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# The use of Near Field Communication Technology in Library Management System

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**ORIGINAL ARTICLE**

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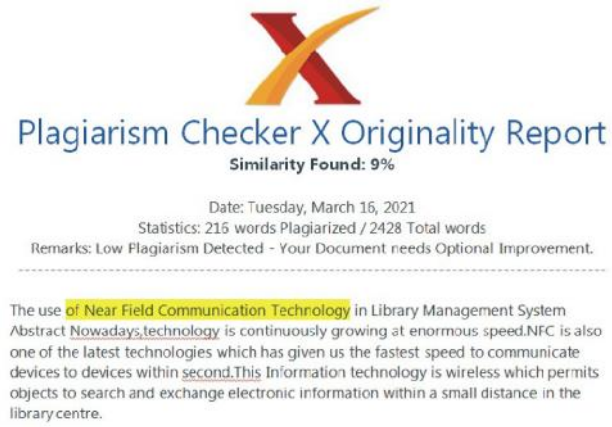

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The use of Near Field Communication Techrology in Library Management System
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## Abstract

*Nowadays, technology is continuously growing at enormous speed. NFC is also one of the latest technologies which has given us the fastest speed to communicate devices to devices within second. This Information technology is wireless which permits objects to search and exchange electronic information within a small distance in the library centre. In the information centre, Near field communication is an automated teller machine which plays an important role in library services such as self check in or out. Most important thing is being user-friendly. Anybody can use NFC techniques in the libraries centre, even direct or indirect most benefits things will happen to the library are save times, reduces staff, as well as workload also in decline position. In this paper, the researcher discusses an overview and its important application in modern library centers and it will be helpful in the various library management systems.*

## Key Words

**NFC, Smart Phones, RFID, NFC tags, NFC-enabled.**

## Introduction

The NFC standardized as "NEAR FIELD COMMUNICATION'' today's generation called wireless networking or closed field communication. In 21st modern society, NFC is wireless technology which provides communication between two mobile phones which contain NFC tags, using short range radio waves. It uses the magnetic field induction for this purpose allowing easy personal communication (Wibisurya, A., Karya, S., & Heriyanni, E. 2016). It evolves sharing of data, we can do payment using

our NFC enabled phone by swiping it out in front of the phone reader and then the purchase price will automatically be paid from credit. NFC enabled Smartphone users can make transactions and access information by a simple touch. NFC devices can send and receive data simultaneously without any help within short range. In 21st modern society the people are very close friendship with Wireless technology has become an integral part of our daily activities. Such as Travelling cards, credit card, master cards, loyalty cards, transaction and in office like biometric devices etc. In everyday life now using NFC technology to access data, share and transfer information. While NFC phone technology has been implementing to possible in every library system and it can be automated can be defined as the use of NFC enabled smart phone in the library, user can scanned and identifying the library documents books, journals, DVD, CD, Audio and Video cassettes and so on (Wiklund, M., Mofidi, M., Gaethke, R., Wong, A., & Kohlmann, M. 2014, January). They perform such basic job of library whatever he/she wants like Issue of documents, Returning, Searching of book, book information, Paying money without delay, Security use, and full records of user profiles into library database. Nowadays the traditional library has been converted into a digital library. So we simply call it, paperless services. These concepts of doing digital libraries can vary in scope and size and can maintained by individuals or organization hence in digital library system, the NFC technology worked to provide continuously improvements within a few year and updated ecosystem, motivation, supportive materials that might helpful to the use of latest NFC effective technology to our upcoming generation make golden society and have new open opportunities. Today, worldwide the most user friendly devices are smart mobiles and its range maximum time exists in every where excluded in remote areas and having bright scope for the development.

## History of NFC

Near field communication (NFC) traces its roots back to radio-frequency identification (RFID). Indeed, NFC is actually a subset of RFID with a shorter communication range for security purposes.

| S.No. | Years | Basic characteristics |
|---|---|---|
| 1. | 2002 | Developed by Philips and Sony. |
| 2. | 2004 | Nokia, Philips and Sony established the NFC platform |
| 3. | 2004-2006 | NFC tags |
| 4. | 2006 | Nokia smart device i.e 6131 |
| 5. | 2010 | Android NFC samsung Nexus |

Today, NFC technology is most popular in countries such as Europe, Asia, Japan, and the USA is the highest market of NFC technology in data exchange.

## What is Near Field Communication Technology?

NFC is a process of contactless communication, which provides bidirectional short frequency i.e. half duplex communication forum between two devices. It was developed by Philips and Sony in late 2002 which is a subfield of RFID. It has an interaction distance of approximately 5-10 cm and a maximum data rate of 424kb/s (Ok, K., Aydin, M. N., Coskun, V., & Ozdenizci, B. 2011). It is run through an electromagnetic induction field which is secure and safe for data exchange (Bhickta, S., 2013).

