THE E-HEALTH SYSTEMS IN POLAND

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Abstract: *Information Technologies are disruptive technologies that have caused major changes in health system in Poland. Current digital economy is driven by modern information and new IT tools, which offer hospitals, doctors and patient access to any type of information, regardless of its form of existence, storage type or geographical location. These tools encourage the development of new activities, health services.*
The purpose of this article is to analyze the the current state of development of e-services in Poland in the context of nowadays health system. In the first part of the paper, the authors present various programmes, which enable the access to the medical services and patients' data online. The next part of the paper is devoted to examining the technical aspects of the said programmes and presenting their advantages as well as the areas which might be improved.
The last part of the work will be focused on the websites of the selected health institutions. According to the authors, WWW services provide much information on how the process of computer systems are being implemented, what data the services include and the capacity of the equipment as well as the software, human resources and the knowledge in this sphere.
Moreover this section highlights the latest trends in e-health with particular emphasis on aspects such as the use of private and public cloud computer and t heir integration with web sites of health institutions.
This study brings its contribution to the understanding of the change of health system in Poland behavior by using a new perspective e-health systems and IT tools above by doctors, officers and patients.

Key words**:** *health, e-health, IT systems, e-services.*

JEL Classification Codes: I1, O31, M15

1. INTRODUCTION

The technological progress, especially the access to the Internet caused and enabled the development of many spheres of life as well as services. In everyday life, everybody more often uses the internet services, not only the ones related to the entertainment or online shopping. The internet users use many applications, which make everyday activities easier and save time, therefore the field of medical services must undergo this kind of metamorphosis as well.
In the first part of the paper, the authors present various e-health programmes, which enable the access to the medical services and patients' data online in EU and Poland. In this part, the authors characterize the programmes, which are currently being programmed and implemented, specify their assumptions, functions, which both the doctors and the patients will be able to use soon. These programmes enable the continuous and undisturbed access to the patients' data, so vital when it comes to the appropriate treatment. The e-patient, e-prescription programmes show, how easily the possibility of connecting different data from various areas makes the treatment process easier, more efficient and definitely safer.

The next part of the paper is devoted to examining the technical aspects of the said programmes and presenting their advantages as well as the areas which might be improved. The authors will analyse different functions accessible by the doctors and patients. The authors will also check their scope and efficiency in Poland and EU countries and will try to forecast some potential solutions which currently might stand for the ongoing process of the improvement in the researched field.

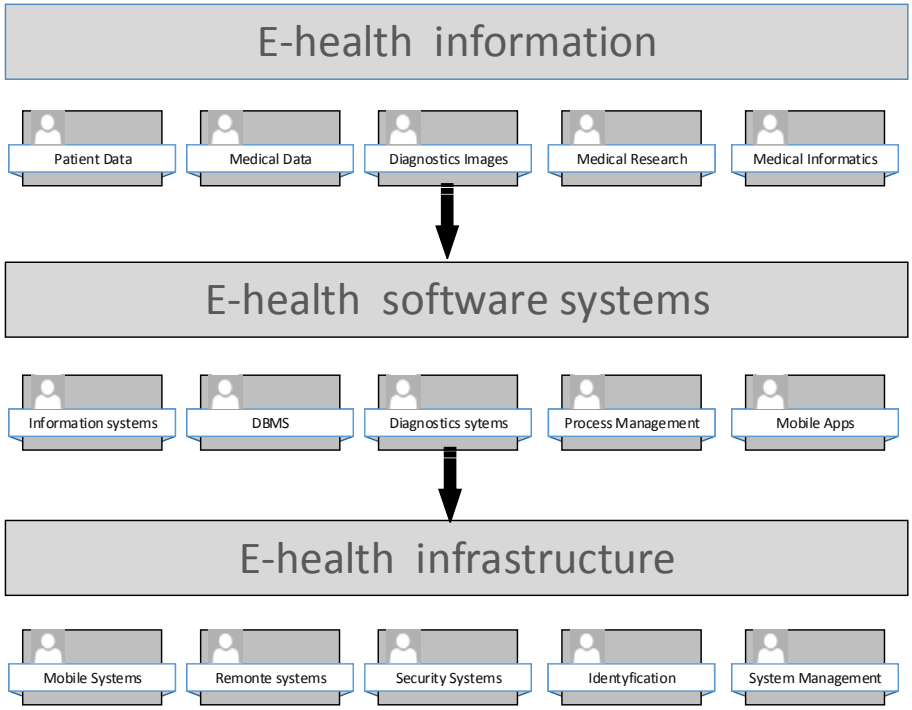

Figure 1: Standards and e-Health (DeNardis L., ITU-T Technology Watch Report, 2011)

"The Strategy of the IT society development in Poland till 2013 and Europe 2020 – the Strategy for the intelligent and sustainable development contributing to social inclusion" and "The European Digital Agenda" served as the basic documents for the study as they give a wider perspective of the actions as to health care. The indications from the European Commission referring to e-health were also taken into consideration while working on the study. The authors also included the concepts of the initiated projects, financed from the Structural Funds and which are being coordinated at the national level by the Information Systems Centre in the Health Care, which is subordinate to and supervised by the Minister of Health.

