

Application of e-Health Services in Greece: Aspects of a Stakeholder Satisfaction Survey

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The growth of electronic services in issues concerning health, commonly called e-Health, has provided new opportunities to public administration, health personnel, patients, and stakeholders in related services and businesses. E-Health services aim to improve the quality, access and efficacy of healthcare by providing information on medical terms and statistics of certain health conditions, as well as communication between patients, health personnel, pharmacies, laboratories etc. In this paper, the degree of application of e-Health in Greece is investigated. The acceptance degree of e-Health service is examined and the results of a survey including 165 responses are presented. The main findings indicate that there is a high readiness for e-Health services in Greece, both among the health professionals and the citizens. Some professionals already use a number of e-Health services and those who do not are prepared to be trained in e-Health issues in order to offer such services to the public.

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Keywords

e-Health in Greece, e-Health stakeholder acceptance, electronic health in Greece, Greek e-Health stakeholder satisfaction survey, e-Health Services

1. Introduction

The European Commission has described e-Health as the application of Information and Communication Technologies (ICTs) across the whole range of functions that affect the health sector, such as products, systems and services that go beyond simply Internet-based applications [1, 2]. Tools for health authorities and professionals, as well as the delivery of personalized health systems for patients and citizens are included. Examples are health information networks and portals, telemedicine services, electronic health records, personal portable communication and sensory systems, as well as many other ICT-based tools assisting the prevention through health monitoring and lifestyle management, diagnosis and treatment of illnesses. The European Commission and some Member States have been actively promoting the advantages of e-Health in recent years. The Commission issued an e-Health action plan in 2004 [3-5]. *“The EU mission of the ICT for Health Unit is to contribute to the better health status and well-being of all European citizens, to bring economic and productivity benefits to the health systems of all Member States, and to stimulate growth and competitiveness of the e-Health industry in Europe”* [4]. In 2008, a recommendation on cross-border interoperability of Electronic Health Record (EHR) systems was proposed for use by doctors to access information on patients from other Member States whom they may be treating. The goal is to enable access to electronic health records and emergency data of patients from anywhere in Europe. A Smart Open Services (SOS) project with twelve Member States and their industry players was created to demonstrate the benefits of such interoperability.

In this paper the degree of Greek e-Health services is investigated and the results of a survey regarding acceptance and satisfaction of the services provided by e-Health to stakeholders, such as patients, health personnel, pharmacies, laboratories etc. are provided. The research methodology was triangulation including questionnaires and interviews. However, the results cannot be generalized due to the small sample and the

distribution of the respondents (165 respondents from three different cities).

2. e-Health Services

The health and social work sector is characterized by a wide variety and very large number of stakeholders, and by their diverse and complex relationships and interactions. These, at the same time, provide an enormous field for potential e-Health applications, but also imply many barriers and obstacles [6].

“Real-time e-Health systems integrating all relevant information on a patient as well as medical and other health-related knowledge can not only substantially improve collaborative care, patient safety, quality and efficiency of health services, but also support medical and clinical research, training and public health” [7].

Some important e-Health services that are currently developing are described below:

Electronic Healthcare Records (EHR) also called *Electronic Medical Records* (EMR) refer to the storage of patient information, such as the medical background of patients, in an information system. The EHR, *“the basic building blocks of an advanced health IT system”* [8] is created by multiple independent healthcare organizations and allowing continuity or care between different care delivery organizations [9]. Access is provided only to specialized medical personnel. Information can be retrieved from e.g. health centers in distant areas with limited medical staff and limited support. The EHR constitutes an essential tool for streamlining communication among health care providers [9]. The use of EHR is imperative for supporting a medically up-to-date and financially sound national medical service system. Medical staff that uses EHR can easily, quickly and safely identify previous medical treatments (e.g. results of examinations). A variant of the EHR is the smartcard (a credit card-sized plastic card embedded with a computer chip that contains personal, medical and insurance information). The health smartcard comes to replace the personal illness booklet of the patient. It constitutes the health identity of each citizen and includes medical services provided to the patient. The smart card has the capacity to

retain and protect critical information stored in electronic form [10]. It can be used for example at hospitals to identify a person's health-insurance carrier and transfer all necessary information from the microchip to an admittance sheet. Tests, treatment, billing and prescriptions could be processed more quickly using the card. Major clinical findings could be added to the medical information section within the microchip. In addition to the requirement for secure and efficient access to patients' EHR the deployment of Regional Health Information Networks (RHINs), infrastructure development (Internet and wireless broadband communications, as well as synchronous and asynchronous collaboration services), as well as novel e-Health (intelligent sensors, monitoring devices, hand-held or wearable technologies) and mobile Health (m-Health) services are needed [11].

