

• Word Count: 2727

### Plagiarism Percentage

13%

#### sources:

- 1 3% match (publications)  
[Communications in Computer and Information Science, 2015.](#)
- 2 2% match (Internet from 26-Mar-2016)  
<http://humblesatan.com/index.php/page/4/>
- 3 2% match (Internet from 07-Jun-2017)  
[http://allinonegadget.blogspot.com/2011\\_11\\_01\\_archive.html](http://allinonegadget.blogspot.com/2011_11_01_archive.html)
- 4 1% match (Internet from 23-Sep-2017)  
[http://repository.gunadarma.ac.id/1251/1/TOWARDS%20UBIQUITOUS%20COMPUTING%20IN%20INDONESIA%20MOBILE%20PAYMENT%20SYSTEM%20THROUGH%20NFC%20TECHNOLOGY\\_UG.pdf](http://repository.gunadarma.ac.id/1251/1/TOWARDS%20UBIQUITOUS%20COMPUTING%20IN%20INDONESIA%20MOBILE%20PAYMENT%20SYSTEM%20THROUGH%20NFC%20TECHNOLOGY_UG.pdf)
- 5 1% match (Internet from 23-Mar-2016)  
[http://en.wikipedia.org/wiki/Near\\_field\\_communication](http://en.wikipedia.org/wiki/Near_field_communication)
- 6 1% match (Internet from 08-Mar-2012)  
<http://blogs.globallogic.com/nfc-strength-and-weaknesses>
- 7 1% match (Internet from 15-Mar-2012)  
<http://developer.sprint.com/dynamicContent/nfc/>
- 8 < 1% match (Internet from 23-May-2016)  
<https://inflexioninteractive.com/tag/mobile-marketing/page/3/>
- 9 < 1% match (Internet from 08-Oct-2015)  
[http://people.kth.se/~maguire/c/DEGREE-PROJECT-REPORTS/150602-Carl\\_Johansson\\_and\\_Soren\\_Kavosi-with-cover.pdf](http://people.kth.se/~maguire/c/DEGREE-PROJECT-REPORTS/150602-Carl_Johansson_and_Soren_Kavosi-with-cover.pdf)
- 10 < 1% match (publications)  
[Audy, Marcel Bonar Kristanda, Seng Hansun. "Smart poster implementation on Mobile Bulletin system using NFC tags and Salt Tokenization case study: Universitas Multimedia Nusantara", 2016 2nd International Conference on Science in Information Technology \(ICSITech\), 2016](#)

#### paper text:

Near Field Communication Technology In Delivering Information In Museums Djoni Haryadi Setiabudi, Ryan Christian Wiguno, Henry Novianus Palit

Informatics Department Petra Christian University Surabaya, Indonesia 1  
djonihns @petra.ac.id, ryancw007 @gmail.com,

hnpalit@petra.ac.id Abstract

-Near Field Communication (NFC) is a close-range, high-frequency 8  
wireless

communication enabling the exchange of data between integrated devices. The NFC service is used on Android-based mobile handsets allowing users to share and receive data or information instantly, interact

with other devices using NFC technology This research presents the development of mobile applications for use in museums to help visitors recognize objects in the form of multimedia information. There are two softwares developed, the first software is an application for visitors using Android Studio. The second software is the web application for museum administrators. As a result, the application developed for visitors has successfully displayed multimedia information in the form of text, images, audio, and video by scanning the NFC tags near the object. Museum administrators can obtain the statistical data for future museum development. Keywords—museum; NFC; tag; Android; multimedia; Mobile; the web I.

