management
- 5.) Integration

##### b. Customer Relationship Management

Customer Relationship Management (CRM) refers to a strategy of managing all company's relationships and interactions with different customers and the potential one. It can help to improve company's profit.

It enables to focus on organisation's relationships with individual people whether those are customers, service users, colleagues or suppliers. Some of the biggest gains in productivity can come from moving beyond CRM as sales and marketing tool and embedding it in a business from HR to customer services and supply chain management.

Benefits of CRM:

- Generating more Leads
- Improving Customer's Satisfaction
- Increasing productivity
- Closing more deals
- Enhancing retention rates
- Sharing information between people

##### c. Customer Satisfaction

According to Ross Beard (2014), customer satisfaction is a marketing term that measures how products or services supplied by a company meet or surpass a customer's expectation.

Though retailers have tried every means that they can provide to boost their customer satisfaction, there are still problems and issues that currently arise in shopping. Some of the prevailing issues often cause the customers to change their minds when buying a product. The reasons why customer change their minds vary but often include simple things like

- They could not find the product
- Customers doesn't have a way of knowing the latest product information
- They could not find a store associate to help them
- Sales associates with indifferent attitudes or poor product knowledge
- Long check-out lines
- Poorly trained retail representatives who could not operate POS systems.

According to SURESCHANDAR there are are 5 factors of service quality as critical from the customers point of view or five factors of customers satisfaction. These are the following:

- Core service or core product
- Human element of service delivery
- Systematization of service delivery
- Tangibles of service
- Social responsibility

d. Near Field Communication

NFC (Near Field Communication) is a short-range wireless communication technology that is based on approved and mature standards in the field of RFID and smart cards. NFC is used at close range for end user applications that have some kind of personal identification attached to it.

NFC is simply a set of short-range wireless technologies, typically requiring a distance of 20 cm (7.5 inches) or less depending on the application. There are two ways this can work: use the phone as an NFC-TAG or use the phone to read NFC-TAGs. An NFC-TAG can take any shape or form and can attach to almost any surface. This TAG can contain information about the tagged location, object, or task associated with it. Then use the NFC-tracker to manage all of the retrieved information. Combine Smartphones, NFC-TAGs, the NFC-tracker software, and some creativity and you have countless options on how to use this system to improve the operations of your organization.

USES OF NEAR FIELD COMMUNICATION:

- Contactless Payments
- Marketing and Advertising
- Security and Access Control
- Product Identification
- Location Identification
- Mobile Phone Task Launcher Application
- Events

Difference between RFID and NFC is that built upon existing Radio Frequency Identification (RFID) technology and takes RFID one step further. Earlier RFID-TAGs could only be read, an example of one-way communication. The new generation of RFID, called NFC-TAGs, can do the two-way (sending and receiving) communicate information. Common RFID bands include 125/134 KHz, 13.56 MHz, and 868/915 MHz, while NFC generally operates on the 13.56 MHz band only.

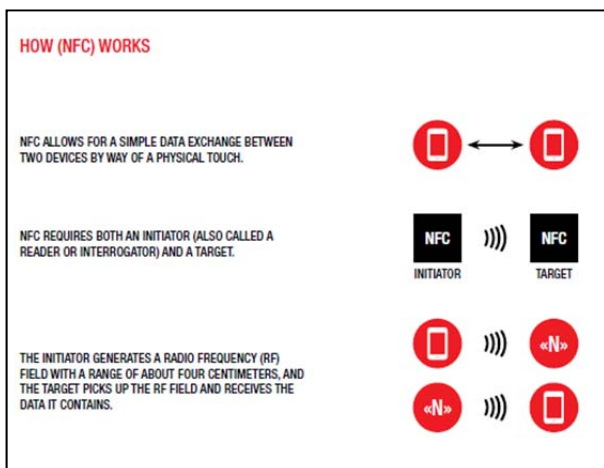


Fig. 1 How NFC Technology works



Fig. 2 Uses of NFC Technology

TABLE 1 Shows the Non-Technical Features of RFID, NFC and Bluetooth

	RFID	NFC	Bluetooth
Power consumption	Less	Very Less	Less
Accessibility	Use RFID Scanner to read/scan RFID tags in items	Tap screen to transfer data (highly intuitive)	Through Mobile and Computing
Ease of use	Easy	Very easy	Easy
Data transfer ability	Depends on RFID Frequency Band	Very fast	Depends on device's Bluetooth version
Cost-effectiveness	Depends on RFID Frequency Band	Expensive	Inexpensive
Convenience	High	High	High
Social networking ability	No	Yes	No
Payment transaction	Yes	Yes	No
Security	Intermediate; neither high nor low	Intermediate; neither high nor low (allows for anti-virus installation)	Intermediate; neither high nor low
Benefited Sectors	Electronics, Healthcare, Transport, Payments, Access Control, etc.	Electronics, Healthcare, Transport, Payments, Access Control, etc.	Electronics, Access Control on Device Console, File Transfer, Transport etc.

e. Database

A database is a collection of information that is organized so that it can easily be retrieved, managed, and updated. In one view, databases can be classified according to types of content: bibliographic, full-text, numeric, and images.

Computer databases typically contain collections of data records or files, such as sales transactions, product catalogs and inventories, and customer profiles. SQL (Structured Query Language) is a standard language for making interactive queries from and updating a database such as IBM's DB2, Microsoft's SQL Server, and database products from Oracle, Sybase, and Computer Associates

f. Mobile Application

According to Vangie Beal (2014), Mobile Application is also called "mobile apps", it is a term used to define Internet applications that run on smart phones and other mobile devices.

