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NFC as an Instrument for Better Health:

Assessing the Conceivability of Utilizing NFC Technology in Health and Medical Marketing

Abstract

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The main objective of this research was to uncover the potential of Near Field Communication (NFC) technology solutions for Health and Medical marketing, primarily from the perspective of the businesses. More specifically, to assess the possible benefits, challenges and ultimately the conceivability of utilizing NFC Technology solutions in Over-the-Counter (OTC) Pharmaceuticals, in Finland.

The framework of the research consists of two main chapters. The initial chapter, the Literature review includes several key aspects. Firstly, explanation over NFC technology, its usage modes, future predictions and safety or security concerns. Secondly, an overview of Finnish OTC Pharmaceutical Markets and marketing, along with relevant findings concerning Health and Marketing, specifically the possibilities of NFC technology in Health and Medical marketing. Thirdly, relevant theories and findings concerning consumers' decision making, adoption processes and technology acceptance. The second chapter consists of the explanation and illustration over the novel NFC concept solution, the PIS – a personal mobile drug checker, used as the practical example throughout this research. As well as findings over the possible future of OTC Pharmaceutical Markets in Finland.

The primary research method in this thesis was qualitative. The study was conducted through semi-structured personal interviews, with professionals from the Pharmaceutical and Medical industry, in order to find answers to the research questions.

The research findings indicated that there are several benefits that could arise from the utilization of such NFC solutions, as the PIS, in OTC Pharmaceuticals. Most apparent were the possibilities for improved point-of-sale communications and services, post sales support, and the ability for the businesses to positively differentiate their products and services i.e. competitive advantage. However, several challenges were also noted, most apparent challenges were concerned with the current infrastructure i.e. the current level of devices and services.

Ultimately, the validity of the assessed research questions was established, with findings that indicated the distinct conceivability and plausibility of such solutions. The results can hence be used to further research and determine actual practicalities and determinants involved in the implementation of such systems. For this purpose, future research should focus on aspects concerning consumers' acceptance and willingness towards adopting and using the technology.

Keywords	NFC Technology, Marketing, Health, Pharmaceuticals

TABLE OF CONTENTS

LIST OF FIGURES

1 INTRODUCTION

The recent developments and advancements, in regards to upcoming technologies has altered the landscape of the current markets and transformed the methods and means of how the businesses' and marketers of today operate. Especially the development of mobile applications and solutions has been immense. These current and upcoming solutions offer new ways for enhanced communication and service exchange. The enabled opportunities and overall impact on both the businesses and consumers' is considerable enough to further investigate the implementation and application possibilities of such promising technology solutions.

Amongst these emerging technologies is Near Field Communication or NFC technology (explained in section 2.1). NFC technology possesses vast potential, in terms of transforming existing communication methods, as well as altering existing product and service offerings. The impact of technology on communication is imminent, the rise of mobile and location based communication services constitutes as the next step towards more individual and relevant means of service and information exchange. Modern technology, such as NFC, allows the businesses to even further cater to the needs of the consumers. With vast possibilities for more enhanced applications, products and services. The increase of NFC technology is also noted in recent forecasts, which predict that the amount of NFC equipped devices will reach approximately 700 million units, by the end of 2016 (Berg Insights 2012).

Due to the unique capabilities that NFC technology possesses, the window of opportunity for creating more value is within reach of the decision makers and the key players of the respective industries. At the forefront of these industries or markets, one may consider to be the Health and Medical markets. Especially whilst considering the opportunities that present themselves when bringing together NFC technology and Pharmaceutical products and services.

This research will be evaluating and examining the conceivability of the aforementioned scenario in Over-the-Counter (OTC) Pharmaceuticals i.e. prescription-free or self care medicinal products, within the Finnish markets.

Especially OTC Pharmaceutical markets can be considered as becoming increasingly more interesting and lucrative for the actors within the Pharmaceutical industry, due to

the steadily inclining price and sales margins of said products (Pharma Industry Finland 2012). And therefore, this research also sets out to examine the possible readiness, willingness and need from the consumers' side, regarding the introduction of NFC technology solutions to the examined markets. In order to ultimately assess the conceivability of said scenario, from the perspective of the businesses'.

For this sake, a specific NFC concept solution was chosen, to act as an example of the capability of NFC technology, in regards to Health and Medical products and services. In this research, the example solution utilized is the Pharmaceutical Information System (explained in chapter 3) proposed by Jara et al., an NFC technology based personal drug checker, designed for the purposes of solving issues concerning adverse drug reactions (ADRs), drug compatibility and allergy detection.
Especially in the case of ADRs, the possible beneficial economic impact alone, resulting from the utilization of such solutions could prove to be rather noticeable. When considering the fact that according to the European Union, the estimated total cost to society resulting from ADRs in the EU is € 79 billion. (European Union 2008)

Henceforth the research is divided into five main chapters. The initial two chapters will establish the framework for this research. The methodology chapter will present the main research questions and objectives, as well as the qualitative research methods and approaches used in the study. The findings and discussion chapter will present the main findings of the research. The final chapter will conclude the research findings, along with the research limitations and premises for future research.

2 LITERATURE REVIEW

The following sections of the literature review will cover relevant aspects of NFC Technology, OTC Pharmaceutical Markets and Marketing, Marketing and Health, and Consumer Behaviour.

2.1 Near Field Communication (NFC)

Near Field Communication or NFC technology was initially launched in 2004, by the joint co-operation between Nokia, Sony and Philips, with the establishment of the NFC Forum (VTT 2007: 9-18). The core goal of the NFC Forum is geared towards advancing, enforcing and educating usage and implementation of NFC short-range wireless interaction technologies (NFC Forum 2011a).

NFC can be described as a short range (0-4 cm.), wireless or point-to-point interconnection technology, that has evolved from earlier forms of Radio Frequency Identification (RFID) contactless identification and interconnection technologies.
NFC is based upon on the more widely used and already available RFID standards, thus allowing NFC device compatibility with existing RFID based systems and infrastructure (VTT 2007: 9-18; NFC Forum 2011b).

RFID technology is based upon electromagnetic wireless communication, commonly conducted with and between a reader device and passive tags. The tags receive power supply through the electromagnetic field of the reader device, thus the tags are considered as not having independent power supply (Roberts 2006). An NFC reader enabled mobile device, is a device which has an RFID reader built into it, for example NFC enabled smartphones. In this system scenario, the built in NFC/RFID reader in the device, both powers and reads the NFC/RFID tags. As well as passing along information from the tag to the device (Isomursu et al. 2008; Hardy & Rukzio 2008; Sanchez et al. 2008). And in comparison to RFID, NFC technology also offers the possibility for different operation modes, explained in detail in section 2.1.1.

NFC enabled phone

Tag

Figure 1. NFC enabled Phone and Tag wireless interaction. (Forum Nokia 2011)

NFC enables users of for example mobile or handheld electronic devices to access content and services in an intuitive way (Figure 1.), via bringing the devices into close proximity or contact with other devices or smart objects (e.g. sensors, tags or devices). In other words, enabling connection between NFC enabled devices and/or objects by either touching or bringing these into a close proximity of each other (VTT 2007: 9-18).

Due to its variability and advanced usage possibilities, the inclusion of NFC technology in especially mobile devices is rapidly increasing (NFC World 2012a; Ok et al. 2010: 336 - 337). As an example of this change in supply and demand, many of the most known device manufacturers or brands have opted for NFC technology as well, including the likes of BlackBerry, HTC, LG, Nokia, Samsung, Sony and many more rumored to follow. (NFC World 2012b; NFC Forum 2012b)

NFC based connection technology is considered to possess a large potential for consumers and businesses alike, in terms of usage, interoperability and implementation possibilities for various different purposes and application methods. Including current and future usage possibilities in consumer electronics, access control, healthcare, information collection and exchange, loyalty and promotion services, different forms of marketing and advertising, various forms of secure payment and transfer methods, as well as public and commercial transport (Ok et al. 2010: 336 – 337; NFC Forum 2012b).

The growth of NFC is also noted in recent estimates, which also portray both, the growing demand and sales of especially smart-phones, as well as the inclusion of NFC technology in said devices. According to Berg Insights (2012) ;

> "Global handset shipments grew 15 percent in 2011 to about 1.5 billion
> units, although the growth rate slowed down in Q4-2011 in the wake
> of the deteriorating macroeconomic conditions, especially in Europe.
> Global sales of feature phones were nearly flat, while smartphone
> shipments grew almost 60 percent to 470 million units in 2011."
> (Berg Insights 2012)

According to these recent estimates, the amount of NFC technology enabled mobile devices is growing and will continue to grow even further. Berg Insights estimates that NFC enabled device sales reached up to 30 million units in 2011, in comparison to sales of 3 million units in 2010 (Berg Insights 2012a). Comparing these estimates to the results presented by IMS research, that stated the number of units sold in 2011, being closer to 35 million units and the forecasted sales for 2012 are estimated to reach up to 80 million units (IMS Research 2011).

Furthermore, according to Berg Insights, the estimated amount for NFC equipped devices will continue to grow and reach approximately 700 million units, by the end of 2016. As illustrated in Figure 2 (Berg Insights 2012a; Berg Insights 2012b).
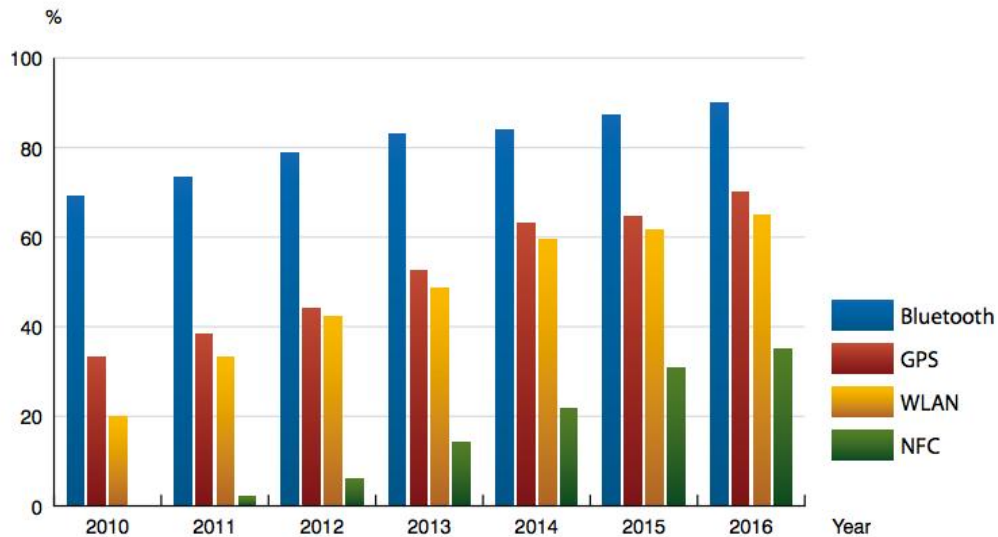
Figure 2. Projected attach rate for handset connectivity technologies, World 2010-2016. (Berg Insights 2012a)

2.1.1 Device Modes and Usage

NFC enabled devices allow the users to both control the operating modes, as well as to opt between the three different device operating modes (VTT 2007: 9-18; Finkenzeller 2006). NFC devices are able to change their operation modes to be in either in a Reader/Writer mode, Peer-to-Peer mode or Card emulation mode (NFC Forum 2011b). The three operating modes and their functions can be explained as follows (NFC Forum 2011b);

Reader/Writer mode: where a user touches an NFC-enabled device against an NFC tag. The data stored in the tag is then read by the device, resulting in the provision of information to the device. Reader/Writer mode enabled applications posses' great potential in use cases of for example obtaining information about a product in store, or for the provision of information about products, via touching an NFC enabled reading device to the tags located on the packages. (Ok et al. 2010: 336; NFC Forum 2011b).

Peer-to-Peer mode: where NFC is used to enable communication between two NFC enabled devices, in order for data to be transmitted or exchanged locally between the two devices. (VTT 2007: 9-18; NFC Forum 2011b)

Card Emulation mode: where the NFC device appears to an external reader in a similar fashion than that of a traditional contactless smart card. This enables for example contactless payments and ticketing. (VTT 2007: 9-18; NFC Forum 2011b)

Also, in the Reader/Writer operating modus, NFC devices are compliant with both the ISO14443A and ISO14443B standards, which enable interoperability with objects or devices that are also used for RFID enabled technologies. Therefore, as mentioned previously, an NFC enabled device is also capable of operating and functioning with RFID based systems (VTT 2007: 9-18; NFC Forum 2011b). Some benefits and future scenarios, involving the device modes and their application possibilities are also illustrated in Figure 3. (Ok et al. 2010: 337)

	Card Emulation Mode	Reader/Writer Mode	Peer-to-Peer Mode
Benefits	1. Physical Object Elimination 2. Access Control	1. Increases mobility 2. Decreases physical effort 3. Ability to be adapted by many scenarios 4. Easy to implement	1. Easy data exchange between devices 2. Device pairing
Future Scenarios	1. Integration of id-cards, passports, finger-prints, driver-license 2. Storage area for critical information to provide user's privacy and authorizing people to access those information	Many real-life scenarios can be adapted to NFC in this mode. In all of the scenarios, some data need to be read from an NFC tag, and additional jobs need to be done by NFC-enabled mobile phone.	1. Secure exchange of critical data 2. Gossiping

Figure 3. Benefits and future scenarios of NFC device modes. (Ok et al. 2010)

As discussed previously, NFC enabled mobile devices, especially smart-phones, are already in wide usage. These devices are used for a variety of different purposes, by several different industry sectors. For example, NFC technology can be found in various smart posters or other out-of-home advertising and information retrieval systems, such as "Touch and Access" solutions (Isomursu et al, 2008 :17-24), as well as in wireless payment applications such as the "Google Wallet" NFC based payment system (Google 2012).

NFC is considered as one of the novel solutions amongst emerging technologies, mostly due it's variability in functions and vast number of implementation possibilities.

As well as due to the close range or touch interaction and intercommunication capability of NFC technology, which enables the users to interact and perform functions with minimal physical effort (Chavira et al 2008: 666-669; O'Neil et al 2007: 19-36).

In accordance with the previously mentioned application possibilities, this research paper will be mainly exploring the possibilities of Reader/Writer mode devices and their interaction possibilities between NFC objects or devices. Due to the fact that the example system solution examined in the latter part of the research, mainly deals with NFC technology enabled mobile device interaction applications and usage possibilities with said operating mode (Jara et al., 2010).

2.1.2 Privacy and Security

Issues concerning the safety and security of various NFC technology related applications may be considered as paramount, and as being one of the main initial obstacles for consumer acceptance and adaptation of novel NFC enabled services and products (Abd Allah, 2011: 51-56).

Despite the fact that NFC technology is limited to a functioning communication range of only a few centimeters distance, there are several privacy and security threats that may be imposed on to the devices or the passive elements i.e. tags. In the case of viewing the possible threats imposed on to the Reader/Writer mode devices, as they are most relevant to this research, one of the main harms that can be opposed on the devices is via the NFC tags. These can be configured to a read-only state, thusly there can be several security issues that can arise from for example malicious acts performed on the tags. These include attacks on the Tags via replacing existing tags with malicious or tampered tags and Inserting malicious or tampered tags on top of the original tags (Abd Allah 2011: 51-56; Finkenzeller 2006).

Also, in most cases NFC enabled mobile devices today are technically highly advanced and able to perform and function beyond the realms of NFC or RFID related technology, as is the case with for example newer smart-phones or PDAs. Therefore the risk of

potential harm and malicious attacks on these devices can be considered as high, due to both the activities performed with these devices, as well as the amount of possible sensitive data these can be used to transfer and exchange i.e. personal information , passwords etc. These attacks may be performed with or without the knowledge of the user i.e. user initiated attack or attack by hackers (Abd Allah 2011: 51-56; Finkenzeller 2006).