Health Information Systems (IS). Health IS, allow the automation of internal processes of a medical unit in combination with the EHR. Examples are electronic appointment booking systems, electronic transfer of prescription and business intelligence for real-time detection of hospital infection patterns. A special sub-unit of the Health Information Systems constitutes the informative systems of laboratories (Laboratory Information Systems), which give the possibility of automated transmission of laboratory results to the health stations. As a result, it changes the quality and the speed of service to patients. Also different Enterprise Resource Planning (ERP) systems unify all operations of a medical unit, from the management of materials (disposable medical materials, office materials, etc) to the financing management and the Human Resources Management (HRM).

Health Portals. Health Portals provide access to briefings and scientific information [9]. The visitor can find information such as:

- Medical and nutrition news and advices;
- Description of illnesses and treatments;
- References to web pages of organizations, pharmaceutical companies, hospitals, private institutions for various services, health administration, etc.;
- Lists of doctors;
- Correspondence possibilities for advice by specialized nurses or doctors;
- Transaction services and special electronic gates for the electronic trade between final consumer (B2C - Business to Consumer)

or between suppliers of companies and services institutions (B2B - Business to Business),

More advanced portals will enable self-service applications such as booking of appointments, Self registration at hospitals and clinics etc.

Telemedicine Services include diagnosis, analysis, consultations, and treatments from distance, independent of geographical restrictions. This is in particular important in difficult approachable locations. By telediagnosis medical data can be transmitted (e.g. encephalograms, radiographs etc.), as well as the other medical data of the patient (e.g. pressure, temperature, vibration etc.) from a remote point (e.g. a small medical centre in a distant location) to a central station for diagnosis by specialized medical personnel. Similarly eAdvisory (consultation) strengthens the health professionals in distance locations or even mobile units due to the fact that they can collaborate with specialized scientists. Telemedicine represents a convenient way for patients to gain access to medical skills in a suitable and timely manner [9]. The big advantage is the benefit of medical help on time, even at small health centers or ambulances. In Greece, there are many inaccessible regions that could gain advantages from telediagnosis and eAdvisory regarding limited expert medical staff availability and related high costs. The units that use these new services of telemedicine cover more completely the population in geographic regions [12]. The Technological Educational Institution of Crete in an effort to assist remote clinics has proceeded with the development of a telemedicine and teleconsulting web application, which allows general practitioner to access the expertise of a specialist expert opinion i.e. for electrocardiograms (ECGs) [13]. Recent development of ICTs enables also teleconference between two or more persons to a relatively low cost. It is common today, in cases where experienced opinion is required, that one or more doctors use teleconference service in order to provide their opinion.

Home Care Information Systmes (Telemetry / Telesurveillance). It is generally considered that the continuous evaluation of the medical status of a patient in the environment in which he lives is preferable to the environment of a hospital, particularly for cases of chronic illnesses. With the help of practices of

telemedicine and new telemedicine devices the personal environment of the patient can constitute a specialized centre of care. The use of new small and functional applications, contribute to the communication between patients and medical personnel in real time and in the direct exchange of medical data. In this way convenient diagnosis is achieved and the follow-up of the health of patients from distance. The new medical applications collect precious diagnostic data that assist the health institutions to the follow-up of physical condition of the patient or to follow-up of treatment progress. The data that emanate from the applications of home care are promoted to the central system of the health via internet or telephone [12, 13].

