

# SMART POSTER FOR INFORMATION DELIVERY SERVICES USING NEAR FIELD COMMUNICATION (NFC)

**\*Zawawi Ismail@ Abdul Wahab, Norfazilah Ibrahim**

Faculty of Computer and Mathematical Sciences  
Universiti Teknologi MARA (UiTM) Terengganu  
23000 Dungun, Terengganu, Malaysia

\*Corresponding author's email: [zawawi@tganu.uitm.edu.my](mailto:zawawi@tganu.uitm.edu.my)

## Abstract

Currently, the traditional posters have been used as the platform for advertising and transmission of information. Typically, traditional posters not only contain elements of texts but also images in order to attract the attention of people. From an initial study conducted, it is found that texts and images have an impact on the effectiveness of information delivery especially for those hectic and less-creativity people. People are now demand for richer contents such as audio and video especially those who own smartphones. Therefore, Smart Poster for Information Delivery Services Using Near Field Communication is proposed through a combination of smartphones and NFC technology. A smart poster will act like the traditional poster, but with wealthier elements such as text, image, audio, and video. This application allows the user to create and retrieve contents of the smart posters, and is developed by adapting RAD model which involved preliminary study, system analysis, system design, system development, system testing and evaluation, and documentation. Results from the analysis indicate that the application has satisfied the respondents in terms of usability (mean = 3.80; SD = 0.42), interface design (mean = 3.80; SD = 0.67), functionality (mean = 4.10; SD = 0.74) and content (mean = 3.30; SD = 0.48) of the application. The dispersion of standard deviation is rather small that is less than one for all categories. This indicates the insignificant difference in the respondents' satisfactory level.

**Keywords:** Smart poster; NFC technology; NFC enable mobile phone; NFC tag

## 1.0 INTRODUCTION

Traditional posters are any kind of printed papers intentionally designed to attract people especially in marketing products or services, and delivering information. Some of the posters are also design for political point of view, and attracting crowd to specific events (Ayu, Mantoro, Ismail, & Zulkifli, 2012). The posters are usually pasted on the walls or any vertical surface. Normally, the posters contain elements of texts and images.

Areas with high number of people passing by or resting such as the bus stations, ATMs or malls are some of the preferred places for sticking the posters. The traditional posters ease the delivery of information and it is promptly taken by everyone. However, it is a problem for hectic people such as students and professionals to spend much time in front of the posters and read or write down all information especially ones loaded with lots of texts (Bhati, Sharma, & Singh 2013).

As many people are now using smartphones that able to play audio and video beside of displaying pictures, the Near Field Communication (NFC) technology is considered as a better alternative for the traditional posters. Using NFC technology in developing a smart poster make it more attractive and easier for the people to retrieve the information because it can store additional forms of data such as pictures, audio and video (NFC Forum, 2007).

This research is being guided by three clear objectives which are to study Android characteristic in developing mobile application and NFC technology in delivering information, to develop mobile Android based smart posters for information delivery services using NFC, and to test and evaluate the usability and functionality of the proposed application.

## 2.0 LITERATURE REVIEW

### A. Smart Poster

A smart poster that embeds NFC tags onto it, is one of the most popular use cases of NFC reader/writer mode. One or more NFC tags may be placed onto the poster and different data types may be saved into those NFC tags to trigger different services on the smartphones (Triggs, 2014). For example, both an NFC tag containing a webpage URL and an NFC tag containing an e-mail address can be placed onto a poster to trigger corresponding activities on the mobile (Gasimov, Tan, Phang, & Sutanto, 2010). In the design phase, it is very important to decide which applications can read the NFC tag (Awad, 2011). One option is to allow all mobile phones to read the tag. In this case, when an NFC mobile scans the smart poster, Android OS handles the data itself.

### B. Wireless Communication as NFC

Wireless communication refers to transmission of data without using any cables. Wireless communication is one example solution, when communication is impossible through the use of cables. Table I shows a comparison of popular wireless technologies currently used such as Bluetooth, NFC, Radio-frequency identification (RFID) and Wi-Fi, in terms of their frequency, range and features.