**INTRODUCTION** Near Field Communication (NFC) is a short-range wireless connectivity **technology that** enables safer **and** simpler **two-way interaction between electronic devices.**

6

**NFC also allows users to conduct** contactless **transactions, access digital** contents **and connect** electronic devices **with**

3

just one

**touch. NFC communicates via magnetic field induction, where two devices are located in adjacent areas that** effectively form **a** transformer with an **air core.** The **Communication** is **between two devices**

3

that support NFC technology when the

**devices are within 4 cm or closer** to each other. **NFC operates** in **13.56 MHz radio frequency licensed ISM band**

3

[1]. There are several studies concerning this NFC Technology. One of them is a research on digitalization for objects in a museum [3], the others are an e-health application for in-patient-tracking and identification of patients in a hospital [5], the utilization of NFC in tourism [6], m-payment system based on NFC to detect the locations of people using smartphones through wireless communication network [7], Smart-posters to display information on bulletin boards at universities by utilizing NFC tags [8], m-commerce with NFC tags to make it easier for shoppers in the supermarkets [9]. The research related to the use of NFC technology in museums is the study of Guiding Mobile Applications in Support of Digitalization of Museums [3]. This study aims to replace the function of a guide and also supports the digitalization of a museum by using mobile technology. This research uses QR code technology through QR code information on objects in the museum that can be accessed via mobile device by visitors. This research undertakes the development of that research by using NFC technology to replace QR code technology. This is because the QR code itself has a weaknesses when performing the scanning process. The camera on the mobile device should be focused on the QR code first and also the orientation (slope) should be completely appropriate, so this process will take a long time. If the condition of the museum is quite crowded then the use of this QR code would be an obstacle for the museum. In the implementation, this mobile application will use NFC technology to send information of the location (URL) about the objects inside the museum. The mobile application will then capture and forward that location (URL) into the database server containing all the information about the objects. Then the content will be delivered to the visitor's smartphone. The Content about the objects can be accessed by visitors via smartphones. It can be text, images, sound, or video to make the information interesting to observe. This application will take the advantage of WiFi, in retrieving the content from the database server. II.

**NEAR FIELD COMMUNICATION (NFC)** Near Field Communication (NFC) is a communication

9

protocol

**-based on Radio Frequency Identification (RFID) technology that uses magnetic field induction** for **communication between electronic devices**

7

containing NFC tags for use at a close range. NFC can be considered as an extension of RFID. Data exchange on NFC also involves initiators and targets such as RFID, but NFC can do more than simply exchange UIDs and read or write data to the target. The most interesting difference between RFID and NFC is that NFC targets are often mobile devices. It means that the NFC target is not only providing static data of the memory, it can actually generate unique content for each exchange and send it back to the initiator. For example, if it uses NFC to exchange address data between two phones, the NFC target device can be programmed to provide only limited information if the device has never seen the initiator before [3]. Devices using NFC chips are divided into two types, one passive tag device and one NFC active device on the smartphone. NFC tags are often considered as a substitute for barcodes. It is because NFC has many advantages over the use of barcodes. When compared to barcodes, NFC has several advantages that are difficult to forge. In addition, NFC can provide a high level of security, while barcodes can be falsified by copying barcodes. Barcodes that have been copied can be used. It is one of the advantages of NFC over barcodes. NFC is also easy to use because it does not need to focus the scanner or set the orientation (slope) as in the barcode system and it only needs to close it to the NFC tag, but the NFC does not completely replace barcode technology, due to the price factor.. In some cases, the use of NFC will be very useful later on. Its uniqueness is traceable when moving from one location to another. This application can help the company to overcome the theft and loss of product. NFC can also be used in point-of-sale applications replacing the cashier with an automatic machine without having to do barcode scanning. Samples of NFC tags

can be seen in Figure 1. Fig. 1.

1

Example of NFC tags [4] The NFC device has two modes of communication. If the initiator always supplies radio frequency energy and the target will be supported by the field of the initiator, then they are said to be involved in the passive communication mode. If the targets and initiators have their own energy sources, they are in an active communication mode. This mode is the same as regular RFID communication mode. Passive operating modes are

important for battery-powered devices such as mobile phones and PDAs that need to prioritize energy use. The NFC protocol allows the device to be used in a power-saving mode so that energy can be saved for other operations [2], [10]. Normally, the

4

NFC tags are passive devices, so their usage does not require a power supply and only utilizes active devices within its operating range before being activated. Consequently, the NFC tag can not operate on its own. It can only be

used to transfer information to an active device such as a smartphone. To provide power to these tags NFC, electromagnetic induction is used to generate current to passive devices. The