Telesurgery. Telesurgery, also known as remote surgery, are surgical tasks performed by a robotic system controlled by the surgeon at a remote site. In the sector of telemedicine telesurgery developed during 90s. The basis of the growth of telesurgery is the need of transmission and diffusion of specialized chirurgical techniques and knowledge. The Telesurgery facilitates the effective education and distribution of e.g. laparoscopic e-Health Application in Crete. Surgeries connected to educational or experienced institutions in remote locations perform Chirurgical processes with picture, video and sound transmission allowing the communication between them. In addition, the use of robotics applications allows the remote surgeons to participate actively in the surgery interventions via virtual reality systems.

One of the great challenges in the 21st century is to make high-quality health care available to all. Such a vision has been expressed by the World Health Organization (WHO) in its health-for-all strategy [14]. In a global survey on e-Health carried out by the World Health Organization survey in 2005 [15] it found amongst other things that " *there is a need to raise awareness as to what e-Health tools and services already exist at global and national levels*".

One objective of e-Health is the improvement of public health independent of economic and geographical conditions. e-Health gives to the health professionals, as well as to the consumers (patients), the possibility of on-line access to health services via global providers. Such services range from the simple advices to complex interventions of pharmaceutical

advice. The benefits of e-Health range from improvements in quality and better access to care by all citizens, to avoidance of unnecessary public cost. High quality in this case does not mean to offer the most expensive treatment to the patient but to be able to give the right treatment at the right time and the right place.

The main advantages of e-Health can be considered to be [16]:

- Cost savings and improved productivity in areas such as billing and record-keeping;
- Reduction of medical error;
- Alleviation of unnecessary care;
- Savings in Business-to-Business (BB) e-commerce relevant to the health care sector.

Experts in Sweden agreed that "*there is a significant healthcare improvement potential using e-Health as a catalyst*". They considered that the use of e-Health tools can reduce prescription errors and bed-days yearly corresponding to a total value of nearly € 4,0 billion [9].

Below the benefits are analyzed in more detail [9, 17]:

Increasing patient safety. The most important objective is to increase the patient safety by reducing the risk of patient harm particularly within the area of medication. Examples are electronic transfer of prescriptions for reducing outpatient prescription errors, decision support systems for preventing adverse drug events and reducing medication errors, business intelligence and data mining regarding real-time detection of infections, electronic medical records and chronic disease management capabilities for reducing e.g. diabetic deaths and finally bar coding and Radio Frequency Identification (RFID) for medication administration to reduce inpatient mistaken identity medication errors [9].

Improvement of the quality of health care. e-Health can improve the quality of health care by allowing comparisons between different suppliers or by taking into consideration the opinions of the customers (patients), such as level of satisfaction, convenience, improved access to resources, effectiveness and efficiency of care. In addition an important objective of e-Health is to increase the efficiency of the health care with simultaneous time and cost reductions. The outcome of e-Health technologies can contribute to

availability by ensuring that resources are utilized more efficient and allocated to cover requirements. Telemedicine and home health monitoring for reducing hospital entrance and electronic medical records for reducing duplicate unnecessary laboratory tests can be mentioned in this category [9].

Encouragement of new relations between the patient and the provider of medical services. This may result in a genuine collaboration, where the decisions are taken commonly. The patients are empowered to take a more active role in their care.

Extension of the field of health care. Extension into new conceptual fields beyond the conventional limits of health care and into distant geographical areas is facilitated by e-Health technologies. The implementations of new technologies provide mechanisms for information sharing and access to resources regardless of distance, location and organizational boundaries. Telemedicine, for example, has potentials to further develop in the future.

Stroetmann et al. [18] found that on average, citizens receive about 43% of the e-Health benefits directly. Health provider organizations, including physicians in private offices, and other professionals receive about 52%, which supports an economic case for them in investing in e-Health. Direct benefits in terms of positive gains or cost avoidance to insurance companies and other third party payers occur at a substantial level in one of the ten cases only.

3. Benefits of e-Health Services

The unprecedented development of ICTs and the rapid spread of the Internet use in public administration, organizations and households seem to be promising for the creation of e-Health systems for personalized health and empowerment of patients' self-management. However, there are many challenges, including social, economic and organizational issues that need to be resolved. Also keeping up with the rapid advance of the technology, as well as determining quality and effects of e-Health applications seems to be a difficult task. Some of the challenges regarding e-Health are described below:

Understanding and utilizing requirements. Decisions on e-Health priorities are often made by governments, whose understanding of the impact of ICTs on the health care process is limited. Also there is a lack in general of evidence demonstrating impact of e-Health. Another important factor for understanding requirements is the interdisciplinary collaboration between software developers and health services researchers and users, who often have different motives, languages and cultures. Similarly are operational constraints of producers and evaluators of e-Health systems and services a barrier for utilizing the requirements of the systems effectively.

