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e-Prescriptions

Privacy concerns and security risks in Greece's e-Health care system

Author: Maria Papakonstantinou
Supervisor: Jeff Winter
Examiner: Christina Mörtberg

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Abstract

The present thesis presents an informed by ethnography research that seeks to explore the privacy concerns and security risks that individuals perceive with regards to the electronic system of handling digital prescriptions. The research takes place in Athens, Greece and the participants are professionals who use daily the e-prescription platform and citizens whose data is being gathered and accessed. The paradiagm within which the research is unfolded is the interpretive one and a methodology of flexible design is followed. Thematic analysis of concepts produced by the data gathered is followed in order to offer an understanding of the concerns that the participants perceive. The methods that were used were interviews with professionals, focus groups with groups of citizens, individual interviews with citizens, observations and thinking aloud in pharmacies. The aim of the thesis is to illuminate those concerns with the aspiration that it be used as a basis for further research on the important issue of privacy of sensitive, medical data and suggest ways that could help ameliorate the identified concerns.

Keywords

Information Systems, medical information, e-prescriptions, privacy, security, flexible design, interviews, focus groups, observation, thinking aloud, Greece.

Acknowledgments

"The best thing for being sad," replied Merlin, beginning to puff and blow, "is to learn something. That's the only thing that never fails. You may grow old and trembling in your anatomies, you may lie awake at night listening to the disorder of your veins, you may miss your only love, you may see the world about you devastated by evil lunatics, or know your honour trampled in the sewers of baser minds. There is only one thing for it then — to learn. Learn why the world wags and what wags it. That is the only thing which the mind can never exhaust, never alienate, never be tortured by, never fear or distrust, and never dream of regretting. Learning is the only thing for you. Look what a lot of things there are to learn."

— T.H. White, The Once and Future King

Through the course of this Master Program I experienced so many diverse feelings: the undeniable joy of learning, the creativity of thinking outside of my comfort zone, the excitement of meeting and working with new people, the occasional despair when projects did not turn out good enough and the perseverance of trying again and again until they finally did. Deciding to apply for this Program was definitely, one of the best decisions I ever made!

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Finally, this thesis is dedicated in loving memory of my grandmother: the strongest and most warm-hearted person I have known. I wouldn't be who I am if it wasn't for you.

List of abbreviations

AMKA: Social Security Number
API: Application Programming Interface
EC: European Commission
ECB: European Central Bank
EHR: Electronic Health Records
EMR: Electronic Medical Records
EOPYY: National Agency of Health Services
EPR: Electronic Personal Record
HPA: Hellenic Pharmaceutical Association
ICD-10: International Codes of Disease
ICT: Information and Communication Technology
IDIKA: Greek e-Government Centre for Social Security
IKA: Asylum for Social Security
IMF: International Monetary Fund
IS / IT: Information Systems / Information Technology
OGA: Organization for Farmers' Social Security

Contents

1. Introduction

Greece, a small country in Southern Europe, with a population of 10.96 million (World Bank, 2014) has been facing substantial economic issues for the past years which led the country to enter the mechanism "STIRIKSIS" of Troika in 2010, according to the IMF (2010). This Triad of constitutions is comprised by the European Commission (EC), the European Central Bank (ECB) and the International Monetary Fund (IMF). One of the conditions of the first Memorandum of Economic and Financial Policies signed with Greece was that the country would be required to digitalize the medical prescriptions as a way to render the country able to better control the budget and financial policies and state of affairs (Vassilakopoulou & Marmaras, 2013, p. 5).

The reason behind this particular condition was that for many years, the organisation of the national health system of Greece was rather chaotic and by digitalising the prescription system the country was expected to observe substantial economic benefits (timetvchannel, 2012). There were multiple social security funds and individuals belonging to each of them had to go to specific doctors who were affiliated with it. To give a deeper understanding of this, it is hereby commented that up until a few years ago when the changes begun to be implemented, there were 35 different social security funds in Greece which according to official statistics, covered up to 97% of the Greek population (Notara, Koupidis, Vaga & Grammatikopoulos, 2010). It goes without saying that the medical prescriptions were written manually and many problems occurred due to this. In October of 2010 electronic prescription (or e-prescription) was introduced to the Greek population, in the beginning only to a small social security fund as explained by the chief consultant of the developing company in national television (timetvchannel, 2012). After a period of testing and further changes in the national health care system (Vassilakopoulou & Marmaras, 2013, p. 6) e-prescription was given its current form. The main mechanics of the platform is that doctors are given credentials to have access to the platform and then by using these credentials to log in to the system they can prescribe medicine to their patients. Additionally, pharmacists are also assigned credentials and granted access to the platform, so that when patients visit their pharmacy they can give them the medicine they need.

As a general definition, e-prescribing is the fully digitalised process of writing, transmitting and fulfilling a medical prescription and when fully implemented it brings substantial benefits to a health care system (Corley, 2003). However, in Greece the e- in the e-prescription comes from a computer generated and then printed out paper prescription, which has substantial benefits none the less (Schade, Sullivan, de Lusignan, & Madeley, 2006, p. 6).

However, the system is not without problems. A very common issue is that the webpage often goes offline, especially during the first and last days of each month when the patients rush to the clinics and private practices of doctors to refresh their prescriptions. During these periods of time the system cannot be of service to the medical staff and the patients cannot be further helped. Additionally, the privacy of the patients may be compromised as the security of the data stored in the databases might be at risk from cyber-attacks that may aim at obtaining information about patients, with malicious intentions.

The main concern in this research is to examine how the involved individuals perceive the potential risks their privacy and personal information face while using the e-prescription system. By focusing on the various stakeholders I will shed light on these issues that may have been overlooked by different groups of people (i.e. doctors, pharmacists and the general public that relates to the online system). As the national health care on-line system is an issue that is relevant to a great number of Greeks, I believe that a study that looks into its perceived security risks and other factors would be of interest. Even though the technicalities of actual security risks and gaps in the e-Health platform are not within the scope of this study, suggestions on how the concerns of the people involved should be taken into consideration will be made nevertheless.

1.1 Motivation and Purpose

Even though technological advancements in healthcare have facilitated the providing of care and are more likely to advance even further the science itself, however, with the same evolution, potential privacy and security risks can be more frequent too (Appari and Johnson 2010, p.297).

In Peter Vlemmix's documentary "Panopticon", the director, through interviews, describes how the hack of a Dutch company that offered security certificates could potentially lead to a major leak of medical data of psychological diagnoses (Vlemmix, 2013). According to him, leaking of such data poses a very real risk when medical data are stored in databases, regardless of the level of encryption that they may have (Vlemmix 2013).

Taking into consideration the abovementioned points, I aim with this research to examine the perception of privacy and security issues in the Greek e-prescription system, both by the healthcare providers and the healthcare consumers. In the event of a clinical information leak, the privacy of citizens would be heavily violated. As a further complication, this may have a negative impact on the citizens' trust in the officials.

Additionally, I will examine how or whether the different stakeholders (medical staff such as doctors and pharmacists and patients alike) understand these risks and how they work around them.

To be more precise, the actual research is focused on understanding how concerned the involved parties are, with regards to privacy of medical data and other sensitive information, as well as security of medical data.

The information gathered from this study will not only be used as a way of mapping the potential risks involved, but I will also be looking at patterns and suggestions on how the concerns of the stakeholders should be taken into consideration while in the design process of the e-Health platform but after it as well.

Thus, the research question is divided in two parts and is formulated as follows:

- Which are the privacy and security concerns that healthcare providers (i.e. doctors and pharmacists) and healthcare consumers (i.e. citizens) perceive, that are related to the use of the on-line e-prescription system?

and

- How can those concerns be addressed in order to assuage the situation?

1.2 Relevance

By looking for answers to these questions I intend to shed light to these complicated issues of privacy and security that may affect the lives of many citizens of Greece. The results might prove useful for individuals in raising the general awareness in privacy and security issues that affect a great number of people. If an issue is not talked about, then it might pass unobserved. However, if the general awareness is raised and individuals speak up about it, then as more attention is drawn to it, the more likely it is to be fixed.

Furthermore, as per my intention, I look at how patients and individuals perceive these privacy and security risks. Thus, the results might prove useful for officials, psychologists or social scientists who might be interested in examining how the population perceives the aforementioned important issues of privacy and security, along with their views on privacy and its protection, from a sociological perspective.

Lastly, even though no developers took part in the actual research I believe that they could benefit from the findings I present later in this paper. To be more precise, developers in the field of e-Health security could find the findings illuminating as the concerns and risks are presented in clusters and thus will offer a relevant ease of reference for anyone interested.

1.3 Scope and Limitations

This research aims at exploring and understanding how citizens of Greece perceive issues that highly affect them, i.e. in this case, protecting their privacy and what may endanger the privacy of their sensitive medical information and security concerns relevant to the software and infrastructure that handles them, stores them and uses them. In order to achieve this aim, individuals from three different citizen categories have participated in my study.
One of the limitations of the research is that no developers of the e-prescription.gr platform have participated. Even though it was initially my intention to also include this category of involved individuals, however I was not able to contact them. I consider this a limitation as their professional opinions would answer and clarify potential questions and illuminate on precious information about the mechanics of the platform to better understand the way that it functions. A second limitation is that most participants of my research were individuals from my greater social circle. Many reasons led me to this decision. To start with, I had to consider what options were available to me with regards to the particularities of a thesis: the big distances that divide different parts of Athens paired with the limited time frame of the research itself

would render it impossible for me to expand the research in various areas of the capital. The result of the aforementioned conditions led me to choose:

- to focus on one area for the individual interviews (i.e. the municipality of Amarousion, individuals where included via invitations left at the Library) and
- easy access to the participants for the rest of the methods used.

More importantly, as not all municipalities are considered the same wealthy and keeping in mind that I aimed to include individuals from various socioeconomic standing, the easiest way to accomplish that was by including citizens from various areas of Athens. In turn, the only way I could accomplish that in a timely manner was by choosing individuals I was already familiar with to participate in my research.
As the subject of the thesis is relevant and informed from Greece's reality it was conducted in Greece and more particularly, in Athens. Citizens in other cities or remote areas may experience the process of working with the platform or the process of being dependent on the platform differently or even have different or additional concerns. Some of the professionals that participated have mentioned the situation in other parts of Greece, but all the information and data that I gathered first hand was about the situation in Athens.
Lastly, as all participants are Greeks, the methods used and the information gathered was in Greek. Consequently, everything had to be translated in English which may have slightly altered the tone that the participants conveyed their thoughts to me.

1.4 Disposition

The following chapters of the thesis are presented below:

Chapter 2: Literature Review
Chapter two presents previous research and literature review that are relevant to the subject of e-Health.

Chapter 3: The Greek medical system
An explanation of the Greek medical system is given in chapter three, with the goal of acquainting the reader with the Greek reality in the health sector.

Chapter 4: Paradigm, Methodology and Methods
Chapter five explains and presents the paradigm within which the research takes place and the methodology and methods that were chosen and used for this thesis. General information about the research setting as a whole, as well as information on participants can be found here. Additionally, the validity and reliability of the research along with ethical considerations are presented in this chapter.

Chapter 5: Data Gathering
This chapter presents the process of gathering the data of the research. The description of the settings for each method used can be found here.

Chapter 6: Analysis
Here is where the empirical findings are presented, based on the concepts generated of the material that was gathered.

Chapter 7: Discussion
The findings of the previous part are discussed in this section. Additionally, ethical issues are also mentioned and discussed as well as personal reflections.
Chapter 8: Conclusion
This chapter contains the conclusion of the research conducted along with suggestions for possible further research.

References
All literature used in this thesis can be found here.

Appendices
In this section of the thesis consent forms, interview guides, invitations, software used and other content can be found.

2. Literature Review

This chapter aims at presenting international scientific articles that can contribute to this research. Their main points are discussed and then similarities and differences are drawn, with regards to the Greek reality. Additionally, they will again be used in the Discussion part of the thesis, as guides, in order to discuss the empirical findings that I locate ad mention.

Information Systems research includes also research with a focus on security issues. For example, Bulgurcu, Cavusoglu and Benbasat (2010) argue how risks that are related to information security in corporate settings are increasingly demanding more attention.

Issues have also been examined in IS/IT systems and services in healthcare. For example, Agbele, Nyongesa and Adesina (2010) describe the situation in a developing country and discuss the technology components of a successful and trusted application of e-Health. Various definitions are provided by them, which aims at familiarizing the readers with the terminology and also making certain that researchers have the same theoretical base, when it comes to terms like e-Health, EHR (Electronic Healthcare Records) and so on. They mention the EHR standards that should define all the interactions that are observed under the umbrella of e-Health and are included in the patients' personal health records. Even though their case is an African country, those standards are meant to be international and thus can be applicable to Greece too.

As trust in these records is of utmost importance, the authors go on to list what they regard are factors that make e-Health systems more trustworthy, by referencing various researchers. Additionally, they explain why special training and professionalism is required when handling sensitive personal medical information and, of course, this can, and should, be applied to the Greek reality as well. If there is a breach in the security the patient is under serious risk of getting discriminated by third parties, such as potential employers or insurance issuing agencies. Proper legislation that would impose heavy penalties for such discriminations in the event of a security breach could function as a safety measure for individuals who might fall victims of leaked information.

Finally, Agbele, Nyongesa and Adesina (2010) make reference to the challenges of implementing EHR in developing or poor countries. Greece, being in the current state of economic recession, faces some of the same challenges that are mentioned. In particular, lack of investments in the health sector of the state and shortage of workforce due to relocation to higher salary paying countries are aspects of the Greek reality in these past years of economic crisis.

Anderson (2007) discusses the benefits and barriers medical practitioners see in the general and widespread implementation of Information Systems in health care in the USA. In addition to that, he makes an account of the contemporary status of said information systems.

Even though the situation in Greece is different compared to the USA there might still be lessons to be learnt. In the US, the most recognizable barriers, according to Anderson (2007), appear to be lack of public or government funding, complex and un-unified systems that do not allow for exchange of clinical data, privacy and legal barriers. He also argues of an open-source and low cost EMR (Electronic Medical Records)

software, as developed by the American Academy of Family Physicians in the US according to the author (2007, p.482), which may prove beneficial for EU states as well. Quite so, if we look at the European Union level, a centralized system for e-prescriptions could solve various issues of compatibility within the EU as citizens of EU member states can travel freely within the Union and seek medical treatment wherever they are, if need arises. (European Commission, n.d.). In Greece's particular reality, relevant issues can be observed. Even though there is a public centralized system for prescribing medicine electronically, not all medical data can be found in one platform nor are they accessible from different ones. Consequently, the barriers mentioned in Anderson's work (2007) could provide useful insight to both the EU and Greece's e-Health systems.

