

NFC - THE FUTURE OF e-SMART BUSINESS

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Abstract: Near Field Communication (NFC) technology is the future of m-Commerce, which has found possible application in contactless cards and mobile phone devices. NFC is technologically integrated with Data Ware House infrastructure and Cloud computing system which are incorporated in the e-Smart Business system. As a product of the implementation of NFC technology in m-Commerce business models there is a need of expansion B2B2C business model towards integration of services with the aim of creating new products, markets and consumer needs tuning. This paper presents a business model called e-Smart-Business as a system integration concept of m-Commerce through direct marketing and market research with the Data Ware House and Cloud computing systems.

Keywords: NFC, CLOUD COMPUTING, DATA WARE HOUSE, M-COMMERCE

1. Introduction

NFC (Near Field Communication) is a very short-range radio communication that enables contactless cards and NFC mobile devices to communicate, exchange data and share resources, and it represents the technology of future which will change and introduce a completely new way of communication, business, trade, marketing, arts, health, social care, security and the like. NFC technology is the future of m-Commerce, which will, by using other contactless communication systems (RFID, Bluetooth and IrDA), constitute a technical-technological and service integrator with the infrastructure of Data Ware House and Cloud computing system and will be consolidated in e-Smart Business systems.

2. Definition of NFC

NFC is a contactless short-range radio communication that works at frequency of 13.56 MHz, with the possibility to transfer data up to 424 kbit/s between two devices. NFC technology is based on RFID technology (Radio Frequency Identification) and uses the same principles of functioning. NFC standard was established in the 2003 year and is defined in the standard ISO/IEC 18092, and it is compatible with ISO/IEC 14443 and ISO/IEC 15693 and with Sony FeliCa contactless smart cards (Ortiz, 2008). In that way, NFC can use the existing RFID infrastructure eliminating the need for specific technical conditions of its own infrastructure. A key advantage of NFC devices is that they can read RFID transponders and emulate them.

One device, the initiator, uses magnetic induction to create radio waves in the own field scope in order to detect and access to another device and to make wireless transfer of certain amounts of data over relatively short distance greater than 4 inches or 10 cm (Madlmayr et al., 2008). NFC communication flow is activated when two NFC compatible devices are brought into listed immediate nearness or when realize their touch. The offering one device to another, or their touch on the designated space for touch, opens the set-up protocol connection and the connection is accomplished by the exchange of all scheduled data in the field of exchange, which should not be beyond the limit of 10 cm.

Comparison of the NFC with other contactless communication technologies discovers the advantages and disadvantages of this new technology and there is the possibility of application as well as the future. The following table shows the comparison of NFC with RFID (Radio Frequency Identification Tag), IrDA (Infrared Data Association Protocol) and Bluetooth.

Table 1: Comparing NFC to other close range communication technologies (Source: Ortiz, 2008)

	NFC	RFID	IrDa	Bluetooth
Set-up time	<0,1 ms	<0,1 ms	~0,5 s	~6 s
Range	Up to 10 cm	Up to 3 m	Up to 5 m	Up to 30 m

The main advantage of NFC over the other contactless technologies is in the two-way traffic that establishes between two

devices. On that way they can automatically send and receive information, as opposed to Bluetooth technology which is necessary pairing to achieve communication or RFID and IrDA which representing one-way communication, only sending certain information.

On the other hand, this pairing that requires Bluetooth NFC done automatically if the two devices come to the field response (less than 10 cm). This very small distance between two devices set the NFC protocol as the safest protocol for the exchange and sharing of data between devices.

However, NFC has the disadvantage, particularly in comparison with other contactless/wireless protocols such as Bluetooth or Wi-Fi. NFC is slow protocol, with a maximum data transfer speed of 424 Kbps or less than a quarter compared with Bluetooth.

This protocol can be used only for transmission of small amounts of data. But, on the other hand, the NFC has several key advantages over Bluetooth, because it consumes very little power, only 15mA, which is almost nothing for today's jumbo smart phone batteries (Ortiz, 2008).

3. Possibilities of using NFC applications

NFC technology offers new possibilities in creating new services, especially related with issue of contactless smart cards, but most preference gives to mobile applications coupled with m-business. Precisely this advantage within the NFC Forum has been recognized by all major telecommunication's company and mobile telecommunications operators. The fact that the average cost of NFC is about 2.5 USD, with such a great application usage possibilities in many areas of human activity and electronic business, encourage the all mobile phone hardware manufacturers to incorporate these components by default as technologically standard of the future in mobile phone devices (Au and Kauffman, 2008).

There are two directions of massive use NFC technology: smart cards and mobile phone devices. Smart cards present a solution that will launch a massive use of this technology, but because of technological limitations very quickly will be replaced with mobile devices that will become the primary standard for personal communication, identification and business interaction in the sphere of the total e-business.