Incompatibility between systems. e-Health relies on the successful integration of many complex health information systems operating at national, regional or local level to enable health professionals to access the medical and medication history of their patients at any time and any place. Health care for a single individual is delivered by many independent health professionals that have different roles, different business priorities and use different ICT support systems.

Required organizational changes. e-Health is inevitable a tool that can strengthen health systems. However, it must be taken into consideration that e-Health requires a change in mindsets and organizational changes, especially in terms of technology, management and training of health personnel. The main e-Health costs are within the areas of procurement and training.

Interoperable e-Health. Due to the globalization citizens have become more mobile; they travel and work abroad and may be in need of medical treatment. In recent years interoperable e-Health in Europe or even on an international scale is a fact. The European Commission is supporting collaboration initiatives through its policy initiatives and funding instruments and the WHO is promoting worldwide e-Health through its Global Observatory for e-Health.

Privacy and intellectual property. A key concern is how to ensure privacy and confidentiality for Electronic Healthcare Records (EHR), as well as intellectual property rights for e-Health. Also security in general is a key question. E-Health includes new forms of interaction of patient-medical personnel and patients placing new challenges and threats regarding moral questions such as on-line

professional practice and subjects of privacy and protection. Nevertheless, e-Health is an issue of debate and the opinions are controversial. One of the biggest challenges in implementing e-Health concepts is convincing the public that their electronic health records will be safe and secure.

Digital divide. e-Health may also deepen the gap between people that can use computers and people that cannot. The digital divide refers to the gap between people that benefit from ICTs and those that cannot use them effectively because of their age, skills etc. [19].

4. e-Health use in Greece

Paragraph 15 in the National Action Plan 2008 – 2012 published by the Greek Ministry of Health and Social Solidarity [20] refers to digital convergence in public health. The objectives concern the exploitation of ICTs in public health, particularly regarding improvement of capabilities related to administrative and public health services. The ultimate goal aims to improvement of the daily life of citizens that use such services. The proposed actions include development of infrastructures, systems, networks and ICT applications for national public health organizations, as well as central, peripheral and municipal health services.

Stroetmann et al. [18] emphasized that policy makers, industry and healthcare providers alike must be aware that the realization of the e-Health potential depends on the following key factors:

- Commitment and involvement of all stakeholders;
- Strong health policy and clinical leadership that guides a flexible and regularly reviewed e-Health strategy;
- Regular assessment of costs, incentives and benefits for all stakeholders;
- Organizational changes in clinical and working practices;
- Strong clinical leadership, good organizational change management, multi-disciplinary teams with a well-grounded experience in ICT and clear incentives
- Long term perspective, endurance and patience.

They conclude that “*beneficial e-Health investment is like a good wine. It takes a*

considerable amount of time (about 5 years) to mature and develop its potential fully”.

According to a study in 2006 59.2% of the Greek citizens would access their EHR online (even on an annual fee) if they were given the opportunity [21].

In 2007 a pilot study on e-Health Indicators was carried out on behalf of the European Commission, the Information Society and the Media Directorate-General [4]. The purpose of the study was to measure the availability and use of ICT by primary care physicians in the EU27 and EEA countries. The use of ICTs in Greece is notable below the averages of the European countries in general and in particular regarding e-Health services. The area in which Greece ranks considerable well is the storage of medical patient data, which is used by more than two-thirds of General Practitioners (GPs). Also in relation to the storage of radiological data, Greece scores slightly above the EU average [4]. In Greece 315 Computer-Aided Telephone interviews were carried out. The results are presented below:

In total 79% of the Greek GPs use a computer, 66% of the GPs practices have an Internet connection and 44% a broadband connection.