2

principle is that the coils of wire can be used to produce electromagnetic waves, which can then be picked up and turned back into the current by another coil of wire. The technique is almost the same as wireless charging, with a less

2

capability. III. ANDROID AND NFC Android supports NFC with two packages: android.nfc and android.nfc.tech. The main class of the android.nfc package is [4]: NfcManager ? Android devices can manage all common NFC adapters. However, since most Android devices only support one NFC adapter, NfcManager is usually called directly with getDefaultAdapter to get a specific adapter with the phone. ? ? NfcAdapter ? It works as an NFC agent, which is similar to a network adapter residing within the computer, where mobile phones access NFC hardware to initiate NFC communications.? NDEF ? The NFC standard defines

a common data format called NFC Data Exchange Format (NDEF) that

5

can store and transmit everything from any MIME-type object to ultra-short RTD-documents such as URLs.

NdefMessage and NdefRecord are two types of NDEF for the data format defined by the NFC forum, which will be used in the sample code. Tag ? Android defines it as a passive object like labels, cards, and more. When the device detects a tag, Android creates the tag object, then puts it in the Intent object, and finally sends it to the corresponding Activity. The android.nfc.tech package also contains many other important sub-classes. The sub-class provides access to tag technology features that contain read and write operations. Depending on the type of technology used, these classes are divided into different categories such as NfcA, NfcB, NfcF, MifareClassing, and others. Basically, NFC can operate on Android by sending and receiving NFC data in the form of NDEF message. IV. PROPOSED SYSTEM There are two applications developed in this research, the application on mobile devices and the application running on the server. The applications are implemented in the Mpu Tantular Museum located in the city of Sidoarjo, East Java, Indonesia. A. Mobile Application This mobile application consists of 6 menus, which are Main Menu, NFC tags Scanner, Museum Profile, Mini-games, Map Museum, and Events. These menus can be accessed through the navigation drawer when opening the main page of the application after the login. Flowchart of the main menu

can be seen in Figure 2. Fig.2. Flowchart of

1

Main Menu The NFC tags scanner menu is used as an NFC tags reader containing the URL address information of the objects collected in the museum. Using this menu, the user can scan the objects of the museum collections that have been equipped with NFC tags by moving the smartphone close to the NFC tag. If the scanning process is successful, then the mobile application will then capture and forward the id of the object to the database server containing all the information about the object. Through this menu, visitors can get information about the objects in the museum either

in the form of text, images, sound, or video

1

using wi-fi technology. Flowchart of the NFC tag Scanner

can be seen in Figure 3. Fig.3. Flowchart of

1

NFC tags Scanner Menu B. Server Application This web application is a back-end software for the administrator of the museum having features for database management such as inserts, updates, and deletes data related to existing museum content including mini-games for this mobile application. In addition, the software for the administrator can also display graphs for statistical reports and evaluation reports from the visitors on the information that is still lacking or required by the museum visitors. The museum administrator can also do some editing on the map view of the museum by using the canvas of HTML5 so that the museum map displayed by the mobile application will be dynamic. Flowchart

of the web application can be seen in Figure 4. Fig.

1

4. Flowchart of the Web Application V. EXPERIMENTAL RESULT To use this mobile application, a smartphone that includes the NFC feature is needed. Without the NFC feature, this application can still run, but the user can not run the NFC Scanner tag menu in this application. A. Menu Login and Register On this menu, the user will be asked to fill in the username and password as seen in Figure 5. However, if the user has not yet registered in the database then the user will be directed to perform the registration process by pressing the Register button. The personal data of this user will then be used as statistical data by the museum. Fig.5. The Login and Register Menu B. Main Menu / Profile of the Museum Mpu Tantular on this page. There is also a navigation drawer to direct the users to other menus contained in the application. This view menu

can be seen in Figure 6. Fig.6.

1

Main Menu of the Application C. NFC Tag Scanner Menu This menu is used to get information about the objects in the museum by doing a scanning of the NFC tag. When this menu is opened, the user will be

prompted to scan the NFC tags found on the objects in the museum. The NFC tag contains the id of the object. After the tag is successfully scanned then this menu will forward the id obtained to the database server. After that, this application will display the

information about the object in the form of

10

text, images, video, and audio. The Display scanning process

can be seen in Figure 7. Fig.7.