NFC Forum as a global association of companies that promote and carry out the implementation of NFC technology cites three key usage of NFC concept: information sharing, pairing devices and transactional exchange data.

Information sharing is used similarly to reading QR codes, for example reading tag with these products in order to obtain basic information about the product. One active NFC device such as a smart mobile phone may be interacting with other NFC device or passive NFC tag. NFC technology allows to mobile phones with NFC chip that they can read labels (tags) on products and objects

(Rukzio et al., 2004). Behind these labels are passive NFC chips and thanks to that phones can share information on mutual interests and the messages they want to convey.

Pairing devices will represent in the future one of the main advantages and standard which imposes NFC technology. The advantage is in two-way traffic of NFC protocol that enables fast (instantaneous), easily and securely connection and pairing with other devices.

Transactional data exchange - NFC will be used as the basic communication protocol of transactional data exchange for smart cards and NFC mobile phones in all types of card payment system, for buying tickets in public transport, for new ID cards for access to public places, for ID cards for access high security systems and spaces and so on (Ondrus and Pigneur, 2007).

4. The development of e-Smart Business

e-Smart Business (e-SB) in his retail part of the business is based precisely on NFC technology and with the information obtained through this mode of communication e-SB actively creates market, making it much more efficient and economical.

NFC technology opens up new channels for distribution of services, but on the other side, compatibility with other types of contactless technology allows that within m-commerce are also defined business models as: m-Merchandising, m-Marketing, m-Loyalty, m-Payment, m-Banking, m-Transport, m-Post, m-Health programs, m-Government, m-Tickets, m-Key, m-Entertainment (see Fig. 1). All of these business models are coupled with the Data Ware House concept of accepting and processing data, as well as Cloud computing systems, and thanks to NFC enable creation, monitoring and improvement of products and services offered to the client, as well as developing market which until now may not even exist (Hassinen, 2008).

Information that user exchange between NFC mobile phones and NFC tag or other NFC devices may be subject to processing within the Data Ware House. This aspect is important because in this moment we can use the data of the wishes, needs, demands of a certain client coupled with his personal data. NFC technology provides two-way communication that allows such a flows so that it becomes powerful tool for market research. Using these data in advanced Data Ware House concept of data processing allows perceiving their needs, desires and habits, which gives the possibility to personalize services, modelling of customer needs, improving and expansion of market, modification and improvement of products and services and so on.



Fig. 1 Platform of e-Smart Business

In architecture of Cloud computing, which was leaning against the m-Commerce system recognizes three models:

- SaaS (Cloud Software as a Service) - a system that provides to use the application of service provider running on a "cloud" infrastructure and where applications can be accessed from the

client mobile devices through a Web browser user interface. Characteristics of SaaS approach are: enabled access and management of commercially available software over the network and management of the activities carried out from central location instead of the location of each provider (service providers) respectively, which basically allows users to access to applications from distance through commercial Web sites;

- PaaS (Cloud Platform as a Service) - a system that provides the user to place on "cloud" infrastructure application which he himself created or requested application that was developed using programming languages and tools supported by the service provider. PaaS system contains so called add-on development tools that are used for customization of existing SaaS applications;

- IaaS (Infrastructure Cloud as a Service) - a system that provides the user to manage the processing, storage, network and other basic computing resources where user can set up and run arbitrary software, including operating systems and applications.

Center of e-Smart Business is NFC technology coupled via m-Commerce services with Data Ware House and Cloud computing systems. e-Smart Business model will enable an entirely new platform in serving clients that will be upgraded by the day with the aim to set new quality in service provision and that will lead to greater efficiency, productivity and profitability in the business environment (Cloninger et al., 2011).

There are three recognized phases in the development of the NFC technology which will be a driving force of the e-Smart Business development (NFC Forum):

1. Contactless card phase – this phase is the most common phase at the moment, and this phase will enable numerous advantages of this new technology to be assessed, such as:

- Fast and efficient payment at the point of sale;
- Speeding up the selling process, thus eliminating queues and standstills while paying for goods and services;
- Decreasing number of deceitful actions and better protection of misuses in payments;
- Decreasing the operating and handling costs;
- Eliminating the need to pay in cash.

2. The phase of adding the NFC chip in mobile phones – as hardware/software addition which is optionally built in phones. After the pilot projects, this phase has already come to practice and it represents the adaptability phase of both service users and total market of service providers. The benefits of this phase are:

- Personalized offer and loyalty program development;
- Better client targeting;
- Better and more efficient promotion of goods and services;
- Decreasing costs of card management;
- Market expansion and new markets penetration.