Below the different kinds of ICT use by Greek GPs is provided [4]:

- Consultation with the patients: 20% (66% in EU27);
- Decision Support Systems: 12%;
- The use of electronic networks for the transmission of medical patient data;
 - 4% have exchanged medical data with other care providers (10% in EU27);
 - 3% have received analytic lab results (40% in EU27);
 - 4% have exchanged administrative data with other health care professionals;
 - 3% have transferred administrative data to reimbursers;
 - 2% have used ePrescribing.

One out of five GP practices in Greece use only coded data for the storage of electronic patient data (21% in EU27). However, in total 58% of GP practices resort to un-coded data only (30% in EU27). Totally 16% of practices use both coded and un-coded data. Coded data entry in this context refers to the use of coding systems such as the ICD (the WHO's International Classification of Diseases) that

allows to store a disease or diagnoses as a code rather than as a textual description. Only in a few countries the practices that use solely coded data are above one third. In most countries the majority of practices use a combination of coded and uncoded data.

On 17 February 2010 the development of the national Electronic Prescribing System in Greece was announced [22, 23]. Some attempts have also been recently made to provide on-line access to patients about different examination results [24]. Recently the Best Practice Award was given by the Executive Agency for Competitiveness and Innovation (EACI) to the to the Greek Healthcare Sector Group of Enterprise Europe Network Hellas for the design and development of the “One-Stop-Shop e-Newsletter for the information provided, the promotion of collaboration and provision of services [12].

5. A survey regarding stakeholder satisfaction

A survey was carried out in order to find out the degree of application of e-Health in Greece, the level of acceptance of such services, as well as stakeholder satisfaction of e-Health services provided. Two different questionnaires were created having in mind issues regarding the quality of service, trust and privacy safety; one to be responded by citizens (patients); the other by health related professionals, such as doctors, nurses, pharmacists etc. The questionnaires were distributed during January 2008 in three different cities in Greece, namely Thessaloniki, Kavala and Heraklion.

5.1 Demographic analysis

In total 165 persons responded to the questionnaires. The response rate was 100%, distributed as follows: 39.4% in Thessaloniki, 10.9% in Kavala and 49.7% in Heraklion. The sample cannot be considered statistically valid due to the distribution and size of the sample. However, it gives an explicit indication of the situation concerning e-Health in Greece.

In total 28.4% of the respondents belonged to the category of medical related professions and 71.6% were citizens (patients). Of the whole population 51.5% were male and 48.5% female. Around half of the respondents were 18 – 29 years old.

In total 69.1% of the respondents have an internet connection at home, 74.8% communicate via the internet by e-mail and 60% by WEB 2.0 communication tools, such as chat, MSN, Skype etc. In total 79.4% of the respondents use internet to obtain information and 74.7% use it for entertainment. These values are slightly higher for the younger ages. In total 4.3% of the medical professionals and 9.3% of the citizens do not use computer at all.

Conclusively the percentages of the demographic analysis seem to confirm that the level of e-readiness is reasonable high in Greece, in particular for the younger population.

5.2 e-Health: the Public Opinion

On the question “Do you know what e-Health Services are?” 48.7% of the respondents replied “yes”. In total 23.7% of the respondents know about the e-Health services from work related sources, 45.1% due to general knowledge and 18% learnt about them from the internet coincidentally. From the 48.7% of those who answered that they know what is meant by e-Health services 52.7% responded that they visit web-pages with medical information because of the following reasons: 44.4% are generally interested in medical issues, 30.6% want to obtain information on a special issue, 22.2% for personal consultation and 2.8% have visited such web pages accidentally. In 2006 37.7-38.5% of the respondents considered the Internet an important information source for health and illness matters. The responses varied considerably between urban and rural areas (29.5% vs. 18.5%), reaffirming the existence of the digital divide in Greece [13].

In Table 1 below, the respondents’ (not related to medical professions) opinions, regarding certain e-Health services, are presented. The responses from the respondents that have reported that they know what e-Health is are analysed (N=58).

