



Inadvertent Impact of Near Field Communication in Advertising

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Abstract — Near field communication (NFC) is a new secure short range wireless connectivity technology, which offers an important contribution to simplify some daily operations, such as payments, ticketing, data transfer and vouchers. The main objective of my project is to design Smart posters, so that users with an NFC enabled mobile phone can simply tap to receive interactive content, download vouchers and promotions, website link and text, loyalty programs and brand apps, links to join interactive games, product information, social media connections and more. This paper is designed with the intention to develop Smart posters, a next generation of poster, it still has the visual impact of a traditional poster that showcases your promotion but it also has an enhanced interactivity which connects the physical world to the virtual world. Using smart posters users by touching their nfc enabled phone against the poster they can be instantly redirected on their mobile phone to the advertising content. In addition, the website promoting the smart poster is aimed at crafting sites to provide an optimal viewing experience i.e., responsive web design that changes display resolution of the website according to the user mobile. ‘

Keywords: NFC, Tags, ISO, Smart Poster

I. INTRODUCTION

NFC is a standards-based, short-range wireless connectivity technology that enables simple and intuitive two-way interactions between electronic devices. With NFC technology, consumers can perform contactless transactions, access digital content and connect NFC-enabled devices with a single touch. NFC simplifies setup of some longer-range wireless technologies, such as Bluetooth and Wi-Fi. It is also compatible with the global contactless standards (ISO 14443 and/or ISO 18092), which means transport agencies that have already deployed contactless programs enjoy a built-in advantage, as their equipment may readily interact with NFC enabled mobile devices and provide richer services. Basically, NFC facilitates data transfer between two ‘devices’ when placed a few centimeters apart swiped or “tapped”. To explain further, this revolutionary wireless technology enables data exchange or information delivery to occur between any two NFC chips they might both be installed within electronic devices. Two NFC enabled smart phones can instantly transfer data with a simple "tap" together. Or you could tap your NFC-enabled device to the distinctive NFC logo on a smart poster. And behind that logo is the unpowered, passive NFC chip, more commonly referred to as the ‘tag’ or ‘touch point’. In essence you are connecting chips; chips that are embedded in devices or marketing collateral. These chips can be placed virtually anywhere and be encoded with almost any type of information or media.

Although NFC use is also beneficial for many operations, the main focus of this paper is on how implementers can improve the advertising experience.

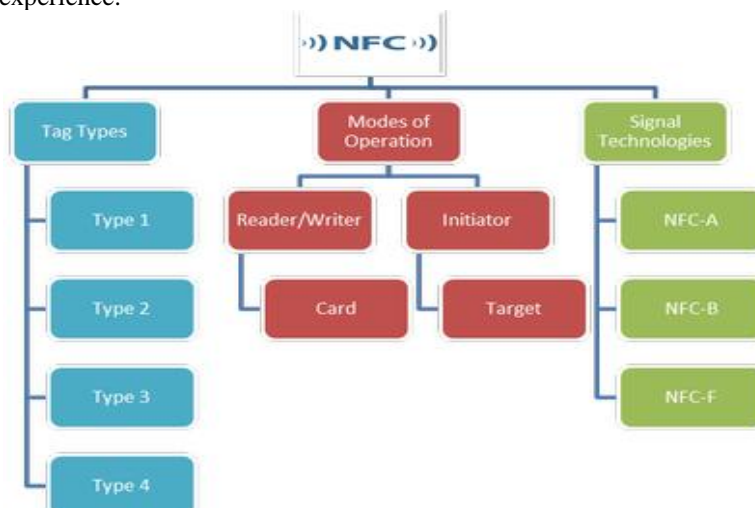


Fig1.1.Overview of NFC

NFC in SmartPosters

NFC enabled Smart Poster Smart Posters are signs, billboards, or any other form of physical advertising which enable companies to reach their target audience through the use of modern technology. By incorporating a Near Field Communication (NFC) tag in an object, users can extract data simply by touching it with their NFC-enabled handset from simple text to links to video and audio content.

