Regional Health Care Authorities delivering application services to primary health care units

Aristides Vagelatos[a], John Sarivougioukas[b]

[a]*Research Academic Computer Technology Institute, Athens, Greece*

[b]*"G.Gennimatas" state hospital, Athens, Greece*

Abstract

Since 2001, a reformation of the Greek healthcare sector is evolving, aiming at the overall improvement of the system. This reformation affected especially the primary health care sector with main goal to improve the services provided to the citizens. In order to leverage the adopted changes appropriate application of information technology has been designed. In this report the proposed business model for the IT incorporation in primary health care sector in Greece is discussed: application service provision by the newly established Regional Health Care Authorities (RHCA) to the primary health care units that supervises. The model under consideration presents a number of advantages originated from the ASP model itself and which ensures reliable arrangements to the special characteristics of the primary health care in Greece: cost reduction, rapid implementation, centralized administration and distributed usage, and less need for IT experts at the remote healthcare organizations. On the other hand, since the ASP model is a new business model for the IT market certain issues/challenges arise such as data security and privacy, need for reliable communication networks, and the maturity of the local vendors to respond to the newly formed reality.

Keywords:

Primary health care, Medical Information Systems, Application Service Provider

1. Introduction

Since 2001, a reformation of the Hellenic National Healthcare sector is evolving, aiming at the overall improvement of the system. One of the main changes, directly affecting the framework examined, is the division of the country in 17 autonomous Healthcare Regions. Each of them has its own administrative structure, supervises all the Healthcare Units that reside in its territory and typically includes 6-10 state hospitals, 10-15 primary healthcare units and 15-20 community clinics. The head department (Regional Health Authority) is responsible for the delivery of high quality health services to the people.

Appropriate application of Information Technology (IT) in the primary health care sector can play a significant role in the reformation of the Greek health care system. The IT application in the primary health care sector is expected to be a major factor in the direction of improvement of the offered services. Informatics is called to picture and operate the applied organizational arrangements in order to provide integrated healthcare services at the regional level allowing the capability of synchronous communication among the healthcare providers. Since the primary health care sector is the citizens' first contact point with the healthcare system, its Information Systems (IS) infrastructure must be well defined and built in such a way to improve the offered services.

The business model of the proposed reform by the Ministry of Health and Welfare for the introduction of Information and Communication Technology (ICT) in the primary health care sector in Greece is presented. In the following sections of the current report, it is firstly analysed the Application Service Provider (ASP) model, then the organization of the primary health care in Greece is presented, next the deployment of the ASP model in primary healthcare in Greece, and lastly, the discussion along with the related conclusions are reported.

2. The Application Service Provider model

The Application Service Provider (ASP) model is a rather new business model in the IT market. An ASP delivers and manages applications and computer services from remote data centre to multiple users via the Internet or a private network [1].

The ASPs offer to their customers a viable alternative instead of procuring and implementing complex systems by themselves. Thus, ASPs have complete responsibility over the management of the infrastructure, hiring manpower and guaranteeing systems uptime. With the ASP model the software and its necessary infrastructure (including help-desks and support) are supplied by the application service provider, and the actual business process operations are handled by the organization.

Service Level Agreements (SLAs) between the ASP and the customer, assure the uptime of the system, the support and the network connectivity that have been agreed on.

Thus ASPs are an interesting new emerging industry since they offer a new value proposition to the customer, moving away from a product-based approach to software procurements to software-as-a-service [4].

The value proposition offered by the ASP model to organizations is rather attractive. The following advantages come from the market experience:

- Savings in total costs: organizations rent/lease the use of the applications with monthly payments. Since they do not have to purchase upfront licensing or implementation cost, organizations realize satisfactory cost savings.
- Scalability: With the ASP model organizations can scale up and down based on actual usage without having to anticipate the appropriate infrastructure.
- Support for distributed and mobile users: Since in most of the cases services are delivered through the Internet, with the ASP model it is straightforward to support mobile as well as distributed users.
- IT expertise: In our days where IT skills are hard to employ and retain, ASP seems to be a promising solution.
- Upgrade and Maintenance: Through the ASP model, the organizations may experience faster upgrades at the time that they become available. At the same time the responsibility for maintenance and 7*24 uptime may be realized in an easier and cost effective manner. ASPs can also provide state of the art IT infrastructure, data security and disaster recovery systems.

Nevertheless and apart from the above-mentioned advantages a number of issues – challenges remain to be obtained.

- Data control: The ASP model implies an application to be run not on the organization's server but instead on the ASP’s one. It can be browsed using a standard

browser at the organization's end. Hence, sensitive data are stored on remote servers apart from the organizations' control. Therefore, one is obliged to rely on the ASP's integrity and realize the loss of control over valuable data.