1

Scanning Process of NFC Tag D. Events This menu will display the existing events in the Mpu Tantular Museum in the form of listview sorted by the most recent activities. If one item is clicked then the application will display complete information on the event in accordance with the user selection as seen in Figure 8. E. Map of the Museum When first opened, the user will be prompted to select the museum layout option that user wants to display in a dropdown or spinner. Then after selecting, the layout will be displayed by the application as viewed in Figure 9. . Fig.8. Events menu and the Information of the Event Selected Fig.9. Layout of The Museum Map F. Scanning History This application displays the results of scanning that has been conducted before by the user in the form of a listview so that if the user has scanned the NFC tags, the user does not need to scan again. Once one item is clicked it will move to the detail of the object that looks the same as the scanning result of the NFC tag. The view

can be seen in Figure 10. Fig.10.

1

Scanning History G. Web Application This web application is intended for the museum administrator to perform database management of visitors, admins, objects in museums, and museum events. This application can also display statistical data from visitors, counting the number of objects scanned in the museum, and the results of mini games. Figure 11 displays the statistical data on the number of visitors per country and per city in Indonesia. ? The museum can obtain various statistics for better museum development through this application. ? This technology can facilitate the museum if there is a change of content because all the information on the mobile application is integrated with the one on the server.

REFERENCES Fig.11. Statistical Data per Country and per City in Indonesia Figure 12 shows the statistics of the number of scanning for each object in the museum. Fig.12. Graph of the Calculation the Number of Objects Scanned Additionally, through this application, the administrator can also perform some editing on the map of the museum to be displayed on mobile applications using HTML5 canvas. [1] [2] [3] [4] [5] [6] [7] [8] [9] Android Developer. Near Field Communication. URL=https:// developer.

android.com/guide/topics/connectivity/nfc/ index.html, Accessed 17 June 2017 Igoe, T., Coleman, D. & Jepson, B. 2014. Beginning NFC. Sebastopol, CA : O'Reilly Media, Inc. Hadi, H.S. (2012). Rancang Bangun Aplikasi Mobile Pemandu dalam Mendukung Digitalisasi Museum. Accessed 18 March 2015, from [http://public.lskk.ee.itb.ac.id/S2-TMDG/2008/23208331/3\\_abstrak\\_paper\\_paper\\_tesis\\_ieee\\_ind.pdf](http://public.lskk.ee.itb.ac.id/S2-TMDG/2008/23208331/3_abstrak_paper_paper_tesis_ieee_ind.pdf).

[www.androidauthority.com/nfc-tags-explained-271872/](http://www.androidauthority.com/nfc-tags-explained-271872/). Accessed 17 Jun 2017 Prodanoff, Z.G et.al, Survey of Security Challenges in NFC and RFID for E-Health Applications, International Journal of E-Health and Medical Communications (IJEHMC) Volume 7 Issue 2, 2016 Juho Pesonen and Eric Horster, Near field communication technology in tourism, Tourism Management Perspectives, Volume 4, October 2012 Sun-Kuk Noh, et.al. Proposed M-Payment System Using Near-Field Communication and Based on WSN-Enabled Location-Based Services for M-Commerce, International Journal of Distributed Sensor Networks, Vol. 2014 Pilar Castro Garrido, et. Al, A Near Field Communication Tool for Building Intelligent Environment using Smart Posters, International Journal Of Computers And Communications, Issue 1, Volume 4, 2010 Saxena, S. et.al., M-Commerce Using NFC Tag, International Journal of Research in Advent Technology, Vol. 2, No. 5, May 2014 [10] <http://nearfieldcommunication.org/technology.html>. Accessed 17 June 2017 VI.

CONCLUSIONS ? Mobile apps can display information on objects in the form of text, images, sounds, or video in the museum by utilizing NFC technology. ? Utilization of NFC technology can be used to calculate the statistical data of the museum.