**Table 1 Comparison of Wireless Communications**

Technology	Frequency	Range	Features
Bluetooth	2.4 GHz	<10 m, up to 100 m with higher power	Low-power version available
NFC	13.56 MHz	<4 cm	Security
RFID	125 kHz 13.56 MHz 902 to 928 MHz	20 cm for passive 400 cm for active	Low cost
Wi-Fi	2.4 and 5 GHz	<100m	High speed, ubiquity

NFC is a technology which used in the development of smart posters. It uses the magnetic induction for data transmission between smart poster as a tag and smartphone as a reader. NFC operates at 13.56 MHz and allows communication in active mode and passive mode. In active mode, both devices have power. In passive mode, one device act as a reader NFC-enable devices and one as a target NFC tag. The target has no power and will get power from the reader when it starts making interaction.

NFC enabled services can run in three different ways which are a reader or writer mode, peer to peer mode and card emulation mode (Clark, 2013). The tool which used in the development is an NFC writer

to store the data to NFC tag. According to Coskun, Ok and Ozdenizci (2013), the data is written to the NFC tag using NDEF (NFC Data Exchange Format) formatting. NDEF is a data format to encapsulate and identify application data that is exchanged between NFC-enabled devices (Wu, Lin Qi, Ram Shankar Siva Kumar, Kumar & Tague, 2012).

Smart posters use the passive NFC tags that allow communication in passive mode. In passive mode, NFC tagged as a target where the target has no power and will get power from the reader (NFC-enabled mobile phone) when it starts making interaction. In this process, the NFC-enabled mobile phone devices will become the initiator that will generate a radio frequency field within a range of about four centimeters. Then the target will grab the radio frequency field. Figure 1 shows the read and write processes of NFC tags.

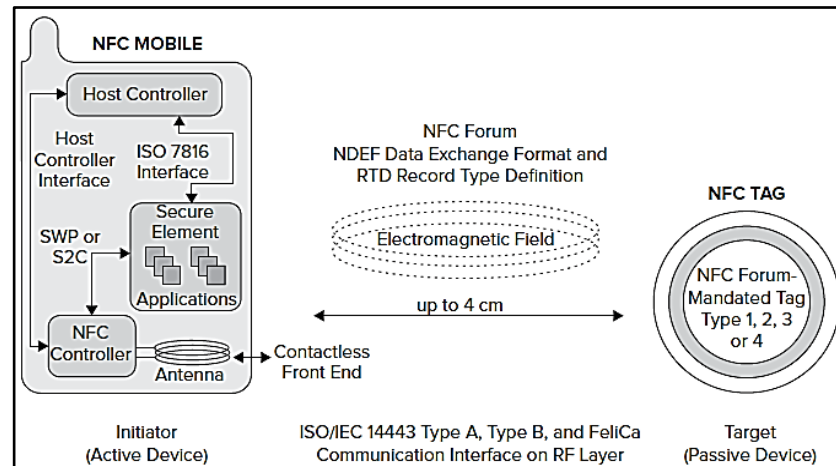


Figure 1 Read/Write Operating Mode Work

### 3.0 METHODOLOGY

In this study, the RAD (Rapid Application Development) model is applied. The methodology involves preliminary study, system analysis, system design, system development, system testing and evaluation and finally documentation.

#### A. System Development

Figure 2 shows an example of an NFC tag. Generally, an NFC tag has antenna coil and small plate as its memory for data storage.

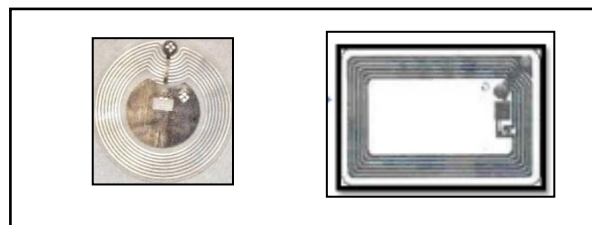
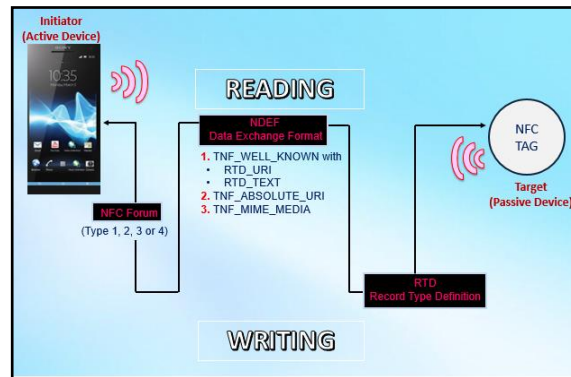