Figure 4 provides an overview of the previously mentioned possible attacks on the Reader/Writer enable environment. Noteworthy is the fact that the other communication modes are in most cases in a similar situation, in regards to vulnerability. Especially with attacks over the Air Interface. These can largely be considered as similar and the NFC devices involved in the attacks can be tampered with, via either the user themselves or by the acts of an outsider i.e. hacker (Abd Allah 2011: 51-56; Finkenzeller 2006).
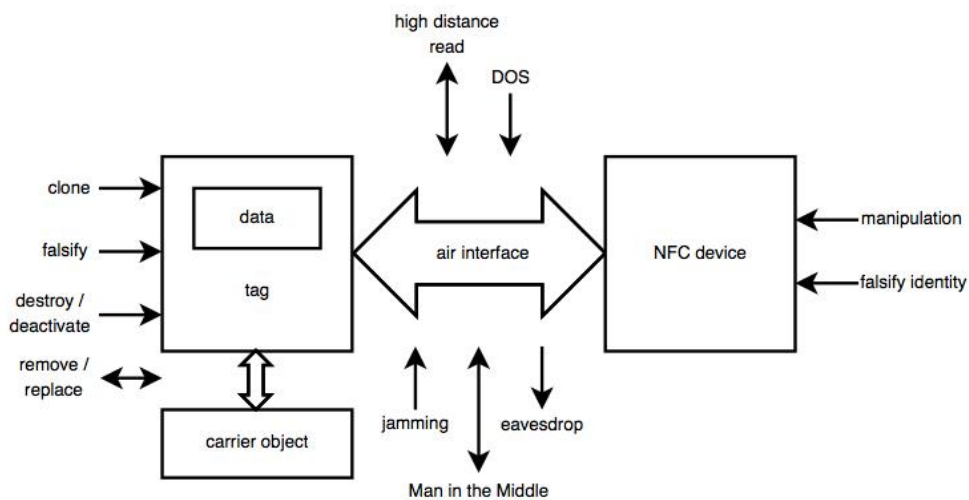

Figure 4. Possible threat scenarios and attacks involving NFC technology. Model adapted from Finkenzeller (2006).

The issues involving privacy and security can be considered as paramount, in regards to the possible success and widespread adaptation of novel NFC technology solutions.

Especially when dealing with user sensitive data transfers via NFC devices. Although NFC based systems are considered as safe and secure, the possible problems, attacks, technical malfunctions or difficulties that the technologies are exposed to, and that may occur or be inflicted upon the systems, could have severe consequences (VTT 2007 :18-19). Also notable is the fact that NFC technology based secure functions, such as NFC based wireless payment systems are inherently more secure than traditional methods of payment, such as credit cards. Due to the fact that the ISO 14443 operating based standards used in NFC technologies, allows the account information to be encrypted, simultaneously allowing different encryption possibilities performed by the users themselves. Also, the very short range of device communication functionality provides can in some cases provide sufficient enough of an obstacle in order to avoid for example tampering or unauthorized access of data or information. However, since NFC is a wireless interconnection technology, the possibility for attacks performed on devices and passive components remains an important factor and a key point of consideration, for both the providers and consumers (VTT 2007: 18-19).

The regulations in Europe concerning security issues around NFC or RFID technology are enforced by the European Union (EU). All issues regarding security and privacy with NFC or RFID technology are based upon the laws and legislations of the EU, were both NFC and RFID related privacy and security are covered by the General Data protection plan. Which is based upon the "Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data " (European Commission 2007).

Section 2.2 will provide information and findings concerning Over-the-Counter (OTC) Pharmaceutical markets, as well as regulations concerning OTC Pharmaceutical marketing in Finland. Along with findings over current trends and future possibilities concerning Health and Medical mobile services and applications. Examining these trends and current state is particularly relevant, when considering the possible conceivability of utilizing applications and services, such as the PIS solution in Health and Medical Marketing.

2.2 Over-the-Counter (OTC) Pharmaceutical Markets and Marketing in Finland

Over-the-Counter or OTC Pharmaceuticals is a term describing medicinal products that can be purchased without a physicians prescription, i.e. prescription-free or self care medicinal products, products that are typically extensively researched and considered to be safe basic medicines. Thusly these products are typically accompanied by a long history of market availability and more knowledge and research over possible adverse side effects and adverse interactions between other substances. (Pharma Industry Finland 2010a)

2.2.1 OTC Pharmaceutical Markets in Finland

In Finland, the pharmacies are responsible for the distribution of OTC pharmaceuticals to end consumers, with the exception of nicotine replacement products, that are allowed to be sold in regular convenience stores (Pharma Industry Finland 2010b; Pharma Industry Finland 2010c). The categorization into prescription and prescription-free medicines is decided upon by The Finnish Medicines Agency (Fimea) and the European Medicines Agency (EMA). Also, notable is the fact that certain OTC pharmaceuticals can be considered as nearly equally effective as their substance related prescription pharmaceutical versions, containing nearly the same active ingredients, with the difference being that OTC pharmaceuticals are not allowed to contain similar amounts of the actual active ingredients, as the prescription pharmaceuticals (Pharma Industry Finland 2012a ; Fimea 2010a).

According to the Association of Finnish Pharmacies, in the beginning of the year 2011, Finland had a total of over 800 active pharmacies, which supplied medicinal products to the majority of all Finnish municipalities. As of current, a few dozen of these pharmacies are active online as well, selling the OTC pharmaceutical products through the internet, directly to end the consumers. (The Association of Finnish Pharmacies 2012).

The Finnish pharmaceutical markets are commonly divided according to the distribution channels, where sales through pharmacies account for approximately 75% and sales through hospitals for approximately 23%, of the total markets. The remaining percentages are accounted with the sales of nicotine replacement products, through convenience stores, with roughly 2% of the whole. And with 1% of the medicinal products being sold through special permits, handed out by Fimea, in most cases these are medicines that are otherwise not available in Finland. (Pharma Industry Finland 2010d)

According to the Finnish Pharmaceutical Data Ltd, the sales of medicines in 2011 reached a total of 2005 Million Euros (€), with wholesale prices. OTC pharmaceutical sales accounted for 230 Million € of the total sum, as illustrated in Figure 5. (Pharma Industry Finland 2012b)

Million euro, with wholesale prices
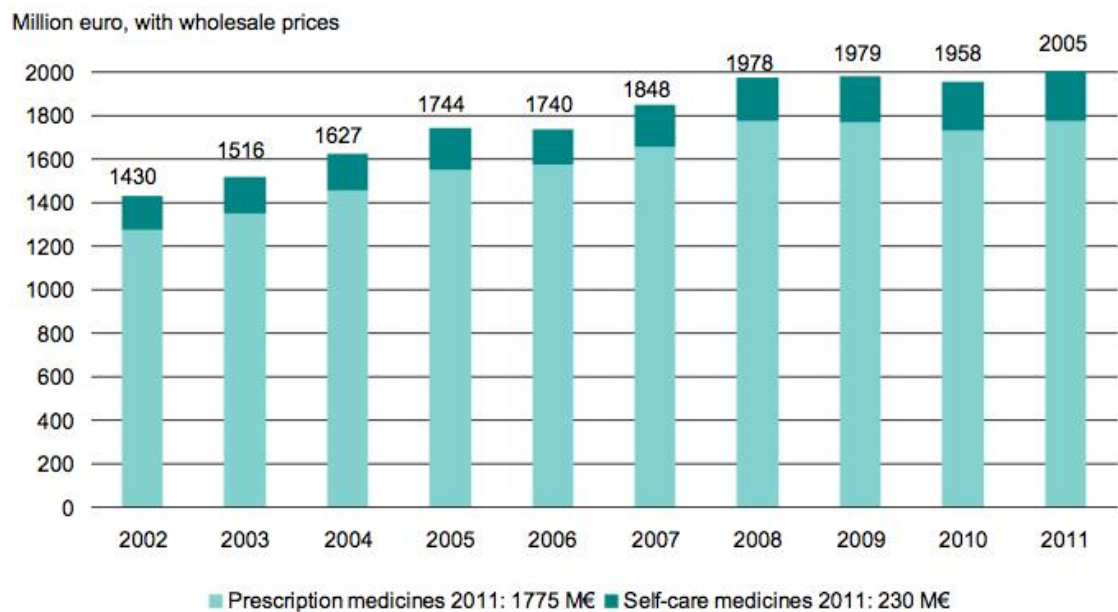
Figure 5. The trend in wholesales to pharmacies, hospitals and retail stores in Finland, 2002 - 2011. (Pharma Industry Finland, 2012b)
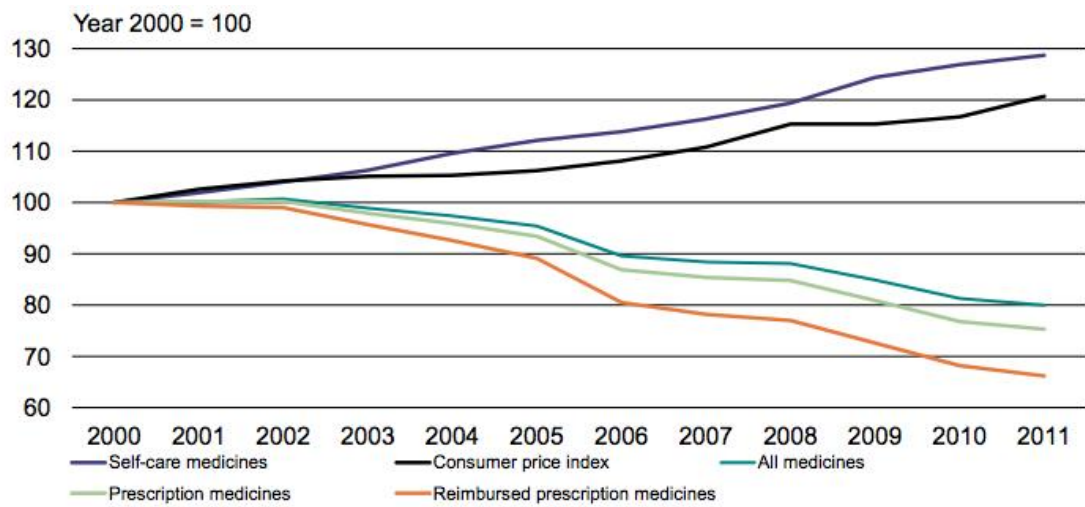
Figure 6. The wholesale price index for medicines in Finland, 2000 - 2011.
(Pharma Industry Finland 2012c).

However, notable is the fact that the price on medicines in Finland has steadily de-
clined during the last decade, with the wholesale index for prescription medication
showing a decrease of over 20 %, between 2000 - 2011.

With the exception of self care medicines i.e. OTC medicines. The price of OTC medici-
nal products has continuously inclined throughout the last ten years, as shown in Fig-
ure 6. (Pharma Industry Finland 2012c)

2.2.2 OTC Pharmaceutical Marketing in Finland.

The core purpose of OTC Pharmaceutical marketing, as described in the Pharma Industry Finland's Code of Ethics (2008) ;

> "Correct information on pharmaceuticals promotes their correct use. The marketing of non-prescription medicines to consumers provides them with information about the available treatment options in cases where the treatment of the illness does not call for medical attention, directing the consumers towards the correct and safe use of medicines." (Pharma Industry Finland 2008: 3)

As stated in the previous section, for the regulatory side of Pharmaceutical marketing, the main governing agency in charge is Fimea, which is in charge of the overall supervision and monitoring of the pharmaceutical industry in Finland. These set regulations and guidelines are as well complimented and stated within the Pharma Industry Finland's Code of Ethics (Pharma Industry Finland 2008). Fimea is the main central administrative agency that operates in behalf of the Ministry of Social Affairs and Health in Finland. And the core aim of Fimea is to ensure and enforce secure and safe usage of medicinal products and also to aid in the development of the Finnish pharmaceutical sector (Fimea 2010a ; Pharma Industry Finland, 2008).

Fimea also works in collaboration with EMA, in order to be in accordance with both Finnish and European laws, regarding medicinal products. This means that all products have to first gain authorization and approval from Fimea, prior to making the products available to the public or any institution that distributes medicinal products.

Thus only the medicinal products that comply with the set requirements and that have been found to be in accordance with the medicinal regulations, in terms of being sufficient in both quality and safety of use, are allowed to be introduced to the markets (Finlex, 10.4.1987/395).

There are however differences in the legislations or laws, concerning the marketing and advertising of pharmaceuticals. These laws prohibit the direct marketing and advertising of prescription medicinal products to end consumers. Prescription medicines are only allowed to be marketed to medical practitioners and pharmacists.

Only prescription-free or OTC pharmaceuticals are allowed by law to marketed directly to the end consumers (Pharma Industry Finland 2008).

Nevertheless, there are some basic rules and regulations concerning pharmaceutical marketing, that are applicable regardless of the medicinal products being prescription or prescription-free. These regulations are enforced by Fimea and stated in the PIF code of ethics (Pharma Industry Finland 2008). Both of which state that prior to any marketing endeavors are granted permission to launch, the medicinal products must first gain authorization and be granted a license (Finlex, 10.4.1987/395). Furthermore, the marketing and advertising of medicinal products is not allowed to be misleading in any way or form and all marketing communications must comply with the information of the product in question (Finlex, 10.4.1987/395).

Regulations concerning the actual marketing communications of medicinal products state that, all messages are obliged to contain all the necessary information, regarding correct usage of the products, as well as encouragement towards abiding by the instructions provided with the products in question. Furthermore, all marketing and advertising communications have to conway a clear and concise message, in terms of clarifying the consumers over the fact that the advertised product is in fact a medicinal product, despite being available for purchase without a prescription. (Pharma Industry Finland 2008)

2.2.3 Marketing, Health, Pharmaceuticals and NFC

According to the American Marketing Association (AMA), "Marketing is the activity, set of institutions, and processes for creating, communicating, delivering, and exchanging offerings that have value for customers, clients, partners, and society at large." (American Marketing Association 2007)

And when defining Health Marketing, the Centers for Disease Control and Prevention (CDC) have adapted the marketing definition provided by the AMA, and defined Health Marketing as; " creating, communicating, and delivering health information and interventions using customer-centered and science-based strategies to protect and promote the health of diverse populations (Centers for Disease Control and Prevention 2005).

Bernhardt (2006) states that, in essence the work of Health Marketing aims towards achieving a world in which every person uses and is provided with accurate, accessible, relevant and timely health information, in order to promote and protect their own personal health, as well as the health of their communities. (Bernhardt 2006)

And due to the development of the Internet and the continuous growth of emerging technologies; the utilization of various forms of Mobile Health technologies, services and applications has steadily become more apparent within the Health and Medical markets. (Foh 2011; Lindqvist et al. 2009).

Amongst these is Mobile Health (mHealth), which in essence is meant for the purposes of mobile communication technologies, in the context of medical and healthcare delivery and assistance, i.e. the provision of health and medical information services via mobile technologies (WHO 2012).

Mobile based health and medical marketing efforts can be seen as possessing valuable opportunities for enhancing communication and providing improved services to the consumers. According to Foh (2011: 3);

> " Mobile health can help create a powerful direct to consumer channel previously unavailable to pharma marketers. The ability to reach out ... to both consumers and healthcare professionals, paired with increasing sophistication of smart phone capabilities, is invaluable in an environment of increasing regulation and marketing noise. "(Foh 2011: 3)

Mobile phones, smartphones and other technologically advanced mobile devices in particular are becoming increasingly present, world-wide. Thus, enabling scenarios and potential insights into assessing, as well as improving health. Very notable is the fact that, regardless of the socioeconomic group in question, mobile phone usage has been widely adopted amongst virtually all demographic groups. And when considering the high level of penetration, in regards to computing capacity in mobile phones, the assumption can be made that especially mobile types of technology advancements may contribute in changing health and medical information and service delivery. Due to the fact that these technologies enable improved data accessibility and availability, in terms of for example medication and health guidance or for direct instructions and assistance for both maintenance and enhancement of overall health. (Office of Behavioral and Social Sciences Research 2012).

