

IMPLEMENTATION OF CLOUD COMPUTATING IN HEALTHCARE SECTOR

Introduction

Digitization of healthcare in Poland may soon enter a further stage of technological change, i.e. cloud computing services. At a first glance cloud computing seems to be an abstract notion that means nothing to the staff employed in healthcare sector. However, that is not the case as – although the name itself may sound strange – the main concept of that technology is commonly known and applied in various forms. It may be referred to as a model of IT¹ services that is applied in data processing without the need to buy additional hardware and one that only requires the connection to virtual resources that are stored in external servers². That is one of the many properties of cloud computing and in this respect such a solution means that its user has the opportunity to store and process data outside his own server, which – to make it simple – could be compared to renting a garage for one's own car. Obviously, one should remember that different legal provisions refer to both situations and, as a result, legal consequences are different. However, when considering the properties of a place where resources are stored – the external location that does not belong to the user – the above comparison is justified. In a way, cloud computing is like outsourcing since the user pays for the application of the resources that are owned by an external unit. Thus, cloud computing is a very wide concept that combines numerous features of the already existing solutions.

First of all, doubts should be dispelled whether the issue of cloud computing should be investigated or not. Why should specialists in healthcare be interested in cloud computing technology? Surprisingly enough, the answer to that question is very easy. Recently, numerous regulations and standards have come into force that concern secure data processing

¹ *Information Technology* – technology used to collect, store, process, transfer and present information (i.e. Texas, pictures and sound) . It particularly includes communication and computer technologies (hardware and software). (Technologie informacyjne. www.old.stat.gov.pl/gus - Accessed: 18.10.2014).

² F. Alleweldt, S. Kara et al., *Chmury obliczeniowe – ekspertyza*, Departament Tematyczny ds. Polityki Gospodarczej i Naukowej, Parlament Europejski, Bruksela 2012, pp. 14-16.

in health institutions and cloud computing³ may be one of the instruments that can be applied to implement legal provisions and meet the requirements of the standards. The services of cloud computing raise several doubts and fears and their opponents are quick to present negative aspects of that technology. However, it has to be said bluntly that such an attitude is a sheer fear of the new and unknown.

Undoubtedly, the use of IT services by medical institutions raises the question of information security. One should be aware of the fact that healthcare sector is a vast system that stores and modifies significant amount of data. Moreover, the range of the data processed is very wide and includes information that is varied as regards significance and sensitivity. That is why, the security of information seems to be now one of the key issues⁴. Data protection should certainly be the priority for medical institutions.

Thus, having taken into consideration the use of the increasingly advanced information technologies, the problems of data protection in the healthcare sector should be discussed. Numerous institutions are seriously doubtful about data processing with the application of the latest technologies. Cloud computing is obviously one of them. At present, the issues of data processing in computational clouds is one of the most difficult problems to be solved as regards medical institutions. Apart from the users' fears about data protection, the unrestricted use of cloud computing is hindered by strict legislator's requirements concerning the security of health data. That is why the use of cloud computing services by medical institutions is open to question.

Because of numerous doubts related to the application of cloud computing models, one should look closer at the issue and analyze current methods of data processing in the healthcare sector. Although the application of some cloud computing models by medical institutions is impossible at present, the situation may change in the nearest future⁵. That is why it is worth considering some of the suggested solutions that would make it possible to use the full potentials of cloud computing by healthcare units in the future. Obviously, the analysis and full understanding of cloud computing is not an easy task. That is caused by the fact that there are no Polish research publications on the subject. And that shows evidently that cloud computing in Poland is a new issue and that it is in an early stage of development. Consequently, more effort and attention should be paid to that concept.

³ K. Nyczaj, *Jak bezpiecznie archiwizować elektroniczną dokumentację medyczną*, „Serwis kadry zarządzającej ZOZ”, October 2011, No23.

⁴ K. Sierota, *Zintegrowane zarządzanie bezpieczeństwem informacji. Zintegrowana odpowiedzialność (part 1)*. „Ogólnopolski System Ochrony Zdrowia” 2010, No 9, pp. 30-31;

⁵ *Chmura obliczeniowa też do wykorzystania w informatyzacji sektora zdrowotnego*, Rynek Zdrowia, 27.09.2011, www.rynekzdrowia.pl (Accessed: 10.09.2014).

The main objective of the article is to point at the potential application of cloud computing in the healthcare sector and to introduce the concept of that technology to a wide range of specialists and managers in the sector. The further part of the article presents the reasons for the application of cloud computing in more detail. However, already at this point it can be stated that cloud computing will make it possible to maintain the standards, to manage the data effectively and to secure the availability and confidentiality of the information being processed.