Similarly, Nataraj (2011) describes the way that e-prescription works in the USA and talks about the risks that the system may have. He argues that privacy and security risks may develop in various areas such as the health care provider's IT environment or the traffic director. As mentioned in his work, in recent years there has been an increase in e-prescriptions in the USA and additionally to this there is a push from the US government for these numbers to grow still.

Even though in Greece the situation is different from North America, but still similarities and comparisons can be observed and drawn. As Nataraj (2011) suggests, there are three main risks of paper prescriptions, among many others:

> *"(...) 1) provider errors in handwriting interpretation by pharmacists, 2) risk of fraud duplicating paper prescriptions and 3) the inability to keep track of a patient's medication list."* (p. 15)

Before the creation of e-prescription.gr, all three risks identified above applied to the Greek situation. Now however, with the e-prescription web page, we may find that just the second one applies.

The liabilities that Nataraj (2011) mentions in the digitalized process of generating prescriptions however, do apply to Greece in their whole. In particular, an individual's privacy would be violated if details of their medical situation were to leak thus resulting in their reputation or even life being gravely affected. Another possible risk may appear in the hardware security, hardware that is used to generate the prescription (such as desktop or laptop computers, tablets or other portable devices) if their firewall or protective software is not up-to-date and properly monitored. A direct implication that might arise from this kind of negligence is the hacking of any of the involved parties' hardware. Last but not least, the human factor must always be taken into serious consideration. As the author mentions, "most breaches to technology systems occur by internal organisational employees" (Nataraj, 2011, p.17). As a result, it would be safe to argue that by investing in organisational training the chances of security breaches would be expected to decline.

As far as the e-prescribing process itself is concerned, Porterfield, Engelbert and Coustasse (2014) examine the effect that its implementation has had in the USA. The researchers study the positive effect that e-prescribing medication has brought in the health sector, by reducing errors in writing and filling prescriptions and costs in the health sector. Of course, the researchers also identify potential barriers in using e-

prescription platforms, such as issues regarding the patients privacy, the high costs of maintenance, inadequate support from administrators of the platforms and others.

Kierkegaard (2013) also examines the barriers e-Health care systems in the European Union countries-states face that hold them back from adopting them in a larger scale. In theory, the e-prescription program allows European Union citizens to seek health care wherever they are but practical issues like different laws about protection of sensitive information and privacy make it difficult to be implemented in all states.
Even though the EU pushes for more data exchange in e-Health within its borders, there are certain barriers that make the extended implementation within the EU improbable (at least in the current state of things) as Kierkegaard (2013) explains. Apart from the legislation and privacy concerns that were mentioned before, he suggests that the existing software and infrastructures would make difficult a broader implementation. Additionally, the high cost of maintenance would prove pivotal to its acceptance by the member states. He furthermore argues that there are various degrees of e-Health applications within the EU country-states, and a unified infrastructure would require uniformity in the software and the same legislation covering the involved parties (Kierkegaard, 2013). An illuminating example of his claim is the situation of Sweden and Estonia, who have fully implemented the e-prescribing process, Greece who is still using mixed digitalised and analogue procedures and Ireland, who in 2013, the year Kierkegaard's paper was published, did not have any plans for implementing ICT projects in the health sector.

Another issue that he states and should be particularly examined regards all the ethical considerations that arise from implementing such infrastructures in the EU level. It is vital that doctors' and pharmacists' professional or ethical duties are not affected by the ICT projects introduced (Kierkegaard, 2013).

By following the EU leaders in e-prescriptions' example, Greece could work towards better or fully implementing applications for e-Health. Even though the country has plans to extend the electronic prescriptions infrastructure throughout the whole public health care system by 2017, it could follow Sweden's example which has shown a deep level of implementation, as shown in a study conducted by Åstrand (2007 cited in Kierkegaard, 2013, p.209) which attributed the deep implementation to factors like high public penetration rate and acceptance of modern technologies, confidence in the secure handling of personal information by the state and general determination for implementing such projects in both national and regional levels by officials.

Lastly, a further concern with regards to paper prescriptions, either hand written or computer generated and then printed out, is the number of medical errors and the rate of patients' negligence to fulfil a prescription given to them in paper. According to Kierkegaard (2013), with transmitting electronically the doctor's prescription to a pharmacy, the likelihood of the medicine being picked up by the patient increases significantly. What is more, it eliminates the vexation cited by patients of having to manually present the prescription to the pharmacy in order to obtain their medicine.

Kierkegaard (2013) addresses plenty of privacy and ethical challenges such as the questions of who can access and process the clinical data, who will ensure their safety in each country-state, questions concerning identity theft and data mining issues. All of the aforementioned issues are problems that may be mentioned in relation to cross-

border databases but quite clearly apply all the same to the case of Greece, as well as any other individual country that utilizes (or is in the process of implementing) ICT projects for national health care.

Ethical challenges are very closely related to the notion of trust in societies. Van der Schee et al. (2007) explore in their study the degree of public trust in the health care system in three western countries in Europe: England and Wales, Germany and the Netherlands. They explain how there are two kinds of trust: the interpersonal one and the public one and they are related to each other in a depth of time (Van der Schee et al, 2007, p.57).

3. The Greek Medical System

Greece has a rather complicated health care system, so in order to understand the e-Health process that is researched in this project, it is deemed useful to briefly explain the health care system itself as well.

Social security in Greece is mainly public but due to the economic turmoil of the country, some citizens opt for private insurance companies. This project however only examines the public sector and its largest public health insurance fund (EOPYY). As however Greece is currently in the process of various reforms in the public sector, as its obligation to the IMF and EU through the first memorandum issued on May 3rd 2010, the situation described here is but an image of the current affairs.

There are various public health insurance funds that the Greek population belongs to, depending on their status and employment. The biggest umbrella fund, EOPYY, is composed of numerous, more than 30, public funds such as IKA, that covers 45% of Greece's population (Mossialos, Allin, & Davaki, 2005, p.152), OGA that covers farmers, OPAD and others. In order for the funds to be able to cover their insured population's medical expenses, employees and freelance working citizens are required to provide the funds from part of their salary or monthly earnings. Each citizen that belongs to any of the public funds mentioned above, has a special health booklet which may be renewed every year depending on his or her status (employee, registered unemployed, child with insurance status through his or her parents, pensioner etc.).

In the event of an illness, the patients are required to call a special 4-digit number in order to schedule a visit for a medical examination with a doctor at a hospital. The patient is required to ask for a specific doctor speciality, according to their needs that they decide for themselves and they do not have to first go through a centralised general health care provider. It should be mentioned that two types of meetings can be scheduled according to the patients' request, daytime (which are free) and afternoon visits (which cost between €16 and €72, depending on the location of the hospital and the rank of each doctor, meaning senior, trainee, university professor etc.). Another option for the patient, is to visit the home doctors that each public fund has (for example the IKA offices in each municipality house various specialities of doctors that the patients can visit for free) but usually the waiting times for these visits last longer than the patients are willing to wait and thus many of patients opt for the third option, which is private practices of panel doctors. Each doctor in his or her private practice can, by law, examine only 200 patients per month for free and, consequently, after this number is reached, patients are required to pay for their visit. In case the patient does not require a medical examination but merely a prescription for medication or a prescription for medical tests at a lab or clinic (and not a medical examination from the doctor), there are more options of doctors who have access to the e-prescription.gr system but require a fee for their services. Finally, and although it is outside from the scope of this thesis, it should be mentioned that there is another category of doctors with private practices who are not affiliated with the health insurance scheme, have no access to the e-prescription.gr system of public health and the fees for their services vary significantly.

All the insured citizens have an identifying number, called AMKA, which is required when scheduling a doctor's visit.

4. Paradigm, Methodology and Methods

The focus of my research is to examine potential security risks and privacy issues involved in the Greek e-prescription platform. As I am seeking to understand this complex issue of security concerns from the viewpoint of various different groups of involved citizens, I will be working within the interpretive paradigm and following a flexible design (as described by Robson and McCartan, 2016). Flexible design, even though informed by ethnography (i.e. using ethnographic methods such as observations and focus groups), the latter is not used in its pure form (Winter, 2013) but rather it offers different methods than ethnography itself. To be more exact, the ethnography type that is informing my flexible design is the Quick and Dirty one. According to Hughes et al. short ethnographic studies are conducted, of course having a duration that is relevant to the scope of the project, in order to gain adequate information about a setting, while always keeping in mind that a deep understanding of it is close to impossible to be attained (1994, pp.424-435).

4.1 Paradigm

The interpretive paradigm aims at looking at how people assign meaning to the world around them and how they perceive the various phenomena they meet in their lives (Orlikowski and Baroudi, 1991). This pattern of thinking does not predetermine variables and patterns and thus is ideal for the approach that I take in this project. The planed strategy for my project was to examine how aware the parties involved are, concerning the possible risks they may face if the security of the e-Health system is not up to date with the current highest standards. According to Walsham (1993, pp. 4–5), the interpretive approach within the field of Information Systems is "aimed at producing an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context". Even though many studies highlight what the potential risks are concerning security of medical information in IS (e.g. Goldman & Hudson, 2000; Mantas, Lymberopoulos, & Komninos, 2012) I will focus on the human actors and how they perceive those risks and security concerns. As I will not look at predefined risks, but rather I will try to explore how the actors understand those issues, it can be argued that, as Kaplan and Maxwell (2005) also mention, the focus will be on the way that individuals make sense as things hitherto unfold, taking into consideration their full complexity.

4.2 Methodology

As far as ethnography is concerned, its underlying purpose is for the researcher to gain understanding by observing, interviewing or participating in focus groups, among others, with certain groups of people that are connected to the phenomena (Cook & Crang, 1995, p. 4). As a more general perspective of ethnography, according to Myers (n.d.), it can be defined as the procedure where the researchers “immerse themselves in the lives of the people they study and seek to place the phenomena studied in their social and cultural context”. Even though historically ethnography was conceptually related to anthropology, today it is not only used to study small communities (Blomberg and Karasti, 2012). In the case of examining an Information System, ethnographic methods can be employed to allow the researchers to gain from-the-inside knowledge and, more importantly, understanding of the Systems, or, to be more precise, aspects that have to

do with the human, social and organizational factor of the System (Harvey & Myers, 1995a, p.22).

For instance, in the case of my research, I examined the stakeholders and actors that are affiliated to the e-prescription process by applying the methodology of ethnography in two pharmacies. Participant observation was performed there in order to gain an understanding of the way that printed paper prescriptions are handled and stored and thus see the security level of the process. However, as the scope of this thesis was to examine the issue of security from various view points and, furthermore, taking into consideration that ethnography can be applied while studying a specific group of people and their understanding of their particular everyday practices (Blomberg *et al.,* 1993 cited in Blomberg and Karasti, 2012, p.88), it is clear that an ethnographic study, as defined above, could not be applied in my case. Consequently, instead of a full scale ethnography, some ethnographic techniques were used combined with various other methods as in accordance with a more flexible design for research (Robson and McCartan, 2011).

4.3 Participants

The participants are healthcare providers, i.e. doctors and pharmacists, and healthcare consumers, i.e. citizens. All the categories of the individuals involved are people that I believe to be relevant to the greater medical community: doctors that prescribe medication and have access to the system of e-prescription.gr, pharmacists who fill these prescriptions and patients who are dependent on this electronic system to get the medicine they need.

The doctors that are interviewed work in the public sector health care (public hospital of Syros island and public hospital of Nikea). They are individuals in my social circle and they agreed to take part in my research. As far as the pharmacist is concerned, he is based in the city of Athens and Lamia and is also part of my social network who agreed to be interviewed. These interviews were conducted via Skype and phone calls and were recorded as per the interviewees' consent.

The pharmacies where the observations took place are located in suburban Athens, one in the municipality of Amarousion, where I currently reside, and the other in the municipality of Peristeri where I used to live. Both of the pharmacies are work environments that both the professionals and myself are acquainted with each other and thus it was possible for me to conduct my research.

All the interviews and focus groups with the citizens took place in the municipal library of Amarousion. The focus groups consisted of individuals from my personal social environment and the individual interviews took place after the interested individuals responded to the invitations I had left in the municipal library.

The participants of my research can be found aggregated in the following table:

Table 1: Participants

Participants	Number of Participants	Methods they participated in
Doctors	2	Interviews
Pharmacist	1	Interview
Pharmacists	4 (in two pharmacies)	Observations + Thinking aloud
Citizens	2	Interviews
Citizens	6 (in two groups of three)	Focus groups

4.4 Data Collection

The methods that were used are semi structured interviews, focus groups, observation and thinking aloud. As the research is a qualitative one, these typical methods will help me understand how the stakeholders view the research questions I have set my mind and research to answering.

4.4.1 Semi-Structured Interviews

The semi structured interviews are selected as a way to gain the advantages of both types of interviews, i.e. both structured and unstructured. Even though structured interviews are usually employed when looking for quantitative and statistical responses (Bødker, Kensing, and Simonsen, 2009, p.228) however, a few same questions were planned to be asked to all participants. These questions aimed at getting a feeling of what each interviewee's background was with the hopes of better understanding their opinions. The idea behind unstructured interviews, according to Bødker, Kensing and Simonsen (2009, p. 228) is to get feedback to " [...] broad questions that do not necessarily require specific answers, but answers that may be elaborated upon and lead to a dialogue".

The course of action I followed was to first interview two doctors and a pharmacist in three different interviews in order to get a first basis of the situation (see Appendix 1 for interview guides). The reason behind this choice was to gather sufficient facts from the professionals and then, based on their concerns and input on security, I would advance to the focus groups and interviews with citizens. Ideally, I would have wanted to also interview an employee from the company that created the e-prescription web platform (IDIKA S.A.) and listen to the programmer's or designer's point of view about the process of creating the e-prescription.gr site as well. As the platform was designed, created and forced to be implemented in a very short period of time for the whole country (no pilot program in a restricted geographic place was to be implemented first), it is understandable that the results were, unfortunately but inevitably, not the best that could have been. However, such interview was unable to take place.

Lastly, it should be mentioned that all interviewees were given prior to the interview an informed consent form (see Appendix 2) to sign informing them that all their views will be treated with confidentiality and that they will be used only for the purposes of this particular research, among other things.

Professionals

The first interaction I had with the participants of my project were the interviews with the two doctors and the pharmacist. It should be mentioned that the doctors I interviewed both have different specialities: one is a urologist and the other is a neurosurgeon. As all three interviewees gave their permission, the interviews were recorded. All three medical staff were given the informed consent form prior to the interviews in order to familiarize themselves with the research questions, their rights and the general scope of the research. However, in addition to this, the participants were all given a short summary of the topic and its purpose before the interview itself begun.

The first doctor interview was performed via phone call and lasted for an hour and 20 minutes. This was the result of an urgent reschedule as the initially arranged meeting was to be done in person with the neurosurgeon in order for him to show me the e-prescription.gr site. However, there was an emergency at the hospital where he works and thus the interview had to be rescheduled for a later time and, consequently, a change in medium was also required. The call was recorded by using an android application called "Call Recorder – ACR" and the file it generated was transcribed using the computer program Microsoft Word 2007 (see Appendix 4 for a layout of the software used).