This demand for increasingly electronic, and especially mobile healthcare and informatics, has exceeded the actual science that would be required to actually comprehend the possible risks or benefits that these may oppose. This phenomenon can mainly be seen in the form of various medical, health or lifestyle "apps", which have emerged throughout recent years and have become increasingly popular and wide-spread. (Office of Behavioral and Social Sciences Research 2012).

This growing trend is also reflected in recent estimates, concerning the growing popularity of health related apps. According to a recent report by Juniper research, there will be a predicted 44 million downloads of health apps onto mobile devices, by the end 2012. The report continues to predict that the number of downloads will reach 142 million, by 2016. According to the report, the acceptance of newer forms of healthcare practices, such as remote patient services, will be directly influenced by the fact that consumers are becoming more and more engaged through their mobile devices. (iHealthbeat 2011; Juniper Research 2011)

This rapid expansion of health and medical apps has clearly been noted by the Pharma businesses as well, and can also be seen in the investments that Pharmaceutical companies are placing in them, specifically in smart phone apps. According to Ernst & Young (2012), the initiatives concerning smart phone health and medical apps, has steadily become one of the main investment areas, as illustrated in Figure 7. (Ernst & Young, 2012)
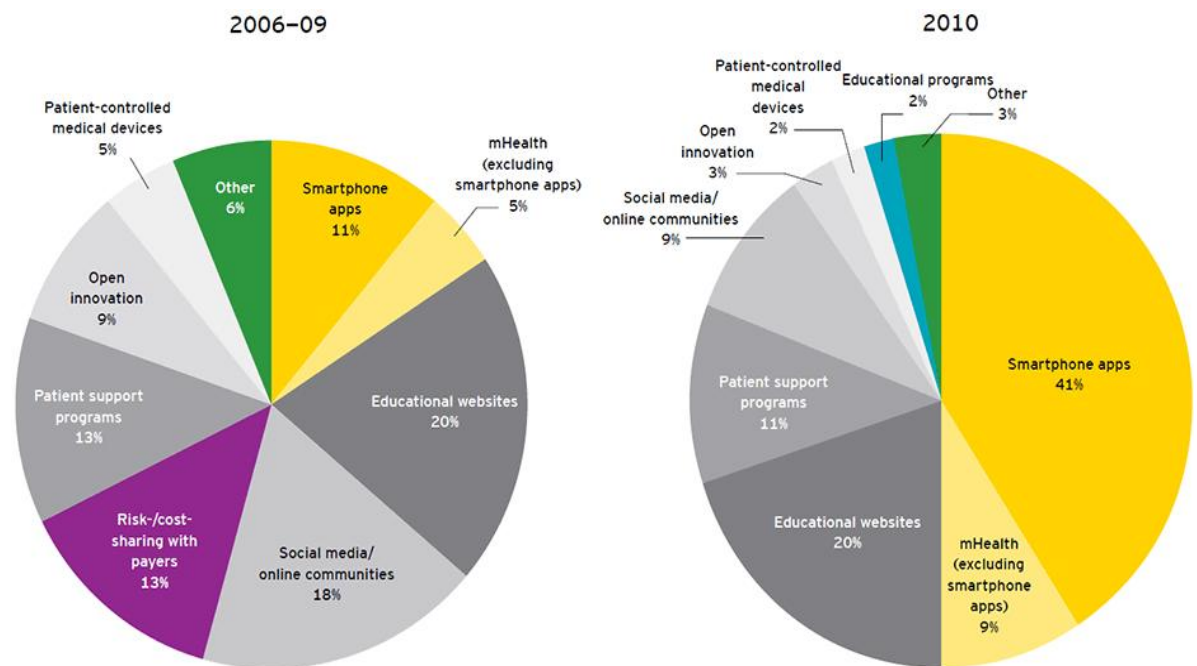
Figure 7. Pharma company initiatives by type, 2006-2009 & 2010. Model adapted from Ernst & Young (2012).

2.2.4 NFC and the Pharmaceutical Value chain

Several applications that are currently available, amongst these NFC and RFID technologies, which have been especially developed and utilized in order to assist with the processes throughout the whole of the value chain (Figure 8.), such as drug authentication processes or production and logistics support (Foh 2011: 2-5; Jara et al. 2010)
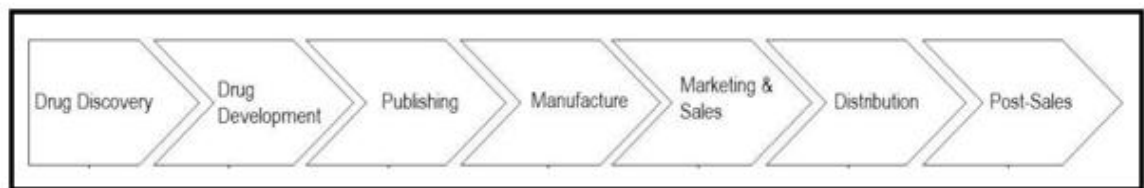
Figure 8. Pharmaceutical Value chain. Model adapted from Foh. (2011:4)

Even more so, NFC technology in particular possesses vast possibilities for bringing information and messages across to consumers via point-of-purchase and post purchase communication and services (Lindqvist et al. 2009). This on the other hand can be considered as especially relevant in regards to providing medical and healthcare related information.

An NFC enabled system, such as the example solution studied in this research, could possibly support several steps and functions of the value chain, the most apparent functions could include the support provided to Marketing and Sales, Distribution and Post-Sales. For example in terms of Marketing and Sales support, an NFC technology based intelligent mobile application could enable several functions, such as mobile medical and health education and support in conveying different forms marketing communication messages. In terms of distribution, the system could provide several beneficial services to the users, such as drug compliance information, dosage instructions and support concerning drug related side effects, in accordance with the individuals personal health and medical information, if indeed these solutions and systems

were to be linked with the individuals medical and health data. Also, similar functions could be enabled within the post-sales support, these kind of mobile solutions could assist the users immensely, for example via aiding in correct and safe usage of the drugs, in the comfort of the individuals own surroundings (Foh 2011: 2-5 ; Jara et al 2010).

Novel NFC mobile solutions, such as the Pharmaceutical Information System, could prove to be of very high value, for example in terms of savings regarding national healthcare costs and expenditures. An example for this is a survey conducted by the Association of Finnish Pharmacies and PricewaterhouseCoopers, which states that the free professional services offered by the pharmacies and pharmacists save more than half a billion Euros of healthcare costs, annually. The survey included evaluation over how much saving were enabled via the free services offered by the pharmacies i.e. advice checking over prescriptions, drug interaction information and general health advice. According to the survey, these savings amounted up to approximately 565 million Euros (€), annually and according to the president of the Association of Finnish pharmacies, Mr. Vidgrén, these savings amount to higher sums than the actual share of all medicine sales, by the pharmacies in Finland. (Association of Finnish Pharmacies 2010)

Arguably, some of these very same functions could be handled by the implementation and synchronization of for example already existing Electronic patient databases (KanTa 2012a) and NFC enabled system solutions.

Section 2.3 will cover relevant theories and findings, concerning consumer behavior, as well as what may be the key considerations for marketers or business, when trying to determine consumers' decision making and adoption processes, and acceptance towards technology i.e. assessing factors involved in the possible introduction, adoption and usage of NFC technology.

2.3 Consumer Behaviour

Understanding consumer behaviour can be considered as one of the most paramount issues in marketing. More specifically, what lies behind the actual purchasing decision of a consumer and understanding why consumers decide upon buying a specific product or service (Egan 2007 : 53).

The way that consumers behave and act, and how they decide upon purchasing or even not purchasing products and services is influenced by several different factors. Not all consumers or consumer groups follow the same mannerisms and patterns, and marketers need to be aware of, and consider cultural, social, personal and even psychological factors, when embarking in the process of understanding consumer behavior (Kotler et al. 2005: 256-266).

2.3.1 Decision making process

Consumers' decision making can be influenced by several factors or stages, which in joint action can contribute to the final decision over purchasing the actual product or service. According to Egan, the simple buying model describes these different stages that a consumer may go through, when engaging in said decision making process. The simple buying model consists of six individual stages, illustrated in Figure 9. (Egan 2007 : 53-55)
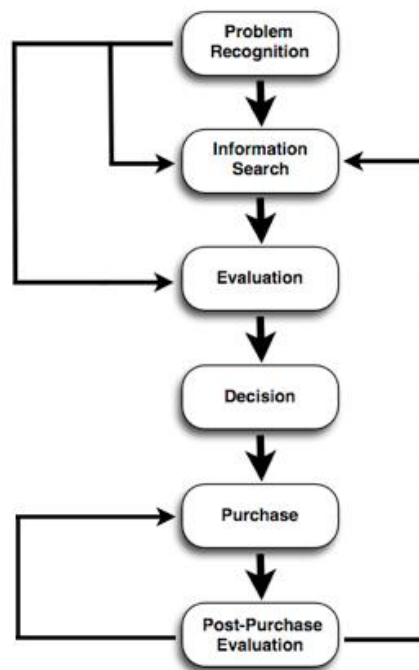
Figure 9. Simple Buying Model. Adapted from Egan (2007 : 54)

1. The initial stage of the model is the ***Problem recognition*** stage; this stage is considered as trigger for the initiation of the process. It may be caused by a specific personal need or even due to an external trigger, such as awareness over new information.

2. The second stage can be considered as the possible next step taken from the initial stage. The ***Information search*** stage is where the consumer gathers the necessary and relevant information concerning the product or service in question.

3. After the information is obtained, the consumer may move to the third stage, the ***Evaluation***. Where the consumer evaluates and judges the alternatives they are presented with, in regards to the information they have obtained.

4. After the evaluation, the consumer may now go through the fourth stage - the **De-cision**. In this stage the consumer decides over the actual purchase.

5. Once the decision has been made, the consumer will move on to the fifth and second last stage, The **Purchase**. Arrived at this stage, the consumer has presumably gone through the previous stages and has completed the transaction of purchasing a product or service.

6. Last but not least, is the final stage **Post-purchase evaluation**. In this stage the consumer may decide over the re-purchase of a product or service, or they may engage in further post-purchase information search or evaluation. Behaviour in the last stage is also dependent on the level of satisfaction or dissatisfaction the consumer may possess, regarding the purchased product or service.

However, according to Egan, one must use the model with sense and understand the fact that it is merely a model and that in reality redundancy could and will occur, during any of the six stages of the model. Since the model is based upon the assumption of consumer's possessing faultless information regarding the products or services in question. (Egan 2007 : 54).

According to Kotler et al (2005), before the consumers actually decide over different products or services, they evaluate the different alternatives that they are presented with. During this evaluation process various product attributes and features that the consumers are presented via the products or services in question come in to play. They initially determine the possible value that may be gained from the acquisition of said products or services. Kotler et al, state that the evaluation of alternatives can either be very extensive at times or in certain cases rather spontaneous or quick (Kotler et al. 2005: 282-283). The consumers' decision to purchase products or services often varies, not all decision are extensively planned and the decision process can be affected by for example the purchasing environment or in-store marketing direct and advertising (Solomon et al. 2006: 323-328). In terms of novel solutions, such as NFC technology, it is crucial understand and be aware of how and where people engage in the steps of the decision process, and what tools they use to aid in them in process.

Thus, rather important to note that especially smart phones have nowadays become an indispensable information gathering and buying tool, and are threfore used across various channels and throughout the research and decision making process. Information seeking is conducted by virtually all smartphone users and consumers are ready to act based upon the information they receive (Google 2010). For the businesses and marketers, the widespread adoption of smart mobile devices presents vast opportunities, in terms of reaching and servicing consumers, at any given time and place.

According to Kowatsch et al. (2011), the product information provided in purchase situations can largely influence purchase behaviour. Especially in online purchase situations, where the usage of online recommendation agents increases the value of product information, as the information becomes more adaptive and relevant to the consumers needs. (Kowatsch et al. 2011: 226-239)

Therefore, especially mobile devices, with internet access and various other capabilities, posses the capability to change consumer buying experiences, as well as the respective marketing efforts. Due to the fact that consumers are nowadays able to quickly search for information, evaluate offerings and conduct purchases, across multiple platforms. Such as web based and mobile channels, which offer more benefits in regards to consumer convenience, flexibility and personalization (Persaud & Azhar 2012).

This change in behaviour can also be seen in Finnish consumer markets, according to a survey published by Statistics Finland, internet usage outside home and work is becoming ever more common in Finland, and when comparing the statistics to the overall internet use prevalence amongst countries in Europe, Finland is ranked closer to the top (Statistics Finland 2011a).

The survey (Figure 10.) states that, the internet has become a daily tool for the majority of people, an estimated 89 % of the population between the ages of 16 to 74 use the internet. Out of these 75 % use the internet on a daily basis and 59 % usually use the internet several times a day. Especially relevant is the fact that, devices suitable for out of home and work internet usage, such as smartphones, are becoming increasingly widespread. According to the survey, already in 2011, 42 % of the population were in

possession of smartphone. And the use of the internet on the move is as well becoming increasingly more common, with 33 % of the population, between the ages of 16-74, being users of the internet outside their homes and work. And according to the survey, Internet is mostly used for everyday matters, such as information search and communication purposes. (Statistics Finland, 2011a)

	Used the Internet in the past 3 months	Uses the Internet usually several times a day	Bought over the Internet in the past 3 months	Followed some social network service in the past 3 months	Uses the Internet with a laptop outside home and workplace	Uses the Internet with a mobile phone in 3G network	Has a smartphone in own use
Percentage of population aged 16–74 years							
Aged 16-24	99	73	56	86	26	36	53
Aged 25-34	100	80	67	78	35	46	55
Aged 35-44	99	76	64	58	36	47	60
Aged 45-54	95	60	46	29	30	26	42
Aged 55-64	81	41	26	15	18	13	28
Aged 65-74	53	23	10	6	11	5	11
Men	89	61	44	43	30	39	49
Women	88	57	47	46	22	19	35
Total	89	59	45	45	26	29	42

Figure 10. Prevalence of Internet usage and certain purposes of use - Finland, 2011. (Statistics Finland, 2011a).

This indicates that businesses need to be aware of the technology usage of the consumers. As well as how the consumers may behave and act in regards to point of sale communication or how they possibly engage in pre-purchase search queries. And what other mediums do the consumers typically use for information gathering, evaluation and ultimately decision making, whilst engaged in different steps of the decision process. Understanding these factors can be of large aid, when deciding over the correct processes, methods and channels, later on used to inform the consumers over for example novel NFC technology solutions.

2.3.2 Adoption of Innovations

For the purposes of understanding new product and innovation acceptance, and consumers behavior towards these innovations, Rogers in his theory of innovation diffusion defined the process how new developments or innovations enter the markets over time and space (Rogers 1995: 5-12). Innovation diffusion theory is based upon the assumption of how innovations spread, from the initial source and thenceforth along the different consumer groups. Rogers defines an innovation as "an idea, practice, or object perceived as new by an individual" and that "diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system." (Rogers 1995: 5-12)

The previous section examined theory concerning general decision making, however there can be considered to be notable differences between the buyers decision making process for existing products and the decision making process for new products or so called innovations. Understanding the theory behind the processes is crucial, since this research examines the introduction possibilities of an innovative novel solution, to the consumer markets (Kotler et al. 2005).