3. Integration phase of the NFC chip into mobile phones – as the last phase of the development of the NFC technology which will definitely change the entire approach in m-commerce and open a way to rendering integral services within the e-Smart Business. Future benefits of this last phase in the NFC technology development will be as follows (Dahlberg, 2008):

- Setting up a virtual m-wallet;
- Personalization of the offer at a selling place;
- Direct marketing at a the point of sale;
- Cross selling at the point of sale;
- Dramatic decrease in misuses and deceitful actions in the process of paying for goods and services;
- Creation of new profit centers;
- Creation of new forms of income for mobile operators.

The greatest danger of introducing NFC technology lies in the personal acceptance of this new service by the client. The adjustment phase must be well promoted in order to break the client's fear of abuse and encroaching upon the privacy by using data about customers and their reactions, purchases and habits. This last problem (invasion of privacy of the client) can be the biggest

obstacle to the rapid implementation of new services in the NFC platform. Privacy and safety are central issues in user's perception in the case of using the service. Beside promotion, also user's education will be necessary to ensure full integration of customers in e-Smart Business models.

Adoption of NFC as a future of e-Smart Business is still not widespread despite its potential. It is necessary to conduct research that provides useful theoretical and managerial implications for mobile phone manufacturers, merchants, software developers, governments and private practitioners when devising their marketing campaigns and business strategies. For this purpose may be used Technology Acceptance Model (TAM). Through this model focus can be on NFC adoption as another form of mobile payment (Tan et al., 2014). Originally, Technology Acceptance Model has variable Perceived Usefulness and Perceived Ease of Use, but in this research framework, were added variable Social Influence, Personal Innovativeness in Information Technology, Perceived Risk, Perceived Financial Cost. Fig. 2 shows the research framework which guided the development of conjectured relationships between the variables.

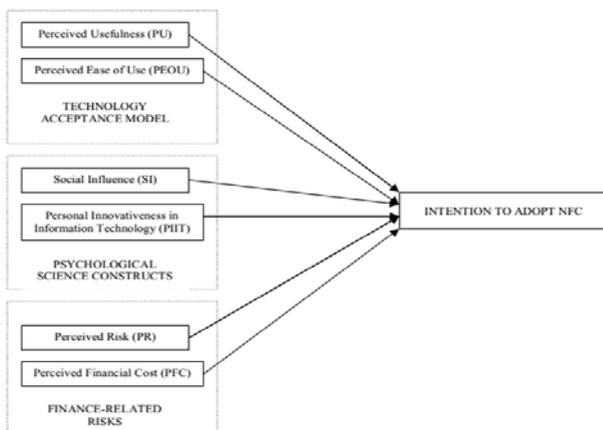


Fig. 2 Research framework

The findings suggest that Perceived Usefulness is a significant construct in predicting the intention to adopt NFC. If consumers find the innovation useful, they are more likely to adopt the services offered. This is particularly in view of the advantages brought about by NFC mobile payment over cash or credit card payment in terms of quicker and more convenient transactions. Likewise, Perceived Ease of Use is a significant factor in predicting NFC acceptance. Social Influence is another influential factor predicting NFC acceptance. Young consumers are usually vulnerable to environmental influences. Since the majority of respondents are young, their decisions whether to adopt certain technologies are likely to be influenced by the roles and opinions of their family members, friends, colleagues, superiors, and classmates (Lopez-Nicolas et al., 2008).

Perceived Risk is a non-significant construct in this research. The reason for this may lie in respondents' age. Majority of them are young users and therefore they may not understand the financial risks involved when adopting NFC. Also, their willingness to try a new technology such as NFC may have helped them to overcome the risks associated with it. Similarly, Perceived Financial Cost was found to be a non-significant factor.

5. Conclusion

NFC technology is the future of m-commerce, created as an extension of RFID technology, using the same principles of functioning. Its compatibility with other contactless communication technologies gives her huge opportunities, especially if it is taken into account that for NFC is not necessary to provide special communication infrastructure. Development opportunities and future application NFC technology will find in mobile handsets as a communication infrastructure that is expanding and which gives a

natural symbiosis between peripheral communication with clients and e-Business. Advantages and opportunities of NFC are quickly recognized by manufacturers of hardware and by mobile telecommunications operators. They are launched NFC Forum as independent association of companies that wish to develop and standardize NFC technology with purpose of its applicability in many areas of business. Exactly they are launched a series of pilot projects that were successful and which already grown into serious e-business projects in many areas of human activity as trade, banking, transport, e-government, postal traffic, telecommunications, health, socially care, entertainment, hospitality, marketing and market research, etc. The 2011th was declared as the year of full commercialization of NFC technology in its applicative and exploitive sense in all areas of business. An important place in the development of a new integrated m-commerce takes marketing and market research with the use of powerful tools Data Ware House and Cloud computing, all of which grew in e-Smart Business. On the other hand, the concept of NFC on the client periphery with usage of other contactless communication system (RFID, Bluetooth and IrDA) presents a technical-technological integrator with an infrastructure Data Ware House and Cloud computing in the concept of e-Smart Business.

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