TABLE 2  
Shows the Technical Features of RFID, NFC and Bluetooth

	RFID	NFC	Bluetooth
Operating Frequency	13.56 MHz	13.56 MHz	2.4 - 2.485 GHz
Communication	One way	Two way	Multi-Way
Standards	ISO 14443, 15693, 18000	ISO 14443	IEEE 802.15.1
Scan Distance	Up to 1 m	Up to 10 cm	Up to 100 meters (328 feet)
Scan Tags Simultaneously	Yes	No	No
Set-up Time	<0.1 ms	<0.1 ms	2.0 ms>

Mobile applications usually help users by connecting them to Internet services more commonly accessed on desktop or notebook computers, or help them by making it easier to use the Internet on their portable devices. A mobile application may be a Mobile Web site bookmarking utility, a mobile-based instant messaging client, and many other applications.

g. Web Application

Web application is an application where all or some parts of the software are downloaded from the Web each time it is run. It may denote to browser-based apps that run within the user's Web browser, or to "rich client" desktop apps that do not use a browser or to mobile apps that access the Web for additional information.

While web application is defined by the company Acunetix as a set of computer programs that allows website visitors to submit and retrieve data to/from a database over the Internet using their preferred web browser. The data is then presented to the user within their browser as information is generated dynamically (in a specific format, e.g. in HTML using CSS) by the web application through a web server.

2. Related Studies

a. Restaurant Pannu, Finland (2012)

According to the study, the Restaurant Pannu offers meal ordering via NFC device, which includes "fast track ordering" during the busy lunch hours. Users can download the Restaurant Pannu application to their NFC Devices. By touching an NFC tag ion the restaurant table and then on the desired menu item, an order is sent to the backend of the system, which delivers the order to the restaurant's payment system and kitchen. Electronic launch coupons can be redeemed via the NFC Ordering System. Users can access additional information from "smart posters" placed on the restaurants tables.

b. THE GAP "Like with a High Five", Japan 2012

In June 2012, 2 Gap stores in Tokyo participated in the "Like with a High Five" Summer T Coordinates campaign, in which customers connected their application to their Facebook account, and then got a bracelet in store to act as an identifier. When customers saw a staff member wearing an outfit they liked, they "high fived" by touching the bracelet to their Smartphone. The phone, after making a cheering sound, sent outfit to the Facebook feed to the customer.

c. NFC Future Shop Project, Finland (2008)

This project enabled participants to make food purchases at home by touching "smart shopping lists" with NFC devices. The shopping lists were compiled according to the wishes of each participant and they included NFC enabled item cards for approximately 200

frequently purchased products (each item card included the name, details and a picture of the product). Selection was either made at the local store using a bar code reader at home using an NFC "smart product list". The shopping order was delivered the same day.

d. Retail Gets Personal: How to Create the Stores Shoppers Want

RIS/Cognizant Shopper Experience Study (2013) highlights that despite the growth of e-commerce, shoppers still need and often enjoy the in-store experience. Moreover, shoppers want shopping experiences to be attentive and efficient. "Showrooming" is the number-one risk facing retailers today. Shoppers overwhelmingly desire personalized in-store experiences. However, in-store shopping sometimes cannot deliver that factor which is why shoppers go to online sites.

Results of the study suggest that at any moment, shoppers are poised to buy – and they want retailers to be ready for them. They expect retailers to get it right on store fundamentals – product assortment, product information, price, efficiency, and service – and they are annoyed when they do not. This expansion will said fundamentals leads in a more complex business model, potentially encompassing services, third-party partnerships, and other elements not part of traditional retailing. In addition, technological evolution is critical for stores to remain relevant to shoppers, and it's an endeavor that they must undertake. Still, retailers may recognize integrating digital opportunities into the shopping experience which is important to all shoppers, and especially to the coveted young and affluent segments.

B. Synthesis

The proposed study is intended to provide solutions for providers in able to analyze the buying habits of their customers. At the same time, in able to provide a usable and time able information of the products/items for the customer so that they will be satisfied and benefited for both parties. On the cited literatures and studies it can be inferred that technology has provided a useful contribution in easing some of the problems of customers. However, customer is now being careful when buying a product which means goods/products must be first scrutinized personally by the buyer. In which way the proponents saw the potential of integrating some functions of online shopping and mobile applications to create an application that will analyze the buying habits of the customer through the collection of data by using their customer information and their current/ previous transaction from the boutique. At the same time, allow the customer to locate that product in the nearby vicinity so he/she can also check the said product personally. The proposed study has a distinct relevance with the field of Business Intelligence, for the proponents intend to produce an application that will make use of the shoppers buying behavior and preferences as input and transform the said input into useful information that will help ease the trouble of shopping. The term business intelligence (BI) represents the tools and systems that play a key role in the strategic planning process of the corporation. These systems allow a company to gather, store, access and analyze corporate data to aid in

decision-making. Generally these systems will illustrate business intelligence in the areas of customer profiling, customer support, market research, market segmentation, product profitability, statistical analysis, and inventory and distribution analysis.

*C. Conceptual Framework*

The boutique will enter its inventory into the system which in turn will update the inventory database. The updated inventory should then be sent to the NFC reader so that the inventory inside the reader would be updated.

For the user’s part, they will register with their details and an email verification will be sent to their email. They must activate their account through the verification link given in the email for their account to be active.

Whenever one transaction occurs, when a customer buys items from the boutique and taps their phone to the boutique’s NFC reader, the customer’s name and the items they bought will be stored in the database. After a set amount of items bought, the system will be able to generate recommendations to the user and be able to create reports, which include statistics of items bought, etc.

*D. Definition of Terms*

**Customer Satisfaction-** is a term frequently used in marketing. It is a measure of how products and services supplied by a company meet or surpass customer expectation. It is how a provider can send an up to date information on that moment to their customer.

**Demographics-** relating to the dynamic balance of a population especially with regard to density and capacity for expansion or decline

**Flexibility-** is used as an attribute of various types of systems. In the field of engineering systems design, it refers to designs that can adapt when external changes occur.

**Near Field Communication (NFC) -** It allows the transfer of data( sending and receiving) between two devices, such as a mobile phone and NFC tag.

**Providers-** in this study, pertain to the Boutique Owners.

**Pseudo Data-** considered the artificial data that will be used in the duration of study.

**Portable device -** is any device that can easily be carried. It is a small form factor of a computing device that is designed to be held and used in the hands.

**Radio Frequency Identification Card (RFID) -** the use of radio waves to read and capture information stored on a tag attached to an object. A tag can be read from up to several feet away and does not need to be within direct line-of-sight of the reader to be tracked.