The doc file was later printed out in order for the codification process to be facilitated. More about the coding process will be mentioned later on in this report. Additional to recording the call, taking into consideration that this was the first interview I conducted, notes were also taken and based on them, more questions than initially planned, were asked to the doctor. After this first interview was completed, the interview guide was altered and adjusted accordingly in order to include the newer, unplanned questions that came up to the following interview that was to take place (see Appendix 1 for the updated interview guide).

The second interview I conducted was with the second doctor, the urologist. As this doctor is employed in an island hospital, the scheduled interview was to take place over a Skype video call, the audio of which was recorded by using the "iFree Skype Recorder" API for Skype.

By conducting a video call, a more direct communication was able to take place thus allowing for a more relaxed experience for the interviewee and an abundance of visual data for myself. The duration of this interview was over 50 minutes with a short break of around 5 minutes that the interviewee requested in order to contact a patient of his. This second interview was also transcribed with MS Word 2007 and later on printed out for the next step in the data analysis process.

The last interview with a medical professional was with a pharmacist that was conducted with means of telephone call. As I had in mind that this would be my first contact with a pharmacist within the context of my thesis, I, once again, kept notes of the changes in the questions I had prepared in advance to ask (see Appendix 1). Some of the clarifications and particular information I was not initially aware of and was provided to me from the pharmacist, were discussed at the pharmacies I visited for the observations. The free android application Call Recorder – ACR was used for the recording of this phone interview as well whose duration was approximately 45

minutes. After the end of the interview, it was transcribed by using MS Word 2007 and printed out like the previous two interviews in order to facilitate the research process.

Citizens

As far as citizen interviews are concerned, the course of action I followed was to include people who have taken part in the electronic prescription process, in other words to have experience visiting doctors and be given prescriptions that they had to fill at a pharmacy. This was preferred in order for them to have an idea of their own about possible security concerns that could affect their personal medical data. The idea behind this was to ask them about their experiences with the system and talk about the security concerns that they have. Two citizens were interviewed, with a semi structured style of interviewing and they were given a consent form to sign prior to the interview, stating that all their answers will be treated with respect to their person and only for the purposes of this research (see Appendix 2).

My initial plan was to conduct mainly focus groups with citizens/patients who had a rather regular contact with the e-prescription.gr platform and present them with some of the concerns regarding security that were indicated to me by the trained medical staff. However, I deemed it useful to involve more citizens into the research process, since the medical data and their safety were regarding the citizens themselves. Consequently, I additionally interviewed citizens individually and asked about their views on the security of their personal medical data, without first presenting them with the professionals' ideas, in order for them to express their own original thoughts.
For this reason, I contacted the local public library and asked the librarians there if it was possible to leave at the front desk a few invitations for the research. Ten invitations were left there and two individuals contacted me to schedule an interview date (see Appendix 6 for a sample of the invitation)

Those two citizens were individually interviewed, but since they did not wish it, no recordings of their interviews were acquired. Prior to the interviews, the day before, the informed consent form was emailed to them so as to inform them about the basics of my research and the reason I requested their participation. Physical, printed copies were presented to them both at the day of the interview that they could keep either for future reference or in case they needed to contact me later on. Both interviews were conducted in the yard of the Amarousion Public Library and they were short in duration, ranging between 15 and 20 minutes. For these interviews only handwritten notes were kept which were later used to generate codes for the analysis part of the thesis.

4.4.2 Focus Groups

Focus groups are defined by Robson and McCartan (2011, p. 300) as a discussion that takes place between a certain number of people and has a specific topic, but the questions are open-ended and the participants can interact with each other.
Within the medical community, there has been a growing recognition of making the patient heard which is made possible by utilizing focus groups in order to "[...] identify barriers and seek to work together to address these" (Barbour, 2005, p. 743). It is therefore considered to be a method that motivates citizens and gets them interested in their own personal (electronic) safety by discussing these issues with others.

To complement the results of individual citizen interviews, two focus groups with different groups of citizens took place and three people were in each group. These focus groups were presented with the security issues that doctors and pharmacists brought to light and then asked about their thoughts, feelings and reactions to these. The individuals that took place in both interviews, and focus groups were not part of a specific group of population (i.e. not a particular age, sex or socioeconomic status). This is so due to the fact that cyber security is a matter that is of interest to all and because I will be looking into individuals' opinions as a category in themselves.

Two focus groups were arranged for this project and three citizens participated in each of them. All six individuals are in my social network and their age varies from 29 to 68 years. Both of the groups were presented with some of the medical professionals' views (i.e. doctors and pharmacists). Based on the concerns that they raised, I asked the participants of the focus groups to engage in discussion related to those risks and express their own thoughts on those.

The first focus group consisted of two females and a male with ages varying from 32 to 63 years old and its duration was about an hour and a half. Initially, the subject of the research was explained to them briefly and then they were all given the informed consent form (see Appendix 2) in print, in order to sign and keep for possible future reference. During the process of the focus group, as per the participants' request, no recordings were made but only notes were kept instead.

The process for the second focus group was similar, the participants, two males and one female of varying ages from 29 to 68, were briefed in about the research topic and then were given a printed informed consent form to read, sign and keep. This second group lasted for about 50 minutes and only notes were kept, as per their request of not recording the process.

4.4.3 Observations

As it is described in literature, observation is one of the main methods of ethnography and takes place in order to better understand the creation of reality through the meaning that is assigned to human actions, or in other words "[...] in qualitative techniques, meaning in context is the most important framework being sought" (Harvey & Myers, 1995b, p. 5). As an additional form of data source of my data collection process, observations were carried out in two pharmacies. The reasoning behind this option is to gain an "insider" understanding of what exactly happens from the moment that an individual with a prescription to fill arrives at the pharmacy until the moment the paper prescription is stored.

The course of action I followed with the pharmacists I visited was similar to previous mentioned courses of action. Both the clients and the pharmacists were presented with a consent form about strict confidentiality, especially so as patients' medical conditions might be discussed in the process. From my experience, I noticed that each of the pharmacies used different methods to tend to their customers' needs. However, the end result was the same in both cases: the customer would present their printed prescription, the pharmacist would log in the system and give them their required medicine, and after the customer left they would deal with the paperwork.

4.4.4 Thinking Aloud

As a way to gain more and deeper understanding, thinking aloud was also used in the observation sessions with the pharmacist. According to Hertzum, Borlund and Krisofferensen (2015, p. 2), there are two kinds of thinking aloud processes: one is more relaxed and the participant is asked to also share his or her thoughts about the process and the second one is more descriptive in the sense that the participant mentions all of his or her actions to the researcher as he or she does them. In my research, I used the relaxed thinking aloud method in order to get more meaningful insight about possible actions that might not be actually performed or the pharmacists' opinion about the standardised processes that they have to follow.

For the method of observation, I chose to work with two pharmacies in two different areas of suburban Athens. In total, 6 days of observations took place in both of the pharmacies. The first day of the observation process was spent at a pharmacy in Amarousion, a northern suburb of Athens, followed by three days spent at a pharmacy in Peristeri, a western suburb. Finally, two more days were spent in the Amarousion pharmacy.

Amarousion is the area where I reside and am familiar with the pharmacist working at this particular pharmacy as it is located in my neighbourhood. Due to the personal familiarity, I was permitted to make my observations in this location. As the pharmacist working there showed extensive interest in the research, the time spent there exceeded three hours each of the three days I spent with them.

The pharmacist in Peristeri is an old family acquaintance and I was allowed to spend with her two hours each of the three days I spent there, so as to observe the process of filling a prescription.

During my stay at their workplaces I asked the pharmacists to explain the organising and sorting system that they used, as well as the Application Programming Interface (API) they were using to fulfil the prescriptions. Due to various reasons mentioned in length in the analysis section of the report, pharmacies opt to use not the e-prescription.gr interface but other, commercial applications that are connected to e-prescription.gr and offer faster and more customizable interfaces. From the explanations and feedback given I was able to understand the details and the issues that they themselves were facing concerning the e-prescription.gr site.

Both pharmacists I worked with were given the informed consent form and were also briefed about the topic I was researching. In both of the observation sites no recordings were made due to the sensitive information that might be caught on tape. However, descriptive notes of the setting and the comments made during the thinking aloud process were kept in order to facilitate the analysis process of my project. As far as patient/customer observations are concerned, the exact process followed for their information took place as follows: the pharmacists would ask their customers if they had a few moments to spare in order for me to inform them about my research. If they were busy, in a hurry to fulfil their prescriptions or just did not want to take place in the research for any other reason, no notes were kept. To those however who accepted, I gave the informed consent form, which they kept for potential future reference or to get in contact with me, and explained the reason why I was there. It should be mentioned

that even though patient information was of no interest to my research, due to its personal and sensitive nature, the patients/customers who visited the pharmacy had to be informed as well about the ongoing research in accordance with the ethics of the field.

4.5 Data Analysis

In order to work with the gathered data, and move to the analysis I made clusters of relevant information so as to discern patterns. These patterns will make the analysis part easier for the reader to follow. My course of action was to collect the data from all the methods that I used and then move to its analysis.

Lichtman's three Cs (Codes, Categories, and Concepts) model (Lichtman 2013, p.251) is used for the process. The underlying idea is to gather all the research data and first summarize the responses and field notes into codes and then compose bigger categories that include various codes. The final step of the process is to generate concepts that function as umbrella terms, that are more general and on which the discussion is based. The process is depicted in Figure 1 below. By following this model, I generated 179 codes which were grouped into 21 categories. These categories were further clustered into 4 concepts which will act as a guide for the presentation of the findings. The said concepts are: understanding the situation, health system mechanics, e-Health platform and ethical issues. In Appendix 3 there is an example of how codes where combined into categories and how certain categories produced general concepts.

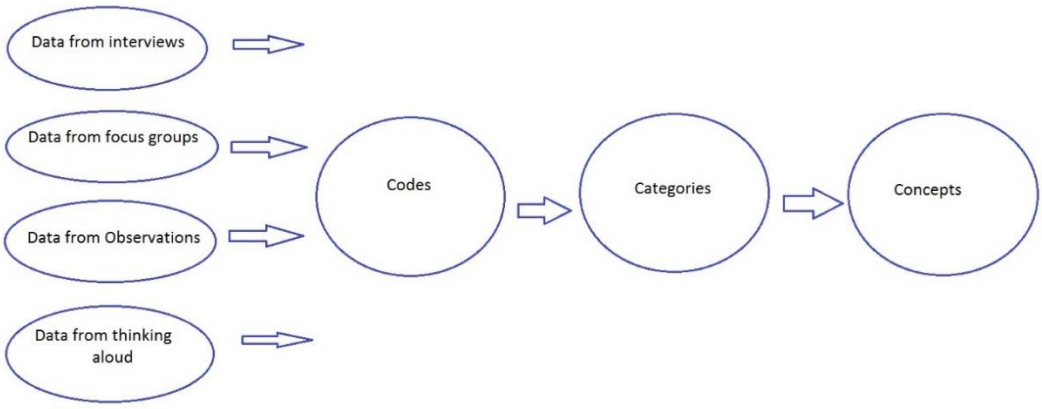

Figure 1: Three Cs analysis (Lichtman 2013, p.252)

4.6 Validity and Reliability

The notion of rigour and how to establish it in qualitative research has been troubling researchers in the social science field for a long time and yet they are no closer on determining a set group of criteria or even deciding on whether or not it is appropriate to have such criteria at all (Sandelowski & Barroso, 2002, p. 2). This claim is supported by recent papers as well, which undoubtedly only fortifies the above opinion. To be more precise, Noble and Smith (2015, p.34) argue that there is no extended consensus on what constitutes a trustworthy qualitative research, since criteria upon which rigour can be judged have not been decided. However, in order to enable this thesis to be judged for its trustworthiness a set of criteria that are endorsed by various qualitative

researchers is adopted (Guba, 1981 sited in Shenton, 2004, p.64), i.e. credibility, transferability, dependability and conformability.

One of the ways to ensure credibility, which has to do with how much the research corresponds to reality, is by triangulation as explained by Shenton (2004, p. 65), or in other words the use of various methods, more commonly: observations, focus groups and individual interviews. As my research focuses on how citizens and professionals perceive the privacy and security risks they may be in, it can be argued that the reality that is presented is more or less subjective. Nevertheless, I have tried to cross check at least the procedural information that was given by the participants. Additionally, whenever I was allowed by the participants, I made certain to record the session in order to be able to return to it later during the translation process, not only to make certain that the diction is maintained during the translation to English but also to be able to refer to it for checking points mentioned.

As far as transferability is concerned, in case the results of this study were to be used in different contexts and situations certain aspects of the research must be taken into consideration first and thus is crucial that they be mentioned in the research (Shenton, 2004, p. 70):

1. How many organizations are taking place in the research;
2. Potential limitations of participants with regards to the information that they provide;
3. What methods were used;
4. How many and how long were the sessions
5. The span of time that the gathering of the data took place.

These aspects are mentioned in the thesis with the hope that in case another similar research takes place, for example in another part of Greece, certain homogeneity can be maintained. More information about the above aspects is presented in the next chapter, “Data Gathering”.

Dependability in a qualitative research refers to the extent where the research can be repeated by other researchers at a later time and the results are expected to be repeated the same (Shenton, 2004, p. 71).
As this work is a qualitative research, and not quantitative, the results could not be repeated in the way that they are presented here in their entirety. As mentioned in the limitations of the research, different individuals in different or remote areas of Greece may be experiencing differently life in connection to the e-prescription.gr platform. In this case, their comments and concerns could differ from the ones that were mentioned to me, in this particular research setting and with these particular participants. Dependability could be observed from the professionals’ perspective, at least to the extent that they discuss the technical aspects of the platform. However, it should be kept in mind that since people’s opinions are the main focus of the thesis they could not be repeated as they are presented here, from a different group of participants. That said, the interview guides that are included in the Appendices could provide the same basis for discussions to future researchers. Additionally, by documenting thoroughly the

processes that the research follows, is a way to ensure dependability, at least to some extent, in the context o a qualitative research (Shenton, 2004, p.71).

Lastly, confirmability refers to how detached the researcher is when interpreting the findings and information provided by the participants. As this particular research is an interpretive one informed by ethnography, by definition the researcher's background cannot be completely eradicated from the equation. It is therefore understood that the analysis of the material gathered is, to some degree, influenced by my personality and personal views. However, by utilizing the above mentioned criteria, any bias is limited and contained.