Table 1 Patients' opinion regarding e-Health services (those who know what e-Health means).

e-Health services	Useful service	Require additional information	Trust the service	Offered in Greece	Known service
Electronic Healthcare Records	43.2%	22.9%	26.3%	15.3%	15.3%
Telemedicine Services	50%	35.6%	28%	9.5%	33.9%
Home Care Information Systems	49.2%	34.7%	22.9%	11.9%	15.3%

As we can see from table 1 all the percentages in the column for known service are lower than the percentage for useful service. This seems contradictory, but considering that a definition for the different services was provided we understand that many of the services are unknown but considered to be useful. Also the respondents generally would require additional information and 20-30% of the respondents would trust the service. This can be compared to the fact that only 6.8% of the respondents would trust a medical visit, where a private doctor offers consultation via the Internet. In a telephone survey regarding the perception and attitude of the population regarding use of the Internet for health and illness in 2006 [13] it was found that 26.0% of the respondents replied that they feel comfortable with medical visits via computer or video-phone. It seems that trust in this issue has declined. However, more research is needed to understand the reluctance of the patients. In total 74.6% disagree with the purchase of medicines from the Internet.

Conclusively e-Health services will play an important role, in particular in the countryside and regions with a lack of specialized medical

staff and medical equipment. In total 79.2% of the respondents consider e-Health services useful in the countryside. Another sector, in which it appears that the e-Health services can be useful, is in the field of the chronic diseases, such as asthma, diabetes, HIV, various forms of cancer, cardiac diseases etc. For people suffering of chronic diseases it is important to be provided with information and advices regarding their inquiries. On the question "Do you believe that e-Health services would help in the confrontation of chronic illnesses" 75.9% of the respondents, including people that suffer from such type of diseases, gave an affirmative reply.

5.1 e-Health: Health Personnel Opinion

The opinion of health care professionals is pivotal to the usefulness of our results. We found it reasonable to include their opinion in a separate section, in order to discover the level of awareness of such services as well as the receptivity of offering such services. In Table 2 we provide the opinions of the medical staff.

Table 2 Health professionals' opinion regarding e-Health.

e-Health services	Known services	Useful services	Require additional information	Offered in Greece
Electronic Healthcare Records	59.6%	74.5%	57.4%	48.9%
Telemedicine Services	66%	63.8%	59.6%	44.7%
Home Care Information Systems	57,4%	68,1%	55,3%	44,7%

Observing table 2, we see that all values are significantly higher than the values in the table 1. This is expected since medical professionals are likely to be more aware of e-Health services than patients. We conclude that there is no doubt about the acceptance of e-Health services by medical professionals and their willingness to offer them. However a majority feel they need more information likely because they consider e-Health services to be useful

and they may not have the infrastructure or experience required.

A percentage of 45.7% have already used e-Health services for personal issues. Related to their wish to learn more about e-Health services, a high willingness is shown to be trained in the application of e-Health services, as the percentages in the specific column are above 50%. Considering a major question the application of e-Health services in distant

regions, we re-examine the subject under the focus of experts on health issues. Taking into consideration their responses, 85% of the medical professionals, consider that e-Health services are in particular useful in regions with difficult access and that they would offer such services if applicable. Finally, regarding the sector of chronic illnesses, 72.3% of professionals consider that the e-Health services will help in the better briefing and confrontation of chronic diseases. In total 10.2% of the professionals have taken part in on-line research regarding chronic illnesses.

6. Concluding remarks and future perspectives

According to the European Commission, Greece is considered to be below the average of the rest of the European countries regarding the use of e-Health services. The best performance is in the patient data storage, which is slightly below the EU27 average. The rather low usage rates of e-Health applications in Greece is likely to be due to the only recently establishment of a National Health Information System (2006) [24] which also includes the introduction of Electronic Health Records. Our study found that there is a high readiness for e-Health services in Greece, both among the health professionals and the public. Some professionals already use a number of e-Health services and those who do not are prepared to be trained in e-Health issues in order to offer such services to the public. ICT use in health should be seen as a tool, not a goal in itself, in order to realize potential benefits. A successful e-Health project is only one element in a process chain of related healthcare activities. It is important to take the needs of citizens into consideration. Given the right framework e-Health can stimulate the development of a single European healthcare market. Important issues for promoting e-Health services in Greece are the improvements of the computer / internet / application infrastructure, the medical personnel training regarding e-Health services and promotion of the services provided by e-Health to the public in order to raise the trustworthiness of e-Health services.

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