RESEARCH ARTICLE   OPEN ACCESS

A Result Paper On Mall Shopping System Using NFC

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Abstract:

The rapid development of mobile communications systems today, along with the changing times and technology, both in terms of hardware, operating system used and the use of Internet bandwidth, making some mobile applications also contribute to exploit these developments. Mobile Commerce Applications for an example became the most popular applications for mobile users who do not want to trouble yourself with having to carry cash everywhere. An important technology behind mobile payments is called Near Field Communication (NFC). As an indication that NFC represents the potential and tremendous business, leading companies such as Nokia, Microsoft and NXP Semiconductors, actively engaged in the NFC Forum.

Keywords **— NFC, RFID, Mobile Phone, Tag , Reader.**

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I.   INTRODUCTION

In this project we are proposing a shopping system with the help of NFC. Mall is a special environment. If you want to achieve the information query and purchase products with hassle free then NFC is the solution. We propose a system where the user can purchase products using NFC reader which are present in today's latest mobile design. Every products of the Mall will be marked with a NFC tag. The user simply scans the Tag with NFC reader which is available in his mobile phone. The tag transfer the information into the user mobile where the user can view the offers related to the products and can make decision whether to buy. On buying a automatic acknowledgement is given by the server where the bill are generated for the individual. After a hassle free shopping while exiting the Mall the server simply verifies the products purchased by the client and the data synchronized on the server network. If a proper matching is done the server service generates a invoice and sends SMS alert to the user registered mobile number. The user then can opt for Payment mode whether Pay by Cash or Cash on Delivery. The products are thereafter delivered to the user residents.

1.1 Problem Statement:-

With the improvement of living standards, shops are growing bigger after constructing with more abundant goods and more variety of wares. Therefore, building a simple, fast and convenient shopping guide system has become a mutual concern of merchants and customers. In recent times mobile phone has become a popular consumer products, a simple optimization method was given to design shopping guide system run on smart phones, with the help of NFC (Near Field Communication) generation and recognition technology. For efficient shopping system, unique NFC Tags are created to record the article name, number, location of goods placed. Phone have NFC reader recognizes the NFC Tag.

1.2 Scope of Project: -

This project aims at user who frequently visits Mall to buy products on weekly or monthly basis.

User of the system downloads the Android application and install on their mobile NFC enabled devices. Every Mall will be having products with attached NFC tags. The User run the application on his mobile scans the NFC tags which are placed on the products. On scanning the Tags transfer some information to the user mobile. This Information carries the details of the product name, prize any

offer etc. The user can select the product and enter the quantity he wants to purchase. The user makes payment electronically and a e-bill is generated on the user mobile devices. The user mobile phone data receive and transfer is controlled by a centralized server which is located at every local Mall centre.

II.   SHOPPING APPLICATION PROCESS WITH NFC TECHNOLOGY BASED ON ANDROID

2.1. Technological Overview :-

NFC is a form of short-range wireless communication where: The antenna is much smaller than the wavelength of the carrier   signal. The receiver is within the transmitter's near field. Thus NFC communicates either by a modulated electric field, or a modulated magnetic field, but not by radio (electromagnetic waves). Some mobile phones now use electric-field NFC (operating at a frequency of 13.56 MHz, corresponding to a wavelength of 22.11 m) for certain special. Present and anticipated applications include contactless transactions, data exchange, and simplified setup of more complex communications such as Wi-Fi Communication is also possible between an NFC device and an unpowered NFC chip, called a "tag".

2.1.1 What is NFC?

NFC stands for Near Field Communication. It is a short-range radio technology that enables communication between devices that either touch or are momentarily held close together.

2.1.2 Tag and reader :-

NFC-based communication between two devices is possible when one device acts as a reader/writer and the other as a tag.
Tag :- The tag is a thin simple device containing antenna and small amount of memory. It is a passive device, powered by magnetic field. Depending on the tag type the memory can be read only, re-writable, and writable once.
Reader :- The reader is an active device, which generates radio signals to communicate with the tags. The reader powers the passive device in case of passive mode of communication.