**Show rooming-** is the practice of examining merchandise in a traditional brick and mortar retail store, and then buying it online at a lower price.

**Smart phones-** a cellular phone that is able to perform many of the functions of a computer, typically having a relatively large screen and an operating system capable of running general-purpose applications.

**Timeliness-** it reflects the length of time between its availability and the event or phenomenon it describes. It depends on the user expectation, the Service providing up to date information to the customers. Data will be updated as of that moment.

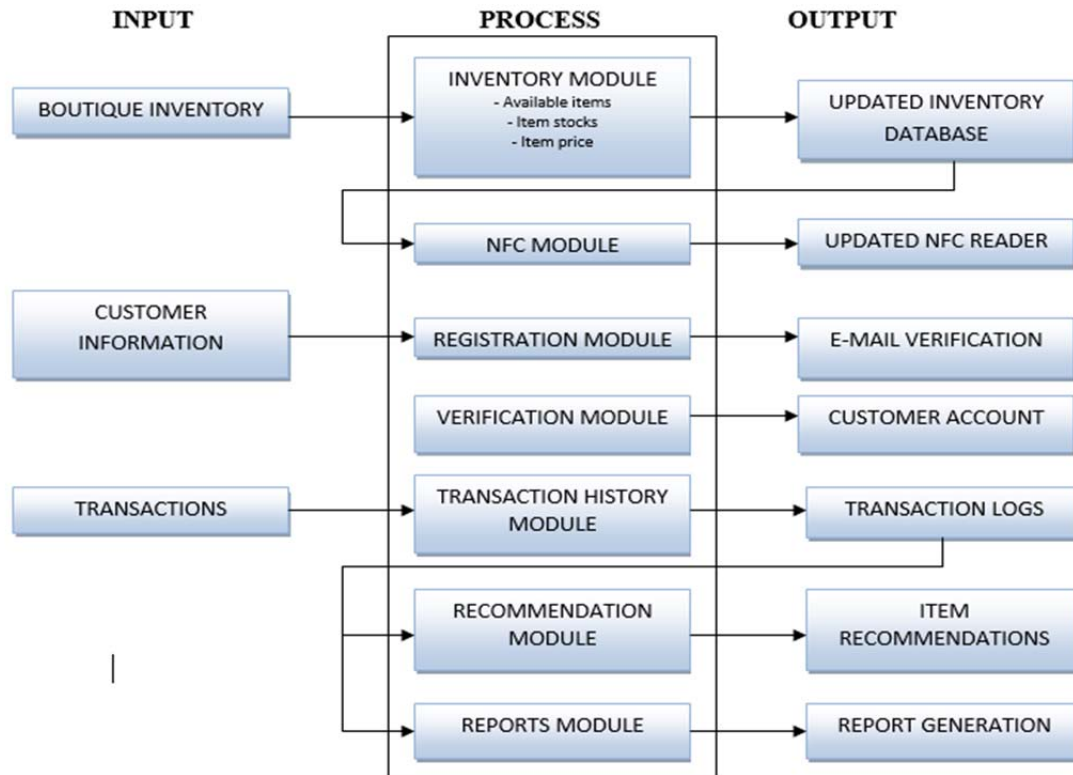


Fig. 3 IPO Chart



### III. METHODOLOGY

#### A. Research Design

The researcher utilized the used of descriptive method in creating and developing a system that can help the provider to improve customer’s satisfaction.

#### B. Research Locale

The system was applied and tested in a boutique located inside the mall at Aurora, Boulevard, Cubao, Quezon City that caters shoes, clothing and accessories both for men and women.

#### C. Instrumentation

The research were conducted in a library and internet research and consulted to IT professionals and mobile application developer in determining the hardware and software components of the system.

a. System’s hardware components are the following:

- Sony Xperia L (Lt26ii) – to be able to use the NFC feature, the proponent installed their mobile application to a smartphone with NFC capability running in Android OS platform. The smartphone specifications are the following: Android 4.1.2 Jellybean OS, Qualcomm MSM28260 Snapdragon chipset, Dual-core 1.7 GHz, 4.3 inches display (720 x 1280 pixels), 32Gb internal memory, 1Gb RAM, 3G, Bluetooth, Wi-Fi and NFC capability.
- ASUS X550L – the laptop provided by the proponent met the required specifications for it to be able to run the system smoothly. Laptop specifications are as follows: Intel Core i5-4200U CPU @ 1.60GHz (4 CPUs), ~2.3GHz, 4096MB (4Gb) RAM, Windows 8.1 operating system, 500Gb hard drive.
- ACR122U NFC Reader – a PC-linked contactless smart card reader/writer developed based on the 13.56 MHz Contactless (RFID) Technology. This is used in order to read and write information on the NFC tag. The specifications of this NFC reader are: USB Full Speed interface, up to 50 mm operating distance, CCID compliance, Read/write up to 424 kbps, built-in antenna for contactless tag access, supports ISO 14443 Type A and B cards, Mifare, FeliCa, and all 4 types of NFC (ISO/IEC 18092) tags, built-in anti-collision feature, supports PC/SC application programming interface.

- HostGator (Web host) – an internet hosting service provider which allows individuals and organizations to make a website and its contents accessible via the World Wde Web. This is also where the MySql database will be hosted to make cloud computing possible. Hostgator provides unlimited disk space, bandwidth, and email, it also has free site building tools, shopping cart software, forums, photo galleries, and membership scripts.

b. System Software Components

- Zend Studio – Zend Studio is the first ever compiler that allows creation of mobile applications through the use of Hypertext Preprocessor (PHP) language. The researcher used Zend as the compiler along with PHP as the language as it is easy to use because of Zend’s object-oriented programming when it comes to mobile applications. Zend Studio’s minimum system specifications are as follows: 800 mHz processor (1.5GHz processor recommended), 1024 MB RAM, 700 MB Disk Space. It can run in Windows x86 platforms: XP, Server 2003, Vista, and 7. It can also run with Linux OS and Mac OS.
- PHP MyAdmin, MYSQL (Structured Query Language) – A machine query language used in requesting information from the database but is used for PHP Language and web applications.
- Hypertext Preprocessor (PHP) – A language that is used mostly for web applications. It has a strong resemblance to the C/C++ language when it comes to structure and syntax.