4.7 Ethical Considerations

As mentioned above, the sensitive nature of this research requires delicate care of the information that will be shared by the participants. Besides, according to Smith,

> *"The understanding of ethics is not just a study in theoretical knowledge, but includes an understanding of the applicability of ethics to real world situations"*(Smith, 1995, p. 3)

In particular, as far as interviews and group interviews are concerned, since the participants will be presented with an informed consent form to sign - along with the researcher- a basic level of security will be offered to them. According to Codex, which is a Swedish website that offers researchers information on regulations and laws on conducting ethical research, the information that should be included in an informed consent form is the general plan of the research, the aim and methods that will be used, who will conduct the research, potential consequences or risks and the facts that participation is not obligatory and can be rescinded at any time (Codex, 2016). Of course, since during the interviews notes or recordings were kept (according to each participant's willingness to speak on tape) additional care was taken so as not to lose the material produced. What is more, all the data gathered will be stored in a secure way (i.e. encrypted and saved in a password protected file). Apart from ensuring confidentiality, certain other steps must also be followed while interviewing individuals. As Gray (2009) mentions in his work, the interviewee should never feel stressed or pushed to give answers he or she does not feel comfortable giving and also, they should be informed in advance that they can terminate the interview for whatever reason that may apply to them. The important aspect of this particular point is that the interviewee, in other words, must never feel obligated to answer questions that are part of a scientific research.

Additional to the above, there are supplementary ethical considerations to be taken into account while performing the focus groups. To be more precise, as interactions of participants with the researcher will take place as well as interactions between the participants themselves, special care needs to be taken so as no disclosure of sensitive, personal information is to be shared with them (Carey & Smith, 1994, p. 124). The researcher should mention clearly in the beginning of the session that this exact problem may arise and thus everyone involved should be careful of the information they share at their own choice (Smith, 1995, p. 6).

Furthermore, as the observation in the pharmacy is concerned and the thinking aloud process, ethics are perhaps of the utmost importance. Additional to the consent form that will be signed both by me and the pharmacist, great care should be exercised so as not to write down any sensitive information about patient's medical condition. Furthermore, it is also vital that the clients of the pharmacy that choose it to fulfil their prescription, should also be informed of the researcher's objectives and an "off the record" mode should be followed in the event that the patient or client does not agree to the observation.

Finally, the selection of the participants needs to also be addressed here. The citizens who took part in the focus groups and the medical professionals I interviewed are all personal acquaintances. This choice must be justified and communicated accordingly so as to address the potential issue of bias.

As mentioned above, Athens has a plethora of municipalities and not all are the same wealthy. As it is my firm belief that privacy and security of medical data is of importance to all citizens, despite their social and economic standing, I wanted to include a variety of participants despite differences in age or status. These points, along with the limited resources I had available led me to opt for acquaintances. As a way to avoid bias, I grouped together in focus groups people who did not know each other. By doing so, I attempted to bring together a diverse crowd of citizens that could make an unbiased conversation on important matters.

5. Empirical Findings

After having completed the research process and having been presented different points of view from all the involved individuals, I have managed to reach certain conclusions. Even though the e-health platform is one entity, I observed that each category of the participants saw issues and offered comments from a different perspective. However, even though they all have numerous backgrounds they also had certain similar concerns to express. The analysis of those points of view allowed me to answer my research questions: explore the concerns and present ideas that could assuage them.

By thematically analyzing the findings of the interviews, observations and focus groups, I managed to compose four concepts which include the concerns that were mentioned to me. The extracted concepts were: Understanding the Situation, Health System Routines, e-Health Platform, and Ethical Issues. In the following part, I will be presenting those concepts.

5.1 Understanding the Situation

In order to be able to understand the mentality and perception of all of the three involved parties (i.e. doctors, pharmacists and citizens) regarding their privacy in the e-Health department, it is vital to previously examine how they perceive the current set of circumstances in the Health system. One of the categories that led to this concept was individuals' comments and opinions on how the situation was before the e-prescription system was implemented. Moreover, thoughts and beliefs on the current health system were expressed and certain comparisons to another country's e-Health system (i.e. United Kingdom) were underlined.

Before the centralized e-prescription system was implemented in the Greek Health system, over prescription was rather common. This is a belief shared both by medical stuff I interviewed and certain citizens that took part in focus groups. According to some of the citizens who participated in my research, both doctors and pharmacists found this reality accommodating to their own personal agenda and thus were reluctant to shift into a digital era of prescribing medicine. A citizen that took part in one of the focus groups had strong feelings about this issue:

> *"I remember when the idea of the electronic system was first introduced, doctors were on strike, demanding that the previous state of things does not change. They didn't want to learn new technologies, were reluctant to go online because all their moves could be traced that way and they didn't like that of course! It meant they could no longer have shady deals!"*

When the e-prescription system was about to be introduced for general use, the HPA organized educational seminars for pharmacists. According to one of the pharmacists that were interviewed it was a more than welcome initiative as the older generation, like herself, was not that accustomed to new technologies.

With regards to the doctors, however, the HPA's example was not followed. In particular, each hospital followed their own course of action regarding educating their staff on the new platform. For example, one of the doctors that took part in an interview

claimed that the hospital he was working at, at the time, provided a brief seminar, *"…that even though was not that well organized, at least they made an effort"*. The second doctor, however, experienced nothing of the above. In his case, he would browse the platform's capabilities at his spare time since no formal form of education or training or even a guide leaflet was offered. He said on the matter:

> *"I taught myself how to navigate and use the system. When I would return home from work, I would browse what possibilities the platform gives us. It was vital for me to know where is what because you can't have queues of people outside your office and struggle to find what you are looking for. For example, you need to know the code of the diseases you may deal with, or as we say, the ICD-10 and not look for it each time."*

According to the comments I received, in the first period that the e-prescription platform was implemented in the public health sector, i.e. early 2010, connectivity issues were occurring several times during the month. The main problem was observed during the first and last days of each month when citizens would rush to their doctors to renew their medical prescriptions. Multiple occasions were mentioned by interviewees where a great number of citizens were facing discomfort due to the doctors' inability to access the e-prescription system. In these cases, there was nothing that the doctor could do but advise the patient to come at a later time with the hopes that the platform would be functioning, as an interviewee described. The same problem was also an issue for the pharmacies. Citizens would ask for their prescription to be filled at the pharmacy that they would visit but since the e-prescription system was offline, the customer could not be attended to and was required to return at a later time and try again.

However, as regular updates (every two to three months) are developed by IDIKA and as connectivity problems was a well-known issue, it was later addressed, for the most part. Nowadays the platform hardy ever goes offline, at least for the doctors, and this particular difficulty is no longer discomforting citizens or medical staff on a recurring rate.

> *"It* [the platform going offline] *used to happen frequently. Especially during the last days of the month when pensioners would come to renew their prescriptions, the system would overflow and crash. It was pretty bad for them but there was nothing we could do. Now it doesn't happen anymore, or if it does it's very rare."*

The pharmacists are still facing some issues with connectivity, particularly since every three months the price tag of the available medicines changes and all pharmacies have to, virtually simultaneously, update the platform. This was mentioned to me by the pharmacist I interviewed, as well as by both the pharmacies I conducted observations/thinking aloud at.

One of the doctors I interviewed used to previously work at a hospital in the UK and he was able to draw some comparisons between the Greek and English e-Health systems. Some of the differences between the two systems are:

- NHS: access to online system only from a hospital. The doctor claimed that the access to the e-Health system is limited in the UK. That means that someone with the proper credentials can only sign in to the platform while being in the premises of the hospital. In Greece however, this is not the case. An individual with valid credentials can use any network to sign in to e-prescription.gr. This, according to the doctor, can be potentially risky. Citizens that took part in focus groups seem to agree with this as well:

  > *"I am very worried that the platform is accessible from any network. What if information is leaked?",*

  one participant mentioned with regards to the issue.

- NSH: only paper prescriptions issued from the hospitals. Another difference between the two countries is that in Greek hospitals paper prescriptions are printed out from data inserted in the e-prescription.gr platform. Whereas in the hospitals in the UK only handwritten ones are issued for the patients.

- According to the same doctor, the English e-Health system accommodates existing patient allergies as well as various other notes in the personal e-Health records. Unfortunately, this feature does not exist in the Greek platform and no banner pops up informing the doctor of any known allergies or other important information about the patient they are examining. The interviewee had an interesting example to share concerning this issue:

  > *"There are certain medical agents, anticholinergics, that we give to patients in order to treat problems with the urinary sac which, however, should not be prescribed in case the patient has glaucoma. So there was once a patient, whom I asked if he has glaucoma and he said no, but by looking at his previous prescriptions in the platform I saw that he had it! If I hadn't looked and went ahead and prescribed for him the anticholinergic, he could have had permanent loss of sight; the platform did not pop up a banner telling me so, it was completely up to me to guess it by looking at previous prescriptions."*

  He then went on to explain that the e-prescription.gr platform is a very simple one, as it was designed and implemented in a very short time frame, which, non the less, was much needed in the Greek e-Health field.

5.2 Health System Routines

As previously mentioned, the Greek e-Health platform produces paper prescriptions; it is in other words, a mix of digital and analogue process. The concept analysed here

provides an overview of what happens with the printed prescription as well as the way that the medical staff operates within this system.

As mentioned by the pharmacists I worked with, they are obliged by law to store and number the paper prescriptions and at the end of each month deliver them to the HPA's offices for checking. All three of the pharmacists I spoke with mentioned that this was a rather serious inconvenience to them as they had to sacrifice working hours to transport heavy packs of paper to the union. One pharmacist in particular mentioned:

> *"We're obliged to get the paper prescription to the union form the 1st to the 5th of every month. We have to carry a huge pile of papers and spent many hours there until we are finished and get back to the pharmacy."*

A special category of paper prescriptions is strong antibiotics and painkillers. For these types a specific procedure is followed, where apart from the typical paper prescription, an additional formal document, stamped by the Ministry of Health is required in order for the prescription to be valid and able to be filled. These formal documents mention the patient's name, condition which justifies the need for strong medicine, as well as the exact dosage of the medicine. A doctor explained:

> *"When it is required to prescribe a patient with strong antibiotics, such as third generation cephalosporins or strong painkillers, such as opioids, we handwrite a special accompanying document, which has been stamped by the Ministry of Health, that the patient has to give to the pharmacy along with the normal paper prescription. Without it the prescription cannot be filled"*

In contrast to the normal paper prescriptions that are submitted each month at the union, the special accompanying documents are required by law to be kept both at the pharmacies and the hospitals that issued them alike, for at least 2 years.

During the thinking aloud process at the pharmacies, I was told that when customers come with prescriptions, the pharmacist would take the printed paper and after he/she were done with serving the customer they would normally place it in a drawer and keep it there until the end of the day, when they would number and file it with the rest of the month's prescriptions. What I observed however was, in reality, different and more chaotic: when multiple customers would come in, paper prescriptions were left on the counter and were only put away at a later time.

5.3 e-Health Platform

This concept has to do with the technical characteristics of the e-Health platform that the medical staff who uses it has to be aware of. Additionally, versions of the doctors' and pharmacists' software are examined. Lastly, after having gained a general understanding of how the platform works for both of the parties, potential compromises and strong points are reviewed.

As I was informed by the interviewees, when either pharmacists or doctors first create their account in the e-prescription.gr platform, they are given a username and a

temporary password, which they then have to change. Also, the password is required by the system to be changed every month. This can cause various issues for the medical staff that will be later examined.
A thing that was made clear to me during the observation process at the pharmacies, and was also mentioned to me by the professionals, was that doctors and pharmacies may operate in the same platform but they use different parts of it. Pharmacists, choose to work mainly through API's that communicate with e-prescription.gr but offer a bigger customization and are relatively faster to browse. Those interfaces require a different set of username and password, which also has to regularly be updated. Even though the API of their choice is more useful to them, not all functions of e-prescription.gr are covered by it. This results in them having to sometimes sign-in in their e-prescription.gr account. As an example, one of the pharmacists I worked with said:

> *"The system allows a 24-hour gap that the status of the prescription can be edited. For example, let's say that a client purchases two boxes of a medicine and they later return one of the boxes for whatever reason, maybe they had one at home from a previous occasion. The cancellation of the filling of the prescription can only be done through e-prescription.gr and not from the API that each pharmacy uses."*

As any electronic platform, e-prescription.gr has certain identified drawbacks. In particular, as mentioned by all of the participants in this research, human error seems to be the most cited one. Having to constantly change passwords, the involved stakeholders try to find easy ways to achieve accessing the system without a great effort. As it was stated to me by one doctor, passwords tend to be simplistic, like *"…the doctor's name and the month we are in".* A pharmacist from the pharmacies I did the observations claimed that *"it's hard to remember all the different passwords, so some of us write them on post-it notes and stick them on the monitor"*.

Another known drawback of this system is its inability to project important comments that the doctors have noted with regards to a patient. There is a field for comments but it is not searchable, thus if a doctor wants to access a comment, they have to manually look for it and open it. This may lead to an error in the prescription and pose a threat to the patient, as seen before, with the example of the patient with glaucoma. Furthermore, an identified security gap is that the doctor has no way of knowing that it is too soon to prescribe medicine for a specific patient, as no pop up window exists informing them so. To highlight this issue, a doctor commented:

> *"There was this time when a senior citizen came to the office and asked me to prescribe his usual monthly medicine but I was sure I remembered him coming last week as well asking for it. So I accessed his History and, alas! I was right."*

The above however comes in contrast to an experience shared by a citizen who took part in a focus group, who claimed:

> *"I was at the cardiologist a few days earlier than I should have gone and the month for which I had medicine prescribed to me*

was not over yet. The system did not allow the doctor to prescribe the medicine to me, he told me that it kept blocking me."

Multiple citizens, both from the focus groups and individual interviews expressed their concerns about the platform itself. They had a feeling of mistrust both in the system itself and the government who, they feel, hastily commissioned the programming and implementation of e-prescription.gr:

"They [the government] *must have known that the platform was not very good. It was created so fast! How could they not have designed pop-up windows? It's a serious lack, I believe.",*

An interviewee mentioned. Another one from a focus group commented that even though the system was much needed in Greece, he does not think that it is up to date in comparison to the technologies that are available today. Lastly, another interviewed citizen commented on the matter:

"I don't feel very confident that my [medical] *records are being very well guarded. You don't have to be paranoid to think about these things: they do happen for real".*

While there is a box to be ticked in e-prescription.gr stating that the patient has given their permission for the doctor to view their medical history, there is no written consent given. This may result in disputing that consent was ever given to the doctor. This may work in both ways, as doctors can tick that box at will, without informing the patient at all, as seen in the above quote.

Moreover, availability of information and medical stats is not always guaranteed. A pharmacist that was interviewed mentioned that they are facing a very serious issue: not all medical EPR systems are compatible with each other. Even though this is not strictly relevant to e-prescription.gr, it does however, significantly influence it: if a patient is admitted to a hospital for a procedure, it does not appear in their personal health card in e-prescription.gr. As it can easily be understood, this may pose significant danger and risks to the patients in case of, for example, dementia. The pharmacist I interviewed commented:

"There was talk that one centralized EPR would be introduced to all public hospitals, for a very simple reason: The way things are now, if a patient was admitted to, let's say Onasio Hospital and then left and got admitted to Red Cross Hospital, doctors there would have no clue, or would have to ask the patient him/herself what was done to him/her at the first Hospital or what medication he/she was given. But the patient maybe did not know exactly, or maybe did not remember."