2.1.3 Communication Modes: -

NFC devices support two communication modes.
Active:- In this mode, the target and the initiator devices have power supplies and can communicate with one another by alternate signal transmission.
Passive: -In this mode, the initiator device generates radio signals and the target device gets powered by this electromagnetic field. The target device responds to the initiator by modulating the existing electromagnetic field.

2.1.4 Operating Modes: -

NFC devices can operate in three different modes based on the ISO/IEC 18092, NFC IP-1 and ISO/IEC 14443 contactless smart card standards.
Read/Write: - In this mode, the NFC enabled phone can read or write data to any of the supported tag types in a standard NFC data format.
Peer to Peer: - In this mode, two NFC-enabled devices can exchange data. For example, you can share Bluetooth or Wi-Fi link set up parameters to initiate a Bluetooth or Wi-Fi link. You can also exchange data such as virtual business cards or digital photos. Peer-to-Peer mode is standardized on the ISO/IEC 18092 standard.
Card emulation: - An NFC-enabled phone acts as reader when in contact with tags. In this mode, the phone can act as a tag or contactless card for existing readers.

2.2 System Architecture:-

Every Product is attached with a NFC Tag. These NFC tags holds a unique number. These tags are scan via Android Smart Phone (NFC reader/writer).
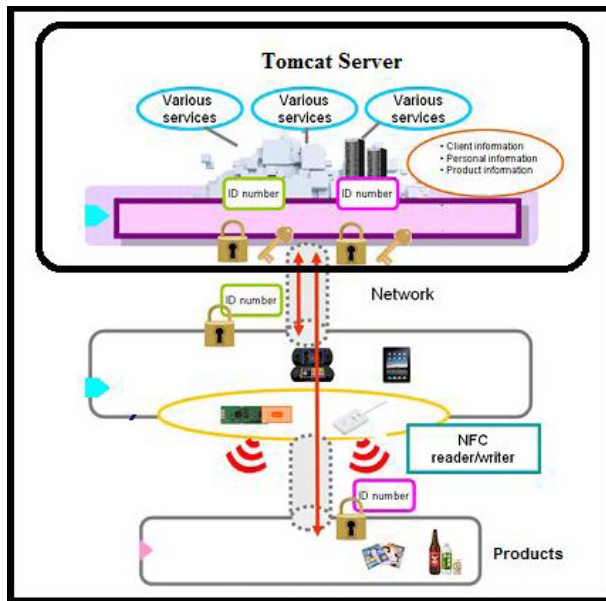
Figure system architecture.

Then the smart phone send the Unique NFC tag ID to the Server which we are using tomcat server. The server holds all the information regarding the products and offers costing. The smart phone and server communicates with each other through a TCP/IP network. Above shows system architecture diagram.

2.2.1 Payment Process :-

Mobile payments are also defined as the process of exchanging financial value between two entities using mobile devices to pay for a product or service as in Figure, alternative payment options that consumers are able to pay for products or services anywhere and anytime with the convenience of using mobile devices such as mobile phones, or smart phone.

This system proposes a secured and easy way of shopping payments using mobile phone. QR Code is used as the item tag which can be easily scanned and also provides detailed information regarding the product. QR code can provide more information when compared to the barcode and NFC.

Above architecture diagram describes the flow of the payment system as follows, the customer on selection of the product scan the corresponding QR code using the mobile

application. Now customer can add the item to their wish list which can be confirmed or cancelled before billing. After confirmation of the products to buy they can generate the bill using the mobile payment system using NFC technology. The customer can confirm the payment by clicking bill pay option from the mobile payment. The products selected could either be collected at the delivery counter or could be delivered to home if required.

III. METHODOLOGY

3.1 Software Development Life Cycle Phases: The details explanation of methodology that is being used to make this project complete and working well. Many methodology or findings from this field mainly generated into journal for others to take advantages and improve as upcoming studies. The method is use to achieve the objective of the project that will accomplish a perfect result. In order to evaluate this project, the methodology based on System Development Life Cycle (SDLC), generally three major step, which is planning, implementing and analysis.
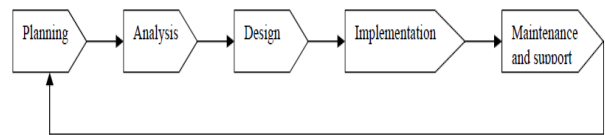

Figure SDLC Phase

Planning: - To identify all the information and requirement such as hardware and software, planning must be done in the proper manner. The planning phase has two main elements namely data collection and the requirements of hardware and software.