Importance of NFC for Business

The ability to easily transfer data is appealing to retailers, advertising agencies, transportation authorities, health care providers, and many other industries, especially those that interact with consumers. The seamless interaction offers new ways to distribute information, and its applications are only limited by the creativity of the provider.

SmartPosters

Smart posters combine the visual impact of a traditional poster with the heightened interactivity offered by NFC (near field communication). Consumers with an NFC enabled mobile phone can simply tap to receive interactive content, download vouchers and promotions or engage via social media. When an NFC-enabled phone is placed in close proximity, typically a few centimeters, it powers the NFC tag and reads the information stored on it.

NFC smart posters create new avenues in which marketers communicate and engage with consumers. Smart posters combine the visual impact of a traditional poster with the heightened interactivity offered by NFC (near field communication). At the heart of each smart poster is an NFC tag, a small unpowered electronic device that holds a small amount of data.

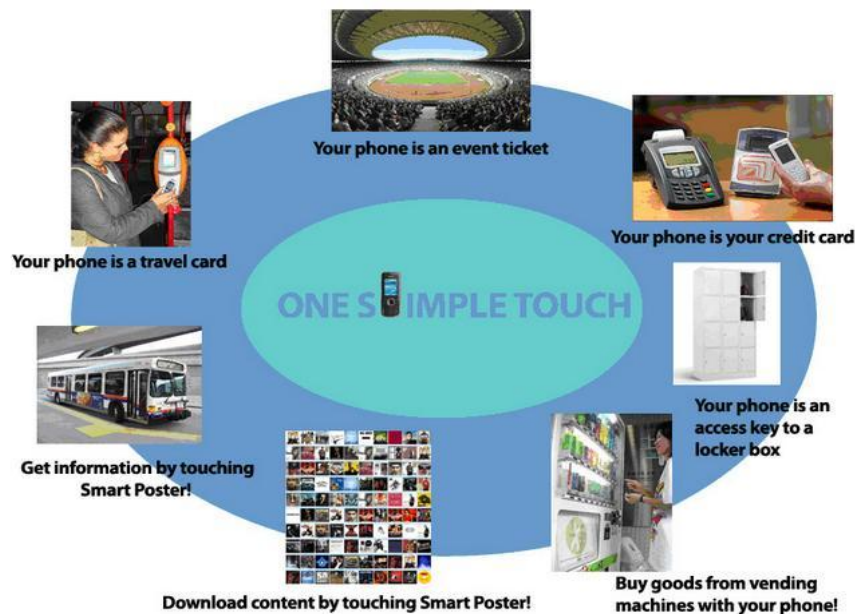


Fig 1.2 Prevalence of NFC

5 Great Ways To Use An NFC Enabled Smart Poster

Vouchers and Promotions. Mobile vouchers offer a quick and convenient way to incentivise a trial of your product or services. Consumer research identifies vouchers and promotions as the primary reason for interacting with NFC-enabled advertising.

Local Information and Directions. It is a common misconception that smart posters are only for big brands and advertisers. Help customers find your business by linking to directions online or provide visitors and tourists with local information.

Link to Online Media. Static 2D advertisements are a thing of the past. Better engage your audience by linking to online video and interactive content.

Make a Purchase. Consumers are increasingly using their mobile phones to purchase online. Offer the option to 'buy now' or link to further product information.

Social Media. Allow customers to instantly 'like' or 'follow' your brand with a simply tap of their phone. If you have something great to offer make it easy for customers to share it online.

II. MODES OF OPERATION

In reader/writer mode, the NFC device is capable of reading NFC Forum mandated tag types, such as in the scenario of reading an NFC Smart poster tag. The reader/writer mode is on the RF interface compliant to the ISO 14443 and FeliCa schemes.

In Peer-to-Peer mode, two NFC devices can exchange data. For example, you can share Bluetooth or Wi-Fi link set up parameters, and exchange data such as virtual business cards or digital photos. Peer-to-Peer mode is standardized on the ISO/IEC 18092 standard.