Figure 2 Examples of NFC Tags

In reads or writes operating mode, an NFC-enabled mobile phone as an active device will create electromagnetic field to transfer or read data in NFC tag as a passive device. To write data to NFC tag, NDEF (Data Exchange Format) formatting need to be prepared based on the desired data type. Figure 3 depicts the general architecture of a smart poster.



**Figure 3 General Architecture of a Smart Poster**

After the writing is done, this written NFC tag label is ready to be embedded onto a poster on its particular location to create a smart poster. To be able to access information embedded in a smart poster, an NFC reader is required. Nowadays, several smartphones have been NFC enabled, which make them able to access NDEF information embedded in smart posters. The NFC enabled phone used in our study is a Samsung Galaxy 2 with Android operating system.

### *B. System Design*

The design of user interface is important in order to develop a user-friendly application. Adobe Photoshop is used in designing the interface as attractive interface is one of the ways to attract users to use the proposed application. Figure 4 and 5 shows the UI (User Interface) designs of the proposed application



**Figure 4 Graphical User Interface for Write Process of the Proposed Application**



**Figure 5 Graphical User Interface for Read Process of the Proposed Application**

### *C. Evaluation*

The evaluation is conducted by distributing a set of questionnaires. The questionnaire is divided into two parts – Part A and Part B. Part A is the questions regarding the respondents' demographic information whereas for Part B regarding to the users' evaluation on the proposed application. Table 2 shows the parts of items for the questionnaire.

**Table 2 Part of Item for Questionnaire**

<b>Construct A : Usability</b>	
<b>Code</b>	<b>Items</b>
A1	It is easy to use.
A2	This application is user friendly.
A3	It is easy to learn to use it and able to remember how to use it.
A4	This application can be effectively used without instruction.
<b>Construct B : Interface Design</b>	
B1	This application has an attractive screen layout and design.
B2	This application using high quality of images and icons.
B3	This application has a consistent design.
B4	Application design is important.
<b>Construct C : Functionality</b>	
C1	The application provides sufficient details of the information.
C2	I am able to save information such picture, audio and video to my smartphone.
C3	The checkout process was done in short period of time.
<b>Construct D : Content</b>	
D1	In this applications everything is easy to understand
D2	This applications is simple to use, even when using it for the first time

#### **4.0 RESULT AND FINDING**

To evaluate the level of effectiveness and the functionality of the proposed application, an analysis has been conducted to ensure the proposed application meets all the intended requirements. The evaluation is conducted by distributing a set of questionnaires to 10 respondents. The questionnaire is divided into two parts – Part A and Part B. Part A is the questions regarding the respondents’ demographic information whereas for Part B is the users’ evaluation on the proposed application.

Part A, the demographic profile is analyzed by involving 10 respondents where it is equally divided to each gender and 90% are aged between 18 to 30 years old. Most of them are single and still studying. Table 3 shows the demographic information of the respondents.

<b>GENDER</b>		
<b>Category</b>	<b>Frequency</b>	<b>Per cent (%)</b>
<b>Table 3 Demographic Information of Respondents</b>		
Male	5	50
Female	5	50
<b>AGE</b>		
<b>Category</b>	<b>Frequency</b>	<b>Per cent (%)</b>
18 – 21	3	30
21-30	6	60
31 and above	1	10
<b>MARITAL STATUS</b>		
<b>Category</b>	<b>Frequency</b>	<b>Per cent (%)</b>
Single	8	80
Married	2	20
<b>EMPLOYMENTS</b>		
<b>Category</b>	<b>Frequency</b>	<b>Per cent (%)</b>
Government Agency	3	30
Private Organization	1	10
Self-Employee	1	10
Student	5	50

Part B is used to determine the usefulness of the proposed application. The evaluation is divided into four constructs; the usability, interface design, functionality and content of the proposed application. These are the factors that contribute to the success and acceptance of a smart poster as the alternative for the traditional posters. Table 4 shows the highest result based on mean for each item. The results showed that majority of the respondents are satisfied and agreed the proposed application is practical. This also shows that the smart poster is an effective platform for information delivery.