According to Kotler et al., a new product can be defined as a good, service or idea that is perceived by a potential customer as something they may have previously not been aware of, i.e. something new or innovative. The so called new innovations may have been already available for some time. However the main focus is on understanding how the consumers learn about the product or service for the first time and then move

on to the decision over whether or not they decide to adopt these. In marketing, it is of paramount importance to understand the process of how a consumer comes to know about a product or service. Kotler et al. (2005) have adopted the original diffusion theory of Rogers, and defined this as the adoption process. "Adoption is the mental process through which an individual passes from first hearing about an innovation to final adoption, and adoption as the decision by an individual to become a regular user of the product". (Kotler et al. 2005: 287)

These stages in the adoption process are explained as follows (Kotler et al. 2005: 287):

1. **Awareness** : the initial stage is when the consumer becomes aware of the new product, however they are still lacking information about it.

2. **Interest** : in the stage of interest, the consumer moves onto seeking information about the product.

3. **Evaluation** : in the stage of evaluation, the consumer is now faced with the decision of whether or not trying the new product even makes sense.

4. **Trial** : in the stage of trial, the consumer tries the new product, on a smaller scale of implementation, in order to improve their estimates in regards to the values offered by the product.

5. **Adoption** : the final stage adoption, is when the consumer decides upon full, as well as regular usage of the new product.
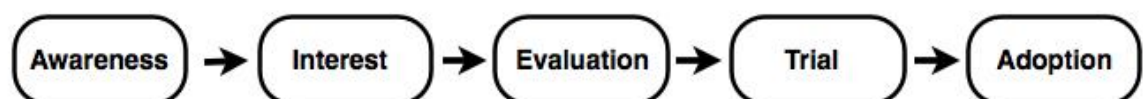

Figure 11. Adoption Process. Model Adapted from Kotler et al. (2005: 287).

The adoption process model suggests that marketers, who are engaged in new-product marketing, should consider thinking about how to aid the consumers in moving along these stages. This can prove of great advantage in terms of understanding consumer behavior and needs. Due to the fact that understanding why consumers may be willing to move onto certain stages, but are not willing to pass through the whole process, could possibly offer valuable insights into how specific products should be marketed and offered, and what kind of optional or differentiated services and methods should possibly be included in the marketing and sales process (Kotler et al. 2005: 287 ; Rogers 1995).

However, according to Kotler et al., one must consider the individual differences in innovativeness, in order to be aware of the differences amongst the consumers in their readiness of trying new products. Since the adoption of new products varies from individual to individual, one can consider there to be in each product area the so called "consumption pioneers" and "early adopters", that are willing and able to adopt new products in a more quicker fashion, than the rest of the consumers. (Kotler et al. 2005: 287)

This on the other hand has led to consumers being classified and placed into specific categories, on the basis of the relative time they are able and willing to adopt the new products, the so called Adopter categories (Kotler et al. 2005: 287-288).
Understanding these individual groups and their behavior is of high importance, in order to be able to effectively market the new innovations. And furthermore, understanding these groups and ultimately effectively targeting and customizing marketing efforts and messages to the right set of consumers, is of utmost importance to this specific research paper and its exploratory nature (Kotler et al. 2005: 287-288).

Accordingly, the consumers are hence categorized into five different types or groups, illustrated in Figure 14. However, in regards to this research, one may consider that the most important groups are the innovators and early adopters, due to the previously unprecedented nature of such novel NFC enabled solutions, amongst consumer markets. Nevertheless understanding the traits and behavior all other consumer groups is still vital and relevant, for the evaluation of consumer behavior and decision making processes (Kotler et al. 2005).
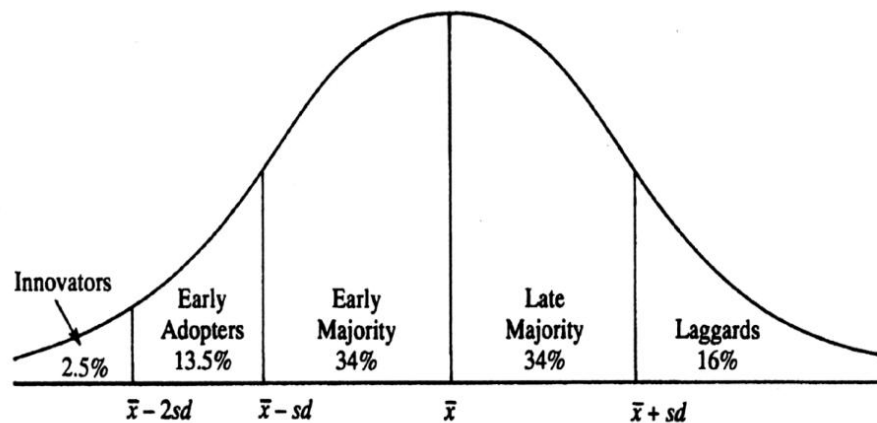
Fig.12 Diffusion of Innovations. Rogers (1995). Figure Adapted from Kotler et.al (2005: 288).

According to Kotler et al. (2005), the first group, the **_Innovators_**, are considered as being the consumers adopt any new product or idea that enters in to the markets with a faster rate than others. These types of consumers are typically status conscious people that are willing to try out new ideas, even with the possibility of encountering certain risks. Therefore the marketers need to pay attention in highlighting the possible esteems or benefits brought on by the new products, in order to make them more appealing to this group of consumers. (Kotler et al. 2005: 287-288)

The **_Early adopters_**, are categorized as being the type of consumers that are usually the opinion leaders within their communities. Therefore they are slightly more hesitant and considerate towards adopting the new products, nevertheless at the same time, due to their knowledge and skills, they are able to exert their influence on to other consumers. Thereby also aiding in the development of the adoption process.

The **_Early majority_** consists of the group of consumers, that are rarely the opinion leaders, but nevertheless this category of the consumers is still more likely to adopt the new products or ideas before the average consumers.

The next category is the **_Late majority_**, these consumers are highly skeptical of the new products or ideas and are therefore more likely to adopt them after the majority of consumers are already acquainted with the new products or ideas.

The last group of the consumers are the **_Laggards_**, these consumers are more tradition oriented and are more likely to adopt the new products or ideas very slowly and hesitantly, preferably after these new innovations have already become widely accepted and acknowledged. (Kotler et al. 2005 : 288 ; Rogers, 1995)

These adopter classifications and the their individual rates of adoption become even more so important when dealing with highly innovative and new products or services, as is the case with this particular research. Since these types of scenarios the marketers need to be able to identify and effectively target the opinion leaders, in order to establish preliminary grounds for mass approval and awareness over the new ideas, in order to ultimately convince the late majorities as well as laggards of these new ideas (Kotler et al. 2005 : 288-289). There are several other factors and considerations that need to be taken into account regarding consumers' adoption of new products. One key consideration is how the actual characteristics of the new products influence the rate of adoption. According to Kotler et al. (2005) "some products can catch on almost overnight, whereas others take a long time to gain acceptance." (Kotler et al. 2005: 289)

When considering the influences on the rate in which an innovation is adopted, according to Kotler et al. there are five specific characteristics that need to be considered (Kotler et al. 2005: 289);

Firstly, the _relative advantage_, meaning the degree to which the innovation appears superior to the already existing offerings. Thus the greater the relative advantage offered, the earlier the innovation will be adopted.

Secondly, the _compatibility_, which means the degree to which the innovation suits the specific values and preset experiences of the consumers.

Thirdly, *complexity*, the degree to which the innovation may prove to be difficult understand or even use.

Fourthly, *divisibility*, the degree to which the innovation may be tried or used on smaller scale scenarios.

And lastly, *communicability*, the degree to which the usage results and experiences may be observed or passed along to other consumers.

Besides these factors, there are several other variables that may influence the rate of adoption, for example costs, risks, social approval and the exerted influence by the opinion leaders. Therefore, in the process of new product marketing, one must consider and research all the underlying and influencing factors, in order to establish a functioning marketing strategy, which can be used to aid and enhance the adoption process of the new innovations. (Kotler et al., 2005 : 289)

In terms of NFC technology adoption, there is very little to no research available.

However, there are some studies that have research this phenomenon, of which the majority have been focused on the concept of privacy. Thus, privacy issues have been identified as being a major practical implementation challenge and as the most significant cost to consumers (Uhrich et al. 2008; Sill et al. 2008). The attitudes that the consumers' possess towards the privacy issues, has been found to directly influence the propensity to purchase NFC or RFID tagged products. These findings imply that, the more value and importance consumers place upon privacy, the less likely they are to adopt NFC or RFID technology in retailing. However, it was also found that when NFC or RFID technology is involved, consumers seemed only moderately privacy aware (Crazier et al. 2008; Rothensee & Spiekermann 2008), this on the other indicates that the consumers might in fact be willing to accept the use and implementation of NFC technology in Marketing efforts (Boeck et al., 2011).

2.3.3 Technology acceptance

For the means of understanding the theory behind consumers' acceptance and willingness to use technology, there are various different user acceptance models that have been proposed in the field of information and computer technologies. The main intent behind these theories is to measure actual user acceptance, in regards to new or innovative technology variations, as well as to predict and identify possible issues concerning the usage of said innovative technologies. Understanding some of basics behind these theories can be considered relevant to this particular research, since the effects of NFC technology and the possible acceptance of these technologies, such as the example solution examined in the last chapter, can up to date still be considered as assumptions, due to both their lack of research and implementation within the consumer markets.

For the purposes of this research, one model in particular, can be considered as relevant in determining factors involving technology. The Technology acceptance model (TAM) is the most acknowledged and most widely used model, originally proposed by Davis, in 1986. Davis adapted the idea of TAM from Fishbein & Ajzen's initial theory of reasoned action (TRA) proposed initially in 1975, which is intended for the purposes of studying user intentions towards accepting information technology (Davis et al. 1989; Venkatesh et al., 2003.).

The main purpose of the TAM model is to predict user behavior, in regards to computer technology usage. The model consists of two key variables, firstly the perceived usefulness of particular system and secondly the perceived usage of said system (Davis et al. 1989; Venkatesh & Davis 2000).

The assumption is that if and when the user believes that the particular system in question can be of aid and assist them in performing a function or task, then the users behavioral intention to forth on use the particular system is accordingly being positively influenced. Also, once the system is perceived as useful and the user is being positively influenced by the system, the users' behavioral attitudes towards continued usage can as well be considered as more probable (Davis et al. 1989; Venkatesh & Davis 2000).
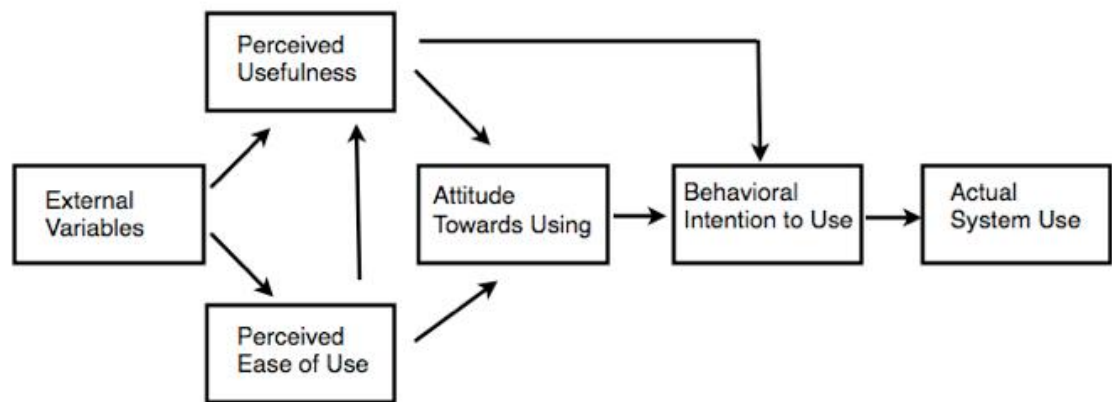
Figure 13. Technology Acceptance Model. Adapted from Davis et al.(1989).

The model suggests that the perceived ease of use also directly influences the level of perceived usefulness, in the sense that once a system is perceived as being too complicated and in some ways unusable, the user is directly inclined towards categorizing the system as non useful, thus the user is more likely to dismiss the system completely (Davis et al. 1989; Venkatesh & Davis 2000).

The users' attitude towards the system is of utmost importance, since the attitudes directly influence the levels of behavioral intentions, which are considered as being the main indicator for predicting end and continued usage (Davis et al. 1989; Venkatesh & Davis 2000). As illustrated in Figure 13, the models core beliefs or variables are concerned with the influences on user adoption and end usage of information technology.

The technology acceptance model specifies the causal relationships between system design features, perceived usefulness, perceived ease of use, attitude toward using and actual usage behaviour. Overall, TAM provides a representation of the mechanisms by which design influences user acceptance, and could therefore be helpful in forecasting and evaluating user acceptance towards technology. (Davis et al. 1989; Venkatesh & Davis, 2000; Lee et al. 2003)

Research has found that the influences of perceived convenience, perceived culture and perceived security to have a significant impact on the consumer's willingness to accept NFC or RFID technology. The perceived convenience has a positive effect on the consumers intention to use the technology, thus this would indicate that the higher the perceived convenience factor of NFC technology, the greater the consumers intention to use the technology. Also, the influence of culture on the consumers perceptions about NFC or RFID technology, is as well a significant factor for determining the consumers acceptance towards the technology. In other words, the extent to which the consumer accepts the technology is directly influenced by their individual beliefs, values, norms and behavior. Another crucial determinant for consumer acceptance of NFC technology is the perception of having information security. It was found that the higher the importance of possessing information security, and the lower the willingness to make compromises regarding these factors, ultimately the lower the actual intention to use NFC or RFID technology (Ohkubo, Suzuki & Kinoshita, 2005 ; Hossain & Prybutok, 2008).

The following chapter will illustrate the novel concept solution, which has been used as both the basis for this research, and as a practical example of the capabilities and possibilities of NFC technology solutions in Pharmaceutical products and services.

3 PHARMACEUTICAL INFORMATION SYSTEM (PIS)

If to become reality, the possible benefits for the Pharmaceutical companies, Pharmacies, Governments and most importantly for the consumers, resulting from the utilization of such proposed novel solutions as the Pharmaceutical Information System (PIS), could be rather wide ranging. With the assumption, that if such a solution would in fact able to decrease the amount of for example adverse drug reactions, drug misusage or drug allergies, by enhancing both the purchase and post-purchase process of pharmaceuticals. Then the economic, financial and social benefits to the society at large could assumedly be rather vast. According to the EU;

> "Medicinal products contribute considerably to the health of EU citizens. They can, however, also have adverse effects. It is estimated that 5% of all hospital admissions are due to an adverse drug reaction (ADR) ... It is estimated that 197,000 deaths per year in the EU are caused by ADRs and that the total cost to society of ADRs in the EU is € 79 billion." (European Union 2008)

Even though the aforementioned ADR cases and their background specifics are not stated by the EU, and therefore could have resulted from various reasons. The fact remains that, if this type of solution could even slightly minimize such incidents and occurrences, there would arguably be sufficient enough causality and reason for the development and end implementation of such technological solutions.