In Card Emulation mode, the NFC device itself acts as an NFC tag, appearing to an external reader much the same as a traditional contactless smart card. This enables contactless payments and eticketing,



Fig 1.3 Basics of Transmission

NFC Tags

An NFC tag is a small passive (no battery) device which contains a tiny microchip attached to a small loop antenna. When the tag is scanned by an NFC reader such as a mobile phone, it powers up and wirelessly transfers information such as a web address, text or a command for an Application.

Tag Types

Tags are integrated circuits with information stored in them that can read by NFC devices. There are currently four tag types used around the world. They are:

- Type 1: they can be read and re-write capable, which means the tag can be configured to become read-only.
- Type 2: similar to Type 1, but with a smaller memory availability at 48 bytes and expandable to 2KB.
- Type 3: Based on FeliCa, these tags are pre-configured to be either read and re-writable, or read-only.
- Type 4: Compatible with NFC-A and NFC-B, the tags are pre-configured to be either read and re-writable, or read-only.



Fig 1.4 Sample NFC Tag

III. EXISTING SYSTEM

Static 2D advertisements are a thing of the past. A traditional poster only gives a visual promotion for either an offer a phone number or a web address. This then requires the customer to either remember the offer and go in store to redeem it or get there phone out and physically input and store the phone number or web address. In today's busy world where people are bombarded with offers people do not have the time nor inclination to stop and do this. Therefore the response rates are very low with minimal track ability. There is no evidence of any smart poster implementation in our country. An advertising campaign is typically broadcast through several media channels.

It may focus on a common theme and one or few brands or products, or be directed at a particular segment of the population. Successful advertising campaigns achieve far more than the sporadic advertising, and may last from a few weeks and months to years.

IV. PROPOSED SYSTEM

In Our Proposed System I have used Near Field Communication (NFC) ,a new wireless communication technology which allows the transfer of data from one device to another at close range, typically a few centimeters with one simple touch. NFC is now supported by 90% of the leading mobile manufacturers including Samsung, Nokia, Sony, Blackberry, Google and HTC

Suddenly the poster is not just a visual offer but it actually allows you to gain repeat business, customer loyalty and even instant sales! This has all the benefits of the traditional poster but it is a dramatic enhancement that offers much

more. Since near field communication requires the user to take action, the opt-in nature of the technology creates an engaged user leading to a much more meaningful interaction with brand and communicate their likes and dislikes and engage with customers.

In addition, since the smart posters provide an optimal viewing experience i.e., eliminate the need for a different design & development for each new gadget on the market.



Fig.1.5 Smart Poster Advertisement

Technical Characteristics and Operation Modes

One of the major advantages of NFC is the fact that the technology is compatible with existing RFID infrastructure, RFID tags and further contactless smart cards. NFC is built upon a subset of existing ISO standards, including the ISO/IEC 14443 standard that is being used by the RFID technology.

NFC hence operates at the unlicensed 13.56 MHz radio frequency band with amplitude shift-keying modulation allowing transfer data rates up to 424 Kbits per second. Theoretically NFC works up to a distance of 20 cm, whereas in most scenarios a working distance of about four centimeters is usual. In contrast to conventional RFID systems, in the NFC technology there is no more strict distinction between reader and transponder. A NFC-capable device integrates both components: a passive transponder and an active reader. It can not only read and write data from or to a tag, but also receive and transmit data directly to another NFC device. Thus, NFC supports in overall three operating modes –

Reader/Writer mode, Peer-to-Peer mode, Card Emulation mode

NFC Data Exchange Format

In all modes of operation an NFC Data Exchange Format (NDEF) message is used for the transfer of data, no matter whether the communication takes place between two NFC devices or between one device and a passive NFC tag. The NFC Forum has hereby defined a universal set of rules for the data structures used for any kind of NFC communication. A NDEF message contains one or more NDEF records that each encapsulates user data of the application layer. The NDEF record is composed of a header and a payload part containing the actual user data. Apart from an ID that uniquely identifies the record, the header most notably defines the type

and therefore of the format of the record data. This could be either a MIME media type, describing a composition of e.g. images, textual content and any other types of information [4, p123], or one of the predefined NFC record type definitions (RTD). In contrast to the MIME media types, the latter specifications define not only the data structure, but also the way how the data should eventually be processed and presented on the receiving output device, i.e. the NFC handset.