#### D. Procedure

The researcher used the SOFTWARE PROTOTYPE MODEL for this system because among all the models it was the most match to the user’s real needs, it can improved the usability, design quality and maintainability. It can also reduce the development effort.

Benefits of Software Prototyping:

- Better quality system delivered
- Identify problems early on
- End user involvement
- Fullfil user requirements
- Cost Savings
- Training

In order for the application to be utilized, the following procedures must be followed:

Provider’s side thru the Customer:

- Download and install the mobile application from the Android store.
- Open the mobile application and create an account in the application and verify it through the use of your e-mail address thru Wi-Fi.
- Tap the phone to the boutique’s NFC Reader (usually located at the entrance of the mall) to update the web application on the boutique in terms of customer’s information and analyze their buying habits. This information will be received by the customer via the application.
- Once the buyer makes a transaction with the store, tap the phone to the NFC Reader by the cashier to immediately store the transaction to the user’s history.

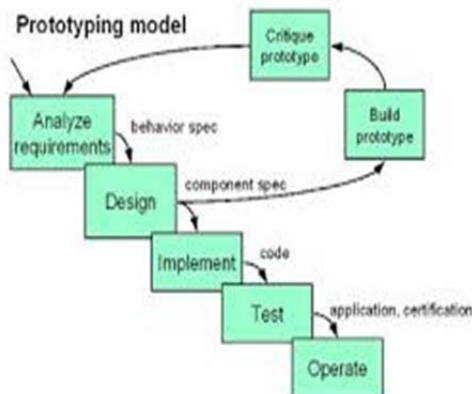


Fig. 4 Software Prototyping Model

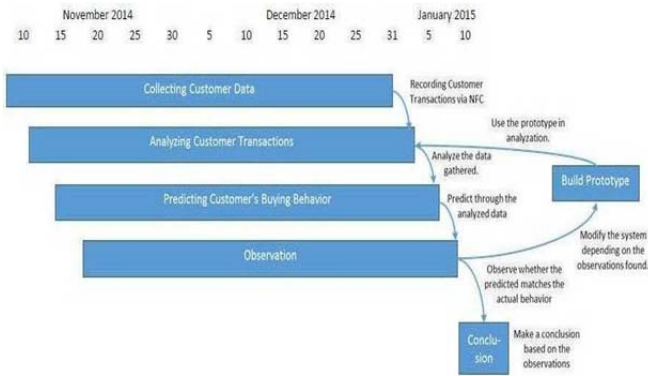


Fig. 5 Gantt Chart

#### IV. RESULTS AND DISCUSSION

This chapter presents and interprets the data gathered which were used for the evaluation of the developed application's analysis of the buying habits of the customer, sending and receiving of information to the customer via NFC and testing the timeliness and usability of the system.

##### A. Results

- a. Analysis of the buying habits of the customer
- b. Sending and receiving of information to the customer via NFC

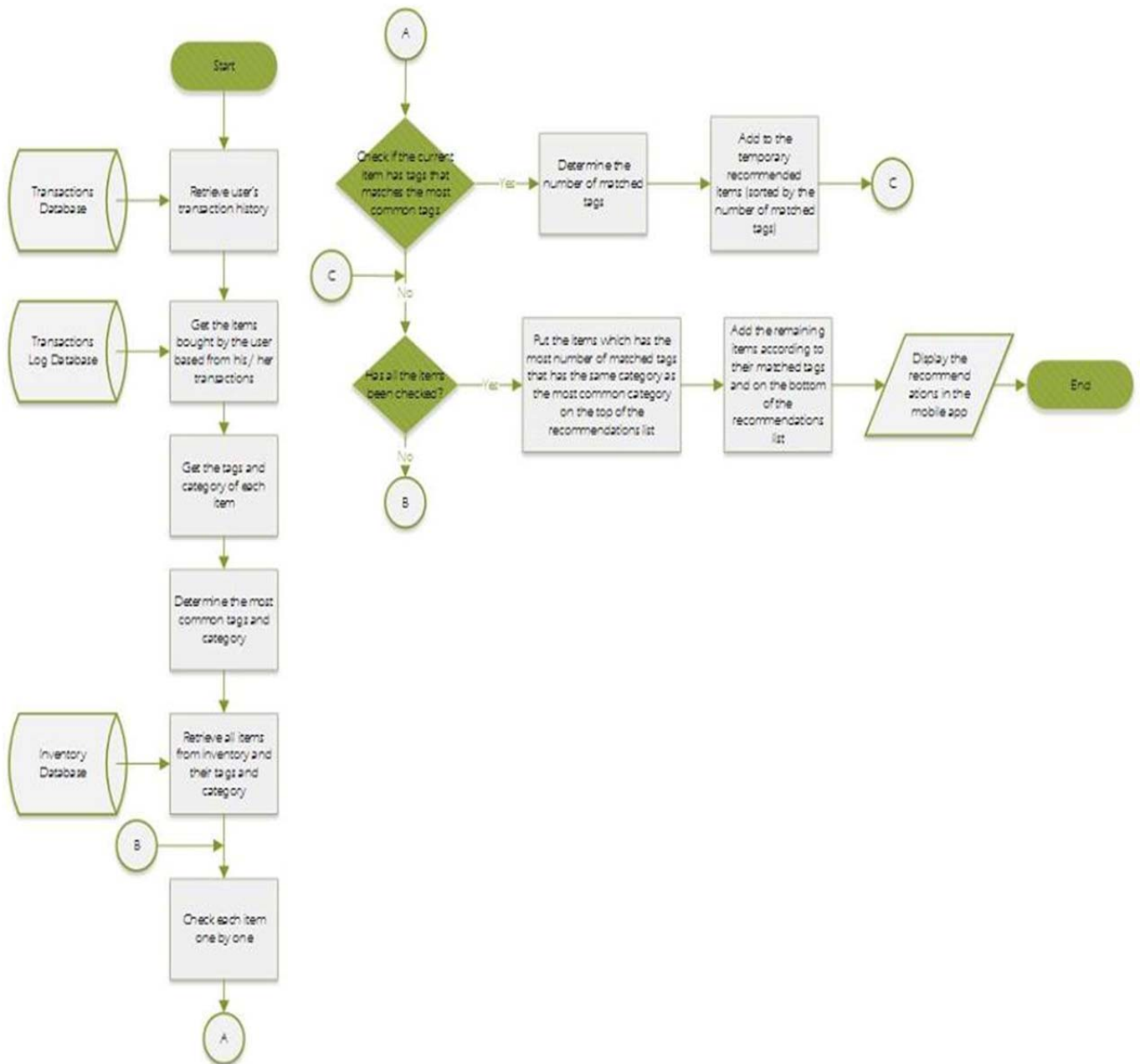


Fig. 6 Process on how to analyze the buying habits of a customer (Flowchart)