In the case of a system failure, pharmacists mentioned that communication with the platform's administrators was problematic. They had no formal notification that the software was facing connectivity issues and were left wondering if it was a local problem or not. The mentioned solution was that pharmacists were communicating with each other and asking if everyone was unable to connect.

Lastly, as observed in the pharmacies, even though, it is required by law that pharmacists must ask for some sort of identification, such as an ID card, when filling a prescription. However, this is not always what happens in reality. It is usual for the pharmacies to have large queues of customers to serve and time is of the essence. Consequently, as the professionals explained to me, they tend to not ask for an ID card. A potential privacy risk is that a prescription can be filled by a third person without the doctor or patient being able to do anything about it. Of course the fact that pharmacies do not ask for IDs is well known to citizens as well. People who took part in the focus groups expressed their mistrust in the users of the platform:

> *"Those people don't ask to see an ID. They have access to all my personal and medical information. How am I supposed to trust them?",*

one citizen mentioned. One suggestion of an interviewed individual was that the state should implement more thorough inspections on pharmacies in order to make sure that proper identification is being asked for upon a prescription filling.

Additionally, another precaution that is sacrificed in order to save time is the required customer's signature on the printed copy of the prescription that the pharmacy keeps. It is obligatory for the customer to sign, however for reasons regarding customer's convenience it is usually omitted. A pharmacist explained on these issues:

> *"In theory, a prescription can only be filled by the person for whom it was issued. If for some medical or other reason that person cannot be there in person, then the representative needs a signed permit which is stamped by the police or by some other state service. This hardly ever happens, though.* […] *if there is a 5-person queue there's no way the pharmacist will wait for the document* [that needs to be signed by the customer*] to be printed. They just give the medicine to the customers in order to offer a fast service and then, when they are gone, they just print the documents and sign them themselves."*

At a further inquiry regarding the possibility that a wrong doing may happen, the pharmacist explained that especially in the cases of heavy antibiotics or pain killers the pharmacist technically has to also sign the patient's health booklet. He claimed that this rarely happens too, as most people do not carry with them their health booklets. However, the pharmacist can deny service if the customer fails to present said booklet, especially *"*[…] *if for some reason they find the transaction shady",* he concluded.

Besides the above mentioned disadvantages, the platform does offer various safety measures for safeguarding the patients' sensitive medical information. To start with, the frequent change of password, regardless of how it ends up being treated by the professionals, is one of these. Additional to this is the required CAPCHA code every time a sign-in in the system happens.

> *"There is a safety valve, the known text, CAPTCHA, that asks you to confirm you are not a robot and then asks you to write a small*

text. They use this so as machines or programs do not try to access the system."

Another point that was mentioned to me was that a paper prescription is more than just a simple printed document, as multiple information is on it. In effect, identifying data about patient and doctor exists on the prescription, along with the doctor's signature and stamp. In case a doctor loses their stamp, they have to inform EOPYY and immediately the system is informed. This results in pharmacists seeing a pop up window that informs them of potential fraud. A unique barcode also exists on the document, that is scanned by the pharmacist who fills the prescription. This barcode can only be used once for filling the prescription and is then locked making the same prescription unable to be scanned again.

It is a firm belief of a doctor interviewed that having both a digital and a printed prescription is not a retrograde thing but rather ensures the safety of the prescription process.

"The citizen's social security number, the doctor's and the hospital's stamps are things that guarantee that a paper prescription is genuine. By having a paper prescription, the chances that a prescription can be falsified are slimmed down. A very important advantage to have."

Complementary to the paper prescriptions, the doctors are required to also write a detailed diagnosis and proposed treatment in the patient's health record. This is, however, a questionable requirement as some doctors claim that medical confidentiality can more easily be broken.

"When e-prescription.gr was first introduced we stopped writing the diagnosis and proposed treatment on the patients' health booklet, and very rightly so. With a recent law however, we are made to write on the booklets again which facilitates potential breach of medical confidentiality as whoever gains access to the booklet will be able to see every medical information of the citizen."

During a recent update a new safety measure was introduced: expired medicine can no longer be scanned at a pharmacy, thus minimizing the risk of a patient getting a wrong item. This information was shared by a pharmacist during the thinking aloud method. Another important addition is that the moderators of the software, i.e. the developers of IDIKA, can monitor in real life the filling of the prescriptions. According to the same pharmacist this can be beneficial:

"As of the last update, IDIKA can see in real time the prescriptions that are being filled. It's a good thing, it can protect both us and the customers from potential fraud."

The innovation that e-prescription.gr has offered is that it facilitates the writing of the prescription. The doctors save considerable amounts of time as they can copy and paste regular or repeating prescriptions of patients. Additionally, life is made easier for the

pharmacists as well, as doctors' bad hand writing is overrun. A doctor shared the following experience:

> *"It may sound cliché, but for me it was a reality: I just have very bad handwriting! I remember when I was in Folegandros[1], the pharmacist of the island would call me and ask me what I had written in that's or that's patient prescription. I did not have a clue! If I was seeing 20 patients a day, how could I remember what I had written for each one of them?! It was very bad. We don't have those kinds of problems anymore."*

The platform offers more controlled prescribing as doctors can only prescribe certain amounts of medicine from specific companies, as professional interviewees explained. Lastly, it also protects patients, in case they forget what medicines they take or in case that an error is spotted on the prescription the doctor has given them: the pharmacist can access the patient's history and get any information they need. A pharmacist commented:

"Sometimes, regular customers will come and ask for their usual medication but upon checking the printed prescription and the patient's history we may see something irregular. For example, the doctor may have prescribed Carvedilol 12,5MG but he/she may have meant to write 25MG, as usually. Then we can ask the customer, did your doctor change your usual dosage?"

5.4 Ethical Issues

It is undisputed that the digital era of prescribing medicine has brought dramatic changes to the olden ways. However, ethical considerations should always influence decision making. In the case of e-Health where sensitive personal data is concerned, all of the three involved parties have mentioned doubts about the way that the e-Health platform was implemented.

One doctor in particular, believes that it is a serious omission of the State that citizens have not been officially informed about the fact that their personal data is being gathered and used. For instance, an example given by the doctor for what a patient can do is when the citizen does not wish to be a part of this database, they should be able to file a formal document to their insurance sector that excludes them of the database and of the data gathering process. One further omission is that patients are not informed about repercussions or penalties that may arise from breach of terms. This point was made by a doctor during communication that took part after the interview was concluded.

Even though having our own national health statistics can be beneficial, not enough attention has been paid with regards to patients' privacy, as mentioned by multiple interviewed professionals.

[1] Folegandros is a small Greek island. All doctors are required to spend a certain amount of time at a remote part of Greece as part of their training.

> *"We now have huge statistical information databases, that we did not have in the past. There is no care, though, for patients' personal medical data"*

one doctor said. This point was mentioned to citizens who took part in the focus groups and concerns were raised by some of them:

> *"Who has access to these stats, I wonder. I'm OK only if the Ministry for Health does. I suppose the people who run the platform too",*

a citizen commented on the matter. A pharmacist however did confirm that indeed, only those two parties can access and review the statistics produced by the e-prescription.gr platform.

6. Discussion

Privacy and ethics are some notions in which I am very interested in personally, and this interest is what prompted me to get involved in this particular research. As Ess (2014, pp.51-52) mentions the person we all are is increasingly the information we choose to share online. In the case of the e-Health records kept by the e-prescription.gr platform, sensitive information is being shared and stored without the explicit consent of citizens. This fact is what prompted me to explore and identify what the caretakers and caregivers see as potential threats to their privacy.

By using interviews, focus groups, observations and thinking aloud methods I wanted to explore the thoughts of the involved categories of people (i.e. doctors, pharmacists and citizens) on the privacy aspect of the current state of e-Health records and practices kept. Their concerns about the security of said records was the main focus of my research and their views are discussed in this section along with back to back comparison with previous literature mentioned in the thesis.

6.1 Identifying the Concerns

The first and foremost aim of my research was to pinpoint what are the privacy and security concerns that health care providers, doctors and pharmacists in this case, and health care consumers perceive with regards to the use of e-prescription.gr. In order to be able to discuss the concerns that emerged from the methods that I used, they are categorized in four themes and discussed with regards to these aspects. These themes are the technological aspect of e-prescription.gr, the functional one, ethical issues tied with its use and concerns about the platform that are connected to the general sector of Health in Greece and the way that it is managed.

6.1.1 Concerns on the Technological Aspect

As seen above, in the Literature Review section, according to Nataraj (2011), security issues may arise in any IT environment that the healthcare professionals (either doctors or pharmacists) use, or the traffic director itself. That could include any device used to access the e-Health platform and of course, the network used. As explained by the professionals who took part in the research however, in Greece this issue has not been taken into consideration and with the right credentials, anyone can have access to e-prescription.gr from any place they may be.

The risks of accessing the platform from a not very safe network, outside of a protected environment (i.e. hospital or private practice) can induce unwanted breach in security. Such an event could consequently cause irreparable troubles to citizens' privacy. One doctor went as far as to suggest that the fact that access can be gained from virtually any place, could be exploited by medical professionals with questionable ethics and professionalism. An obvious comparison can be made to the UK's NHS. In the UK doctors can access their online system only from licensed networks, such as hospitals and private practices. Greece, and especially IDIKA who is in charge of the e-

prescription.gr platform could look to such examples in order to make adjustments to the platform that can ensure a higher level of security.

To discuss further the connectivity related issues, it is worth to mention at this point the occasional unavailability of the platform. As multiple professionals mentioned, there are times when the e-prescription.gr platform is offline which results in them having to tell the citizens/patients (when talking about doctors) or the citizens/customers (when talking about pharmacists) that they cannot be served thus having to leave and return at a later time when the platform is online again. As it can be understood, this unavailability causes various troubles for all of the involved individuals. The health care providers are not able to do their job and the citizens do not get the treatment they require. In other words, the availability of the platform is severed. To make matters worse, as explained by pharmacists, it can be difficult to communicate in a timely manner with the administrators of the platform in the event that it goes offline.

The International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) have introduced and revised the Code of Practice for Information Security Control, known as ISO/IEC 27002:2013 (Lois, 2016, p.29), which defines Information Security as the practices that ensure confidentiality, integrity and availability of information (von Solms & van Niekerk, 2013, p.98).

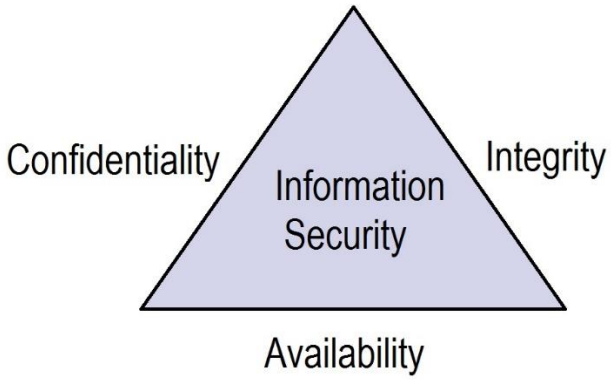

Figure 2: The CIA triad (Yeboah-Boateng, 2013, p.35)

The CIA triad is a generally accepted standard in the field of Information Security and thus, when one of the components is no longer a variable, security issues may arise (Gomes & Lapão, 2008, p.768).

As seen in the analysis and explained by the pharmacist I interviewed, each hospital uses its own EPR system. Even though this by itself does not affect or produce any security concerns for the citizens (it was not mentioned by any citizen who took part in either the focus groups or the individual interviews), it may pose a risk indeed, at least in the eyes of the pharmacist who mentioned it. To be more exact, if a patient visits a hospital for a medical reason and then checks out, there is no way for another hospital that the same patient may visit in the future to know exactly the treatment that he or she received in the first hospital. Consequently, information is not being available to the individual/professional who needs it. In other words, one of the three main areas of Information Security is not covered.

Kierkegaard (2013) talks about barriers that hold back a unified platform from being implemented in a greater scale, through the whole of EU. Apart from this bigger picture however, most of the barriers can also be mentioned with regards to a unified EPR system for the Greek hospitals and private practices of doctors who are working with the public sector. Some of the barriers mentioned by the researcher are:

1. Existing software and hardware would make it expensive to migrate to a unified platform.
2. Maintenance costs would be high.
3. Varying degrees of e-Health implementation throughout the EU currently, would complicate adopting a unified infrastructure in the future.

A comparison can be made regarding the above-mentioned numbers one, two and four points to the Greek reality. The third barrier is not applicable to the Greek reality as the whole of the country has moved past the pilot period of implementing the e-prescription.gr platform in certain areas and has moved on to use it in its whole. Regarding the first one, it can safely be assumed that it would apply to the country's circumstance. As there are various EPR platforms in each hospital, a unified implementation would make it prohibitive to implement. This issue is amplified by the economic state not only of Greece in general but also of the economics of public hospitals who are facing economic turbulences and distress. Specifically, in 2015, amidst the economic crisis, health spending amounted to 8,2% of GPD (or 2245 USD per capita) in comparison to 11,1% of GPD in Sweden (or 5228 USD per capita) or 9,8% of GPD in the UK (or 4003 USD per capita) (OECD 2015). For reference, health spending in the year of 2009, a year before the documented start of the crisis was 9,8% of GPD (or 2991 USD per capita) (OECD 2009). This comparison highlights and, to some extent, explains why it is more difficult for Greece who has substantially less funding for the Health sector than countries like Sweden or the UK, to sufficiently fund the creation or update of a better functioning e-prescription platform.

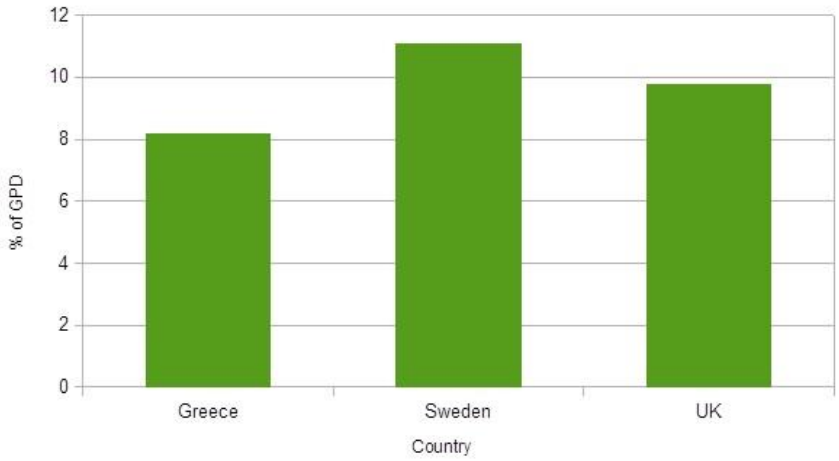

Figure 3: Data from OECD, 2015

With regards to the second point, maintenance costs would not be higher with a unified system, by contrast to having multiple systems to maintain. The Greek e-Government

Center for Social Security (IDIKA) would have one software to handle and thus it would prove to be both cost effective and less time consuming to train employees.