Amongst others, the following NFC record type definitions are possible:

The Text Record Type allows the encapsulation of basic text strings including information about the character encoding scheme and the language of the text.

The URI Record Type contains a Uniform Resource Identifier, e.g. an email address or a web address. An application receiving this NFC record can for example be adjusted to automatically process this information to a web browser application.

The Signature Record Type offers a security mechanism by providing the possibility to sign a whole NDEF message. The application receiving the signed message can then verify its integrity and authenticity by cross checking the signature with a corresponding signature approved by a Certificate Authority. The issue of NFC communication security will be addressed

later in this paper in more detail.

The Smart Poster Record Type provides a practical opportunity to augment physical objects, e.g. a smart advertisement poster equipped with a NFC tag, with the virtual content hence enabling the previously described concept of the "Internet of Things". The Smart Poster Type encapsulates multiple NDEF records containing for example a textual title record, a URI record and also a recommended action to perform when receiving that message, for example to open a certain URL with the browser or to compose a SMS message. Via a simple tap on the tagged object, a receiving NFC device can thus

easily be provided with related content that is presented accordingly formatted . In the scenario of buying a concert ticket, as shown in Figure 1, most probably such Smart Poster Record Type will be used.

Connection Handover

For the transfer of huge amounts of data at high speed or over a large distance between initiator and target the described capabilities of the NFC technology might not be sufficient. In theory however, NFC also provides a mechanism for connection handover to another wireless technology with higher data rates like Wi-Fi or Bluetooth. In general, the establishment of such data communication requires a lot of configuration effort. The simple touch-and-connect principle of NFC though can be used ideally in order to exchange the required configuration parameters. Following a technical specification provided by the NFC Forum in this way the negotiation sequence for activating a new communication channel can be achieved via NFC hence enabling an easy connection handover.

Hardware Architecture of NFC-capable Phones

Before presenting several NFC application scenarios in the subsequent chapter, it will be useful to discuss the basic NFC hardware components in smartphones and their role within the NFC communication flow. This will be useful to also understand the position and attitude of the various stakeholder parties and the resulting, later discussed, conflicts between them. For NFC in mobile devices essentially four components are required: A Host Controller, a NFC Controller, a NFC Antenna and a Secure Element. The Host Controller acts as the heart of every mobile phone. This processor is not only necessary for executing the mobile's operating system, but also manages the user interface and the GSM/UMTS modem and serves as Application Execution Environment (AEE). It is the gateway for the other NFC components to the mobile phone's system itself and is therefore an essential part for integrating NFC functionality into the handset. The NFC Antenna obviously is needed for receiving and transmitting adequate radio signals. The NFC Controller modulates, demodulates and processes the signals in accordance with the mentioned NFC specifications whilst supporting all three modes of operation. Last but not least, the NFC architecture provides a Secure Element (SE) serving as Trusted Execution Environment (TEE). Many NFC systems deal with critical and sensitive data and therefore need a secure environment to store data and to execute applications being protected against manipulation and misuse. Such Secure Element can be integrated into a mobile phone in several ways.

It could either be a dedicated chip that is a fixed part of the phones hardware or it could be realized as a removable and exchangeable chip card. Maybe the most evident and reasonable way is to use the Universal Integrated Circuit Card

(UICC) as Secure Element. This card is provided by the mobile network operator (MNO) to its customers anyway and does not only contain the SIM module but also a multi-functional and secure platform for various applications. When switching to a new phone, the customer can hence easily continue to use his data applications stored on 'his' Secure Element, i.e. his UICC.