Following the trends which have been widespread around Europe, Poland is also engaged in introducing the latest developments in e-health field. The targets as well as the stages to be followed related to "e-Health Poland" for the years 2011-2015 are presented below.

A. The implementation of information programme by health care units with the use of IT
B. The implementation of Medical Information System
C. The integration of the central data bases and register within the Health care system
D. The increased access to the information within health care.
E. Promoting telemedicine
F. The improvement of the health education and promotion
G. Providing the data protection
H. Carrying out the review of the information systems in health care units.

2. THE ANALYSIS OF THE SELECTED E-HEALTH PROJECTS AND SOLUTIONS IN POLAND.

Characteristics of the project 'e-health Lower Silesia'

"Dolnośląskie E-health" is the result of the need to adapt the system to the requirements of healthcare information economy, which is a part of the emerging information society The migration of the patient from one provider to the other in the majority of cases don't involve a parallel migration of medical data gathered. This means that they are likely to be lost and the process of diagnosis and collection of data on patient begins again. Moreover, patient data are available only by employees of the providers. Access to them, even in the event of a life-saving is not possible outside of the parent entity providers. These problems and technological conditions were the basis for the development of the concept of an Electronic Patient Record (EPR). Its main goal is to create a central database that will enable to access, collect, store, share and process the personal and sensitive data in a way that ensures continued access to them no matter the current place of residence or in case of hospitalization. Electronic Patient Record will ensure the free and not violated movement of patients from one provider to the other and assuring that both personal and sensitive data are being collected continuously. (age, blood type, allergies, medications, history of disease, etc.).

The problem of collecting and storing patients' data seems to be of vital importance as to their safety and the specifying the range of access possibilities the users of such data base will have. Therefore the system of medical information is going to be created in the near future in Poland. The initiator of the system if the Minister of Health and currently the Parliament is working on the draft of the Law Act. However, the creation of the system leads to many controversies due to the low level of data safety in it. "The Ministry included in the project only general recommendations related to sensitive data" It is not sufficient to properly protect patients' data"(Strug 2012). According to the Law Act the employees of NHF, hospitals, patients and local self-government units will have the access to the data. The Law Act does not state precisely what access each of the mentioned employees will have – it will be defined in the Directives. The General Inspector for Data Protection indicates that the access must be specified clearly in the document of the Law Act rank. The patients' data basis, including the sensitive data, are not hermetic and there have been examples of the data leakage, which had to be dealt with by the General Inspectorate of Personal Data Protection. The release of the patients' data may lead to legal proceedings as to those units following the article 455 of the Civil Code and consequently the payment of enormous compensations. The system is to be implemented by the end of 2014, if it goes smoothly through the legislative process. It is financed from the European Union funds (150 m Euro).

The E-wuś system

The introduction of the health care system solutions in Poland is being done gradually and now the positive effects of it can be noticed. The latest facilities have been possible due to the e-wuś system i.e.: Electronic Verification of Patient's Insurance.

The implementation of that system means not only the advantages for everybody, but also the measurable profits of saved time and money, it is also a revolutionary project which enables to use the free health care system with only Id card and Birth Identification Number (PESEL). The system ensures fast and efficient patients' verification through the internet or in the clinic with only some identity document (Id, schools' ID, driving licence, etc.). Children younger than three months, who do not have Birth Identification Number, are verified on the basis of their parents' number.

Electronic Patient Record

Characteristics of an electronic prescription

What is an Online Account e-prescription?