6.1.2 Concerns on the Functional Aspect

One of the concerns of the professionals involved in the research was that e-prescription.gr was hastily designed and implemented. Additionally, citizens mentioned that the platform does not appear to offer the functionalities that IS nowadays can offer. These views are supported by the official dates that highlight the reality: e-prescription was a term in the Memorandum signed on May 3rd of 2010 and the platform launched on January 24th of 2011 (Vassilakopoulou & Marmaras, 2013, p.6).

To begin with, as professionals explained, there are no built-in decision support mechanisms that could alert the prescribing doctors for multiple medicine inconsistencies or allergies of the patients. As expressed, while the doctors prescribe medication there are no popup windows that could warn them about, for instance, know allergies of the patient that render them incapable of taking a certain medicine. This is a functionality that could have been incorporated in the platform, as it is done in the UK for example, according to one interviewee.

Today, shortcomings like the above are fairly easy to deal with. According to some researchers, most platforms for e-prescribing medication in the USA include a system that alerts doctors when inconsistencies are present with regards to medication and allergies of the patients (Porterfield, Engelbert & Coustasse, 2014). However, they do mention also that, on the other hand, having too many such alerts could cause alert fatigue: a phenomenon where doctors tend to ignore alerts altogether if they are overwhelmingly many.

Some other functional shortcomings mentioned by the doctors, were that there is no way for the doctor who is about to prescribe medicine through e-prescription to know that it is too soon for the same patient to be given medicine for the same condition. In cases of chronic disease, patients are given enough medication to last for three to six months and they cannot be given medication sooner than that. However, as doctors mentioned, there is no pop up banner that informs doctors that it is not yet time for the patient to be given medication. This leads to extra manual work added to the workload of a doctor, who has to check the date of the previous prescriptions given to the patient. Many doctors find this to be a functional flaw of the platform, besides being inconvenient, that could lead to serious consequences.

It is worthwhile to mention here however, that a citizen who took part in focus groups narrated that she was once denied by her doctor medication with the excuse that the platform did not allow him to prescribe medication for her condition as the three months from her previous visit to the doctor had not yet expired. This is a curious case, but it could be explained by the fact that doctors can access the history of each patients' prescriptions and visits to the doctor. However, ethical issues may arise from this, which are discussed next.

6.1.3 Ethical Concerns

As an interviewed doctor explained, when a doctor is to access a patient's history they are required to tick a box that says they have the patient's permission to do so. They are required to ask the patient first before ticking the box but, in reality, they rarely do so. The fact that the patient does not explicitly give consent to their medical history being accessed could raise serious ethical concerns as to where the doctor's job ends and where the obligation to ensure safety of the general population starts and it could be the topic of another research altogether. However, it could provide an adequate explanation of why some citizens believe that e-prescription.gr can prevent doctors from prescribing medication before is due time, as it was mentioned to me in a focus group.

To take the above mentioned point a step further, a more general ethical consideration is that citizens have not been informed that their medical data is being accessed and used in order to extract statistical information. Professionals that took part in my research mentioned that it is a considerable step forward to have our own medical statistic and not have to rely solely on foreign studies about the Greek reality, but in the hasted way that the platform was designed and implemented, not enough attention was given to protecting patient privacy while mining data from the e-prescription.gr platform for statistical purposes.

The question of who will have access to the medical data in a unified EU e-Health system and who will safeguard them in each country-member has been in scope in Kierkegaard's research (Kierkegaard, 2013). Ethical questions such as who will have access to the data in each country, who will be able to process them and for what purposes and, perhaps, most importantly who will be keeping them safe are important to research and answer before any attempt to a unified platform will be proposed. However, it is an important point to consider for each country-state individually as well. As I was informed by a participant doctor, these questions were not given much thought, consideration or planning in Greece's case. Citizens have not been explicitly informed by the state about what kinds of data is being gathered, who can access their data or have not been given the choice to opt out of the database or of any parts of it. Additionally, citizens of Greece have no access to their medical data so far.

This lack of proper studies in handling medical data in an ethical way is quite well documented in an interview of the ex-managing director of IDIKA in national television. In the interview he admitted that raw data is being gathered but unfortunately there is not enough filtering or anonymization processes before the data is processed (timetvchannel, 2012). On a positive note, however, professionals confirmed that only the National Agency of Health Services, the Hellenic Pharmaceutical Association and the administrators of IDIKA have access to the raw data and the whole of the statistical information. As such, the citizens' concerns on who can have access to the processing of their personal medical information can be reassured.

6.1.4 General Concerns

Pharmacists are required by law to ask for official identification before proceeding to fill a printed prescription presented to them by a client. However, as explained by pharmacists in my observation sessions, they rarely do so. Particularly in rush hours

and days when a nearby hospital is open in overtime, pharmacists have large numbers of prescription to fill, thus making it impractical to ask for an ID card from every customer that asks to be served. Citizens that participated in focus groups expressed their concerns about this and in certain cases outright mistrust.

The fact that another requirement is not enforced strains the citizens' trust even further: when filling the prescription, the customer who receives the medication is required to sign it. However, in order to maintain reasonable serving time for their customers, pharmacists, as explained to me in the thinking aloud process, tend to omit this step and provide the medicine to their customers.

As van der Schee et al. (2007) explain, public trust is the way that an individual or group of people view an organization or a sector. It is influenced by the citizens of a country and in turn, it influences the way that citizens feel towards this particular organization or sector. Trust is a notion that is also in focus in Agbele, Nyongesa and Adesina's study (2010). The researchers claim that medical personnel are required to show the utmost professionalism and special care when dealing with personal medical data due to their very sensitive nature. Therefore, it is understood that in order to keep the citizens satisfied and have them trust in the health care sector, an equilibrium must be maintained between keeping their privacy safe and serve them in a timely fashion.

6.2 Recommendations

One of the aims of this research was to find ways that could potentially ameliorate the reality of the involved parties. Below, I chose two of the problematic areas explored before and present suggestions that could help assuage them.

6.2.1 Channel of Communication

From my empirical findings, it was clear to me that one of the issues that healthcare providers faced was the insufficient communication, both between them and with the developers of the platform. From the lack of communication multiple issues arise:

> *"The system may go offline but IDIKA needs time to officially announce it. This leads to us not knowing if it's an issue on our part, I mean that our internet connection has a problem, or a system error. We end up calling neighboring pharmacies to ask "Hey, is IDIKA working over there?!" and stuff like that."*

mentioned a pharmacist in the thinking aloud process. Taking into additional consideration the lack of satisfying information on how the system works, as expressed by other pharmacists in the thinking aloud process and doctors that were interviewed, and the mistrust with regards to the effectiveness of the system that some of the citizens who participated in focus groups showed, I understand that communication is an issue that may affect all the involved parties.

My suggestion would be to create an official channel of communication between the relevant public sector along with IDIKA developers on one hand, and healthcare

providers and consumers alike on the other. For example, a forum could be created where individuals could post questions on technicalities, mention that the system has gone offline on real-time, require assistance on a particular aspect of the platform, or even post how-to videos for the less technologically literate professionals. It would be beneficial, in order to protect the sensitive medical information or privacy of the stakeholders, for each user of this system to have specific rights within the medium according to their role. For example, limited access on what different stakeholder groups can read and what sub-forums they can post on.

6.2.2 Local System

Availability seems to be another important issue. As a doctor I interviewed, said:

> *"If the system is down, my hands are tied. Even if it's a prescription I need to write for something simple, I can't do anything if the platform is offline."*

Comments like the above lead me to conclude that the medical professionals are unable to perform even the most basic of tasks if there is a malfunction at the platform. A possible solution to this issue would be for IDIKA to create a secondary, local platform that could provide the healthcare providers with basic tools in order to accommodate the patients and the customers. Then, when the error is resolved and the platform goes back online, all the actions they did on the secondary system can be imported on e-prescription.gr. By creating a secondary IS that could be locally installed on the professionals' computers, the most basic of the issues could be resolved.

Of course, the above are but two suggestions that would have to be very carefully researched, as there is a plethora of ethical, technical and other issues to be addressed.

6.3 Reflections

My research has been informed by ethnography with the aim of understanding the point of view of the participants, be they citizens who are affected by the e-prescription.gr platform or professionals who use the system daily. As I was working within the interpretive paradigm, my personal views and background have undoubtedly affected, to some extent, the way I conducted the research. A different researcher might have approached the individuals that participated in another way than I did, different methods might have been chosen to be used and other conclusions might have been drawn from the findings.

For myself, as I am personally interested in privacy and security, as well as ethics of the people who are in power or hold authority as professionals over others, I had an emotional preoccupation with the subject. This thesis gave me the opportunity to examine in depth how individuals perceive issues of privacy and security and what problems professionals encounter in their daily use of the platform.

7. Conclusion

The risk of personal and sensitive information leaking is a constant thought for individuals of the 21st century. In the era of technological and personalized innovations, people often choose to store their information for easy access thus making privacy concerns a constant. A particular area of concern for privacy matters is, for me personally at least, the e-Health sector. As mentioned in this thesis, medical records can be a category of the most sensitive personal data and could affect the lives of people that have their privacy breached.
It has been my aim, through conducting this work, to answer the research question I posed: i.e.

- Which are the privacy and security concerns that healthcare providers (i.e. doctors and pharmacists) and healthcare consumers (i.e. citizens) perceive, that are related to the use of the on-line e-prescription system?

and

- How can those concerns be addressed in order to assuage the situation?

For the research, I chose to work within a flexible design that is informed by ethnography and involve as many different categories of individuals as possible. Doctors, pharmacists and of course citizens took part in the methods that I employed and even though, ideally, developers of the platform should have been also involved, however the results that I gathered were able to illuminate the question posed for this thesis. Some individuals, i.e. those who took part in the focus groups, were presented with professionals' concerns that had not previously thought of themselves and they became more aware of the potential risks that are apparent. Through the methods used, the concerns of the participants were depicted with regards to various areas such as the technological aspect of the e-prescription.gr platform, the functional one, ethical issues tied with its use and concerns about the platform in connection to the general sector of Health.
Additionally, two ideas were discussed, that could address the concerns of the healthcare providers and healthcare consumers alike. By creating a close-knit network of the stakeholders and a secondary, local system, all the involved parties could a) be reassured that there is a medium where they can all communicate if need arises and b) that the process of prescribing and buying medicine can be undisturbed even if the online system in temporarily unavailable.

7.1 Contribution

First of all, this research aims to raise awareness on important issues that are relevant to all Greek citizens. Healthcare providers and healthcare consumers alike, can all be affected by a potential breach of privacy or an event that would pose a security risk of medical data. The fact that people discuss openly about their thoughts can only prove beneficial for the advancement of the society as a whole.

The empirical findings are presented in clusters, which can be of service for future research attempts of various scientific fields. An attempt has been made in this work to showcase the concerns of the stakeholders as a way of mapping their thoughts on the issues of personal privacy.

Furthermore, it was my intention to facilitate the effective and as direct as possible communication and sufficient information access. Based on the thoughts and ideas that were mentioned to me by the participants of the research, I propose the creation of a network channel that all the involved stakeholders can have. Of course, they would each have specific access rights and measures should be taken in order to guarantee that ethics and privacy will not be violated.

Finally, my second suggestion of having a local program that would function as a temporary system while the online platform is offline, could solve any problems of adequate accessibility issues there may be. Once again, particular care should be shown in the designing process of said system and ideally, the users should be consulted and included.

7.2 Future Research

Even though security risks are indicated through the research process, the scope of this research does not suggest solutions for a safer system, as such an event would require deeper technical knowledge not feasible to obtain for this project. That said however, they can certainly be used as a basis for further research or participatory approaches in order to come up with ways to ameliorate said concerns and assuage the involved parties that their fears and requests are taken into consideration. Moreover, the findings can be the first basis for developers to work on any of the concepts described and offer solutions.
It would be also interesting, to see a research of the same topic and draw comparisons with this one. Not only nationwide but also in other European or other countries, research about the concerns of citizens and professionals could be studied. This could function as the start of a bigger study for wider implementation of an e-Health platform throughout the Union. What is more, another possible further research that would be interesting to see is differences in concerns depending on which category individuals belong to (i.e. a certain age group, sex, socioeconomic status etc.).
Apart from the usability of the research in the field of Informatics, it could also be used to initiate further research in other fields that may be intertwined or relevant, as for instance psychology.
As a matter of fact, they can be the start of a new research that would deal with the psychology of citizens with regard to privacy and security and how it affects them.

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Appendices

Appendix 1

Interview Guide: Doctor

- How long have you been working as a doctor?
- Could you describe the process of obtaining credentials for the e-prescription.gr?
- How did you learn how to operate the system?
- Which patient data is registered in the system? (ex. Can doctors see potential allergies patients may have to certain medicine ingredients? Are potential illnesses mentioned in the patients' page in the system?)
- Do all doctors have the same access to the same data?
- In the case that a patient does not wish all of their data to be available to all doctors, are you aware if they can opt out?
- Through e-prescription.gr doctors can print paper prescriptions for the patient to fill at a pharmacy. Could you tell me any advantages and risks a paper prescription may have?
- Do you suppose there are any risks in using the system? For example, are the passwords safe? How often are they changed?
- Do you know how paper prescriptions can be protected against fraud? For example how can paper prescriptions be ruled as genuine? Do you suppose digitalizing the whole process would prove benefitial?
- Do you know what happens if a patient loses the paper prescription before it is filled?
- What would you advise a third person does if they find a prescription?
- Did you ever face any difficulties while using the system? For example, does the system ever go off line?

Is there something you would like to add?

Interview Guide: Pharmacist

- How long have you been working as a pharmacist?
- As a pharmacist, do you have access to e-prescription.gr? And if so, could you describe the process of acquiring your credentials?
- Do you know if you have the ssame access to the system as the doctors?
- Through e-prescription.gr doctors can print paper prescriptions for the patient to fill at a pharmacy. Could you tell me any advantages and risks a paper prescription may have?
- Do you suppose there are any risks in using the system? For example, are the passwords safe? How often are they changed?
- Do you know how paper prescriptions can be protected against fraud? For example how can paper prescriptions be ruled as genuine? Do you suppose digitalizing the whole process would prove benefitial?
- In order for a patient to fill a prescription, are they required to pressent identification or just the paper prescription?
- In case a patient loses the prescription and it has not been yet filled, can a doctor rewright the prescription? What happens if, in the meantime, the initial prescription has been used by a third person?
- What would you advise a third person does if they find a prescription?
- As far as you know, has there ever been an event of identity theft, i.e. somebody filling a prescription that is not theirs?
- Are you familiar with the percentage of unfilled paper prescriptions? Do you think that these numbers would decrease if the prescriptions were sent digitally to pharmacies or to the cloud?
- Are you aware of any mistakes in paper prescriptions that patients bring to the pharmacies?
- Can pharmacists check for errors, wrong or immproper medicine in the prescriptions and notify the patients?
- Did you ever face any difficulties while using the system? For example, does the system ever go off line?