- Telecommunication connectivity: In ASP business model the users access the applications via their browsers. Thus these remote run applications are fully depended on telecommunication connectivity. Therefore the ASP must guarantee acceptable data network connectivity.
- Data privacy and security: Since in most of the cases the data connectivity is accomplished through the web, another issue that has to be arranged by the ASP is the security of the data that are carried over Internet.

3. The primary health care sector in Greece

For the local population of a geographical area, it is provided the availability of private or public General Practitioners for medical consultation, which it is considered as the first level of the primary care's structure. The local patients have the option to enjoy the treatment of the next level in the structure of the primary care contacting private diagnostic centres, wherever available, or the public healthcare centres for further diagnostic services. The healthcare centres besides the available diagnostic services cover additionally medical, nursing, short-term hospitalisation, and emergency treatments. Administratively, the healthcare centres have the capability to cooperate with regional state hospitals to facilitate the access of the patients to the hospitals' medical specialists.

Long lasting relationships between the local patients and the medical professional whom covers a small area provides mutual benefits for both parties. The GPs servicing a specific area with a determined maximum number of patients allow the development and benefits the interpersonal communication. In addition, the GPs have the chance to properly keep the patients' health records, refer the patients to medical institutions and sometimes to get involved in the necessary arrangements depending on the patients' health status.

The healthcare centres assist the GPs' efforts to keep the health status of the areas of their responsibility at acceptable levels according to the holding epidemics. The healthcare centres frequently are used for their capabilities to face emergency or first aid services to local population. The managerial and the administrative personnel of the healthcare centres have available organized communication channels with either the GPs or the regional hospitals.

The proper operation of the healthcare centres assist the regional hospital in the decentralization of its external wards avoiding the crowded congestion of its facilities for patients whose health status would better be serviced at the local medical premises. Keeping patients that do not necessarily need the hospital's special services at the local healthcare centres allows to focus on those patients that require medical attention at the hospital. At the same time, the hospital's administration is capable to concentrate and perform better services with characteristics such as timing, scheduling and availability. In addition, the proper operation of the healthcare centres may provide valuable epidemiological data that may let the hospitals management to get prepared on time and effectively alert the hospitals reaction services to face the expected demand for healthcare treatments.

4. The ASP model in the primary health care sector

The infrastructure of the primary care is consisted of a large number of healthcare organizations much smaller than the organization of a regional hospital. Each healthcare organization in the primary care sector presents and performs independent and similar but not identical administrative tasks. The operation of the healthcare organizations in the primary care seem and must be alike taking under consideration the peculiarities of each them due to environmental reasons. The purpose of operation of each healthcare organization in the primary care is to promote the health status of the local population activating preventive mechanisms to keep the local habitants healthy. The medical, nursing and administrative personnel, dispersed all over the country's territory, it must be continuously informed about the evolution of the medical science and trained in the conquests of new methods and practices. The remote healthcare organizations ought to be in contact with the cooperating regional hospital and the rest of the entities in the healthcare infrastructure in order to exchange information about the patients and for administrative and synchronization purposes.

The introduction of Information Systems (IS) in the primary sector gives the impression to be difficult and very expensive task. The large number of dispersed healthcare organizations in the territory including isolated areas requires a large number of Information Technology (IT) professionals assigned the installation and maintenance of an equally large number of software applications. Also, the extent of the software applications does not justify the presence of permanently employed IT professionals. The excessive costs related to such a venture for the development, installation and maintenance of IS makes the task prohibitive. Hence, the distribution of IS at each of the local healthcare organizations attains the limits of the impossible.

The deployment of centralized IS that would have the capability of serving a number of healthcare organizations of similar operating requirements reduces the financial implications. The contemporary technological conquests present a number of solutions that can provide an acceptable solution provided that such technological achievements are integrated properly. The wide spread of the web along with the technologies that have been developed for the exploitation of the web's availability, provide the means to lower the barriers opposed by the above mention technical, organizational and financial problems. The Regional Health Care Authority (RHCA) may provide IT services to remotely located healthcare organizations which include both the approved and controlled software applications while, at the same time, keeping the gathered locally data. In addition, the private healthcare organizations may have the chance to take advantage and utilize such services provided that all precautions have been taken in favour of security and individuals' personal data anonymity. The remotely located users have no concern about maintenance procedures since specialized personnel will perform all such actions at the RHCA premises. The hosting of such services by the RHCA is widely recognized by the acronym ASP, Application Service Provider. In such a case, there exist a large number of commercially available products that warranty the reliability of such a system and integrate into a concrete Information System.

An IS serving the above-mentioned purposes is based on a logical 3-tier model. In the first level, it is employed a standard web browser allowing the users transparently operate their specific software applications. The remotely gathered data are stored at the RHCA facilities and reachable through the web based software (client) application. In the middle tier, the applications are accessed via standard Internet protocols while the last tier refers to the

execution of the software applications on a web application server located on the RHCA computer system.