Internet email account is an online recipe notebook containing information about prescribed medicines bought from a pharmacy. Data on medicaments are sent to your account directly from medical institutions and pharmacies cooperating with e-prescriptions. It is also possible to complete the information by the user. Account may also contain basic data rescue, information on chronic diseases and medicines and chemicals which a patient is allergic to. Having the e-prescription Internet Account will increase the safety of patients. The moment the doctor is prescribing some medicines and later while buying, the doctor's computer systems and pharmacist connect with e-prescriptions and check the patient's account whether the given medicines cause interactions or may result in allergic reactions. You will receive a doctor's legible, computer-printed prescription, which will contain all the necessary information and will enable quick and proper sale of medicines in the pharmacy. E-prescription system will also have an electronic database of medicines, so your doctor will be able to choose a cheaper one, the pharmacist will also be able to point a cheaper replacement (if the doctor has not indicated the replacement drug). The access to information on cheaper substitutes will also be available to the patient with the e-prescription online account.

What is the Register of Entities Performing medical activities?

RPWDL is an electronic registry that within its functions, enables to create the applications as to:

- registering the entity
- entering the changes in the register
- removal the data of an entity from the register
- sending electronically of the signed the electronic application
- retrieval of the certificates
- storage and subsequent access to business applications and applications signed and sent electronically.

In order to use the system, you must have a user account and log in. The system also allows you to search and browse entries of the entities (and their companies) into the register, according to different criteria and view registration logs.

Electronic Mail System of Health Care

Electronic Communication System in Health Care called "ZOZMAIL", was created in accordance with the implementation of the Programme while getting ready for Polish accession to the European Union. The aim of the system is to improve the ZOZMAIL - electronic information flow between providers of Health Care, as well as the institutions, and institutions operating in the field of health care. The adoption of a uniform system of naming mailboxes and using the tools to search for a particular recipient enables fast transfer of information. ZOZMAIL system will also make the contact of the patient with a particular health care institutions possible as well as it will facilitate the transmission and acquisition of statistical information. In the future, the use of digital signatures will be introduced, giving tangible savings from replacing the paper correspondence with the electronic one. At present, the system includes all health care facilities.

3. RESEARCH METHODOLOGY

In the current development e-health systems context, deepened by the economic situation, managers, authorities must look at the past; they need reports on previous and current situation to improve the future operational efficiency – figure 2. The general goal is to make informed forecasts about the future e-health systems in order to optimize resource allocation and consumption, and also to avoid possible problems that could have a negative impact on development e-health systems.

Managers, It specialists use forecasting also to extrapolate how trends will change in the next years or as a benchmark for a long-term perspective of it systems (Banica L., Pirvu D., Hagiu A., 2012).

IT providers, interacting with these requests, have launched various systems and tools to support managers in making better decisions, such as business intelligence platforms, forecasting software and e-health systems.

In this paper, we will discuss the capabilities of forecasting e-health systems and will highlight the advantages of using this kind of tools to improve services for patients.

The services characterized above definitely lead to a considerable changes in any e-health systems. Since the process of the implementation has been already started the authors decided to analyse the WWW services dealing with the Heath care.

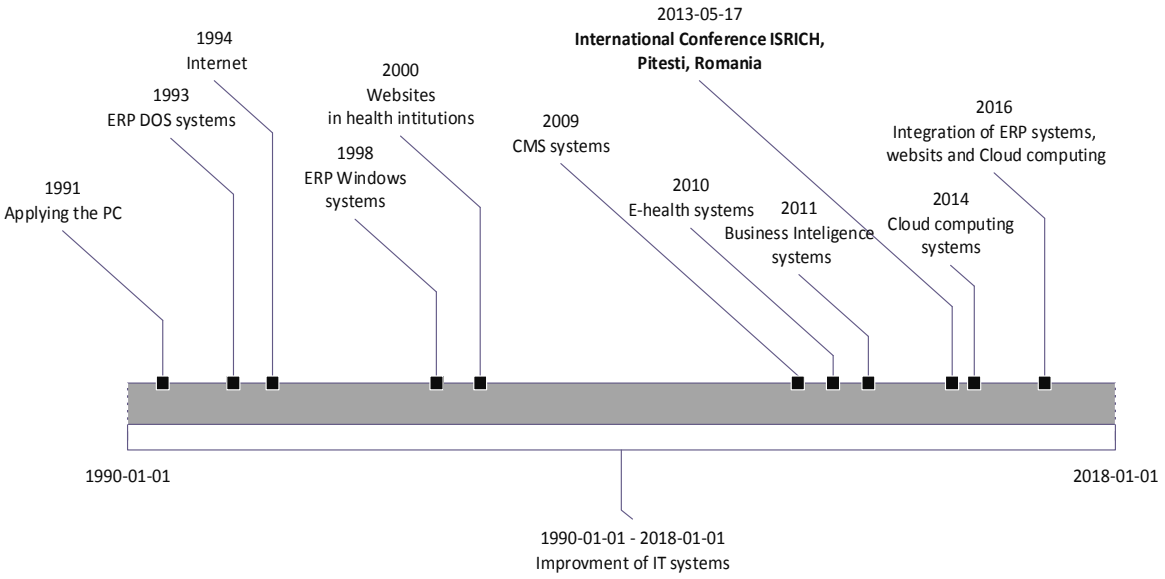

Figure 2: Past, current and future of e-health systems in Poland
(These dates should be treated with caution, Pólkowski 2013)