Is there something you would like to add?

Interview Guide: Individual Interview of Citizen

- Has there ever been a need for you to use e-prescription.gr?
- Are you aware of who can access the platform?
- Is there something that worries you with regards to its use?
- Is there anything that you would like to change in e-prescriptions?

Is there something you would like to add?

Appendix 2

Informed Consent Form (in English)

i. Research title
"E-prescriptions: security concerns and risks in the Greek e-Health care system"
ii. Researcher
Maria Papakonstantinou, Master Program in Information Systems, Linnaeus University, Sweden.
iii. Purpose of the research
The aim of the research is to examine the awareness of any security issues found in the system and the environment of electronic prescriptions in Greece and any risks that may arise from its use.
iv. The research process
The interviews that will be conducted for this project will gather information concerning how all the different stakeholders perceive the risks that may arise by using the e-Health system, as well as the way that they perform their tasks despite those risks. Interviews will be conducted with doctors, pharmacists and citizens. Additionally, observations will take place in pharmacies in order to witness the process of fulfilling a printed paper prescription and the way that those papers and consequently kept and stored until they are handed in to the competent body.
v. Benefits of the research and benefits for the participants
Initially, I aim at gaining a deep understanding of how the stakeholders (individuals who use the system in their everyday practices as well as patients who are dependent on it) perceive the risks that may be found in the use of the system. Through this research project I seek to document those risks and sensitize the responsible parties of the system about the risks that the stakeholders face. Additionally, I seek to raise awareness about the complicated issues of security and engage the patients' attention to these concerns as they are most affected by potential security breaches in the system that would jeopardise their personal medical records.
vi. Risk and discomfort
The research does not asks for or presents any information that may pose risks or cause discomfort to the participants. Their names or other personal information provided during the course of the research will not be revealed in order to secure anonymity and confidentiality. Any recorded sessions will not be made public.
vii. Participants' rights
Taking part in this research is voluntary and all the participants have the right to withdraw from the process at any time and for any reason without having the obligation to state the reason for their withdrawal. Additionally, the analysis of the data that is relevant for them will be given to them in the event that they request it.
viii. Access to the data gathered
The data, information and evidence that the participants provide will be only used and be accessed by the researcher, her supervisor and the examiner of the thesis and they will not be disclosed to third parties. Once the thesis is concluded the data, information and evidence stored will be deleted.
ix. Questions about the research

In case that the participant requires any additional information or has any questions about the research or the research process, they can ask for clarifications either in person, during the process of the research or by sending an email to: mp222sz@student.lnu.se.

x. Consent

I hereby state that I understand and agree with the aforementioned YES NO

I understand that it is my right to deny the use of any of the information I have provided during the process of the interviews

YES NO

I consent to the recording of my interview YES NO

Date:
Media of Interview/ place:

Name of participant Signature of participant

Researcher's name Researcher's signature
Maria Papakonstantinou

Informed Consent Form (in Greek)

Φόρμα συγκατάθεσης για συμμετοχή στην έρευνα

i.Τίτλος έρευνας
«Ηλεκτρονική συνταγογράφηση: ζητήματα ασφαλείας και ρίσκα στο ελληνικό σύστημα ηλεκτρονικής υγείας»
ii. Ερευνήτρια
Παπακωνσταντίνου Μαρία, Master Program in Information Systems, Linnaeus University, Sweden.
iii. Ο σκοπός της έρευνας
Ο σκοπός της έρευνας είναι να διερευνήσει τα ζητήματα ασφαλείας του συστήματος και περιβάλλοντος της ηλεκτρονικής συνταγογράφησης της Ελλάδας με τον τρόπο που αντιλαμβάνονται οι εμπλεκόμενοι και τα όποια ρίσκα για τα προσωπικά και ιατρικά δεδομένα προκύπτουν με τη χρήση του.
iv. Περιγραφή της ερευνητικής διαδικασίας
Στα πλαίασια της συγκεκριμένης έρευνας θα διεξαχθούν συνεντεύξεις με τις οποίες θα αντληθούν πληροφορίες σχετικά με το πώς οι εμπλεκόμενοι αντιλαμβάνονται τα ρίσκα που υπάρχουν με τη χρήση του ηλεκτρονικού συστήματος υγείας καθώς και ο τρόπος που ενσωματώνουν την ύπαρξή τους όταν χρησιμοποιούν το σύστημα. Συνεντεύξεις θα διεξαχθούν με γιατρούς, φαρμακοποιούς και ασθενείς. Επιπροσθέτως, θα γίνει παρακολούθηση σε φαρμακείο της διαδικασίας με την οποία εκτελούνται οι συνταγές και του τρόπου με τον οποίο αποθηκεύονται μετέπειτα μέχρι να παραδοθούν στον αρμόδιο φορέα.
v. Τα οφέλη της έρευνας και τα οφέλη για τους συμμετέχοντες
Αρχικά επιδιώκω να κατανοήσω σε βάθος το πώς αντιλαμβάνονται οι εμπλεκόμενοι (χρήστες του συστήματος και ασθενείς) τα ρίσκα που εμπεριέχονται στη χρήση του συστήματος. Μέσω της έρευνας αποσκοπώ να καταγράψω τα ρίσκα και να ευαισθητοποιήσω τους υπεύθυνους του συστήματος e-prescription.gr σχετικά με τους κινδύνους που αντιμετωπίζουν οι εμπλεκόμενοι. Επίσης, επιθυμώ να επιστήσω την προσοχή των ασθενών στα συγκεκριμένα ζητήματα καθώς τα δικά τους προσωπικά/ιατρικά δεδομένα και η ασφάλειά τους είναι το κύριο ζητούμενο.
vi. Κίνδυνοι και δυσφορία
Η έρευνα δεν παρουσιάζει στοιχεία που μπορεί να προκαλέσουν κινδύνους ή δυσφορία στους συμμετέχοντες. Ονόματα ή άλλες προσωπικές πληροφορίες τους δεν θα αποκαλυφθούν για να διασφαλιστεί η εμπιστευτικότητα και η ιδιοτικότητα. Οι ηχογραφημένες συνεντεύξεις δεν θα δημοσιευφθούν.
vii. Δικαιώματα συμμετέχοντος
Η συμμετοχή στην έρευνα γίνεται εθελοντικά και όσοι λαμβάνουν μέρος διατηρούν το δικαίωμα να υπαναχωρήσουν ανα πάσα στιγμή και για οποιονδήποτε λόγο χωρίς να τον κατονομάσουν. Επιπρόσθετα, η ανάλυση των δεδομένων που τους αφορούν θα είναι στη διάθεσή τους εφόσον το ζητήσουν.
viii. Πρόσβαση στα δεδομένα
Τα δεδομένα, οι πληροφορίες και τα στοιχεία που θα δώσουν οι συμμετέχοντες θα χρησιμοποιηθούν και θα θα είναι μόνο στη διάθεση της ερευνήτριας, του επιβλέποντα καθηγητή και του εξεταστή της διπλωματικής εργασίας και δεν θα

κοινοποιηθούν σε τρίτα πρόσωπα. Με το πέρας της εργασίας τα στοιχεία αυτά θα διαγραφούν.

ix. Ερωτήσεις σχετικά με την έρευνα

Σε περίπτωση που οι συμμετέχοντες επιθυμούν οποιαδήποτε διευκρίνυση ή περαιτέρω πληροφορία μπορούν να τη θέσουν είτε κατά τη διάρκεια των συναντήσεων και συνεντεύξεων, είτε αποστέλοντας mail στην ηλεκτρονική διεύθυνση της ερευνήτριας: mp222sz@student.lnu.se.

x. Συγκατάθεση

Δηλώνω ότι κατανοώ και συμφωνώ με τα παραπάνω ΝΑΙ ΟΧΙ

Κατανοώ ότι μπορώ να απαγορεύσω τη δημοσιοποήηση και χρήση οποιονδήποτε στοιχείων έχω δώσει ΝΑΙ ΟΧΙ

Συμφωνώ να γίνει ηχογράφηση της συνέντευξης ΝΑΙ ΟΧΙ

Ημερομηνία:
Μέσο συνέντευξης/ τόπος:

Όνομα συμμετέχοντος Υπογραφή συμμετέχοντος

Όνομα ερευνητή Υπογραφή ερευνητή
Παπακωνσταντίνου Μαρία

Appendix 3

Example of Creating Codes, Categories and Concepts

Code	Category	Concept
over prescription	Historical information	Understanding the situation
unavailability		
Educating professionals		
Wasted medicine	General stats and information	
Filling prescriptions		
Statistical information on medicine		
Limited system access	Comparison to other countries' health system	
Paper prescriptions		
Alert banner		

Appendix 4

Programs Used for Interviews

ACR

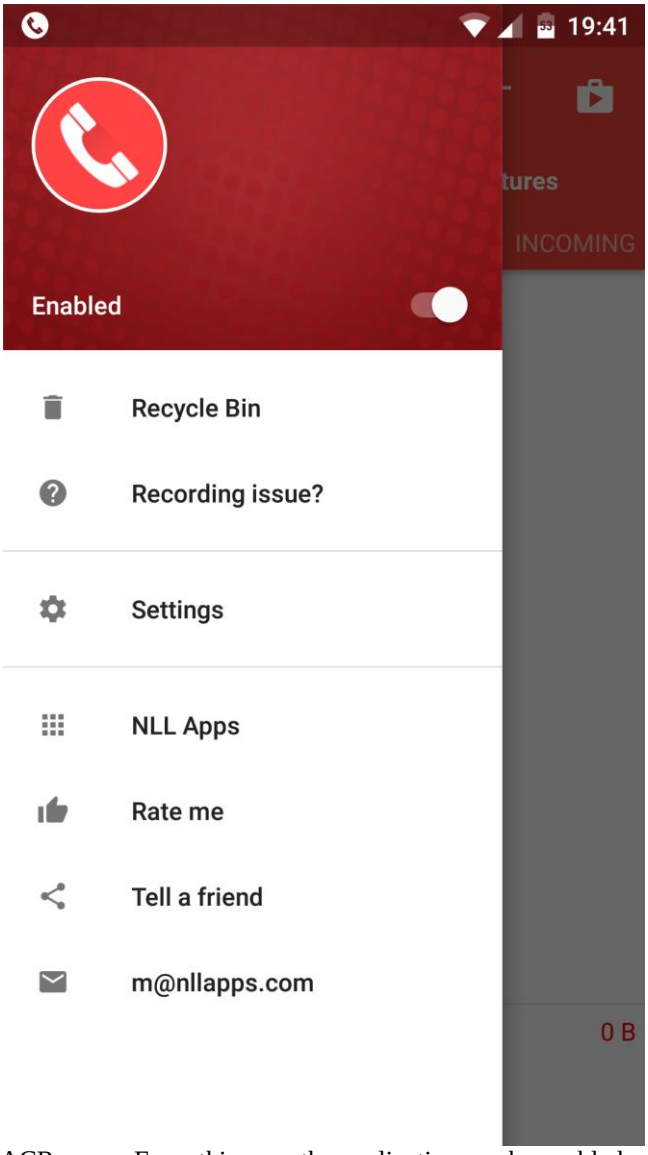


Image 1: ACR menu. From this page the application can be enabled or disabled

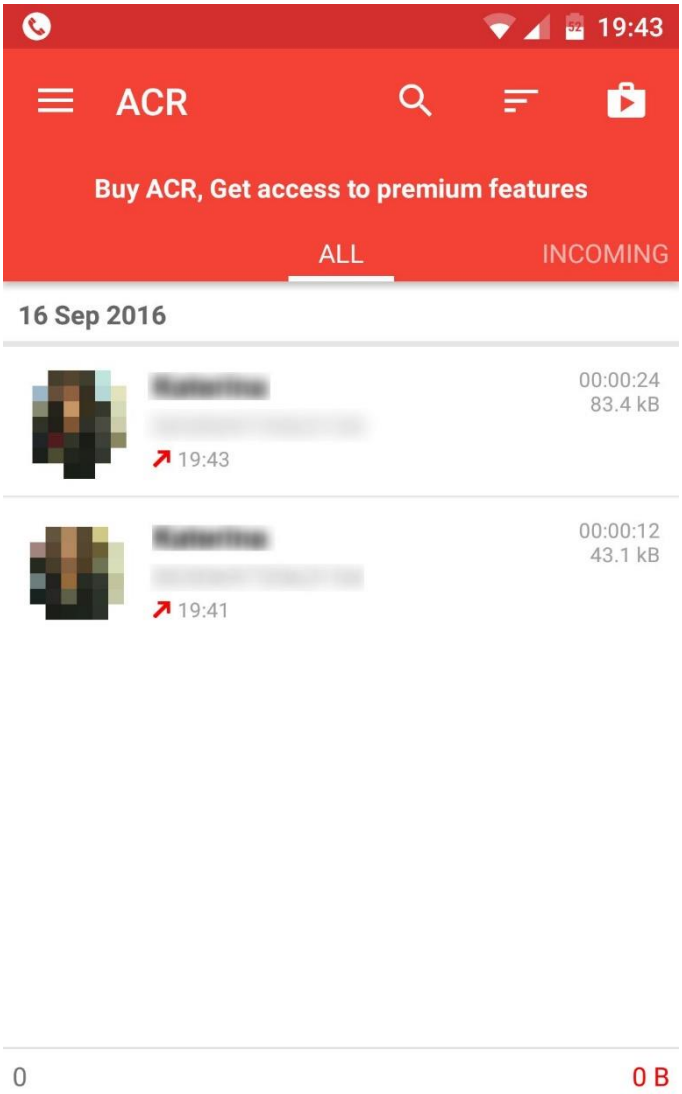


Image 2: Example of how the calls are saved on the application. The phone number, duration, time of call and file size are saved as well