Data collection :- Data collection is a stage in any area of study. At this stage we planned about the projects resources and requirements, literature studies and schedule to get more information in this study. All the materials are collected from journal, texts book and research papers gathered from libraries and Internet.

Within the data collection period we have found the study about the GPS in the Internet and do some research about the project related. While planning, we have done the research about the project related, which including with study about the hardware requirement to make the system feasible.

3.1.1 Waterfall Methodology:

The waterfall approach is the earliest approach that was used for software development. Initially, most projects followed the waterfall approach because they did not focus on changing requirements.

3.1.2 Waterfall Approach Phases:

Conception: Triggers when a problem is perceived. This phase involves identifying goals to be achieved after the problem is solved, estimating benefits in the new system over the current system, and identifying other areas that are affected by the solution. This phase also involves and developing the business case for the project. A business case provides the information that a manger needs to decide whether to support a proposed project, before resources committed to its development are.

3.2 Software Requirement Specification (SRS):

3.2.1 Introduction

With the improvement of living standards, shops are growing bigger after constructing with more abundant goods and more variety of wares. Therefore, building a simple, fast and convenient shopping guide system has become a mutual concern of merchants and customers. In recent times mobile phone has become a popular consumer products, a simple optimization method was given to design shopping guide system run on smart phones, with the help of NFC (Near Field Communication) generation and recognition technology. For efficient shopping system, unique NFC Tags are created to record the article name, number, location of goods placed. Phone have NFC reader recognizes the NFC Tag. After being recognized and converted, the code will be compared with the data in the server that is placed in the cloud. It provides different services according to customer's choice customer receive the latest promotions of businesses, buy the products and pay the bill by Cash or E-Transfer or Cash on Delivery mode.

3.2.2 Document Purpose :-

The rapid development of mobile communications systems today, along with the changing times and technology, both in terms of hardware, operating system used and the use of Internet bandwidth, making some mobile applications also contribute to exploit these developments. Mobile Commerce Applications for an example, became the most popular applications for mobile users who do not want to trouble yourself with having to carry cash everywhere. An important technology behind mobile payments is called Near Field Communication (NFC). As an indication that NFC represents the potential and tremendous business, leading companies such as Nokia, Microsoft and NXP Semiconductors, actively engaged in the NFC Forum. Shopping application process integrated with NFC technology based on Android. Shopping application system designed, for the 2 sides: on the user and on the merchant sides, by leveraging the use of handset that already has NFC technology.

With the improvement of living standards, shops are growing bigger after constructing with more abundant goods and more variety of wares. Therefore, building a simple, fast and convenient shopping guide system has become a mutual concern of merchants and customers. In recent times mobile phone has become a popular consumer products, a simple optimization method was given to design shopping guide system run on smart phones, with the help of NFC (Near Field Communication) generation and recognition technology. For efficient shopping system, unique NFC Tags are created to record the article name, number, location of goods placed. Phone have NFC reader recognizes the NFC Tag. After being recognized and converted, the code will be compared with the data in the server that is placed in the cloud. It provides different services according to customer's choice customer receive the latest promotions of businesses, buy the products and pay the bill by Cash or E-Transfer or Cash on Delivery mode.