According to the authors and on the basis of figure 2, WWW services provide much information on how the process of computer system processes are being implemented, what data the services include and the capacity of the equipment as well as the software, human resources and the knowledge in this sphere. For this reason it is very likely that in the future there is the integration of information systems working in the private and public cloud computer with internet systems.

This research depended on primary data. Field data were collected through research of 60 selected www health institutions. The particular health care institutions selected for the research analysis were chosen following the typical way like it is done by patients (e.g.: entering :hospital and location" or "the clinic and location". In case of no results the advanced search method was

used. Moreover the authors used method of entering the internet domain: e.g.: www.szpital.lubin.pl.

The target of the research were the websites within the Dolnośląskie province in Poland. It represents the country as a whole in terms of e-health systems use. The research was done by testing www of health institution. A total of 60 tests were made. During the tests the following aspects were checked:

1. *If the health institutions have www?*

The websites the institutions have are their "Identification card" enabling the patients to learn about the scope of the health care services, the location of the units, the best way to contact the clinic, hospital or the doctor. Websites today, contain the additional panel, which makes the contact with the particular centre possible but also gives the opportunity to order certain services. It beneficial for both sides. This way, the area and the distance limits are eliminated. In the world today, all institutions providing the Heath care services should have their own websites. The possibility to obtain the information as well as to reach the wider spectrum of patients. The trend to obtain the greatest number of patients in so called "fight" seems to have been prevailing in Poland for few years now. Therefore the websites are being ordered by the smallest units like consultant's offices, small clinics, which try to obtain patients this way.

2. *If it's easy to find this www?*

The internet domain is not only an element of the internet address, which plays distinguishing role. Currently, it also allows, as a trademark, to identify the goods, services or the institution. The use of the internet domains is a common activity exploited by the institutions to indicate the business activity run by them, the goods sold by them or services provided. The institutions use the domains of the second rank. The domains constructed this way include the name of the institution and its location.

3. *Which internet domain they have? Do they have city domain?*

The average patent, when searching some online services, often enters the name of the sought service together with the town he lives in. Therefore, the right selection of the internet domain is the key element of creating the appropriate image of the institution in the Internet, including the health care centre.

Results

The authors examined 60 randomly selected public and private institutions providing health services in the province of Lower Silesia. 42 institutions have websites. 38 pages working in the national domain of pl, 1 com, 1 eu, 2 net. In 4 cases, the parties in the urban domain: klodzko, dzierzoniow, walbrzych, zgorzelec. Some of the pages related to health care institutions contained only Tele address information general data of the hospitals. In one case, there was a statement that health services are provided to foreigners. In 2 cases only the BIP (Public Information Bulletin) was found. In one case the website included the basic information about hospitals: http://www.szpital-kowary.pl/ Only in the case of the Provincial Hospital in Legnica, the website was functioning in German. However the domain was set up incorrectly http://www.lubszpital.republika.pl/ In 18 cases, the institutions lacked their own sites or information was placed only on the city webpage.

Despite the optimistic forecasts made by government analysts regarding e-health solutions in Poland, results of the research which was carried out shows us that the reality is pessimistic. This is pointed out by the fact that a great majority (42 health institution) have own website and only.