After all; "Improving quality assurance and providing effective healthcare are some of the most important aims of information and communication technologies". (Jara et al., 2010)

3.1 The PIS

The PIS is an assisted living solution i.e. personal drug checker, proposed by Jara et al. (2010), for the purposes of solving issues concerning adverse drug reactions, drug compatibility and allergy detection. The system process can be explained as follows, once the drug(s) have been identified via the NFC enabled device and NFC tag interaction, the information over this is sent to the PIS, which the commences in matching the

ingredients of the drug, with the individual users allergy profile and health records, in order to detect and prevent potential reactions. The system uses frameworks to model the user profile and drugs, in order to apply rules, which detect side effects and potential problems, related to the ingredients in the drugs. The information regarding these can be accessed by the user via a specifically designed easy to use interface on the mobile devices terminal. (Jara et al., 2010)

The PIS itself is composed of three parts, a drug database that was synchronized with a national Pharmaceutical database, a knowledge-base system and a rule engine system (Jara et al. 2010). The Knowledge base system, proposed and implemented by Jara et al., represents firstly the subjects allergies and secondly the drug information from the database, therefore it is able to detect issues relating to drug interactions, for example a drug is consumed by the subject is categorized and classified by the system as having certain side-effects if consumed simultaneously with a another substance or drug, the system identifies this and advises the subject over the possible adverse interactions of the two drugs or substances, and thenceforth commences in recommending an alternative drug, which would be compatible with the original substance consumed. After the individual patient profile has been defined and the information over the subjects drugs is implemented onto the system, the rule engine system is then after used in order to detect the possible ADR's, allergies and other drug interaction variables. (Jara et al. 2010)

With the use of NFC technology, the application solution is able to provide extended information about drugs, explaining for example why a drug may not be compatible with the subjects' profile. The PIS matches the drug ID with its knowledge-base and the patient's profile, and displays an answer on for example the smartphone of the user, thus informing whether or not the drug in question is safe for usage. For the identification of the drugs, NFC tags were implemented onto the drug packaging's (Jara et al., 2010). The first window of Figure 14 displays an example of the subjects currently used drug's incompatibility or side effects associated the simultaneous usage alongside with Aspirin. Additionally, the smartphone solution enables the user to define and update their own profile, illustrated in the middle window of Figure 14. The third window of Figure 14 shows the intuitive interface, which enables the users to update their profiles. (Jara et al., 2010)

Fig.14 Left: Drug extended information. Middle : Patient profile. Right : editing information. Jara et al. (2010)

For the test solution itself, Jara et al. added an NFC/RFID tag to each drug package. This tag contained a unique ID, in order to identify each individual drug, without any doubt or errors. Illustrated in the first window of Figure 15 is one of the drug packages with the NFC/RFID tag implemented onto the upper right corner of the package. (Jara et al., 2010)

Fig.15 Identifying pharmaceuticals, using NFC technology. Jara et al. (2010)

The test solution was carried out using a pocket PC, illustrated in the second window of Figure 15. This device used an external NFC reader device implemented onto the device, in order to read the data from the tag. An NFC reader/writer mode enabled device such as an NFC enabled smart phone, would have been able to perform the same tasks, without the need for external devices. As illustrated in the second window of Figure 15, the device is placed in close proximity of the tag, after which the PIS enabled device then reads the tag and commences wireless intercommunication i.e. data retrieval and analysis. (Jara et al., 2010)

The PIS was tested with a patient, with a pre-existing drug regimen and an allergy profile, this means that when and if the patient were to take simultaneously another drug or substance that would collide with either the drugs or the individuals profile, the system would be able to detect and present this information. (Jara et al., 2010)

The system was designed in a flexible way, in order to enable extensions to other mobile platforms, as well as other identification technologies.

More importantly, the applicability in the real world can be considered as direct, since the drug database of the system was directly synchronized with a national health and

medical database, in the case of this solution, Jara et al., synchronized the system with the Spanish Pharmaceutical Associations database, which enabled the system to take full advantage of all current and future drug information. (Jara et al., 2010)

Similarly, in Finland the system could hypothetically be synchronized with The National Archive of Health Information (KanTa), which is the collective name for several national medical and healthcare information systems in Finland. Including, the electronic archive of patient records and information or eArchive. (KanTa 2012a)

The eArchive grants centralized access to the patient's medical health records, however only with the permission of the patient. Thus unifying and enhancing the transfer of patient data and information across all units, organizations and platforms. The eArchive acts as a final and central archive for all the patient information. The system also allows all patients over the ages of 18 to access personal information online, which is stored in the electronic archive of patient records. Therefore the individual is able to check and review their personal health and medical information, without restrictions, once these have been stored in the electronic archives (KanTa 2012b). The systems will be implemented in stages and to all public and private sector care providers, pharmacies and citizens in Finland. All healthcare and medical units nationwide will have to implement the KanTa services by the end of 2015. (KanTa 2012b)

3.2 The PIS and the possible future of OTC Pharmaceutical Markets in Finland

The inclining price indexes (noted in section 2.2.1) is one of the main reasons as to why OTC medicines can be considered as becoming increasingly more interesting for the actors within the Pharmaceutical industry. Thus many of the Pharmaceutical companies are now seeking for increased growth, especially through OTC medicine markets. Due to the fact that the prescription medication markets are more competitive and the prescription medication pricing levels are monitored and controlled by the governing authorities, whereas OTC medication pricing is up to the companies themselves. (Fimea 2010a; Pharma Industry Finland 2010e; Pharma Industry Finland 2008)

One aspect that could completely alter the current markets, as well as communication and service efforts, and increase the availability and sales of OTC pharmaceuticals in Finland, is the fact that the Finnish Daily Consumer Goods Trade (PTY) is currently lobbying for modifications in current laws and legislations, which if passed would give convenience stores the legal right to sell all OTC pharmaceuticals. Thus, possibly replacing many of the current pharmacies as main sales outlets. According to the PTY, a change of this magnitude would enable both improved accessibility and lowered price margins for the consumers, as has been the case with other Nordic counties, which have allowed convenience stores to sell OTC pharmaceuticals, for example, as of the beginning of 2009, Sweden. (PTY 2009; CapGemini 2011: 2)

The efforts by the PTY are now being supported by the Consumer's Association of Finland, which believes that the current monopolistic markets of the Pharmacies can no longer be seen as justifiable (Federation of Finnish Commerce 2011). The Consumer's Association of Finland is now along with the PTY, are demanding that OTC pharmaceutical sales would be allowed through convenience stores as well.

These efforts are however being opposed by The Association of Finnish Pharmacies, which claim that the release of OTC drugs into regular stores, would for example compromise consumer safety and security, in terms of drug purchase and consumption, if the consumers would not be offered sufficient guidance and support by professionals. (PTY 2010; Association of Finnish Pharmacies 2009)

This possible future market scenario is where NFC enabled technology solutions such as the PIS in OTC pharmaceutical products and services could prove to be of significant aid. For example, in the case of medicine purchases from larger convenience stores, with possibilities for enhanced usage instructions, such as drug compliance and drug interaction information. In this scenario the assumption may be that, for example sales through convenience stores might not be accompanied with sufficient professional support and advice, such as is the case in pharmacies (Association of Finnish Pharmacies 2009), and that in this case these very same support and advisory functions could be enabled, if not even managed via utilizing NFC technology enabled smart systems and products. (Morrison & Arnall 2011; Lindqvist et al. 2009; Jara et al. 2010)

This on the other hand could also constitute significant changes in both general marketing and advertising efforts, as well as a hypothetical increase in health and medical based electronic and mobile communications. For example if convenience stores would have the ability to sell OTC drugs, the clear assumption would be that, since the consumer base would become much larger, and since OTC drugs are rather lucrative products, with the price margins being quite high, that the stores and drug brands would be willing to invest far more efforts in marketing the products and services, to the consumers at large. If these health and medical products and applications would indeed be sold along with "everyday items" (Pharma Industry Finland 2008).

Following from the both literature review and the PIS chapters, the methodology chapter will present the main research questions, objectives and qualitative methods of the research.

4 METHODOLOGY

4.1 Research Questions and Objectives

After extensively reviewing various relevant theories and aspects from literatures, publications, and other materials, primary research needed to be conducted, in order to find answers to the research questions;

"What would be the possible benefits, challenges and ultimately the conceivability of utilizing NFC technology in OTC Pharmaceutical products and services?"

In order to answers the research questions, and in order to gather sufficient evidence to support the answers, a suitable research approach and method, alongside the literature review, needed to be selected, These approaches and methods are explained and justified in the following parts, along with the data collection and analysis methods and procedures.

4.2 Research Approach

The use of theory is involved in any type of research, and the theoretical approach of a research can be considered as either inductive or deductive, which both approach and propose two slightly different, yet not mutually excluding, ways of drawing conclusions (Saunders et al., 2000: 116-120).

When deciding upon what type of research approach to adopt, Saunders et al. (2000) suggest a number criteria to be considered. Of these criterions, perhaps the most important is the nature of the research topic. If there is a vast amount of literature regarding the topic, it is most often suitable to use a deductive approach. In opposition, when researching a topic that is new and little existing literature or research can be found, it may be more appropriate to use an inductive approach (Saunders et al., 2000: 117-121).

Concerning this topic, little to no theory and research is previously available, over the implementation, effects and acceptance of NFC technology in Pharmaceuticals, and what the possible benefits, issues and challenges regarding the technology and its use might be. Due to this, an inductive approach was chosen. Largely based upon the fact that the highly exploratory and hypothetical nature of the research is more suited towards this approach (Saunders et al., 2000).

4.3 Research Methods

For this particular research, qualitative research methods were chosen, for a number of reasons. Firstly, qualitative research methods, in contrast to quantitative, are by nature more flexible and versatile. Qualitative methods are designed towards aiding in the understanding of people and their contexts. They also emphasize on the description of a phenomenon, and attempt to explain the residing relationships in a deeper and detailed manner. Whereas quantitative research methods are considered as less flexible, due to their often standardized measures, used in order to validate and generalize the experiences and perspectives of people.

Secondly, qualitative research should be applied if a phenomenon or topic is new and innovative, and since the wider scope of NFC technology related services and systems is as of current considered as an emerging and rapidly developing field, a qualitative research approach can be considered as more suitable. (Hirsijärvi & Hurme 2004: 21-32) Thirdly, in order for quantitative research methods, such as questionnaires to provide results for this study, the participants should preferably posses some level of previous knowledge over either Pharma or NFC. However, fact of the matter is that the overwhelming majority of people do not possess the necessary knowledge over NFC technology, especially when researching this in the context of Pharmaceutical products and services, therefore quantitative methods were excluded (Hirsijärvi & Hurme 2004: 21-32). And lastly, quantitative research methods were ultimately excluded due to availability of resources and materials, i.e. NFC concept solution and pharmacy testing environment. Due to the fact that in order to properly assess acceptance and usage of NFC based applications, and in order to obtain any relevant research insights, one would have had to preferably develop these currently un-existing solutions, in order to

allow the participants to physically test and assess these applications (Hirsijärvi & Hurme 2004; Saunders et al. 2000).

For this research, semi-structured, personal interviews, with an explorative nature were chosen. Semi-structured interviews are more suitable for this research, since these allow more customization, context adaptation in accordance with the particular inter-viewee and interview situation. When conducting semi-structured interviews, the re-searcher may have preset a list of themes and questions to be covered, however with the possibility to adopt, vary and add questions based upon the nature or flow of the individual interviews, in order to further improve the amount of relevant insights to be gained. Having some preset structures, themes and questions also allowed to collect more relevant material, in the realms of the given topic, thus the collected materials would also vary according to the interviewee's personal and professional opinions, nevertheless remaining relevant to this research (Saunders et al., 2000: 311-313; Hirsijärvi & Hurme 2004: 21-32).

Also, personal and in depth interviews were chosen due to the advantages they would offer, in regards to this particular research topic and its questions. The advantages of personal interviews over for example group interviews, is a higher level of control over the end outcome, the avoidance of individuals influencing each other and the possible dominance of one individual over others within the group. In other words, personal interviews may produce more honest answers. This approach was mainly chosen in order to gain deeper and far reaching knowledge over various relevant factors and topics, such as the OTC Pharmaceutical markets, marketing practices, the consumers, as well as NFC technology (Saunders et al. 2000: 311-316 ; Daymon et al., 2004).

4.4 Data Collection

For the means of qualitative research, the selection of participants is of utmost im-portance, in order to further increase the value of the research. Qualitative research and especially one with an exploratory approach is more aimed towards investigating a phenomenon. Thus, not every person can be considered as suitable to contribute to the research, with their knowledge and experience (Hirsijärvi & Hurme: 58-63; Saun-

ders et al., 2000 ; Daymon et al., 2004).For qualitative research it is not a must to include a wide range of participants, since qualitative research cannot generalize that much to a wider population, but it may instead take advantage of participants with specific presets of knowledge and relevant experience, in order to better explore a phenomenon and the relevant factors or considerations that may be involved (Hirsijärvi & Hurme: 58-63; Daymon et al., 2004).

Primary research based upon qualitative interviewing is considered to be able to obtain enough information from a smaller number of participants. However, the amount of relevant and meaningful information gained also depends on the knowledge and contribution of the participants. Therefore, the participants were carefully selected, according to their function, position and experience within relevant fields and markets, in regards to this research topic, and the perceived value and meaning they would be able to contribute to the research (Saunders et al., 2000 ; Hirsijärvi & Hurme, 2004).
Due to the limited time scope of the thesis, four participants were chosen.
Nevertheless, Kvale states that the knowledge and information obtained through interviews compensates for the smaller sample size that these may constitute (Kvale, 1996).

The criteria was to be able to conduct personal interviews with people that possessed the necessary experience and knowledge about the Pharmaceutical and Health industry, OTC markets, actors and entities within the industry and markets, as well as the actual marketing practices and methods of OTC products and services in Finland. And also, people that possessed first-hand knowledge and experience over consumer traits and behaviour, within the aforementioned frameworks.

Four personal interviews were conducted, two face-to-face interviews and two interviews over the phone, with professionals from the Pharma, Medical and Health sectors, that the researcher was fortunate enough to gain access to.

Director A - is amongst other functions, the managing director of a pharmaceutical marketing company.

Director B - is a director at one of the world's leading pharmaceutical companies.

Director C - is amongst other functions, a director of pharmacology at a specialized agency of the United Nations (UN).

Director D - is the managing director of a Medical and Pharmaceutical consulting company.

Full interviewee profiles can be found in Appendix 1.

As stated previously, the nature of this research was to explore and understand, not to confirm, and thus the semi-structured interview approach was chosen.
The interview structures and questions, illustrated in Appendix 2, were structured according to the theory and material examined in the literature review, and therefore some of the interview questions were as well to an extent based upon subjects and theoretical principles deducted from the literature review.

However with the emphasis in both maintaining a certain structure, yet still keeping the questions and structure relatively open, in order to allow subjective answers and minimize bias and interviewer effect, and in order to gain more far reaching and broad perspectives in regards to the assumptions, theories and questions. Based upon these particular approaches and methods, the interview question also included probing, follow-up and clarifying questions, in order to act as an qualitative research aid in the interview sessions, however with the emphasis on not being set in any strict or specific order (Hirsijärvi & Hurme, 2004: 102-115). This on the other hand enabled to create a more natural and free-flowing conversation atmosphere, which in retrospect, positively influenced the end outcome of the interviews.

The interview outline was composed of subjects deducted from the theoretical principles and other findings. However with an emphasis deliberately avoiding too direct questions concerning NFC technology, which may have interfered negatively with the amount of relevant material obtained from the participants, due to the interviewee's possibly un-presented knowledge and unawareness over NFC technology and its application possibilities (Hirsijärvi & Hurme, 2004).

All interviews were recorded and transcribed, in order to ensure proper data analysis, and in order ensure that all information was retained. This also enabled the interview sessions to become more participatory, and allowed the researcher personally to become more attendant, as well as more absorbent towards detailed answers and thoughts of the interviewees (Daymon et al. 2004: 179). All data is represented in accordance with the individual interviewees' opinions, and are presented objectively.

4.5 Data Analysis

When analyzing qualitative data, the separation between conceptualization, categorizing, analysis and interpretation may often be intertwined, and may also take place simultaneously throughout the research process. However, the goal of the data analysis was not to develop a theory, instead the emphasis was on finding causalities, obstacles and the possible conceivability of NFC solutions, within the frameworks examined in this research (Daymon et al. 2004: 231-232).