However, the UICC is released by and bound to a specific network operator making it problematic to develop UICC based NFC applications without involving the MNOs.

Comparison to Similar Technologies

Certainly, there are other technologies for wireless communication providing capabilities that are similar to the just presented RFID respectively NFC based specifications.

Bluetooth is a further short-range communication technology that can also be integrated into mobile phones. It operates at a higher frequency band of 2.4 GHz, provides greater data rates up to 2 Mbit/s and is therefore more suitable for the transfer of larger amounts of data. It allows considerably higher working ranges of several meters making it on the other hand easier to undesirably intercept signals. It hence provides less security. Furthermore, NFC connections can be established at once within a fraction of a second, whereas Bluetooth usually involves further configuration settings and user interaction or device pairing. However, a new Bluetooth feature, called Bluetooth low energy (BLE), also aims to provide a more usable, low-powered technology with much faster connection setup.

Wi-Fi is another mechanism to exchange data wirelessly. It operates on the same frequencies as Bluetooth, but with higher power. This leads to more power consumption on the mobile device, but allows still higher data rates and larger working ranges of typically up to 100 meters. The connection setup is also quite complex and time consuming. Another important difference to NFC is the fact that both techniques, Wi-Fi and Bluetooth, are not able to communicate with passive, no powered devices such as passive tags. QR codes provide capabilities that are similar to the usage of NFC tags. They represent two-dimensional optical barcodes, visualized by coded black and white patterns storing various types of data, i.e. up to several thousand characters depending

on the tag's size and error correction level. Whilst generating virtually no costs, QR codes can be printed on different kinds of surfaces, typically on product packages and advertisement posters. In order to read the tag content, a camera sensor is required. In contrast to NFC tags they are thus not only more conspicuous, but also sensitive to the readers pose, lightning conditions and other disruptive conditions in the environment.

QR tags are cheaper, but reading a QR tag with the built-in camera of a Smartphone is in general more cumbersome and time consuming than reading a NFC tag.

In some areas, NFC has certainly benefits compared to other technologies, but the comparison also reveals that those technologies can complement each other quite well. It is therefore likely that NFC will coexist with existing technologies like Wi-Fi and Bluetooth in future smart phones.

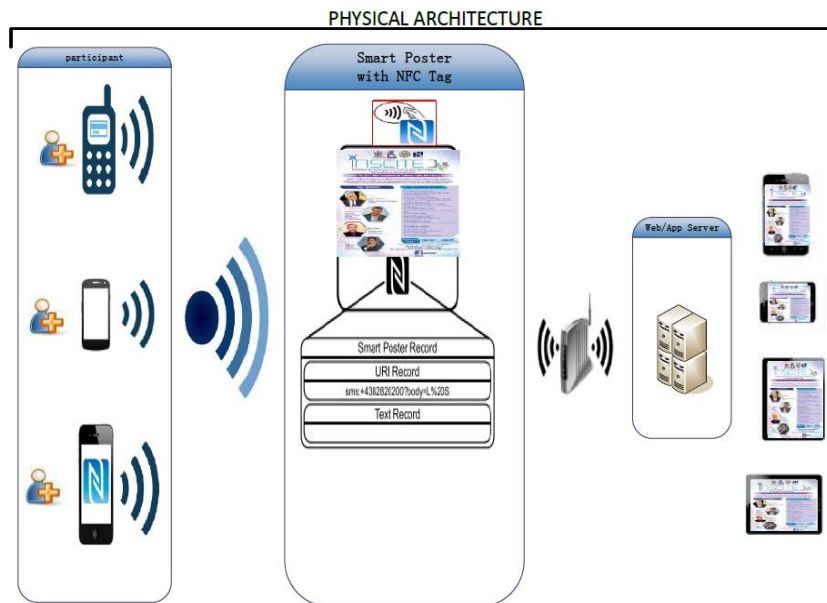


Fig 1.6 Smart Poster Advertisement

V. MODULE DESCRIPTION

NFC Smart Poster Writer App

Smart Poster NFC Writer application enables to write more than one data type on the SAME NFC tag. i.e to write an url ,short text message,E-mail,Map location,Plain text all on ONE tag.