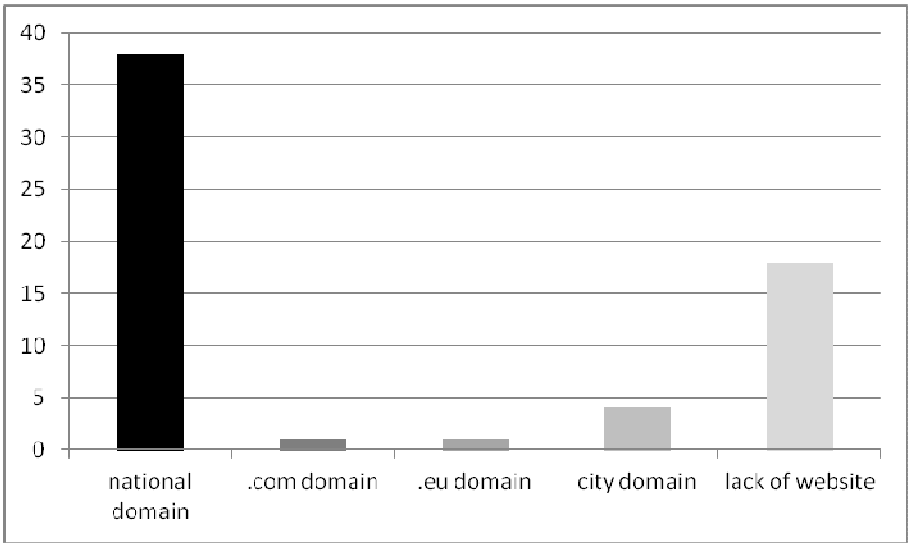

Figure 3: Websites and domains of health institutions in Poland in (Pólkowski 2013)

The research results show, that though there are various interesting and innovative IT projects carried out by the Ministry of Health and other NGOs, some kind of chaos can be noticed. There is lack of principal rules necessary in the field of computerizing as well as when recognizing the role of the Internet in particular units. It surely results from incomplete coordination of IT actions between the health care units and governmental ones. On one hand, there are innovative projects being implemented, on the other hand the www services lack the basic elements significant when it comes to the contact with the patients. The solution to this "resonance" might be the introduction of standard and unified IT elements used in health care centres. Similar situation exists in other public institutions such as schools and offices. Despite there are some regulations related to the use of the IT systems, data safety, the level of computerizing depends vastly on human resources (IT specialists), equipment, software as well as the open-mind of decision makers towards the innovation.

Moreover use of private and public cloud computer and their integration with web sites of health institutions can improve the current situation. It is obvious that in order to proceed with the integration of emerging operating systems in the cloud, it is necessary to have a web service in the correct domain at first. The studies described above unfortunately show that few institutions own web sites in the correct domain. Of course, it can be changed at any point, but it may increase the patients' inconvenience who used the internet services earlier. Moreover, a domain change leads to negative results on SEO (Search Engine Optimization).