The core purpose behind the interviews with Pharma professionals was to gain insights over the current and assumed future markets, along with their respective practices. Due to the exploratory nature of this research and the lack of previous research, the knowledge and input of the professionals was much needed, in order to take into account various factors, from both the business and consumer perspective. And secondly to assess NFC solutions, and how these might or might not fit within the examined frameworks, thus attempting to bridge the relation, and correspondence between the published material and qualitative findings.

The topics and questions covered in the interviews were derived from the examined materials of the literature review, however with the aim of ensuring that neither personal thoughts nor theory would interfere with the gathered information (Saunders et al., 2000). And as previously mentioned, all interviews were recorded and transcribed, thus allowing me to go through the material, as many times as necessary. And also to examine these in relation to the materials presented in the literature review.

5 FINDINGS AND DISCUSSION

The core aim of this research was to seek answers concerning the possibilities, challenges and causalities for the implementation and utilization of NFC technology solutions in OTC Pharmaceutical products and services. In this research, the unit of analysis was the PIS concept solution by Jara et.al, which was used as the practical example of NFC technology's possibilities for Health and Medical Marketing.

Due to the lack of existing research concerning this topic, the need to draw opinions and insight from Pharma and Medical professionals was needed, in order to assess the possible benefits, challenges, and the actual conceivability of the explored implementation scenario, and to compare these qualitative findings along side with the findings drawn from the literature and other empirical materials; in order to ultimately find validation for the research questions.

The main findings are presented and analyzed in the following sections. The questions, as well as the findings are categorized in accordance with the main sections presented in the paper.

5.1 OTC Pharmaceutical Markets and Marketing

The unanimous opinion of all interviewees, respectively, was that OTC Pharmaceuticals have become more attractive to Pharmaceutical companies, due to their limited regulations in marketing, sales and pricing, in comparison to prescription Pharmaceuticals.
And according to *Director A*, one of the main reasons for the lucrative state of OTC pharmaceuticals being the continuously inclining price, sales and profit margins.
In accordance, Statistics Finland showed that the price of OTC pharmaceutical products has continuously inclined throughout the last ten years, with an increase of nearly 30 %, from the year 2000 to 2011 (Statistics Finland, 2012).

Director B stated that since OTC pharmaceuticals are becoming more and more lucrative, and the sales are inclining, the urge for improved and enhanced communication, via for example advanced mobile technologies is becoming more apparent and needed.

Another important consideration, brought forward by *Director A*, is the fact that price/quality ratio remains the most important factor, from the consumer's perspective, therefore improved quality or decreased pricing in the products would constitute as main selling arguments, over the competing products. And according to *Director D*, the consumers generally are willing to pay more for the perceived quality or superiority of the products and services. In accordance, *Director B* stated, in OTC pharmaceutical marketing, the key advantage lies in the marketing of perceptions, in most cases either via conveying superior quality or effectiveness. Therefore especially novel products need to be accompanied by one of the aforementioned traits.
And according to *Director B,* a solution such as the PIS, could in fact constitute as possessing both traits.

According to *Director C* and *Director D*, respectively, another reason as to why OTC pharmaceutical sales have increased so dramatically is the fact that the Pharmacies or Pharmacists themselves are trying to more actively persuade consumers to buy OTC pharmaceuticals. Due to the higher profit margins obtained from the sales of OTC pharmaceuticals, in comparison prescription pharmaceuticals. According to *Director C*, thus more effort is actually being placed upon both actively marketing, promoting and selling specifically OTC pharmaceuticals to the end consumers. Therefore, any unique selling point or perceived advantage offered by specific products, such as containing NFC technology, would most likely increase the likelihood of these being both marketed and recommended by for example the Pharmacists and doctors. Also, according to *Director A,* the role of specialists in drug recommendation and advice situations is vital; therefore it would also be important that the specialists themselves would possess some sort of reason or motivation towards recommending for example NFC enabled solutions. And according to *Director A*, the motivation in the case of solutions such as the PIS, would clearly be improved customer safety and satisfaction, along with the possibility for increased re-purchases.

According to *Director A* and *Director D*, respectively, this particular research is more than current and highly relevant, partly because of the efforts enforced by the PTY, of moving OTC pharmaceutical sales to convenience stores and supermarkets.

According to the PTY, a change in this direction would enable both improved accessibility and lowered price margins for the consumers, as has been the case with other Nordic counties, such as Sweden. (PTY, 2011 : 10 ; CapGemini, 2011 ; 2).

If this scenario would indeed become reality, according to *Director B*, several factors would become relevant and apparent, especially when considering utilizing novel technologies, such as the use of the PIS solution in OTC pharmaceutical products and services. Firstly, this would mean that OTC drug sales would become more customer centered. According to *Director B,* this becomes highly important when considering the current situation, where point of sale information and help is provided by professionals in the pharmacies, whereas if OTC drugs were to be sold in convenience stores, the amount of advice and guidance would most likely be very minimal.

And according to *Director A* and *Director C*, respectively, this effect can already be seen in the selling of nicotine-replacement products, which are sold through convenience stores, and according to both, there are severe limitations and problems in terms of consumers receiving sufficient guidance and information, from the stores and their employees. This of course would become even more crucial and even vital, when dealing with numerous amounts of present OTC pharmaceuticals, since the amount harm that may be caused via for example unwanted drug side effects or ADRs, caused by misinformed usage, could be rather vast.

And therefore, according to *Director A* and *Director B*, respectively, especially in these situations, the need for NFC solutions, such as the PIS, would become very apparent.

Director A and *Director C*, respectively, both raised important points, concerning the current relevance of mobile marketing, especially in the context of health. They both stated that since the Pharmaceutical industry is developing rapidly, and in general moving towards more technological based efforts; smart phones and other mobile devices can be considered as valuable tools to convey and communicate marketing messages across to consumers. Furthermore, according to *Director A*, health and medical applications are becoming ever more apparent, and are constantly being developed. This has lead to the consumers being more independent, as well as inclined towards

getting medical information and advice through various electronic and mobile platforms or applications. And according to *Director A*, this could in fact indicate that the consumers of today are accepting and willing towards using more advanced technologies, such as NFC. Similarly, the growing popularity of for example health related apps can be seen in recent estimates. According to recent estimates by MobiHealthNews, the number of health related apps will reach over 13 000, by the end of 2012 (MobiHealthNews, 2011). And according to Juniper research, a predicted 44 million downloads of health apps onto mobile devices, will be reality by the end 2012. And that the number of downloads will reach 142 million, by 2016. (iHealthbeat, 2011)

Furthermore, according to *Director A*, the most apparent utilization method for NFC solutions, in the current market state, would be point of sale communication and post purchase support. To enable services and communication to the consumers, pre and post purchase, thus making the whole purchasing and consumption process more simple, convenient, and safe as possible.

Lindqvist et al., state similar benefits in regards to NFC technology; the most apparent benefits of the technology are the possibilities for communication via location based communication and services, especially with health related information (Lindqvist et al. 2009). And according to *Director A*, a solution such as the PIS, could enhance both pre and post purchase functions, to the extent that these types of novel solutions could in fact be utilized for Health and Medical Marketing purposes.

5.2 Consumer Behaviour

According to *Director A*, one key factor would be able to "package" i.e. properly market and communicate these types of novel NFC products and services, through the right channels, and preferably to the opinion leaders, in order to make these compelling enough, so that both the pharmacies and consumers would implement and purchase them. Therefore, marketing efforts should be carefully considered and customized to meet respective trends, demands and consumer patterns, in order to ultimately convince the remainder of the consumer groups, over the benefits of such NFC solutions.

Director A and *Director C*, respectively, mentioned that in OTC pharmaceuticals, the commercial factor is especially important, since these products and services can be directly marketed towards the end consumers. Therefore, the key considerations in the case of introducing new and novel products or services, such as the PIS, according to *Director A* and *Director D*, respectively, would be to not make the marketing, advertising and selling efforts too technology focused and centered. Meaning that, when trying to market these types of solutions, emphasis should be placed upon bringing across all the benefits gained from these, instead of for example praising or detailing novel technologies and their functions, and thus running the risk of simply confusing and alienating the consumers.

In accordance with this, *Director B* mentioned that many years ago, when the internet was emerging, he was asked whether or not he thought that in some year's time people everywhere would use the internet as a daily tool, for both work and leisure. And according to him, his response was; "people probably aren't ready yet". Therefore, according to him, there will always be people who could be against the new technologies and do not at first see the need for it. However, the main idea is to initially target the right set of people, who actually need such solutions as the PIS, people who in fact could gain substantial health benefits from the utilization of such solutions.

Director B also mentioned that, initially the innovative and technologically aware consumer of today, would most likely be willing to use and adopt such novel concepts rather quickly, if these were indeed marketed and presented correctly, in order to convey both the safety and security benefits that these would enable. Whereas, according to him, the technologically less capable or aware consumer might be more hesitant towards adopting and using such NFC solutions.

However, according to *Director A* and *Director B*, respectively, both mentioned that it is a given in today's society that consumers utilize internet and mobile services and applications for comparing and obtaining information, and simultaneously receiving communication messages by the influencers, such as the Pharmaceutical companies. Therefore, according to *Director A*, the amount of presence by the companies, in online, mobile and point of sale marketing has dramatically increased. And according to *Director A*, especially OTC pharmaceutical marketers have to, and will increasingly utilize electronic and mobile health communication methods, to better reach and service

the consumers. And that therefore the utilization of NFC technology solutions in Pharmaceuticals, according to *Director A*, can be seen as plausible, due to the possibilities for enhancing the means and methods of mobile marketing, sales and services.

In accordance, Persaud & Azhar state that, mobile devices, with internet access and various other capabilities, actually posses the capability to change consumer buying experiences, as well as the respective marketing efforts used in the processes. Since consumers are nowadays able to instantly search for information, evaluate offerings and conduct purchases.

According to *Director A* and *Director C*, respectively, the conceivability for NFC technology based mobile solutions is much more likely today, than it would have been just a few years ago. Since the internet has become one of the most important referees for the consumers and that this can also be seen in the behavior of the consumers. *Director D* mentioned that nowadays consumers, even before going to the doctor or pharmacist, have already conducted personal research and evaluation over products or conditions, trough online and mobile mediums or applications.

And according to all interviewees, respectively, the people of today are more willing and inclined towards using electronic and mobile health and medical services.

According to *Director A*; today's consumer is more likely to search and compare product information, and seek advice through online and mobile mediums, before purchasing for example OTC drugs. Interestingly enough, according to Google, especially smart phones have become an indispensable information gathering and buying tool. And that these are used throughout the research and decision making process. And that information seeking is performed by the majority of smart phone users (Google, 2010).

In accordance with this, *Director D* stated that even doctors and other professionals usually tend to seek information and advice, through for example online mediums or applications, since many medical professionals, much alike consumers, often tend to rely more on what other people have stated, as supposed to relying solely on their own knowledge. *Director A* also said that he himself uses his smartphone to access various health and medical applications, and according to him, especially mobile communication means are highly useful and practical, after all most people tend to carry their mobile devices with them all the time and everywhere, ergo one is able to access the

necessary information at any given time and location. In accordance with these statements are current findings; Statistics Finland states that in 2011, 42 % of the population in Finland were in possession of a smartphone. And that 33 % of the population, between the ages of 16-74, used the internet on the move (Statistics Finland, 2011).

Director B and *Director C*, respectively, stressed the point, that the situation with such technologies as the NFC - PIS system, is that one would have to convince the technologically aware or innovator groups of the benefits gained from the utilization of these solutions, in order to be able to gain any foothold within the markets. And according to *Director C*, if the Pharmaceutical businesses see demand and acceptance from the consumers' side, they would be more likely to utilize such concepts, and be willing to invest in these. Since, according to *Director C*, the apparent benefits of such NFC solutions are evident enough to convince at the very least some of the main opinion leaders i.e. doctors and other professionals.

Director A as well stressed the point, that in order for such types of novel technologies to be adopted by both the businesses and consumers alike, firstly one would have to convince all parties of the benefits that could be gained from such changes. And secondly, it is of utmost importance to convince consumers over the ease of use, if indeed these systems were to be found user friendly and simple to operate. Similarly, the research on NFC or RFID acceptance has shown that the perceived convenience having an significant impact, as well as positive effect on the consumers intention towards using the technology (Ohkubo, Suzuki & Kinoshita, 2005 ; Hossain & Prybutok, 2008).

According to *Director A*, convincing the consumers over the benefits gained, in exchange with the added discomfort of learning to operate such NFC solutions, is in fact key in regards to the possible adoption of such concepts. Due to the fact that consumers might easily shy away from these solutions if the amount of technical operating difficulty would prove too high in comparison to the reaped benefits.

5.3 NFC and OTC Pharmaceuticals - the Pharmaceutical Information System

According to *Director B*;" If this solution could save even one life, then there is enough causality and motivation for implementation, from the perspective of the governments and businesses"

However, according to *Director C* and *Director D*, respectively, currently one barrier for this type of system could be the fact that for example the "common man" i.e. technologically less capable or aware consumers would more likely still be inclined to ask the pharmacists and doctors for advice. According to *Director D*, usually the common preference is to place the responsibility on others, such as the professionals. Therefore the barriers for such technologies would become increasingly strong, if for example the main recommenders of these solutions would not include also professionals or other influencing entities, for example pharmacists, doctors and major drug manufacturers or brands. According to *Director D*, therefore it would be crucial for this type of technology be made aware to the consumers, by the professionals or opinion leaders, and with the leading example of the bigger and more known drug brands. Similarly, previous findings have found that the attitudes of the consumer towards the safety and security of NFC or RFID tagged products has been found to directly influence the propensity to purchase these products (Boeck et al. 2011).

And according to *Director A* and *Director B*, respectively, the consumers are currently not the main obstacle, in terms of adoption and acceptance, but that the main obstacle lies within the entities that would be willing to invest in such technology, and take the risks, with currently no information or research about the perceived acceptance or willingness of consumers to utilize these types of solutions.

Accordingly, *Director A* and *Director D*, respectively, stated that if such NFC solutions would indeed be made available, many of the current consumers would definitely utilize these, despite the added technological adaptation or learning that the usage of these would require. According to *Director A*, especially the people who use more than one drug simultaneously, and people that have pre-existing allergies, since these con-

sumers could in fact, in a worst case scenario, be placed in a life threatening situation, due to for example unawareness over medication compliance.

And according to *Director A*, these consumers who possess the very definite need for these types of technologically advanced solutions could possibly simultaneously also act as the innovators or early adopters, leading the way towards more wide spread consumer acceptance.

Director B brought forward an important consideration, that in the case of OTC pharmaceuticals, and all pharmaceuticals for that matter, there are two main parameters to consider, firstly Safety and secondly Effectiveness. If a new product or service would possess or enhance either one of these attributes, that already would constitute as a large enough reason for investment, implementation and simultaneously a very compelling sales argument as well. And according to *Director B*, a solution such the PIS, if being fully functional and cross implemented in the products and services, would certainly possess, and most likely also enhance both parameters. According to *Director B,* therefore the possible infrastructural changes are the main consideration, and barrier for current implementation of such NFC solutions, within the respective markets.

Accordingly, *Director A* and *Director B*, respectively, stated that many consumers might initially view such concepts as not being a necessity, more so if the amount of infrastructure, i.e. devices and applications, are as scarcely available as is the currently the case. Therefore the consumers might not be willing to make acquisitions of for example NFC enabled smart phones, simply for the sake of one application.

And according to *Director A*, the infrastructural changes is a key concern, according to him; if for example the majority of future smartphones would possess the technology readily implemented, then the barriers for adoption and usage would be far smaller, and most probably these types of NFC based solutions could become widely accepted and utilized.

And according to *Director A* and *Director D,* respectively, these systems would furthermore need to preferably be synced with the current and up-coming health and medical databases (eArchive), in order to avoid additional infrastructure modifications and investments, for the purposes of encompassing all health and medical data of the users.