3.2.3 Overall Description :-
3.2.3.1 Product Perspective:-

Now become a technology shift from one machine to the network and the devices connected to a single concept from hardware to multiple devices purposes. It is important that consumers do not face complications in the hardware configuration for the establishment of a network, leading to near field communications, will be the NFC is a combination between identity and connectivity through technologies that contactless proximity between information and become easy communication between small electronic devices to be created to urge the magnetic induction when they are touching the devices or become closer to each other with a few centimeters to enable communication between them. Also been established and peer-to-peer network for data exchange. Once you create a communications network to other wireless technologies can be used such as Bluetooth and Wi-Fi to exchange a large amount of data and increasing the range of communications including . Let's take an example if you have a laptop and cell phone equipped with NFC, then you can easily download data from Internet into your cell phone by simply touching your cell phone with laptop. Like that you may take pictures from your cell phone and if you want to show those pictures to your friends on big screen (TV) then you may just touch your phone with TV and show them. Or if you want to print those pictures then by touching the cell phone with NFC equipped printer will give you the prints of those pictures. This principle works with any kind of devices equipped with NFC to communicate with each other. There is no need to set up the communication link initially. Suppose you want to transfer a file from one laptop to other by using novel technologies, like Bluetooth or Wi-Fi. You need to manually set up the communication link between laptops. But if you are using NFC enabled laptops, then you may transfer the file by just touching both laptops. In another situation you may establish the link using NFC and once communication link is established Bluetooth or Wi-Fi can be used to transfer dada. Advantages of using this method is to transfer larger data or containing the communication session if devices go away after touching each other.

NFC enable two way communication between electronic devices. And has the capability to write to the RFID chip.

Therefore bidirectional communication between NFC-equipped cell phone and NFC reader can be established. That makes the possibility to develop complex applications like payment, secure exchange of data and identity's authentication. NFC implements touching paradigm. This touching paradigm was initially used in RFID (Radio Frequency Identification) technology. In RFID technology items marked with tags contain transponders which emit messages in the form of signals. RFID readers were used to read those messages. NFC is now integrated with this RFID technology. The tags to be readable by NFC reader should have 4 to 10 byte unique ID. This unique ID is used for the identification of the tag. There are multiple manufacturers in the industry, so ID's length may vary in size. From the technical point of view, NFC is blend of contactless smart card technology and cell phone. NFC equipped devices normally operate in three different modes. Card emulation mode , peer-to-peer mode , and reader-writer mode. In card emulation mode NFC device behaves like a reader e.g. NFC tag. This tag has the capacity to store data securely and the applications of this mode are electronic ticketing and payments. In peer toper mode two devices equipped with NFC can exchange data directly by touching each other. Applications of P2P mode are transferring data between laptop and cell phone. Printing of data by touching laptop with printer. In reader writer mode NFC device can read or write the tags in similar fashion like RFID tags. NFC can read and write data on RFID chip. And RFID (Radio Frequency Identification) chip can be embedded in everything starting from paper to machinery. RFID is manly used for tracking and identification through radio waves. NFC core applications include connecting electronic devices, Accessing digital contents and making contactless transactions.

3.2.4 Users And Characteristics
Administrator
The administrator can carry out following functions:

Database   Maintenance   .
Products   Inventory   System   .
Stock Updating .

1. User

The Card Holder can carry out following functions:
Register   Buy Products   Recharge the Account

2. Reception Counter

a) Login   b) Responsible for Bill Collection   c) Report Generation

3.2.5 Operating Environment

In this section we describe the environment in which the software will operate, including the hardware platform, operating system and versions, and any other software components or applications with which it must peacefully coexist.

The Project will be developed under Windows 2007   Platform.
The Programming language will be used for development   will   be   Java.
Technology Used for Development will be Java and   J2EE.
Database in Oracle 9g/10g . Alternative will be Microsoft   SQL   Server   2005/2008.

3.2.6 Design And Implementation Constraints

If there is power failure system cannot recover the   ongoing   session.
Time: The project must be completed in a time span of 5 months including testing and Documentation.
Cost: The approximate cost of the system comes out   to   be   Rs.65000/-.
The system must provide accurate results i.e. it must execute the commands properly and must .
The system must be fast in processing the request and   sending   the   appropriate   response.
Provides better flexibility.

3.2.7 Assumption and Dependencies

The   system   is   centralize.
We assume that the API will be used for NFC   Interface.

Test challenges the assumptions, risks and uncertainty inherent the work of the other disciplines, addressing those concerns by concrete demonstration and impartial evaluation.