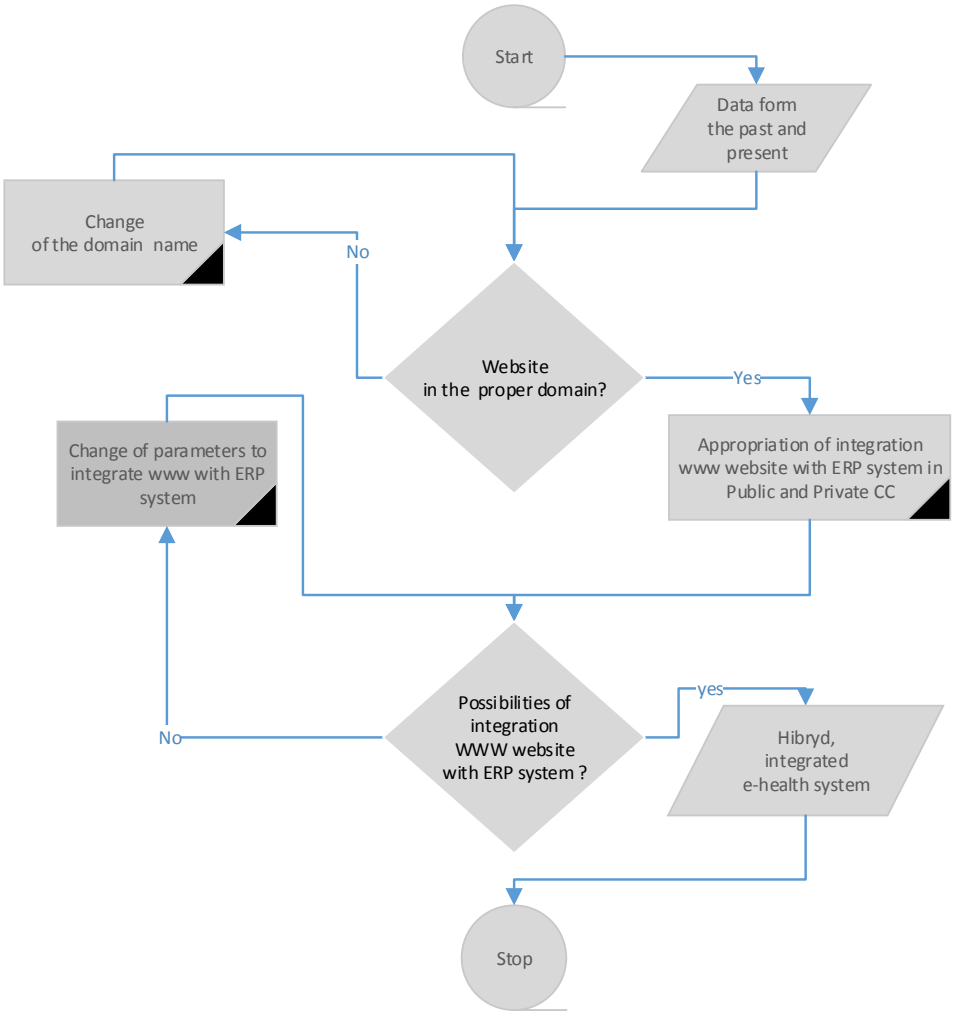

Figure 4: Algorithm of integration www website with Private Cloud Computing in health institution (Pólkowski 2013)

Therefore the development and the implementation of the hybrid solution might turn out to be the most convenient one. This solution combines elements like species, types, structures, methods into an integrated whole. The result of the merger reveals a synergistic effect; hybrid demonstrates the qualities that are hard to watch in the original ingredients. The unique properties of the hybrids meant that in many disciplines working on such systems can be considered as one of the most promising research directions. (Radosiński 2001).

This is an integrated method for the development of hybrid information systems, which combines conventional information system development methods with knowledge based system development methods. The method is an integration of four existing methods using two integration process approaches: intra-process and inter-process. In the requirements analysis phase, a structured method is applied to function analysis, an information modeling method is applied to data analysis, and a knowledge acquisition method is applied to knowledge analysis. We then use an intra-process approach to integrate these techniques together using consistency rules. In the design phase, we use an inter-process approach to transform requirements analysis to object oriented design by a transformation algorithm. Finally, an object oriented method is applied to the design and implementation of hybrid information systems. This method can take

advantage of the four methods and also remove some limitations of each individual method. It is applicable to the development of traditional information systems, knowledge based systems, and large and complex hybrid information systems.

For this reason, it is meaningful to search for solutions that will combine the advantages of creating a single system Integrated Hybrid System. In the present case the model describes the combination of hybrid solutions employed in the public cloud, private institutions and the internet system. The use of private cloud seems to be necessary for the security of the system. The access to specific resources in a private cloud will be possible via the website. It is recommended to use the replication of data: the process of creating and managing duplicate versions of a database. The replication process not only copies a database but it also synchronizes a set of replicas so that changes made to one replica are reflected in all the others.
The key asset of replication is that it enables many users to work with their own copy of the database but have the database updated as if they were working on a single, centralized database. For database applications where users are widely distributed geographically, replication is often the most efficient method of database access.