Very notable is the mention by *Director A*, he sees that there is a clear social demand for such applications, and that for example the PIS system clearly makes sense, from a business perspective, due to the relative advantage that especially these NFC enabled products could provide the companies with. In accordance with this, *Director B* and *Director D*, respectively, mentioned that especially the Pharmaceutical brands should have great interest in being the first ones to utilize these types of NFC technology systems and applications, due the clear competitive advantage these would offer, and the ability to stand out positively in comparison to rivaling products or brands that may not yet utilize these. Thus, according to *Director D*, the companies or brands would also be establishing themselves as the main brand or company that consumers in their minds associate with the novel technology solutions, according to *Director D*; it's better to be first, than it is to be better.

All interviewees, respectively, stated that one of the key benefits of such a solution as the PIS, would the added possibilities for point of sale communication and post purchase services, with added opportunities for more personalized and enhanced service and information provision. And according to all interviewees, respectively, the possibilities for post purchase support provide by such NFC systems; can be seen as very important. Since the consumers would be able to utilize the system to self administer and use drugs, even with the simultaneous use of for example prescription medicines, thus gaining a substantial benefit, in terms of improving drug compatibility and coherence, and possibly even effecting and altering the number of for example ADR cases, for the better.

And according to *Director A*, people with substance or drug allergies would be especially eager to have such solutions in their possession, since for example certain substances in everyday OTC drugs, such as painkillers, could be very harmful for some people, and in some cases the consumers themselves are not aware of this. Since normally people consider that basic drugs like Aspirin or Ibuprofen, are coherently safe, even with simultaneous use alongside other drugs. And according to *Director A*, this would be one scenario where added user safety, as a selling argument, would become apparent. Since one of most apparent added benefits gained from these solutions would be the added user safety, and arguably better health. In accordance, Foh (2011) states that, mobile health technologies could in fact enable and take over several functions,

such as point of sale medical and health guidance, as well as post purchase health and medical support (Foh, 2011).

Another point brought forward by *Director C*, is that these solutions could as well be beneficial in terms of financial savings. For example for the pharmacies or even in the future the convenience stores, considering if such NFC systems as the PIS, could for example lower personnel related costs, due to the system taking over some of the main advisory functions. According to *Director C*, this would mean that even if one person's monthly salary would be sufficient enough to cover the implementation and other related costs of these technologies, then the pharmacies would have sufficient enough reason to be interested in these solutions.

Interestingly enough, according to the survey conducted by the Association of Finnish Pharmacies and PricewaterhouseCoopers, the free professional services offered by the pharmacies enable more than 500 million Euros (€) in healthcare savings, annually. Via the free health and medical advice and services offered by the pharmacies (Association of Finnish Pharmacies 2010). Therefore, the hypothetical economic and financial bene-fits of such solutions could become very apparent, and could constitute as a significant enough reason for considering the utilization of such applications and services, as the PIS, from both the Pharmacies and Governments point of view

According to *Director A*, *Director B* and *Director C*, respectively, ultimately the Pharma-ceutical companies are always after profit, and therefore the willingness to invest in both the infrastructural, as well as marketing and advertising changes, would have to be backed up by concrete and meaningful advantages.

Director A and *Director B*, respectively, said that one possible motivator for businesses to invest in this type of NFC solution, would be the support or possible exemptions provided by the Government. According to *Director A*, that due to the possible benefits reaped from this solution, one could argue that healthcare costs are minimized, since people are less likely to suffer from ADRs, and thus less likely to need health or medi-cal care. Hence the governments as well would be saving money, due to lowered healthcare and medical costs of the society at large.

And according to *Director A*, the hypothetically lowered tax rates or other monetary exemptions could also enable the products to be sold at competitive prices, with still large enough profit ratios for the businesses to be sufficiently interested in investing in NFC technology. If in fact these NFC products and services would be sold at aforementioned competitive prices, this would constitute as a rather strong marketing and selling point, and would simultaneously lower the barrier for consumer purchase decision making as well. According to *Director A*, when considering the fact that a brand that offers this technology in their products, would also be willing or able to sell these at reasonable prices, with added benefits in comparison to rivaling products, according to him; "this would be a definite win win situation."

Adding to this, *Director B* mentioned that the Finnish government could for example be willing to lower the TAV tax rates on the products that contain the NFC enabled PIS systems, since these could possibly be indirectly linked with benefits, such as improved health, and lowered healthcare and medical costs of the society.

These arguments are very much relevant, when considering estimates by the European Union; that the total cost to society of ADRs in the EU is € 79 billion (European Union, 2008).

6 CONCLUSIONS

The purpose of this thesis was to uncover and assess the possibilities, challenges and ultimately the conceivability, of utilizing NFC technology in Health and Medical Marketing, specifically within Finnish OTC Pharmaceutical markets.

For the means of this exploratory research, the PIS concept solution proposed by Jara et al. was chosen as the main practical implementation example, in order to more validly assess the aforementioned factors.

The main attempt was to try and shed light upon the question of whether or not NFC technology solutions, such as the PIS, would indeed have something meaningful to offer, for both the businesses and consumers.

This research can be considered valuable, in terms of portraying the bigger picture of Health and Medical marketing, applications and their respective services, in terms of their recent developments and assumed future directions, since similar research has previously not been conducted within these frameworks. Therefore, the research findings may be used in order to assess factors involved in the utilization of NFC technology based applications and services in OTC Pharmaceuticals. And as the interview findings of the research indicated, the possible benefits gained from the utilization of such solutions could in fact be rather wide ranging. However, these are accompanied by several challenges as well, which as of current may be considered as a rather large stepping stone, especially for the Pharmaceutical companies, that presumably would be the ones to initially invest and create these solutions.

The following conclusions are divided into three main sections, in accordance with the research questions, i.e. possible benefits, challenges and conceivability of utilizing NFC technology in OTC Pharmaceutical products and services.

6.1 Benefits

Drawing from the main interview findings, one may assume that the increase in both the supply and demand of Health and Medical applications and services, along with the increased usage of both online and mobile services and applications, according to the interviewees, can be considered as a positive sign towards both consumer and business willingness and readiness towards more enhanced and personalized means of Health and Medical marketing. And according to the interviewees, this increases the conceivability of the possible introduction of novel NFC technology solutions such as the PIS system, into the respective markets. Due to the fact the solution would enable the Health and Medical marketers' to deliver truly meaningful communication and services. In other words, promoting and protecting the Health of the consumers.

The growing market of OTC pharmaceuticals, and their increased sales margins, according to the interviewees, is one of the main reasons as to why these specific markets are becoming increasingly interesting and lucrative for the Pharmaceutical companies. Thus, according to the interviewees, the possible competitive advantage enabled by such product and service variations, could be seen as sufficient enough of a causality, for the both the device and system manufacturers, as well as Pharmaceutical companies, to be interested in creating and implementing these solutions.
And according to the interviewees, this on the other hand can viewed as an opportunity for improved marketing and advertising efforts i.e. health and medical based electronic and mobile communications and services.

Especially in the case of possible future scenarios, where OTC Pharmaceuticals could be sold through convenience stores as well. According to the opinions of interviewees, in these scenarios one could assume that, since the general exposure and consumer base of convenience stores higher than that of for example Pharmacies. And that assumedly the professional advice and support would become lower, in comparison to Pharmacies, that in this case both the stores and the Pharmaceutical brands would be willing to invest more efforts in various marketing efforts, such as point-of-sale marketing, in order to promote and advertise the benefits of such novel products and services, i.e. the provision of accurate, accessible and safe information concerning the purchase and consumption of Pharmaceuticals.

Based upon the opinion of the interviewees, the most apparent benefits for the consumers are rather clear; the NFC technology enabled PIS solution, if fully implemented and functional in mobile devices, as well as pharmaceutical products and services – could in fact largely enhance the purchase and post purchase processes and consumption of Pharmaceuticals, even to the degree where the Health of the consumers could be positively impacted, i.e. the solution could prevent ADR and allergy cases, hence preserve the Health of the users. According to the interviewees, this is because in most cases the patients themselves may not even be aware of the possible allergic or adverse reactions that may occur with the consumption of prescription-free or OTC Pharmaceuticals.

And when considering the possible benefits for the assumed providers of such NFC technology solutions, i.e. the Pharmaceutical companies, the interviewees stated as the most apparent benefits being the ability to provide a unique service, via the NFC enabled systems and products, and therefore being able to achieve an advantage over the competitors. The possible benefits could reach anywhere form; re-structuring Health Marketing efforts of the Pharmaceutical companies for the better, with the ability to provide much needed accurate and accessible Health and Medical information and services to the consumers. And according to the interviewees, this could also positively affect sales, since assumedly the purchase and re-purchase rate of the products that would contain the added benefit of NFC technology, would most likely be higher that of those that do not contain it.

Furthermore, according to the interviewees, there would also be other providers that could be very interested in these types of technology solutions, for example the pharmacies and the government. The interest of the pharmacies could lie within the possible personnel savings that such solutions could enable, via taking over some of the advisory functions. And the government should as well be interested in these solutions; since these possess the capability of minimizing medicine consumption related allergy and adverse reaction cases, as well as provide major saving in national healthcare expenditures via advisory and guidance function over medicines. Thus, possibly altering the amount of overall health related incidents and overall healthcare costs to the society, i.e. economic, financial and social benefits.

6.2 Challenges

The interview findings indicated that there are several challenges, concerning the momentary conceivability for the creation and implementation of such systems from both the business and consumer perspective. A large scale implementation of such solutions would require firstly significant infrastructural changes, i.e. majority of mobile device manufactures including NFC in their devices. As well as infrastructure changes from the information and service supply side, i.e. Pharmaceutical companies, Pharmacies, National healthcare and medical systems, as well as from the Governmental side. Secondly, the systems would have to coherently safe and secure, with strict rules and regulations, as well as monitoring over implementation and usage, in terms of personal safety and information security and confidentiality.

Hence, the current infrastructure levels were identified as being one of the main momentary barriers. Since NFC technology itself is currently still on the verge of growth, and the amount of devices that currently possess the capability to perform these NFC based functions, may possibly not be sufficient enough, in order for the main investors to take the risk, without sufficient market and consumer experience i.e. actual wants, needs and demands from the consumer side.

According to the statements provided by the interviewees, some of the key factors that come into play, whilst assessing factors regarding consumers' acceptance towards NFC technology products and services. Firstly the level of technological usage difficulty, secondly the security concerns involved with NFC technology use, and thirdly the personal traits of the individuals in question i.e. personal or community needs towards such solutions. Accordingly, the interviewees stated that; one of the main challenges, in terms of consumer acceptance and adoption of such NFC solutions, is the ease of use in regards to the benefits achieved from the actual system or service usage. In other words, the solution should provide the users with significant enough benefits, in order for them to be willing to adapt and cope with the usage of such technologies, along with their respective devices and services.

Current challenges for mass market implementation and approval became also apparent, whilst examining the interview findings. There are several key considerations that need to be taken into account, whilst assessing consumers wants, needs, willingness

and even usage ability towards the technology, especially in the context of Pharmaceutical products and services. Due to the fact that, according to the interviewees, the majority of people, when dealing with Pharmaceuticals, even in the case of OTC Pharmaceuticals, tend to prefer the advice of for example doctors or pharmacists. Therefore, in order to achieve acceptance and ultimately adoption of these solutions, emphasis must be placed upon marketing and promoting these to the opinion leaders. According to the interviewees, these initial consumer groups need to firstly, become interested, secondly purchase, thirdly be able to actually cope with the use of the technology, and lastly to see sufficient enough beneficial gains achieved from the use of these products and services, in order for them to positively influence the behaviour of the remaining consumer groups.

Furthermore, according to the interviewees, these assumed innovator or early adopter groups would most likely initially consist of consumers with distinct needs towards such applications. For example people who use more than one form of medication simultaneously, people who have substance allergies or people who are very conscious and particular about the safety and general usage of Pharmaceuticals.

6.3 Conceivability

Based upon the opinions of the interviewees, this type of technology solution could be more than beneficial for businesses and consumers alike, and thus according to the interviewees, it can be considered as possessing immense potential for mobile health and medical technologies, as well as their respective methods and means of marketing. The possible benefits that were stated by the interviewees, could range anywhere from; major savings in national healthcare costs, due to for example taking over some of the advisory and guidance functions and hypothetically reducing the amount of ADR incidents. Or improved profit ratios, due to for example governmental tax exemptions. Also, according to the interviewees, one may assume that these could be accompanied by the increased sales of the products and services that contain the technology, due to their specialized and unique offering. And last but, very certainly not least, the interviewees were in the opinion that the assumable benefits for the consumers, the actual

users of these solutions, would be very considerable – with enhanced purchase and post purchase communication and support, concerning the consumption and usage of medicinal products, accessible through the users own mobile devices, at any given time and place, i.e. numerous Health and Medical related benefits for the users.

According to the interviewees, there is a clear role that such NFC technology solutions could play in the future of Health and Medical marketing efforts. After all the purpose of Health Marketing is to create, communicate and deliver Health information and services, in order to promote and protect the Health of the consumers. According to the interviewees, in essence, the PIS would be meant for these exact purposes – therefore there is not only a clear plausibility for the utilization of such solutions, according to the interviewees; there is a clear need for such solutions, since assumedly these solutions could improve and make the purchase and consumption processes of medications more accurate and safe i.e. providing overall Health benefits to the consumers.

Concluding the opinions of the interviewees concerning the current conceivability of the assessed scenario, the assumption can be made that, at the very least the Pharmaceutical manufacturers or marketers should have sufficient causality to look into these types of solutions, whether form an economic, social or financial stand point - despite the amount of overall changes and investments that this scenario would require. However, one key take away from the interview findings is that; if in fact such solutions would be made into reality, and available for consumer use and purchase, the hypothetical timeframe of this happening, may most likely be still years away.

6.4 Limitations and Future Research

There were limitations to this research. The lack of existing concept solutions, such as the PIS solution, did not allow to field test these applications. In order to validly assess and determine factors concerning the usage and resulting implications, one would have had to firstly, create the solution, with the help of experienced professionals. And secondly, one would have had to gain access to national healthcare databases of the test

subjects, and preferably with the allowance and co-operation of Pharmacies, in order to conduct realistic field testing within the examined sales outlets.

Simultaneously, the same limitations apply to the assessment over consumer behaviour, in regards to the actual acceptance and usage of the proposed system solution. As the research relied on the findings from existing literature and qualitative interview materials, and due to the lack of existing research concerning the topic and proposed scenario of the research, the findings can be considered as exploratory.

Nevertheless, validity for the research questions was achieved, since the core aim was to determine the possible benefits, challenges and ultimately conceivability of utilizing NFC technology in Health and Medical marketing, more specifically in OTC Pharmaceutical products and services.

Therefore it would be of even greater use, for both the Pharmaceutical businesses, as well as for the consumers at large, if future work would dive deeper into the actual functionality and usage aspects of such concept solutions and their respective users.

The apparent need to firstly create and secondly more extensively test such concept solutions is evident. In order to more explicitly determine the benefits and challenges that may arise with mass market trial and usage. Consequently finding definite answers to the question of; whether in fact such technology solutions actually possess the capability of becoming the next big breakthrough in Health and Medical marketing.

REFERENCES

Abd Allah, M.M., 2011. Strengths and *Weaknesses of Near Field Communication (NFC).* Technology Global Journal of Computer Science and Technology Volume 11 Issue Version 1.0 March 2011. 51-56.