First, testing software is enormously difficult. The different ways a given program can behave are unquantifiable. Second, testing is typically done without a clear methodology so results vary from project to project, organization to organization: success is primarily a factor of the quality and skills of the individuals. Third, insufficient use is made of productivity tools, making the laborious aspects of testing manageable: in addition to the lack of automated test execution, many test efforts are conducted without tools that allow the effect management of extensive Test Data and Test Results. While the flexibility of use and complexity of software makes complete testing an impossible goal, a well-conceived methodology and use of state-of-the-art tools, can help of improve the productivity and effectiveness of the software testing.

3.2.8 Specific Requirements
3.2.8.1 External Interface Requirements
User Interfaces

The user will be provided with a simple and user friendly GUI. The GUI components of the System will be developed using: Swing   HTML, JSP, Servlets.

Communication Interfaces

Wi-Fi Network :- Wi-Fi is a popular technology that allows an electronic device to exchange data wirelessly over a computer network, including high-speed Internet connections. A device that can use Wi-Fi (such as a personal computer, video game console, smart phone, tablet, or digital audio player) can connect to a network resource such as the Internet via a wireless network access point. Such an access point has a range of about 20 meters indoors and a greater range outdoors. To connect to a Wi-

Fi LAN, a computer has to be equipped with a wireless network interface controller. The combination of computer and interface controller is called a station. All stations share a single radio frequency communication channel. Transmissions on this channel are received by all stations within range. The hardware does not signal the user that the transmission was delivered and is therefore called a best-effort delivery mechanism. A carrier wave is used to transmit the data in packets, referred to as "Ethernet frames". Each station is constantly tuned in on the radio frequency communication channel to pick up available transmissions.

GSM Network

GSM is a cellular network, which means that cell phones connect to it. There are five different cell sizes in a GSM network—macro, micro, Pico and umbrella cells. The coverage area of each cell varies according to the implementation environment.

GSM was designed with a moderate level of service security. The system was designed to authenticate the subscriber using a pre-shared key and challenge-response. Communications between the subscriber and the base station can be encrypted. The security model therefore offers confidentiality and authentication, but limited authorization capabilities, and no non-repudiation.

3.2.9 Functional Requirements

Applications that will be created consist of two parts, namely the application of the User and Shopping Cart applications on the Merchant. Simulation system made only a prototype and the Client-Server. Application on the user side can do some things that:

1. Expenditures by doing tap / tags to an existing product shopping tag NFC that in planning this time using a Mifare 1K Card for NFC Tag.
2. See Balance.
3. Record Shop, with this facility the user can perform and see the results of spending tag, and user can perform editing shopping results from the process of adding, reduction and elimination.

4. Shopping Log, with this facility the user can view the transaction history that has been done.

Application on Merchant side there are several functions that can be a merchant that is:

1. Transactions, serves to provide confirmation of the shopping process with the payment transaction process is also integrated in it, so for this process to occur connection / relationship between p2p users with a merchant to exchange information and confirmation.
2. Write Data, serves to make the process of writing or updating data on the product tag. So only the merchant who can perform the process of writing data in tag items /shopping items with the format prescribed.
3. Transaction logs, its function as a result of the log or record of the shopping process with detailed item information in goods spending, the amount of transactions and transaction status.

To design is the main specifications and device / application support used is:

1. Cellular Phone Handset Device (Mobile) Samsung Nexus S with specifications that use the Android operating system version 2.3.3 or 2.3.4, an integrated NFC technology in it.
2. Device PC / Laptop to the development process and planning applications made in which installed:
a. Software Development Tools (SDK) Android : installer_r12-windows.exe
b. Netbeans 7.3
3. RFID Tag/NFC Tag and Data cable

Users make the shopping process by doing a tag to the item of goods to be purchased. Tag on the goods themselves in order to have the format can be read by an application is made, namely like the example: KD090#Toko100#TShirt#750. Users can perform a modification of shopping items tagged e.g. by doing editing (delete, add or subtract).

Once the items are finished shopping the next process is to communicate with a merchant to make the process of sending the item shopping before the payment is made, so the merchant can find out detailed spending items that will be processed and will be paid by the user. For the process of communication with a merchant that is sent by users other than expenditure item is the IMEI # TRANSACTIONCODE #

RANDOMNUMBER#TOTALPAY. And for the communication process is used as the security PIN.