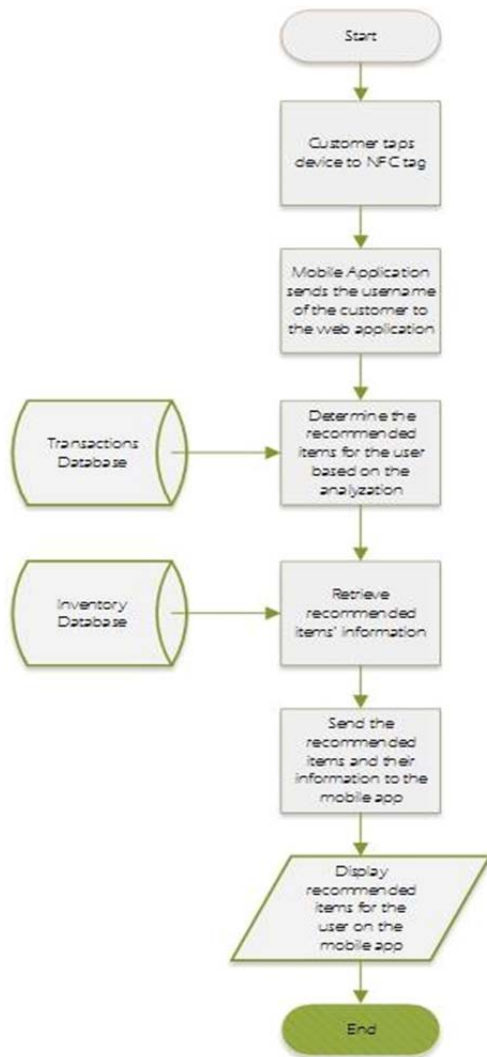


Fig. 7 sending and receiving information to the customer (Flowchart)

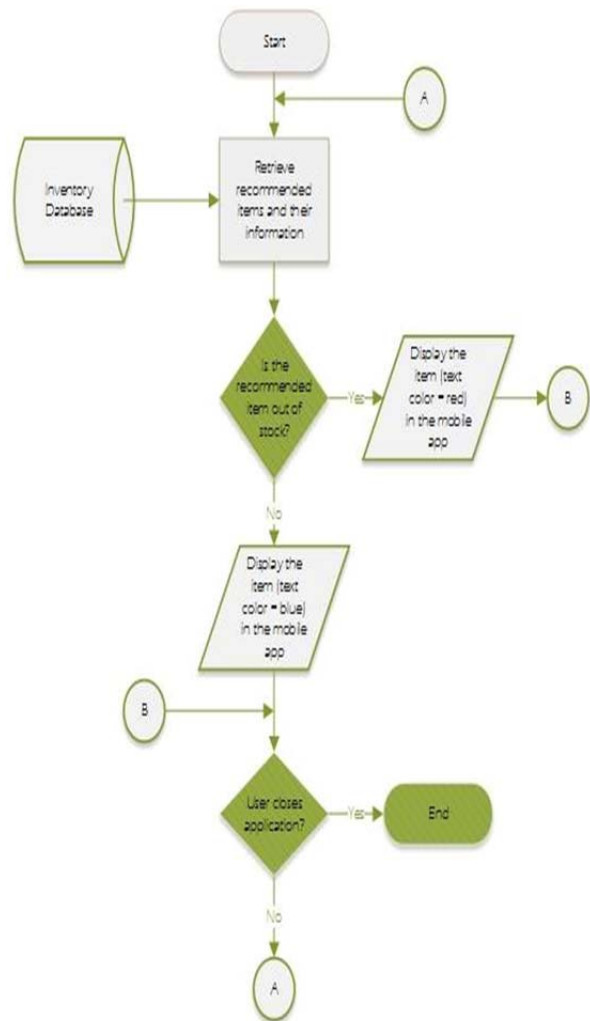


Fig. 8 Timeliness of the system (Flowchart)

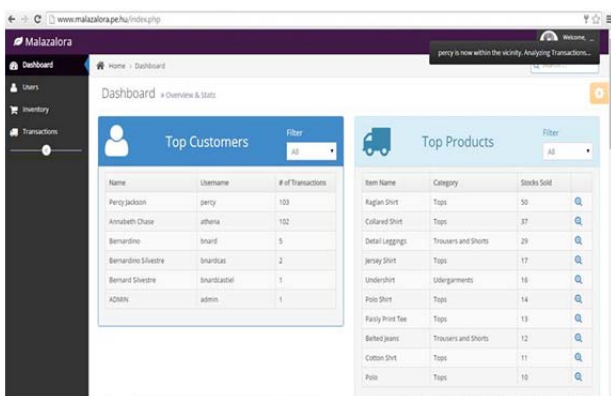


Fig. 9 Main Dashboard (WEB APPLICATION)