The capabilities of the centralized system's operations would be designed to support the following services: Patients identification, Patients records keeping, Scheduling patients appointments, Patients reference, Access to national drugs' data base system, Prescriptions' administration and management, Distributed use of patients record and centralized administration, The personnel' s management, The management of the procurements, The processing of insurance matters, The administration and management of economic and financial matters.

5. Discussion - Conclusions

In this report, the ASP model is proposed to serve the needs in Informatics applications of the primary health care sector in Greece. The current suggestion has certain advantages that mainly originate from: the intrinsic characteristics of Web technologies and the specific characteristics of primary health care in Greece regarded with respect to both its organizational structure and its current incomplete IT infrastructure.

The model described and analysed above, presents certain benefits that serve the circumstances formed in Greece in the primary health care sector:

Open Architecture. The examined model is based in widely accepted - due to the proliferation of the Internet - open architectures and protocols. Such architectures are supported by well-known software vendors. Hence, the software applications might be based either on MS Windows DNA/.NET framework or the J2EE platform (that has been developed by SUN). It has to be stressed that inclusion of XML (eXtended Markup Language) is one of the most significant feature since it is embedded in both of the above-mentioned frameworks. With the exploitation of the XML, solutions for Business to Business (B2B), Business to Customer (B2C) and Business to Employee (B2E) services may very easily be realized.

Ease of implementation and cost effectiveness. Taking under consideration, the large number of the primary health care sites and the geographic dispersion of small communities, it is self evident that the proposed model is time effective. Furthermore, such a system would provide a less expensive development, installation and maintenance cycles.

Pooling IT expertise. The lack of IT personnel in the public health care sector in Greece is an actual reality [2]. Furthermore, the plan for informatization of the primary health care, it demands more IT expertise that is hard to find and hire. The ASP model offers a viable solution by requiring well-trained IT personnel only at the RHCA premises where the systems may be installed.

Accessibility. The only requirement for the users (client side) is that of a standard Web browser. Hence, new services may be easily added not only for the health care personnel but for the citizen too. Also, since the infrastructure is based on Internet, mobile users may have equal accessibility.

Risks Factors

The above-mentioned advantages may have been idealized presenting the proposed model. Nevertheless certain risks factors exist that have to be considered.

Telecommunication network. As it is stressed in the previous parts of this paper, the need

for a data network is essential for the realization of the proposed solution. The decision to use the Internet through VPN (virtual private network) technologies [2] is desirable and acceptable for the predetermined purposes. Nevertheless, in certain isolated areas the telecommunication lines are not reliable due to extreme weather conditions.

Security Concerns. Issues involving data protection, privacy and communications have been considered in the proposed model. It remains, the RHCA to adopt the proper security procedures and protocols (e.g. encryption, firewall hardware and software configurations) for the physical security of servers and data that reside at its facilities.

Services and Support. The RHCA acting as an ASP for all the primary health care units has an enormous supporting task to carry out. Thus, the management of RHCA has to be determined to assist the IT department with all the appropriate preparations and support: IT stuff hire (depending on the current situation), new procedures and protocols (security issues), ability to visit the remote sites, when necessary.

Maturity of the Greek software vendors. The required software applications are going to be developed by independent vendors while the RHCA is concerned with the hosting and operation of them. The vendor must present such qualities that ensure the desired cooperation and reliability in the new business model.

The RHCA are called to play effectively the role of regulator in the everyday operation of primary health care units through the deployment of ASP model. The advantages of the proposed model are sufficient to assure the success while the risk factors must be considered.

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8. References

[1] ASP Consortium, *Frequendly Asked Questions*, http://allaboutasp.org/faqs (accessed on October 9, 2002).

[2] Vagelatos A, Sofotassios D, Papanikolaou C, Manolopoulos C. ICT penetration in public Greek hospitals, Proceedings of *Medical Informatics in Europe Conference* (MIE2002), Budapest, Hungary, August 2002, pp. 702-706.

[3] Patnayakuni R, Seth N. Why license when you can rent? Risks and rewards of the application service provider Model. *SIGCPR 2001;* pp. 182-188.

[4] Ekanayaka Y, Currie W, Seltsikas P. Delivering enterprise resource planning systems through application service providers. *Logistics Information Management.15 – 3, 2002;* pp. 192-203.

[5] Sarivougioukas J, Vagelatos A. IT outsourcing in the Healthcare sector: The case of a state general hospital. *SIGCPR 2002*; pp. 1501- 1505.

14. Address for correspondence

Dr. Aristides Vagelatos

Research Academic Computer Technology Institute

Eptachalkou 13, GR- 11851 Thiseio, Athens, Greece

E-mail: vagelat@cti.gr