## Characteristics of NFC Technology

- NFC is inexpensive, as it does not license fees and is compatible with all other contract less standard including Bluetooth and availability of different types of Smartphone with NFC devices.
- This technology is used to improve speed, accuracy and efficiency with regard to the performance of the various functions.
- A new communication approach in library which can describe as the “touching paradigm”

- Numerous NFC transreciver chips are available as well as download music or video from a smart poster.
- Print an image on a printer. Short range communication, where RFID may use long range especially for active tags that contain embedded energy.
- Passive tag usage only (actually occurs only in reader/writer mode) whereas both active and passive tags are possible in RFID. Inherent secure data exchange because of short range communication.
- Implicit matching of pairs that express their willingness to form NFC communication by bringing themselves close to each other.
- Interest from companies to integrate many services such as payment with debit and credit cards, loyalty, identification, access control and so on, because of the secure communication and implicit matching as described in the previous item.

## Advantages of Near Field Communication

**Transaction :** NFC is easy to help in transaction any time make it possible for the phone to store information or make transitions like debits and credits used in ATM same things while doing in library section like issue and return the documents and paying late fine etc.

**Employee Communication :** Worker interaction to check in their location of the document and allow management to be aware of the staff where the documents are placed from the stack area of the libraries.

**Reduced staff :** To develop and evaluate a mobile application implementing NFC in a digital library to make different services process more efficient and to identify the documents and location easily by user enabled NFC smart phone.

**Security purpose :** NFC is based on contactless smartcard technology which means it utilizes similar EMV security measures same as metro security by touching NFC enabled smartcard users can pass out from inside of the library.

**Expenses Low :** Intuition libraries always want to purchase good quality materials at low rates that will help every individual's user and their flexibilities.

**Safety and secure :** NFC enabled smart cards are very much secure, and always input security passwords to exchange information. For these users always feel flexible as well as everyone takes it anywhere.

**Technical Specification of NFC, RFID & Bluetooth**

| | NFC | RFID | Bluetooth |
|---|---|---|---|
| Set -up time | <0.1ms | <0.1ms | ~6sec |
| Range | Up to 10cm | Up to 3m | Up to 30m |
| Usability | Human centric<br>Easy , intuitive , Fast | Item centric<br>Easy | Data centric<br>Medium |
| Selectivity | Fast<br>High, given, Security | Partly given | Who are you? |
| Use cases | Pay, get access, share, initiate services easy set up | Item tracking | Networking for data exchange<br>Headset |
| Consumer | Touch , wave, | Get information | Configuration |
| experiences | Simply connect | - | Needed |
| International standard | ISO 14443 | | IEEE 802.15.1 |
| Operating Frequency Maximum | 13.56MHz | 125KHz-2.5GHz | 2.4GHz |
| Data | 0.42 Mb/s | - | 3 and 22 Mb/s |
| Complexity | Low | Low | Hi |
| Cost | Low | High | Low |
| Power Consumption | ∞ | Hours/day | Hours/day |
| Directional Communication | Two way | One way | Two way |

**Figure 1:** Comparison with other wireless Information Transfer Technology

## NFC Modes of operation

NFC reflect two types of modes of operation i.e.

1) Active
2) Passive

**Active modes** of operation have actively received and send the power of communication through radio frequency energy. It involves both an initiator and targets on the data exchange. So, simple we called as power supplies in both devices.

**Passive communication mode :** The initiator device provides a carrier field and the target devices answer by modulating the existing field. In this mode, the target device may draw its operating power from the initiator-provided electromagnetic field, thus making the target device a transponder.

## Types of NFC tags and their special functions

There are four types of tags defined by the NFC forum; all based on the RFID control protocols described previously. There's a fifth that's compatible, but not strictly part of the NFC specification. Types 1, 2, and 4 are all based on ISO-14443A, and type 3 is based on ISO-18092. These tags are probably run across them in everyday life without knowing it. They are as follows:

| Tage types | Nature | Examples |
|---|---|---|
| **Type 1** (Based on ISO-14443A specification) | ❖ Can be read-only, or read/write capable<br>❖ 96 bytes to 2 kilobytes of memory.<br>❖ Communication speed 106Kb<br>❖ No data collision protection. | Innovision ,Topaz, Broadcom,DCM.0203. |
| **Type 2** (based on NXP/Philips Mifare Ultralight tag (ISO-14443A) | ❖ Read-only, or read/write capable.<br>❖ 96 bytes to 2 kilobytes of memory.<br>❖ Communication speed 106Kb.<br>❖ Anti-collision support. | NXP MifareUltralight. |
| **Type 3** ( based on the Sony FeliCa tags (ISO-18092 and JIS-X-6319-4) | ❖ Read-only, or read/write capable.<br>❖ Variable memory, up to 1ME per exchange.<br>❖ Two communication speeds, 212 or 424Kbps.<br>❖ Anti-collision support.• Example: Sony FeliCa. | N/A |
| **Type 4** ( based on NXP DESFire tag ISO-14443A) | ❖ To be read-only, or read/write capable.<br>❖ 2, 4, or 8KB of memory. 29<br>❖ Variable memory, up to 32KB per exchange<br>❖ Three communication speeds: 106, 212, or 424Kbps<br>❖ Anti-collision support | NXP DESFire, SmartMX-JCOP |
| **Type 5** (Proprietary to NXP Semiconductors, is probably the most common in NFC use today: Mifare Classic tag (ISO-14443A) | ❖ Memory options: 192, 768, or 3,584 bytes.<br>❖ Communication speed 106Kbps.<br>❖ Anti-collision support<br>❖ | NXP Mifare Classic 1K, Mifare Classic 4K, Mifare Classic Mini. |

**Figure 2:** Represent the Types of tags in NFC

## Application of NFC technology in Library Management Service

Application of NFC technology in library services is the need of the hour. Interaction with the user community can be achieved due to the advancement in mobile technology. Library has design information for delivery on mobile devices so that people on the move can access information as wanted. Latest Mobile communication technologies can improve library and information services all over the world. In LIS Services, it includes delivery of Information, learning materials on mobiles devices, alert services, Mobile references, Access e-resources, Mobile OPAC, Issue and return document, security guard, late fine payment etc. NFC mobile phones are a new type of system which is less time consuming and reduces the complexity of the earlier process. In NFC, just waving the book near NFC

devices and the book will be issued or returned according to user choice. The basic three process of NFC are:

1. Every user has an active tag attached with an Id-card.
2. Every user is registered with an NFC- enabled library.
3. NFC reader / writer device to install in the library which will be connected to the server.

- **Check IN/Checkout:** Users make an entry in the library's computer system manually, the entry made by the user both times when they enter and leave. User shows his NFC ID card to the reader in the library for automatic login, now he puts books to be issued on NFC reader for NFC books issued.
- **Receipt Generation:** Receipt generation is another feature of NFC enable library system. A receipt is generated when the user lends books with all transaction details.
- **SMS Service:** SMS sending facility in NFC system by using mobile gateway is a unique feature, Reminders of dues of books are sent to the user.
- **Anti-Theft Detection:** NFC enable library management has an anti-theft part in which RFID gates are installed. NFC tags are used which are attached with library items. If a user moves, quit taking away the book through the security system at the library exit gate without any theft alarm.
- **Shelf Management:** The self-management system consists of mobile NFC reader integrated with library software. This service for users to search according to needs what they want from different sections in the library and manage itself.
- **Stock Verification:** SV is the process in which staff can count the whole book with the help of a reader scanner and it will give automatic results of the book by generating the unique accession no of the book. The collection accession nos. are transferred to library software and a stock verification report is generated.
- **Identified the documents:** For searching a book enter accession number to enable NFC TAG read and sweep across shelves for searching. When a book is nearby beeper sounds to alert the user.
- **Web OPAC Service:** It is a service run through internet and its stand for library is provides web OPAC (online public access catalogue) services. It provide the bibliography of documents and user can search by title, keywords, author name publisher as well as ISBN and ISSN and so on at anywhere of world through network server and even get details status of books (available or issued), Number of copy availability, location and other bibliographical details in NFC enable mobile devices can accessed information through library OPAC system.
- **Access of e-resources service:** Library can be provide e-resources to the user through their NFC enable application in the system within one touch device to devices, Transfer the e- resources like audio book, music, video, downloading, Social media news and also update the information on the mobile to another devices without opening the web page.

## Conclusion

Contactless card services have been coming into widespread use in recent years. In this summary the value of NFC enabled Android smart phones is a special category of communication technology in the modern age, it is easy to pick up and carry android handsets in everywhere and enhance existing ones by adapting them to the mobile world. So, they have the potential to develop in a new specific area. Important factors to consider in NFC are expense, staff time and skills, and potential benefits to the library and its users. Library has been developed as an alternative application for use in the Information Center. All these applications enable users to perform various activities of library-based

transactions which includes take in take off and details of user profile history and searching. Therefore, results mention that NFC is on solid ground and it has been enormous growth and also inviting in the future possibility in information centers. NFC technology are many ways in which this NFC can be taken forward and the main way in which the property of the mobile device can be used is through the use of location of the users and identity documents. And also, users get authority to self-service i.e what type of documents or information they want, share, record, hide and to subscribe for personalized offers within seconds with security.

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