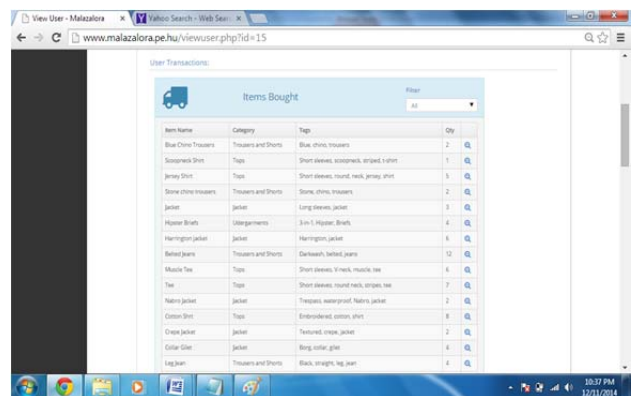


Fig. 10 Customer's Transaction (WEB APPLICATION)



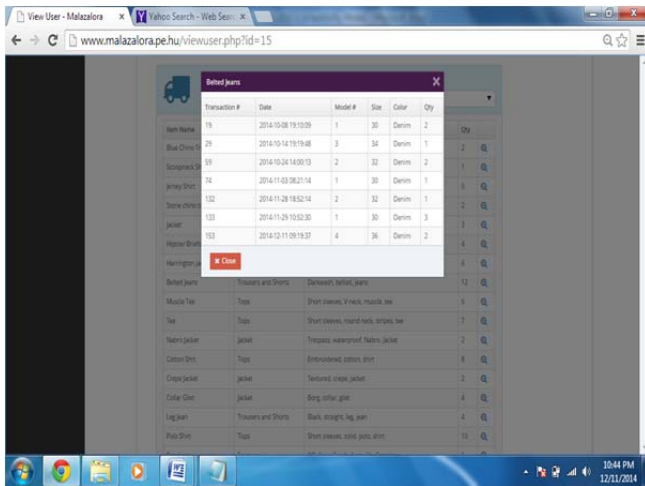


Fig. 11 Specific Details of Transaction (WEB APPLICATION)

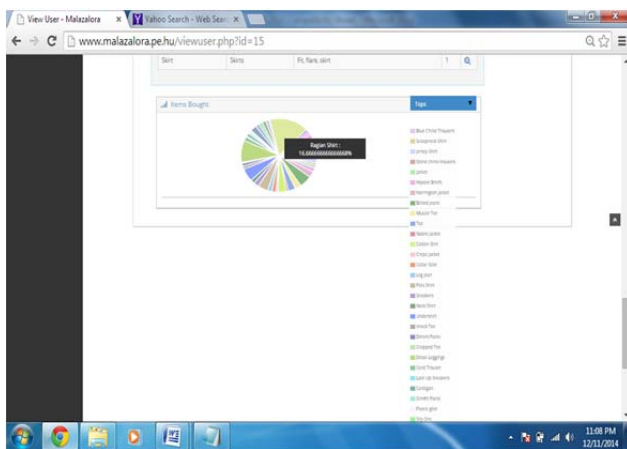


Fig. 12 Pie Chart for Customer's Transaction (WEB APPLICATION)

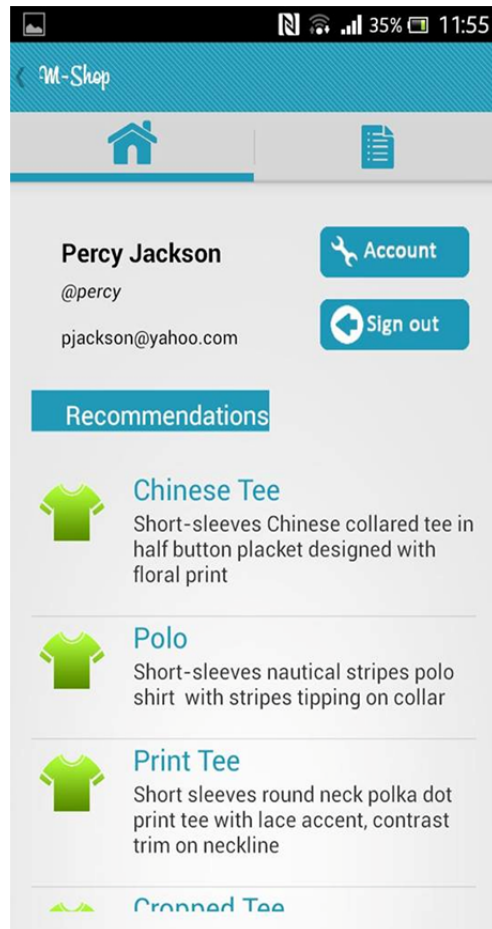


Fig. 14 Recommended Items (MOBILE APPLICATION)

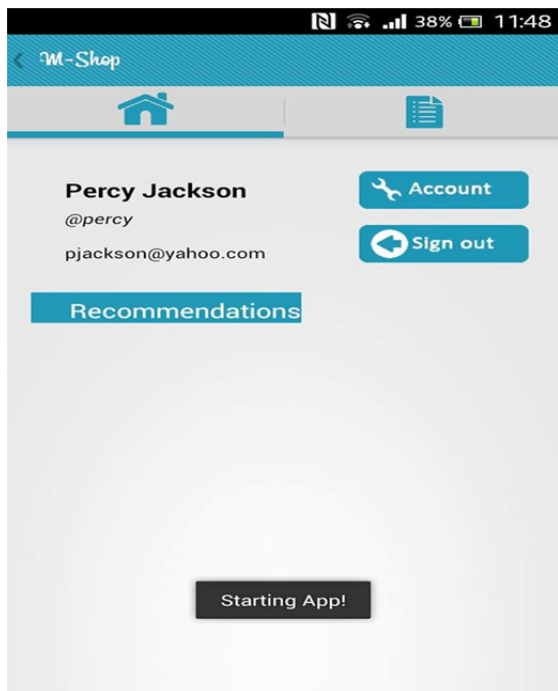


Fig. 13 Log in Page (MOBILE APPLICATION)