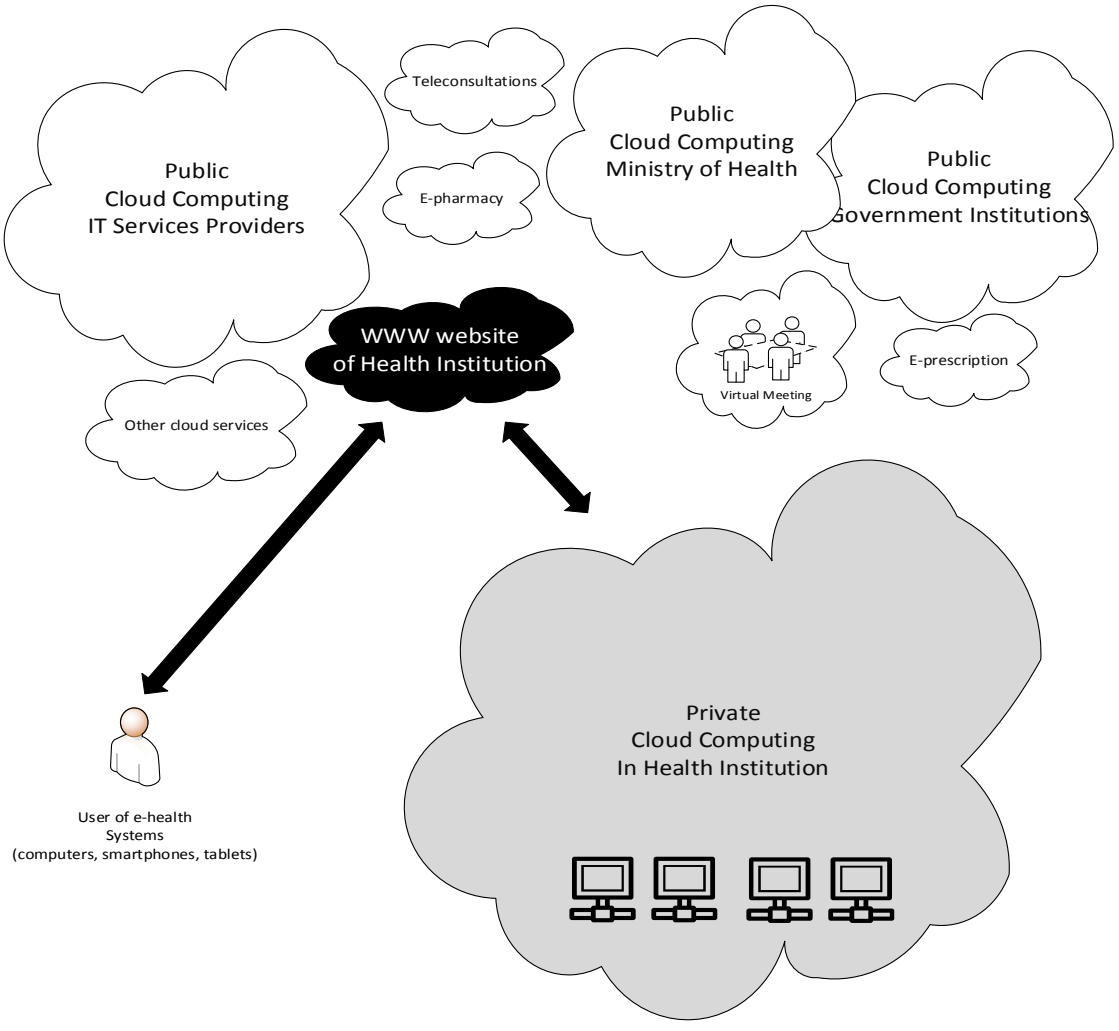

Figure 5: The model of the hybrid e-health system integrated website health institution whit Public and Private Cloud Computing (Pólkowski 2013).

The implementation of the hybrid e-health system

Some mangers, authorities, and IT specialists can consider the opportunity of implementing innovative solutions only when the institution passes through a crisis period because of the evolution of some external or internal factors. In this case, the implementation process implies sudden changes and sometimes can imply radical changes within institution. Others will decide to implement new IT solutions taking to account an realistic and desired future structure and of the IT systems. In this case, mangers, authorities, and IT specialists will adopt the „step by step" implementation, avoiding change resistances. Even if we are talking about a radical or a „step by step" implementation, managers have to know that the implementation and integration of e-health solutions is a long-term process (Pandelica, Diaconu, 2011). Taking into account the main changes that should occur within the transition process, we think that some phases should be done according to figure 6:

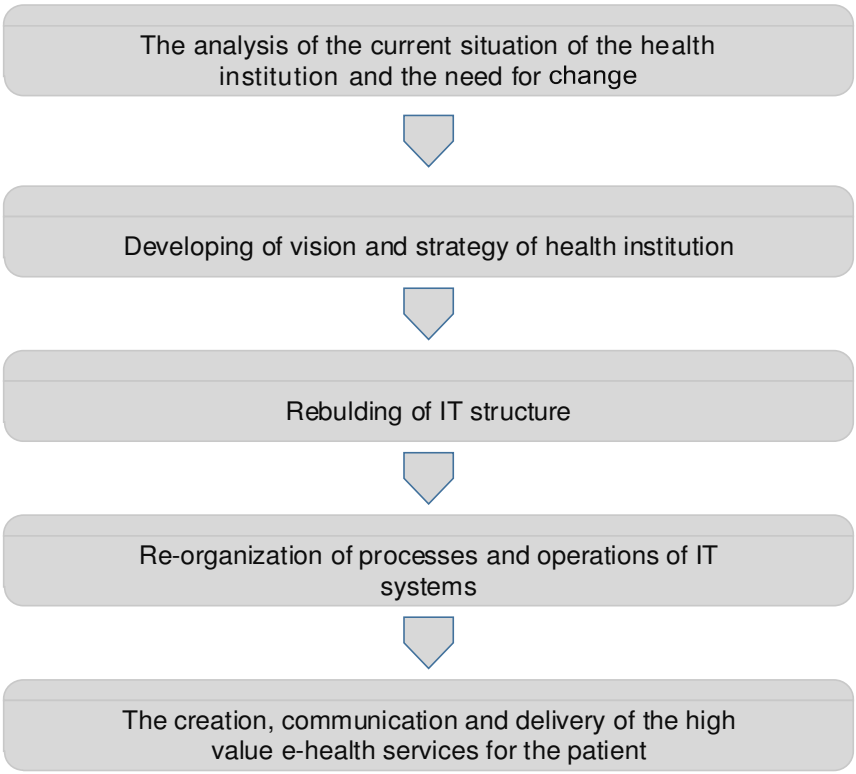

Figure 6: Phases of the implementation and integration of the hybrid e-health system (based on publication of Pandelica A., Diaconu M., 2011).