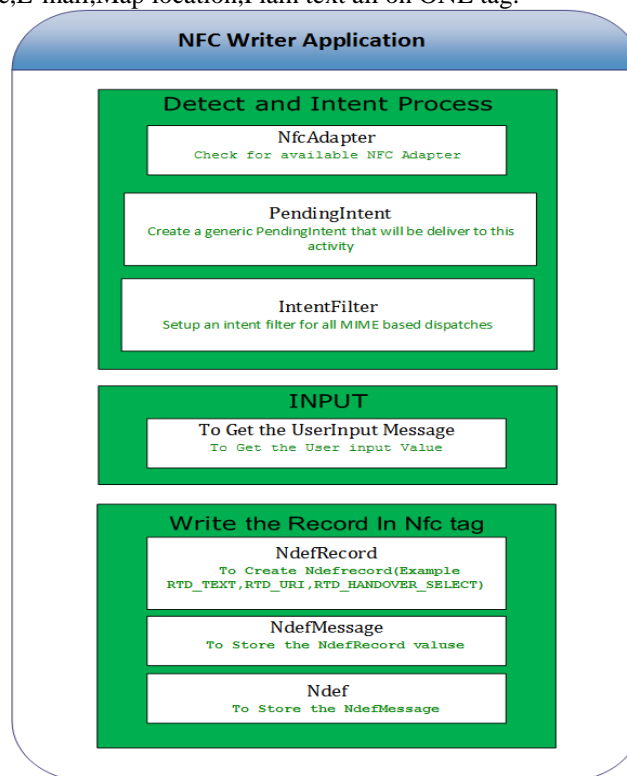


Fig 1.6.NFC Write App

NFC Smart Poster Read App

Smart Poster NFC Reader application enables reading various tags and view contents of a NFC tags.Involves Process of Tag detection,and Reading the NDEF Records

Smart Poster Creation

A smart poster is created by combining printed media with either a visible or hidden NFC tag, usually in the form of a sticker. Custom Print NFC Tags are available with full colour print and can include branding, promotions or an NFC logo. Once encoded with your desired web address, text or command the NFC sticker can be simply stuck onto the visible face of the poster. A cheaper option is to use a clear or white NFC tag such as the NTAG203 Round 29mm and stick it to the reverse of the poster, aligned to an NFC logo or call to action within the creative.

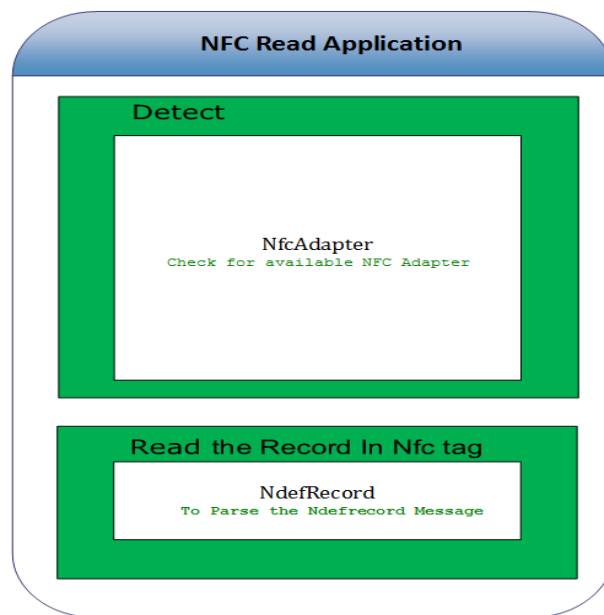


Fig 1.7 .NFC Read App

ADVANTAGE OF NFC OVER BLUETOOTH

NFC require very less power or even no power to work as compare toBluetooth

NFC tags are passive RFID tags which means they take power from the near by sources but Bluetooth can consume reasonable amount of power.