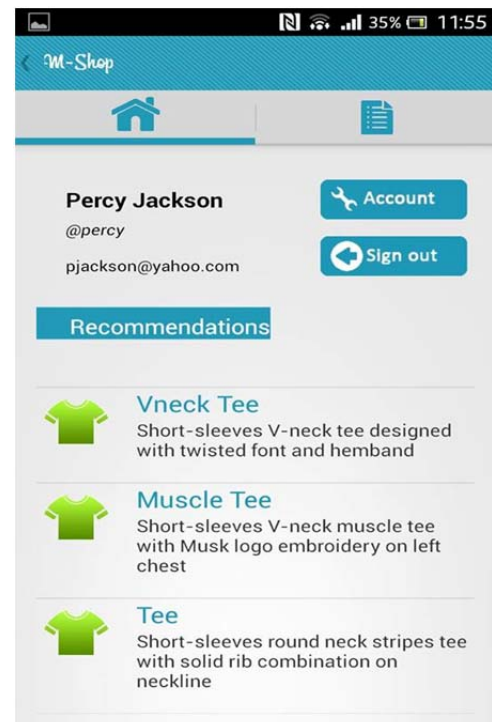


Fig. 15 Recommended Items (MOBILE APPLICATION)

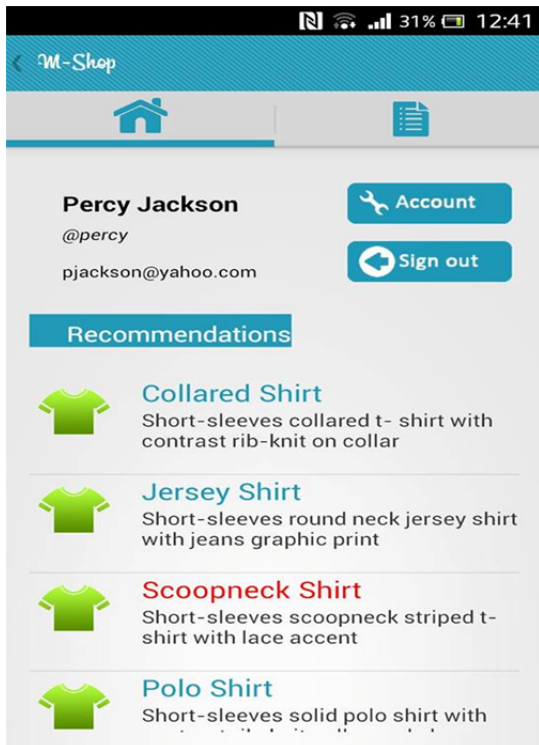


Fig. 16 Out of Stock Item- Red Highlight (MOBILE APPLICATION)

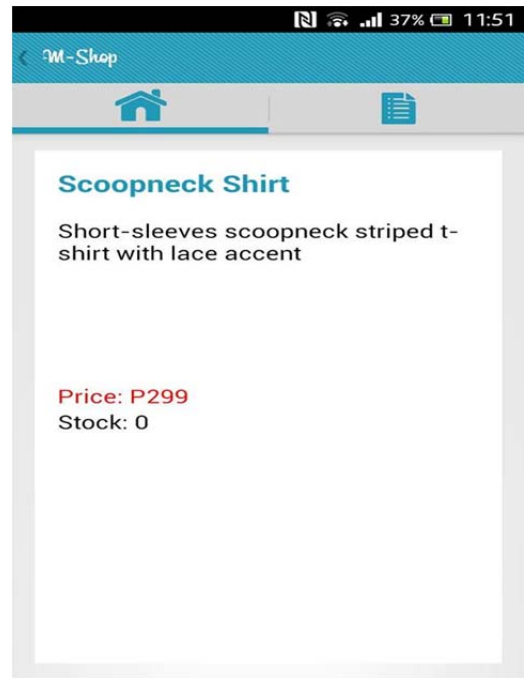


Fig. 17 Out of Stock Item (MOBILE APPLICATION)