American Marketing Association., 2007. *Definition of Marketing.* [online] Available at: http://www.marketingpower.com/AboutAMA/Pages/DefinitionofMarketing.aspx [Accessed 10 May 2012]

Association of Finnish Pharmacies., 2009. Kymmenen kysymystä itsehoitolääkkeistä. [online] Available at: http://www.kokkolankeskusapteekki.fi/wp-content/uploads/2011/07/10_kysymystä_itsehoitolääkkeistä_suomeksi_2009.pdf [Accessed 22 April 2012]

Association of Finnish Pharmacies, 2010. Advice from pharmacies saves hundreds of millions. [online] Available at: http://www.apteekkariliitto.fi/en/press-releases/advice-from-pharmacies-saves-hundreds-of-millions.html [Accessed 26 April 2012]

Association of Finnish Pharmacies, 2012. [online] Available at: http://www.apteekkariliitto.fi/fi/apteekkitieto/apteekit-numeroina.html [Accessed 26 April 2012]

Berg Insights, 2012a. *Handset Connectivity Technologies* [online] Available at: http://www.berginsight.com/ReportPDF/ProductSheet/bi-hct3-ps.pdf [Accessed 16 April 2012]

Berg Insights, 2012b. *NEWS ARCHIVE / News* [online] Available at: http://www.berginsight.com/News.aspx?m_m=6 [Accessed 16 April 2012]

Bernhardt, J.M., 2006. Improving Health Through Health Marketing. Prev Chronic Dis., 3(3).

Boeck, H., Roy, J., Durif, F. and Grégoire, M., 2011. *"The effect of perceived intrusion on consumers' attitude towards using an RFID-based marketing program".* The Fifth International Workshop on RFID Technology - Concepts, Applications, Challenges. Procedia Computer Science 5 (2011), 841-848.

Cap Gemini. 2011. Kauppa osana lääkejakelun uudistusta - lääkejakelun pohjoismainen kehitys. [online] Available at: http://www.pty.fi/fileadmin/pty_tiedostot/tiedotteiden_liitetiedostot/Kauppa_2011_201 2/Kauppa_2012_PTY_Sami_Finne.pdf [Accessed 28 April 2012]

Centers for Disease Control and Prevention., 2005. Gateway to Health Communication & Social Marketing Practice – What is Health Marketing? [online] Available at: http://www.cdc.gov/healthcommunication/ToolsTemplates/WhatIsHM.html [Accessed 10 May 2012]

Chavira, G., Nava, S. W., Hervás, R., Villarreal, V., Bravo, J., Martín, S. and Castro, M., 2008. *"Services through nfc technology in ami environment",* in iiWAS '08: Proceedings of the 10th International Conference on Information Integration and Web-based Applications & Services. New York, USA: ACM, 2008, 666-669.

Crazier, J., Jensen, A., and Dave, D., 2008 "*The Impact of Consumer Perceptions of Information Privacy and Security Risks on the Adoption of Residual RFID Technologies."* Communications of the Association for Information Systems, 23(14).

Daymon, C., and Holloway, I., 2004. Qualitative Research Methods in Public Relations and Marketing, Communications. London: Routledge.

Davis, F. D., Bagozzi, R. P. and Warshaw, P. R., 1989. "User acceptance of computer technology: A comparison of two theoretical models", Management Science, vol. 35, no. 8, 982-1003.

Egan, J., 2007. Marketing Communications. London, Thomson Learning.

Ernst & Young., 2012. *Building Pharma 3.0. There's an app for that: investments in smartphone apps soars.* [online] Available at:
http://www.ey.com/GL/en/Industries/Life-Sciences/Progressions--building-Pharma-3-0 [Accessed 10 May 2012]

European Commission, 2007. Protection of personal data. [online] Available at:
http://europa.eu/legislation_summaries/information_society/data_protection/l14012_en.htm [Accessed 16 April 2012]

European Union., 2008. *Strengthening pharmacovigilance to reduce adverse effects of medicines.* [online] Available at:
http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/08/782&format=HTML&aged=1&language=en&guiLanguage=en [Accessed 30 April 2012]

Federation of Finnish Commerce. 2011. Itsehoitolääkkeitä vaaditaan kauppoihin. [online] Available at:
http://www.kauppa.fi/ajankohtaista/uutiset/itsehoitolaeaekkeitae_vaaditaan_kauppoihin_21227 [Accessed 28 April 2012]

Fimea. 2010a. Kansallinen lainsäädäntö. [online] Available at:
http://www.fimea.fi/lait_ja_ohjeet/kansallinen_lainsaadanto [Accessed 20 April 2012]

Finlex. Lääkelaki 10.4.1987/395. [online] Available at:
http://www.finlex.fi/fi/laki/ajantasa/1987/19870395 [Accessed 20 April 2012]

Finkenzeller, K., 2008. *RFID Handbuch. Grundlagen und praktische Anwendungen von Transpondern, kontaktlosen Chipkarten und NFC.* Carl Hanser Verlag, München (2008). 239-263.

Foh., 2011. Mobile health in the pharmaceutical industry. [online] Available at:
http://serving.webgen.gsm.org/5926DA9A-2DD6-48E7-BAD4-50D4CD3AF30A/assets/mobilehealthinthepharmaceuticalindustry-1.pdf [Accessed 20 April 2012]

Forum Nokia, 2011. *Introduction to NFC* [online] Available at: http://www.adafruit.com/datasheets/Introduction_to_NFC_v1_0_en.pdf [Accessed 15 April 2012]

Google, 2012. Google wallet [online] Available at: http://www.google.com/wallet/ [Accessed 16 April 2012]

Hardy, R., and Rukzio, E., 2008. "*Touch & interact: touch-based interaction with a tourist application",* in MobileHCI 08: Proceedings of the 10th international conference on Human computer interaction with mobile devices and services*.* New York, USA: ACM, 2008, 531-534.

Hirsijärvi, S. and Hurme, H., 2004. Tutkimushaastattelu. Teemahaastattelun teoria ja käytäntö. Yliopistopaino. Helsinki

Hossain, M. M. and Prybutok, V. R., 2008 "Consumer Acceptance of Rfid Technology: An Exploratory Study", IEEE Transactions on Engineering Management, (55) 2, 316-328.

iHealthBeat., 2011. 44M Mobile Health Apps Will Be Downloaded in 2012. [online] Available at: http://www.ihealthbeat.org/articles/2011/12/1/44m-mobile-health-apps-will-be-downloaded-in-2012-report-predicts.aspx [Accessed 10 May 2012]

IMS Research, 2011. *35 Million Handsets in 2011 Marks Breakthrough Year for Mobile Near-Field Communications* [online] Available at: http://imsresearch.com/news-events/press-template.php?pr_id=2469 [Accessed 16 April 2012]

Isomursu, H., Isomursu, P. and Komulainen-Horneman, M., 2008. *"Touch to access the mobile internet",* in OZCHI '08: Proceedings of the 20th Australasian Conference on Computer-Human Interaction. New York, NY, USA: ACM, 2008, 17-24.

Jara, A.J., Belchi, F.J., Alcolea, A.F., Santa, J., Zamora-Izquierdo, M.A. and Gómez-Skarmeta, A.F., 2010. *"A Pharmaceutical Intelligent Information System to Detect Allergies and Adverse Drugs Reactions based on Internet of Things"*. IEE 2010, 809-812.

Juniper Research., 2011. Mobile healthcare opportunities. [online] Available at: http://www.juniperresearch.com/reports/mobile_healthcare_opportunities [Accessed 10 May 2012]

KanTa., 2012a. *eArchive – An electronic archive of patient health records* . [online] Available at: https://www.kanta.fi/c/document_library/get_file?uuid=b45748a6-a478-47d2-931e-1b4eaed16f44&groupId=10206 [Accessed 28 April 2012]

KanTa. 2012b. Potilastiedot sähköiseen arkistoon [online] Available at: https://www.kanta.fi/fi_FI/c/document_library/get_file?uuid=837d99e3-7fe9-4ef8-9e99-feb9f8dfd128&groupId=10206 [Accessed 30 April 2012]

Kotler, P., Wong, V., Saunders, J., and Armstrong, G., 2005. Principles of Marketing: Fourth European Edition. Harlow. Pearson.

Kowatsch, T., Maass, W. and Fleisch, E., 2011. The role of product reviews on mobile devices for in-store purchases:consumers' usage intentions, costs and store preferences. Int.J. Internet Marketing and Advertising, Vol. 6, No. 3, 226-240.

Kvale, S., 1996. Interviews: An Introduction to Qualitative Research Interviewing. London. SAGE.

Lee, Y., Kozar, K. A. and Larsen, K. R., 2003. "The technology acceptance model: Past, present, and future", The Communications of the Association for Information Systems, vol. 12, 752-780.

Lindqvist U., Aikala, M., Federley M., Hakola L, Mensonen, N., Moilanen, P., Viljakainen, A. and Laukkanen M., 2009. *Hybrid media in packaging.* VTT Working Papers 142, Espoo, 2009. 9-50.

Morrison, A. and Arnall, T. 2011. *Visualizations of Digital Interaction in Daily Life.* Computers and Composition, Volume 28, Issue 3, September 2011, 224-234.

NFC Forum, 2011. *NFC Forum White Papers. Near Field Communication in the real world – part I: Turning the NFC promise into profitable, everyday applications* [online] Available at: http://www.nfc-forum.org/resources/white_papers/Innovision_whitePaper2.pdf [Accessed 16 April 2012]

NFC Forum, 2012a. *The NFC Forum.* [online] Available at: http://www.nfc-forum.org/aboutus/ [Accessed 15 April 2012]

NFC Forum, 2012b. *Near Field Communication and the NFC Forum: The Keys to Truly Interoperable Communications* [online] Available at: http://www.nfc-forum.org/resources/white_papers/nfc_forum_marketing_white_paper.pdf [Accessed 15 April 2012]

NFC World, 2012a. *NFC Phones that you can buy today.* [online] Available at: http://www.nfcworld.com/nfc-phones-list/#available [Accessed 15 April 2012]

NFC World, 2012b. *NFC Phones that are coming soon...* [online] Available at: http://www.nfcworld.com/nfc-phones-list/#rumoured [Accessed 15 April 2012]

Office of Behavioral and Social Sciences Research, 2012. mHealth - Mobile Health Technologies [online] Available at: http://obssr.od.nih.gov/scientific_areas/methodology/mhealth/index.aspx [Accessed 25 April 2012]

Ohkubo, M., Suzuki, K. and Kinoshita, S. 2005. " Rfid Privacy issues and technical challenges". Volume 48, Issue 9, September 2005, 66-71.

Ok, K., Coskun, V., Aydin, M. and Ozdenizci, B., 2010. *Current Benefits and Future Directions of NFC Services*. 2010 International Conference on Education and Management Techology (ICEMT 2010) 334-338.

O'Neill, E., Thompson, P., Garzonis, S. and Warr, A., 2007. *"Reach out and touch: Using nfc and 2d barcodes for service discovery and interaction with mobile Devices"*. Berlin, Heidelberg, 2007, vol. 4480, 19-36.

Persaud, A. and Azhar, I. 2012. *"Innovative Mobile Marketing via Smartphones: Are Consumers ready?"*. Marketing Intelligence & Planning, Vol. 30 Iss: 4, 3-3.

Pharma Industry Finland, 2008. Code of Ethics. [online] Available at: http://www.pif.fi/Banners/PIF_Code_of_Ethics_08_final%20(ID%203978).pdf [Accessed 16 April 2012]

Pharma Industry Finland, 2010a. Self-care medicines. [online] Available at: http://www.pif.fi/frontpage/pharmaceutical_industry/selfcare_medicines [Accessed 24 April 2012]

Pharma Industry Finland, 2010b. Pharmaceutical Distribution. [online] Available at: http://www.pif.fi/frontpage/pharmaceutical_industry/pharmaceutical_distribution [Accessed 24 April 2012]

Pharma Industry Finland, 2010c.Area of Operation. [online] Available at: http://www.pif.fi/frontpage/pharmaceutical_industry [Accessed 22 April 2012]

Pharma Industry Finland, 2010d. Pharmaceutical Market. [online] Available at: http://www.pif.fi/frontpage/pharmaceutical_industry/pharmaceutical_market [Accessed 20 April 2012]

Pharma Industry Finland, 2010e. Medicine Prices. [online] Available at: http://www.pif.fi/frontpage/pharmaceutical_industry/medicine_prices [Accessed 22 April 2012]

Pharma Industry Finland. 2012a. Itsehoitolääkinnän taloudelliset vaikutukset ja itsehoi-tolääkinnän institutionaalinen toimintaympäristö. [online] Available at: http://www.laaketeollisuus.fi/Tiedostot/LT_itsehoitoraportti_valmis_netti_2%20(ID%20 24630).pdf [Accessed 24 April 2012]

Pharma Industry Finland, 2012b. Finnish Pharmaceutical Market. [online] Available at: http://www.pif.fi/Tiedostot/10%20wholesales%20trend.pdf [Accessed 21 April 2012]

Pharma Industry Finland, 2012c. Medicine Prices. [online] Available at: http://www.pif.fi/Tiedostot/06%20Wholesale%20price%20index.pdf [Accessed 21 April 2012]

PTY., 2010. Pitäsiikö reseptivaitten lääkkeiden vähittäismyyntiä laajentaa myös suo-messa? [online] Available at: http://www.pty.fi/fileadmin/pty_tiedostot/tiedotteiden_liitetiedostot/Kuulemistilaisuus/F armasialiitto.pdf [Accessed 28 April 2012]

PTY., 2009. Itsehoitolääkkeiden kaupan vapauttamisen merkitys kuluttajille ja kaupalle. [online] Available at: http://www.pty.fi/fileadmin/pty_tiedostot/Tutkimukset/ETLA_Itsehoitolaeaekkeiden_ka upan_vapauttamisen_merkitys_kuluttajille_ja_kaupalle.pdf [Accessed 28 April 2012]

Roberts, C., 2006. Radio Frequency Identification (RFID), "Computers & Security" Vol, 25, no. 1, 18-26.

Rogers, E., 1995. Diffusion of Innovations. Fourth edition. New York. The Free Press.

Rothensee, M. and Spiekermann, S., 2008 *"Between Extreme Rejection and Cautious Acceptance: Consumers Reactions to RFID-Based IS in Retail."* Social Science Comput-er Review, 26(1), 75-86.

Sanchez, I., Riekki, J., Rousu, J. and Pirttikangas, S., 2008. *"Touch & share: Rfid based ubiquitous file containers"*,in MUM '08: Proceedings of the 7th International Con-ference on Mobile and Ubiquitous Multimedia. New York, NY, USA: ACM, 2008, 57-63.

Saunders, M. and Lewis, P. and Thornhill, A., 2000. Research Methods for Business Students. Second edition. Essex, Pearson Education.

Sill, H., Fisher, S. and Wasserman, M., 2008 "Consumer reactions to potential intrusiveness and benefits of RFID."International Journal of Information Technology and Management, 7(1), 76.

Solomon, M., Bamossy, G., Askegaard, S. and Hogg, M.K., 2006. Consumer Behaviour- A Euoropean Perspective. Third edition. Upper Saddle River, New Jersey, USA. Prentice-Hall.

Uhrich, F., Sandner, U., Resatsch, F., Leimeister, J., Helmut,M., *2008 "RFID in Retailing and Customer Relationship Management."* The Communications of the Association for Information Systems, 23(13), 219-234.

Venkatesh, V. and Davis, F., 2000. "A theoretical extension of the technology acceptance model: Four longitudinal field studies", Management Science, vol. 45, 186-204.

Venkatesh, V., Morris, M.G., Davis, G. B. and Davis, F. D., 2003 "User acceptance of information technology: Toward a unifed view". MIS Quarterly, vol. 27, no. 3, 425- 478

VTT, 2007. *Physical browsing with NFC technology.* [online] Available at : http://vtt.fi/inf/pdf/tiedotteet/2007/T2400.pdf [Accessed 15 April 2012]

WHO, 2012. Mobile Health (mHealth). [online] Available at: http://www.who.int/goe/mobile_health/en/index.html [Accessed 25 April 2012]