3.2.10 Other Non-Functional Requirements
3.2.10.1 Performance Requirements

Server programs are supposed to serve multiple requests simultaneously on various TCP/IP connections. Client loads vary and so do requests per client. Taking that into consideration, the performance parameters of web servers include the following: number and type of requests per second; latency time, measuring in milliseconds how long it takes to complete each new connection or request; throughput or the amount of data transmitted in response to a request measured in bytes per second. This depends on, among other things, file size and available network bandwidth. Performance is also determined by concurrency levels or the ability for the server to provide access to specific files, in this case, those that make up web pages, to multiple users simultaneously. Finally, the server model, whether client-side or server-side, used to execute web server programs establishes scalability. Scalability is a system property that refers to a system or network's ability to manage increasing workloads well and the ability to expand gracefully.

3.2.10.2 Safety and Security Requirements

The data handled in the Server system is very vital. The server should always be confirmed to run properly and the data are saved to the database at consecutive intervals.

Power is a significant feature and the power supply should be always taken care of. An Uninterrupted Power Supply is always recommended.

The system has number of features to protect the integrity of the message.

The security system features from having a login for all the usersto access the software. The login details are encrypted will be used in the system also. Soothe chances of the software getting intruded are very less.

3.2.11 Software Quality Attribute
Reliability:

The system will be designed with reliability as key feature. The system is guaranteed of providing the services to user according to his login

information. This system is guaranteed to be reliable with maximum time.

Maintainability:

The system will be developed using the standard software development conventions to help in easy review and redesigning of the system. The system will be backed up by a full fledge documentation of the product which is available online as well as free to download.

Availability:

The system is available on demand.

3.2.12 Other Requirements
3.2.12.1 Database Requirement

A database will be kept to store options about the software. This database will hold string, integers and floats as well as Boolean data. Software engineering methods and tools have to be used for the construction of software providing database functionality and for the development of database applications, thus we will be using ORACLE 10g as software
environment for running the SQL queries and the computer that hosts this database must run an instance of SQL Server Database Engine.

The information stored will be access at almost every possible interface with the user and by almost every internal system. The software will allow a user to store and recall values. These values will be stored in a database and will be accessed only if the user updates or requests a stored value. The input interface and the algorithm processor will access this database. The expected growth rate for this database impacts the scalability of the database hardware and software. So it is common to underestimate the actual disk space needed by a database.

I V. PROJECT QUALITY AND TESTING

There are many types of testing are here
System Testing

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub assemblies, assemblies and/or a finished product. It is the process of exercising software with the intent of ensuring that the

Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement.

System testing ensures that the entire integrated software system meets requirements. It tests a configuration to ensure known and predictable results. An example of system testing is the configuration oriented system integration test. System testing is based on process descriptions and flows, emphasizing pre-driven process links and integration points.

Functional test

Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals.

Functional testing is centred on the following items:

Valid Input : identified classes of valid input must be accepted.

Invalid Input : identified classes of invalid input must be rejected.

Functions : identified functions must be exercised.

Output : identified classes of application outputs must be exercised.

Systems/Procedures: interfacing systems or procedures must be invoked.

Test Work Products

The works products produce as a consequence of the testing strategy are :

   Tested Individuals components

   Completely tested system

   Test plan

   Testing log indicating errors discovered to be fixed.

V. CONCLUSION AND FUTURE SCOPE

The Project uses contact less NFC Tag technology for purchasing of products at Mall Centre's. Thus the time required to purchase and billing will be reduced as the user can purchase the products directly from his Android NFC enabled Mobile. This project aims at user who frequently visits Mall to buy products on weekly or monthly basis.

Our application is for mobile users who do not want to carry cash everywhere and want to do a trouble free shopping. An important technology is called Near Field Communication (NFC). At the moment, the only problem with our approach is in a low number of NFC enabled mobile phones. Some of them are already available, but the price is still very high. Application created a prototype that shaped the future still remains much to do development and improvement of existing models. Shopping and NFC applications NFC Merchant shopping process is created as a model with NFC technology that allows users to do the shopping process and verification of expenditure.

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