IFree

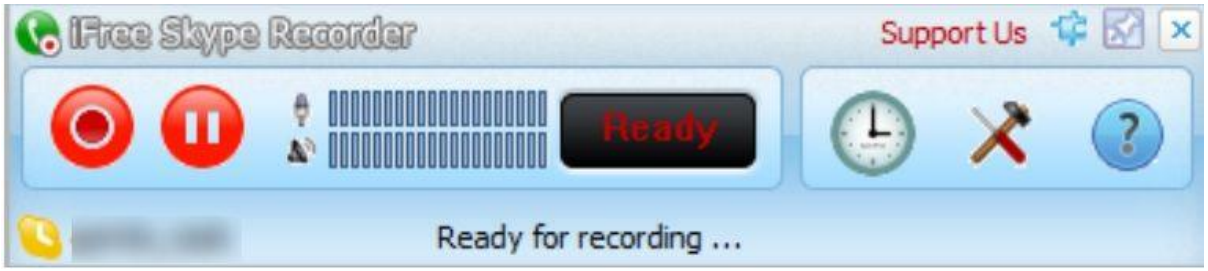


Image 3: The application connects on the user's Skype account and starts recording when a call is started

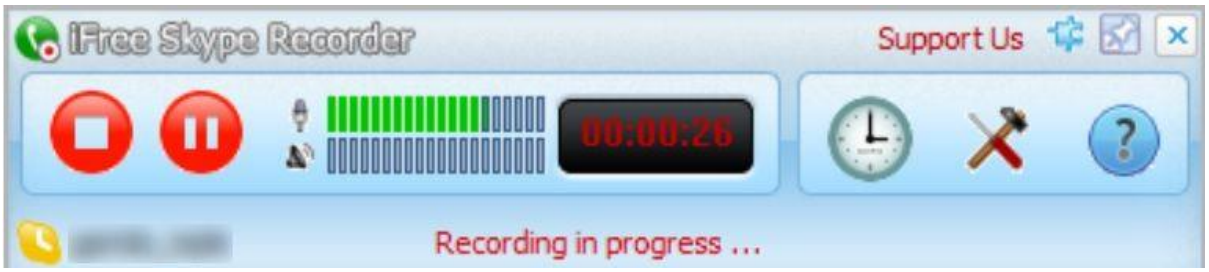


Image 4: Example of recording. The duration and volume of the call are visible on the interface. There is the option of pausing or stopping the recording

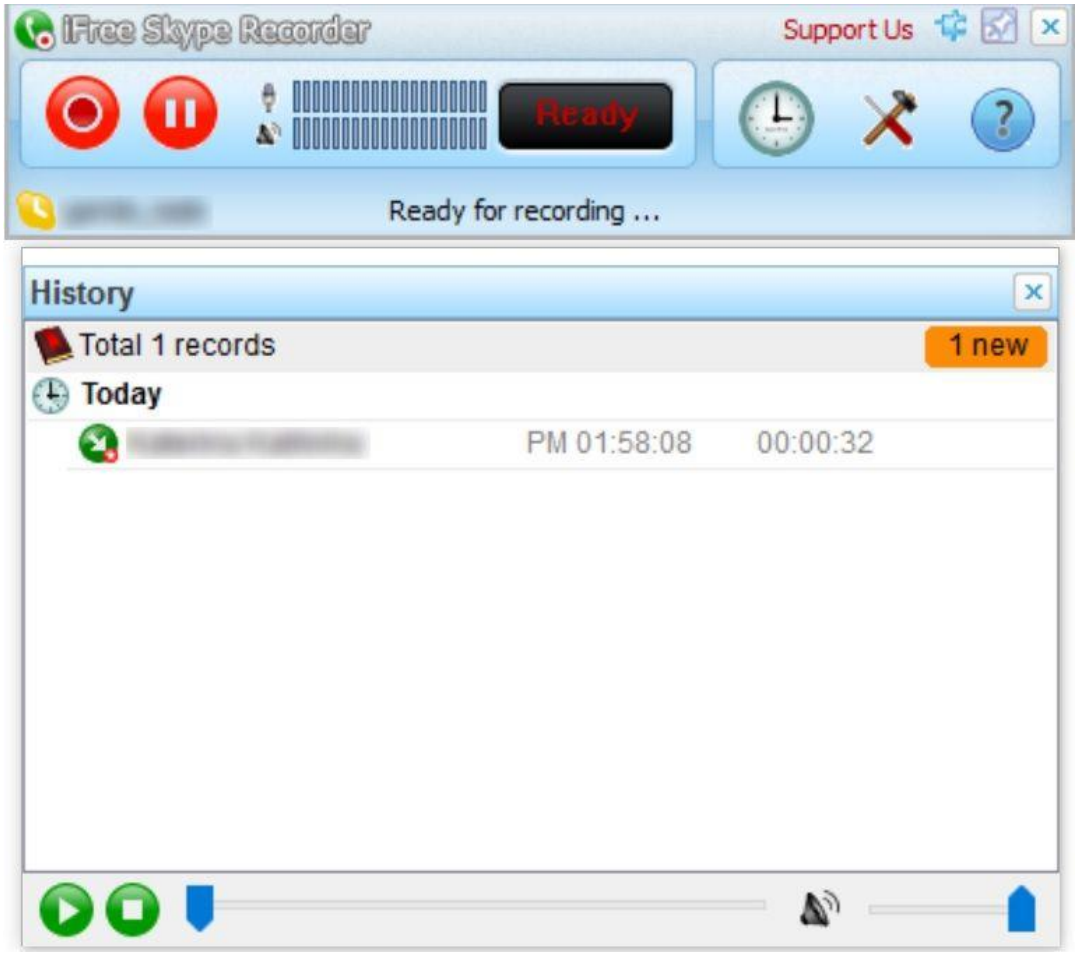
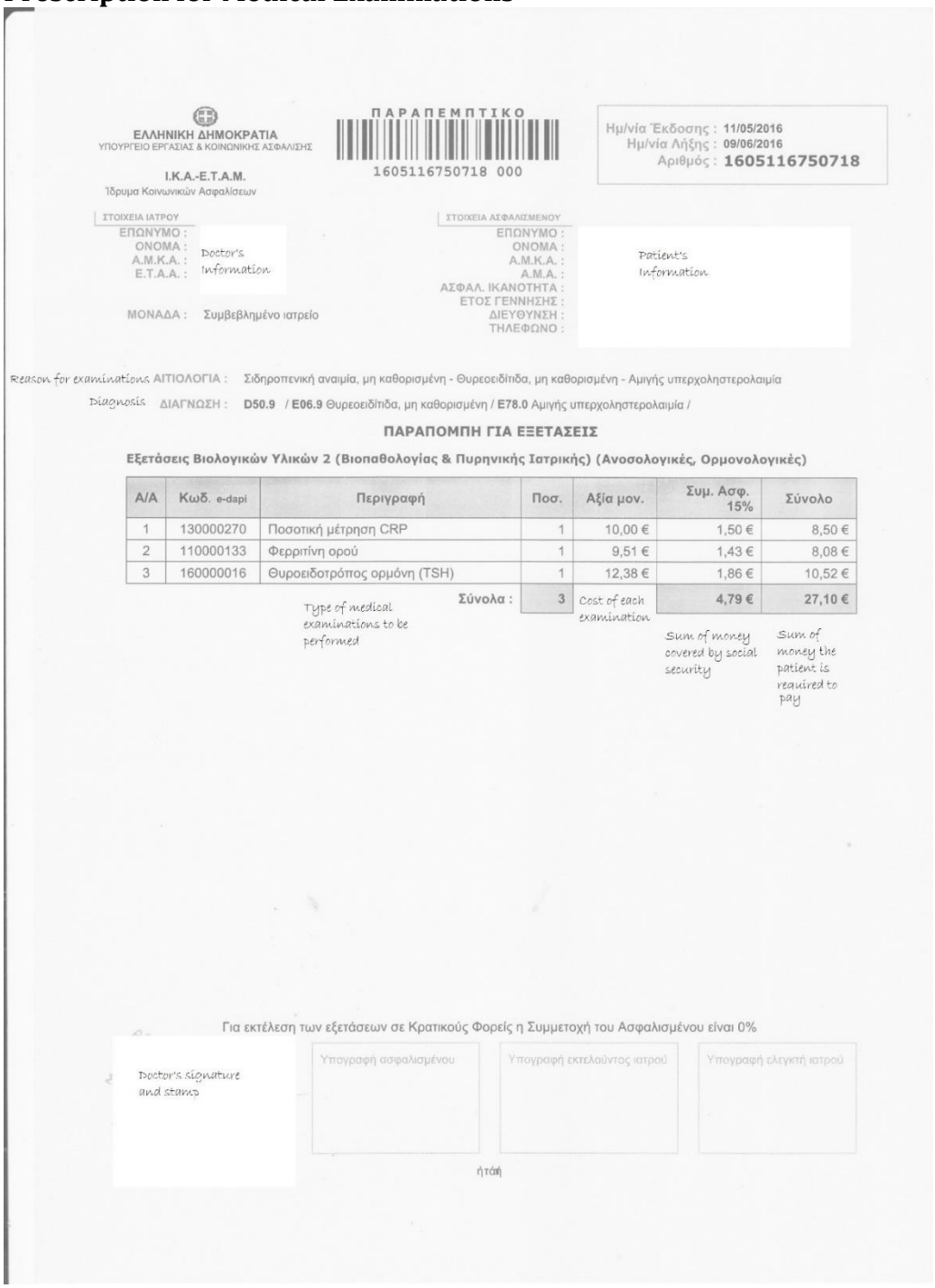


Image 5: After a recording is stopped it is saved in the application's interface for later use.

Appendix 5

Examples of e-prescription.gr Generated Printed Paper Prescriptions

Prescription for Medical Examinations



ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
ΥΠΟΥΡΓΕΙΟ ΕΡΓΑΣΙΑΣ & ΚΟΙΝΩΝΙΚΗΣ ΑΣΦΑΛΙΣΗΣ

I.K.A.-E.T.A.M.
Ίδρυμα Κοινωνικών Ασφαλίσεων

ΠΑΡΑΠΕΜΠΤΙΚΟ
1605116750718 000

Ημ/νία Έκδοσης : 11/05/2016
Ημ/νία Λήξης : 09/06/2016
Αριθμός : 1605116750718

ΣΤΟΙΧΕΙΑ ΙΑΤΡΟΥ
ΕΠΩΝΥΜΟ :
ΟΝΟΜΑ :
Α.Μ.Κ.Α. :
Ε.Τ.Α.Α. :
Doctor's information

ΜΟΝΑΔΑ : Συμβεβλημένο ιατρείο

ΣΤΟΙΧΕΙΑ ΑΣΦΑΛΙΣΜΕΝΟΥ
ΕΠΩΝΥΜΟ :
ΟΝΟΜΑ :
Α.Μ.Κ.Α. :
Α.Μ.Α. :
ΑΣΦΑΛ. ΙΚΑΝΟΤΗΤΑ :
ΕΤΟΣ ΓΕΝΝΗΣΗΣ :
ΔΙΕΥΘΥΝΣΗ :
ΤΗΛΕΦΩΝΟ :
Patient's information

Reason for examinations ΑΙΤΙΟΛΟΓΙΑ : Σιδηροπενική αναιμία, μη καθορισμένη - Θυρεοειδίτιδα, μη καθορισμένη - Αμιγής υπερχοληστερολαιμία

Diagnosis ΔΙΑΓΝΩΣΗ : **D50.9** / **E06.9** Θυρεοειδίτιδα, μη καθορισμένη / **E78.0** Αμιγής υπερχοληστερολαιμία /

ΠΑΡΑΠΟΜΠΗ ΓΙΑ ΕΞΕΤΑΣΕΙΣ

Εξετάσεις Βιολογικών Υλικών 2 (Βιοπαθολογίας & Πυρηνικής Ιατρικής) (Ανοσολογικές, Ορμονολογικές)

Α/Α	Κωδ. e-dapi	Περιγραφή	Ποσ.	Αξία μον.	Συμ. Ασφ. 15%	Σύνολο
1	130000270	Ποσοτική μέτρηση CRP	1	10,00 €	1,50 €	8,50 €
2	110000133	Φερριτίνη ορού	1	9,51 €	1,43 €	8,08 €
3	160000016	Θυρεοειδοτρόπος ορμόνη (TSH)	1	12,38 €	1,86 €	10,52 €
		Σύνολα :	3		4,79 €	27,10 €

Type of medical examinations to be performed

Cost of each examination

Sum of money covered by social security

Sum of money the patient is required to pay

Για εκτέλεση των εξετάσεων σε Κρατικούς Φορείς η Συμμετοχή του Ασφαλισμένου είναι 0%

Doctor's signature and stamp

Υπογραφή ασφαλισμένου

Υπογραφή εκτελούντος ιατρού

Υπογραφή ελεγκτή ιατρού

ήτάή

Prescription for Medicine, After It Has Been Filled at a Pharmacy

Appendix 6

Invitation Left at the Public Library of Amarousion, for Citizen Interviews

Πρόσκληση σε έρευνα

Περί τίνος πρόκειται :
Στα πλαίσια διπλωματικής εργασίας, σας καλώ να λάβετε μέρος σε συζήτηση σχετικά με την προστασία της ιδιωτικότητας, αλλά και την ασφάλεια των προσωπικών ιατρικών δεδομένων.

Η διαδικασία :
Η διαδικασία που θα ακολουθηθεί, περιλαμβάνει συγκεκριμένες ερωτήσεις και συζήτηση επ' αυτών, καθώς και ανάλυση συμπληρωματικών θεμάτων που ενδεχομένως να προκύψουν στην πορεία.

Ενδιαφέρεστε;
Εάν ενδιαφέρεστε να συμμετέχετε, παρακαλώ επικοινωνήστε μαζί μου μέχρι και 13 Μαΐου 2016.
Στοιχεία επικοινωνίας,
Μαρία Παπακωνσταντίνου
email mp222sz@student.lnu.se

Appendix 7

Declaration Form

Linnæus University
Sweden

Declaration – Submission of the Thesis

This form should be included in the thesis. Before you sign please see http://refero.lnu.se/english/what-is-plagiarism/ where you found information about plagiarism and check also the Harvard System of referencing http://libweb.anglia.ac.uk/referencing/harvard.htm

Name	
Maria Papakonstantinou	
Course	Course Code
Degree Project Master Level	5IK50E

Did you write the thesis alone or in cooperation with someone? Tick one of the boxes	
☑	I am the sole author of the thesis.
☐	The thesis is co-authored with other students, and together we are resposible for the entire project.
☐	The project report is co-authored with other students, and I am responsible for part of it. The parts I am responsible for are specified in the project report.

I declare that in my/our thesis, I

1: did not re-use my previous work without referring to it
2: did not use others work without referring to their work (e.g. course literature, scientific publications, other types of articles, web sites or lecture material)
3: use the references and quotes in a proper way
4: included all references and resources in a reference list

I am aware that not citing and using references in a correct way may be considered as plagarianism

Signature	Date
[signature]	22/5/17

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Linnæus University
Sweden

Faculty of Technology
SE-391 82 Kalmar | SE-351 95 Växjö
Phone +46 (0)772-28 80 00
technology@lnu.se
Lnu.se/fakulteten-for-teknik