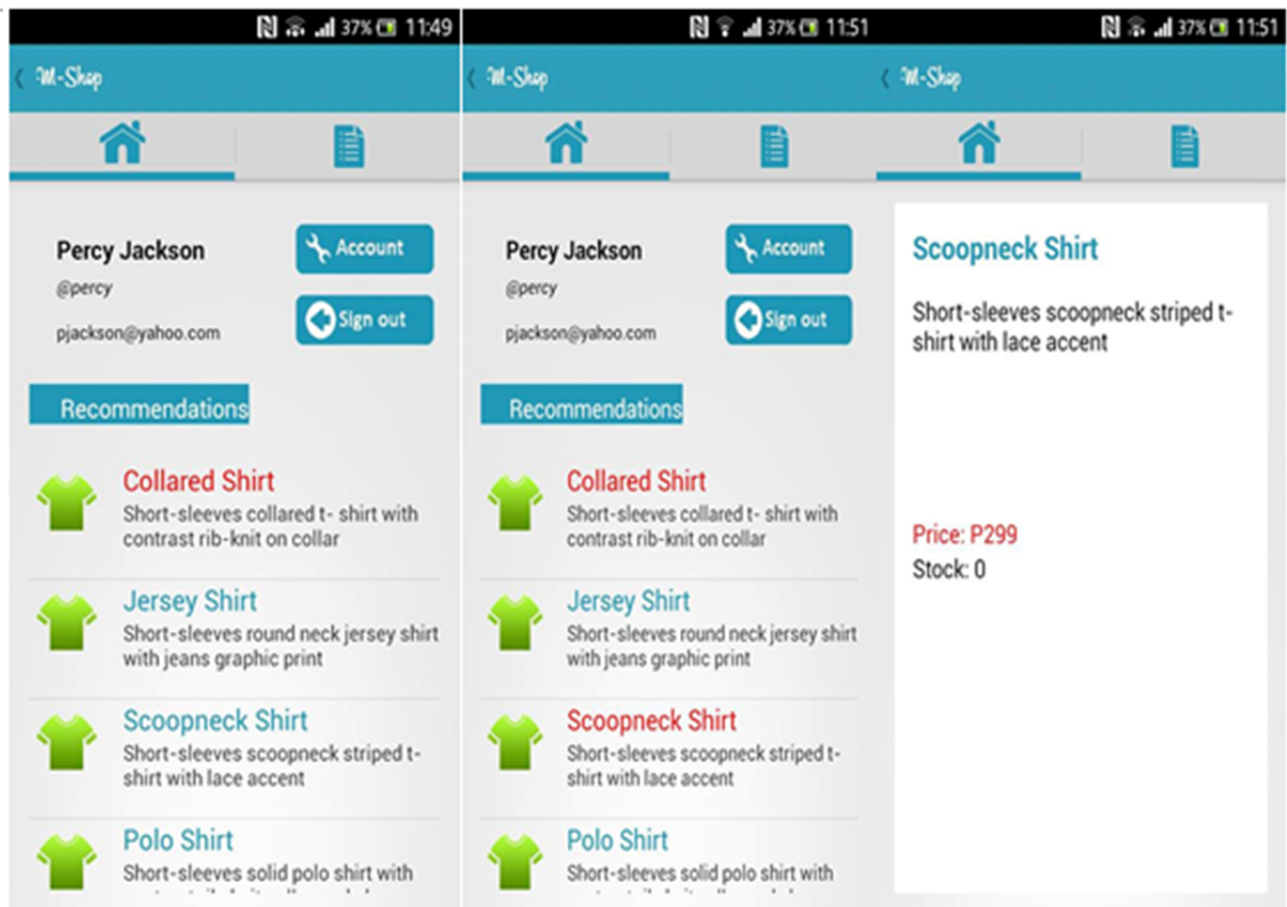


Fig. 18 Updated recommended Items (MOBILE APPLICATION)

### C. Timeliness and Usability

The researcher conducted several testing to prove that the objectives were met based on the analysis of the buying habits of the customer, sending and receiving of information to the customer through the use of NFC and evaluating the usability and timeliness of the system.

From figure 9 until figure 15 it shows the output of the analysis of the buying habits of the customer wherein it was based on the previous transactions of customer, refer to figure 10 until 12.

In figure 14 and 15, it refers to the recommendation of items to the customer based from his buying habits. It shows the output of a mobile application wherein it can send and receive information with the use of NFC.

In figure 16 until 18, it shows the timeliness and usability of the system. From figure 9, where it detected the customer and quickly showing the recommended items in figure 11 and 14. It is also stated in figure 13 the items that were in color red are out of stock and how quickly it refreshes to an item with stock in figure 18. As you can see in the figures, the time of the phone is still the same when it changes from out of stock to available stock. Usability because it denotes the sending and receiving of updated information to the customer with the use of NFC.

### V. SUMMARY, CONCLUSION AND RECOMMENDATION

This chapter contains the summary of results acquired in the study, conclusions derived from the results and recommendations for the enhancement of this study.

#### A. Summary

The project, Improving Customer Satisfaction through Smart Shopping: A Prototype presented an easier way for customers to received an updated information on that moment. Specifically the recommended items coming from the boutique based from the customers buying habit. The prototype application was implemented in a NFC (*Near Field Communication*) enabled android Smartphone. Once the application was installed, a customer can create his own account. By tapping the NFC - enabled android Smartphone in the NFC reader the customer can received the recommended coming from boutique. All of the customer's transactions in the boutique were saved every time he used the application. The gathered customer transactions were be transformed into useful information of a recommendation of items that can helped ease the trouble of shopping.

The prototype application was divided into two, web application that was installed in the boutique where the analysis of buying habits of the customer happened. And the mobile application installed in the customers Smartphone wherein it can send and receive updated information on that moment about the recommended items.

The developed prototype applications have their set of instructions that were programmed using Android Development Kit and Hypertext Preprocessor (PHP) for android smartphone and web respectively. The proponent also used PHP MyAdmin, MYSQL as a database to store and save customers' information and corporate data.

The developed prototype applications were tested by undergoing several trials, that is to test their usability and

timeliness. After a series of trials and test, the proponents have evaluated the usability of both applications. Furthermore, the proponent also found that both applications were responsive in providing real-time updates for buyers and sellers.

#### B. Conclusion

Through a number of researching, evaluating, testing of the prototype applications the proponent was able to meet the objectives of this study. The prototype applications presented an easier way for customers to send and receive information through the use of NFC. Moreover, it also initialized the boutique to recognize their customers' buying habits.

Based from the outcome of the studies and tests, the following conclusions can be drawn:

1. The developed prototype applications analyses the buying habits of the customer, by gathering the customers' transactions. Every time the customer bought an item to the boutique they were required to tapped their phone on the NFC reader to updates his account, refer to figure 3. Once it was been accumulated, the process of analysis of the buying habits of their customer happened, refer to figure 6. Then the result of the analysis part which is the recommendation of items will be sent to the customers' Smartphone via NFC, refer to figure 9 until figure 15
2. A mobile application was developed to allow the customers to send and receive information regarding a specific product, using NFC, refer to figure 6 the NFC and recommendation module. The process was to tapped the customers' Smartphone to the boutique's NFC reader in able to detect and start the analysis part. Customers' received the recommended items coming from the boutique. Refer to figure 7 for the process and figure 13 until 15 for the sample output of the mobile application.
3. The timeliness and usability of the developed prototype were evaluated through the test of the application. In addition, in terms of evaluating the timeliness the mobile application was responsive in providing real-time updates for the customer. For instance, the boutique recommend some items to the customer and it was only one item left, then suddenly that item was purchased by another customer automatically the system will notify the mobile application of the customer by having a red highlight in the item that means that the item is no longer available and out of stock, refer to figure 7 for the process. The sample output about timeliness, refer to figure 16 until 18. In terms of Usability it means that ease of use; the comfort and acceptability of the work system to its users and other people affected by its use. Even non technical people can understand it without reading the manual. In this part, usability refers to the sending and receiving of information, the recommended items to the customers' Smartphone via NFC. It was easy and accessible to tapped the Smartphone to the NFC reader and receive updated

information. Refer to figure 3 for the process. Sample output refer to figure 14 until 18.

### C. Recommendations

The following recommendations are offered for related research of this study:

1. It will be useful if the customers can also reserve their desired items using the said application.
2. While the proposed mobile application updates the customer while he is connected thru wi-fi, the proponent suggest that future researchers add a new feature wherein the customers may also receive updates thru SMS via offline.
3. The proposed system can be run using android smart phone and web. for better use of this application, it may also be applied in a kiosk where a customer can access a store's information easily.

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