4. LIMITS OF THE RESEARCH AND FUTURE RESEARCH DIRECTIONS

The limits of the study result from the advancement level of the works related to the implementation process of the e-health services. Many of them are being implemented at present, therefore the moment for testing the e-health online tools could not have been carried out as it had been assumed. As a further research, the intention is to observe the ongoing changes and developments in order to test the potential and solutions launched with the e-health. Moreover, as it has been already pinpointed, the recommendations related to the language aspect as well as on the obstacles when using the websites will be handed over to the institutions and authorities and hopefully following the introduction of the solutions, the research will be carried out and the

tests of the tools will be performed. The outcomes of the further study, after the e-health services and tools have been implemented and used by patients will constitute the next study.

5. IMPACT OF THE UE (ESPECIALLY THE LEGAL ASPECTS) AND ITS IMPACTS IN POLAND

The development of e-health in the Republic of Poland requires the cohesive policy of the country while implementing the available remote medical services, publishing the valuable information on health in the internet as well as providing the condition to increase the level of health knowledge among the citizens together with obtaining new qualifications and skills by the employees of the health care sector. The initiatives which develop the electronic services are also recommended and sufficiently financed by the European Union. In order to make the implementation process easier and to precisely assign the particular tasks to particular enterprises at the same time providing the coordination and control of the actions, the Polish parliament passed the Law Act of 28 April 2011 on information system in health care sector. This Law Act will enable the legal functioning of the whole information system.

The main goal of the Law Act of 28 April 2011 about the IT system in the health care is:

1. Regulating the existing system of collecting, processing and using the information in health care sector.
2. Creating the information and communication environment enabling making the optima decisions in the further perspective related to the health care policy independently of acquired organizational model of the health care and the rules for its financing.
3. Creating the stable information system in the health care sector, characterized, on one hand by the flexible approach to the organization of health care data system.
4. Improving the functioning of the health care system in Poland by providing the full-scale, updated and consistent norms, processes, systems and information resources of the health care sector influencing the cohesiveness of the information order in the health care considering the citizens' information needs.
5. Optimizing the financial expenditures born on computerizing the sector of the health care and the development of information society within the area of the health care as to the obtained results.
6. Bringing back the appropriate relations between the data creator, the information system guests who collect data and the entities using and analyzing the information generated in the information systems.
7. Creating clear legal basis for medical registers functioning at present and for the future ones.

6. CONCLUSIONS AND IMPLICATIONS

E-health solutions look positive and the government's awareness of the advantages can increase its usage. It appears that E-health services are indeed relevant to Poland, despite the current limitations with the existing infrastructure and other issues related to the economical and socio conditions. E-health offers excellent opportunities and possibilities for those whose health

disorders limit them greatly and when expanded not only will facilitate the access to medical services but will also improve the quality of their lives. The expansion within the Polish borders will enable to use the capability of the institutions and also will enable them to enter the European market. The potential of Polish professionals is unquestionable and the implementation of the IT tools will surely enhance the institutions' competitiveness so crucial especially in the crisis environment.

The study was focused on understanding how health institutions are using www website and to create good environment to do the best health services using IT. The research that was carried out, revealed that there is certain resonance between what particular institutions do within the field of computerizing and what the Ministry of Health implements. The examination of the www services, as the basic source of information related to the health care services provided showed that particular institution do not have the basic knowledge in the field of the internet technologies exploitation. On the other hand, the projects being implemented by the Ministry of Health indicate that these actions seem to be the accurate ones. The legal issues tend to create certain obstacles, as they do not specify precisely the matters referring to e.g.: sensitive data protection. The examples of the data leakage can be found in Poland and they attest to the necessity to thoroughly specify the legal aspects in this area. The cooperation between the General Inspectorate for Data Protection and the Ministry of Health is clear as to that issue. The results of the study emphasized that taking action for the integration of different systems and information developments can bring many advantages. The use of hybrid solutions Hybrid Information Systems can help to create a comfortable living environment of e-services to the patient. The use of a private cloud as data replication can provide a high level of system security.

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