NFC is faster than Bluetooth

No need to pair two NFC devices with pass code or anything. To send data all you need to do is bring two NFC supported phones closer and data is transfer automatically. It is best to send small data like images and URL.

NFC is anonymous

No user data is collected while setting up a connection using NFC, thus keeping you anonymous.

NFC can be used to make payment

NFC payments are widely accepted in America and soon will be available worldwide. While this is not possible with Bluetooth yet.

NFC can work with passive rfid tags called NFC tags

consumers usage of NFC smart posters

Depending on the poster and environment, the consumer may receive targeted information about their current location. A lost tourist would find a smart poster extremely helpful if the poster launched a map application with directions to a nearby landmark. In a retail setting, an NFC smart poster may offer coupons, information about a product, or loyalty points. The consumer's phone acts as the loyalty card and stores the information. The convenience of not having to keep track of multiple loyalty cards or worry about activating accounts is beneficial for the consumer.

NFC technology streamlines the user experience. Even though smart posters may simply take the user to a website, the user didn't have to take time and type out the URL. Typing isn't an arduous task by any means, but any convenience added, no matter how small, is a win for the overall user experience.

Technical Principles and Historical Progression

NFC is a short-range wireless communication technology that is based on approved and mature standards in the field of RFID and smart cards. RFID, which has already been introduced in the 1970s, realizes automatic identification and data transfer via electromagnetic radio signals typically mymeans of an active reader that is connected to a source of energy and a passive electronic tag that is a transponder receiving its power from the reader by magnetic induction. The RFID tag normally contains an antenna for receiving and transmitting the radio signal and an integrated circuit for processing and storing information and for modulating and demodulating the signal. The RFID tag can be placed almost everywhere and is normally hidden behind existing material, like the packaging of a product, thus being invisible to the user. Those passive RFID tags without own battery usually cost between \$0.1 and \$1 apiece. For many business models these costs of RFID tags are still relatively large resulting to the fact that until today RFID hasn't been integrated into daily use on this scale. Also, the lack of affordable and permanently available mobile devices containing RFID readers, has led to the more or less prevalent absence and unattractiveness of the RFID technology.

In 2004, NXP Semiconductors, Sony and Nokia founded the NFC Forum in order to bring existing standards and efforts of the RFID and smart card technology together and to create a novel and innovative capability for short-range communication. Up to now, the NFC Forum counts more than 100 members and supporting companies aiming to find a worldwide standardization for the NFC.

For a long time, only a small handful of NFC mobile phones were available, mainly manufactured by Nokia, until Samsung and Google attracted a large audience when releasing the NFC supporting Nexus S phone in 2010. With the

current rush on smartphones mentioned above and further successful NFC field tests in the past years, it is expected that in near future most of the top class smartphones will be equipped with NFC support.

Challenges And Discussion

In general, one can summarize that NFC is not more insecure than other related technologies. At present, the NFC technology has reached a level where commercial launch preparation can begin and should be established. Reliability and usability of NFC applications are probably the most important determinants of the user experience in everyday use of the NFC technology and therefore important keys to its success. When compared to alternative technologies, NFC offers great advantages. Essential corner stones have already been established and effectual field trials have been completed. Now, based on successful partnerships and collaborations between the mentioned stakeholders, applications with good user experience need to be published. The existence of such applications is attended by the motivation of handset manufacturers to be incentivized to the production of NFC capable smartphones. Having this accomplished, it is very likely that the NFC technology will play a big role in our future everyday life

For trend setters everywhere, Near Field Communication (NFC) technology is, without doubt, the next big thing. NFC technology uses radio waves over short distances to connect smart posters with smartphones and download everything from the tiny NFC chip or 'tag' in the poster with a single elegant swipe. Many brands have been experimenting with different engagement technologies to close the gap between digital, social, online activities and the "real world". Consumers don't need to install any apps or commit to any system to engage with NFC. It's all built in. Touch your phone to something, consume content. "I sometimes forget my keys, my ID, my watch, my wallet... but I NEVER forget my phone"

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