**Table 4 The Highest Result based on mean for each item**

<b>Construct A : Usability</b>				
<b>Code</b>	<b>Items</b>	<b>Mode</b>	<b>Mean</b>	<b>SD</b>
A1	It is easy to use.	4	3.80	0.42
<b>Construct B : Interface Design</b>				
<b>Code</b>	<b>Items</b>	<b>Mode</b>	<b>Mean</b>	<b>SD</b>
B4	Application design is important.	4	3.80	0.67
<b>Construct C : Functionality</b>				
<b>Code</b>	<b>Items</b>	<b>Mode</b>	<b>Mean</b>	<b>SD</b>
C1	The application provides sufficient details of the information.	4	4.10	0.74
<b>Construct D : Content</b>				
D2	This applications is simple to use, even when using it for the first time	3	3.30	0.48

## 5.0 CONCLUSION

Information delivery particularly to attract hectic people's attention is no longer limited to text and image based content only. With more and more people use smartphones which capable of playing multimedia contents such as images, audio and video, make it a better solution and an alternative platform to the traditional posters that can only contain text and images. Information can be created in such an effective way by providing audio and video so that the people can extract the information anytime and anywhere without spending much time to read and write down the content in front of a poster pasted on the wall ever again.

## References

Ayu, M. A., Mantoro, T., Ismail, S. A., & Zulkifli, N. S. (16-18 May 2012). Rich information service delivery to mobile users using smart posters, Paper presented at Second International Conference on Digital Information and Communication Technology and it's Applications (DICTAP), 149–153. doi: 10.1109/DICTAP.2012.6215341



- Clark, M. (14, August 2013). NXP begins shipping NFC tags that can wake up a host device. *NFC World Knowledge Centre*, Retrieved from <https://www.nfcworld.com/2013/08/14/325492/nxp-begins-shipping-nfc-tags-that-can-wake-up-a-host-device/>
- NFC Forum. (2007). Near field communication and the NFC forum: The keys to truly interoperable communications. Retrieved from [http://www.portech.co.uk/go\\_files/whitepapers/214793-nfc-forum\\_marketing\\_white\\_paper.pdf](http://www.portech.co.uk/go_files/whitepapers/214793-nfc-forum_marketing_white_paper.pdf)
- Caskun, V., Ok, K., & Ozdenizci, B. (2013). Professional NFC application development for Android. Chichester Wiley: England.
- Gasimov, A., Tan, C.-H., Phang, C. W., & Sutanto, J. (2010). Visiting mobile application development: What, how and where. Paper presented at 2010 Ninth International Conference on Mobile Business and 2010 Ninth Global Mobility Roundtable (ICMB-GMR), 74-81. doi:10.1109/ICMB-GMR.2010.20
- Awad, M. (2011). NFC forum certification: The key to interoperable innovation. *NFC Forum*. Retrieved from <http://nfc-forum.org/wp-content/uploads/2013/12/MWG-NFC-4G-World-2011-vFINAL2.pdf>
- Bhati, S., Sharma, S., & Singh, K. (2013). Review on google android a mobile platform. *Journal of Computer Engineering*, 10(5), 21-25. doi:10.9790/0661-1052125
- Triggs, R. (2014). What is NFC & how does it work?. *Android Authority*. Retrieved from <http://www.androidauthority.com/what-is-nfc-270730/>
- Wu, J., Lin Q., Kumar, R. R. S., & Tague, P. (2012). S-SPAN: Secure smart posters in android using NFC. Paper presented at IEEE International Symposium On a World of Wireless, Mobile and Multimedia Networks . 1-3, doi:10.1109/wowmom.2012.6263736