1.Characteristics of cloud computing

As the expansion of cloud computing services is inevitable, one should get acquainted at least with the fundamentals of that technology. The knowledge that computational clouds do exist and have nothing to do with clouds in the sky is not enough. Although cloud computing lies mainly within the interest of computer scientists, it is worth understanding its fundamental mechanisms and operating principles due to the potential application opportunities in the healthcare sector.

At a first glance, the understanding of the idea of cloud computing does not seem to be simple. First of all, there are several definitions that focus on different aspects of cloud computing. On the other hand, the explanations that cover all elements typical for cloud computing are ambiguous and, consequently, useless as they miss their explanatory function. The multitude of models offering cloud computing services also impedes a precise definition of the concept.

A fairly complete definition that points at the key features of cloud computing is given by NIST (the *National Institute of Standards and Technology*⁶). According to the definition “cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction”⁷. It is probable that such an explanation of the concept will not be clear to laymen so it is worth mentioning that e-mail service is one of the simplest examples of cloud computing⁸. That is because e-mail – in accordance with the definition – is

6 founded in USA in 1901; at present a part of the US Department of Commerce), www.nist.gov (Accessed: 28.09.2014).

⁷ P. Mell , T. Grance, *The NIST definition of Cloud computing (draft)*, Gaithersburg 2011, www.pre-developer.att.com (Accessed: 28.09.2014).

⁸ F. Alleweldt, S. Kara et. al., *Chmury obliczeniowe – ekspertyza*, Departament Tematyczny ds. Polityki Gospodarczej i Naukowej, Parlament Europejski, Bruksela 2012, p. 22.

easily available as it is enough to have the access to the hardware connected to the Internet. Moreover, it is not located in the internal server of the user. The use of e-mail does not practically require any interaction with its administrator or any big effort and complex operations. What is more, e-mail enables the storage of data, which is the essence of cloud computing.

Apart from the definition itself, the NIST determined 5 essential characteristics of cloud computing⁹. They are:

- measured service;
- on-demand self-service;
- broad network access;
- resource pooling;
- rapid elasticity.

The above properties can be defined as follows:

Measured service – the resources can be measured. The usage can be monitored, controlled, and reported which ensures transparency for both the provider and the consumer;

On-demand self-service – a consumer can unilaterally provision new computing capabilities such as mass memory without requiring any interaction with the provider;

Broad network access – the resources are available over the network and accessed through standard mechanisms;

Resource pooling – the resources are pooled to serve multiple consumers using the cloud simultaneously. Customers usually have no control or knowledge over the exact location of the provided resources. They can only specify the country or a bigger administration unit (e.g. a state, region, etc.) where the available resources are stored;

Rapid elasticity – the resources can be promptly and elastically provisioned. They are unlimited and can be purchased in any quantity at any time.

Thus, it can be stated that computational clouds have been applied for many years although the service was not referred to as cloud computing. Everyone uses e-mail on a day-to-day basis and processes data in the way typical for a cloud computing model. Once we are aware of that fact, cloud computing services will not seem so incomprehensible or complicated. However, the only problem may be constituted by the multitude of the types of

⁹ P. Mell , T. Grance, *The NIST definition of Cloud computing (draft)*, Gaithersburg 2011, www.pre-developer.att.com (Accessed: 28.09.2014).

services that cloud computing offers. Yet, one must have in mind that they are based on the same assumptions¹⁰.

2. Services offered by cloud computing

There are three types of services¹¹ offered by cloud computing models :

- Storage cloud;
- Compute cloud;
- Cloud applications

Storage cloud consists in storing one's data in external servers offered by service providers. The data can be in the form of texts, pictures, sound files, etc. Probably very few users are aware of the fact that storage cloud services are provided by e.g. Facebook, YouTube or My Space which the majority of the Internet users deal with. Thus, most of them definitely do not know that they use one of the forms of cloud computing. Storage cloud, as opposed to compute cloud and cloud applications, is paid by the user only for the services consumed (e.g. for the storage and transfer of data) and not for the use of the whole platform. However, it is worth mentioning that not every storage cloud provider charges fees.

Cloud applications offer the opportunity to use particular software and applications that are available on the service provider's servers. The suppliers are – for example - Adobe (Acrobat Connect, Create PDF Online, Buzzword, Share) and Google Apps (office applications package, e-mail, communicator, organizer¹²).

The providers of compute cloud enable consumers the access to their own applications that are stored on the service provider's platform after entering an appropriate code. The Amazon Internet shop is an example of a service that, apart from e-trading, deals with the sales of compute cloud services within the offer of the *Amazon Elastic Compute Cloud (Amazon EC2)*. It must be emphasized that a particular provider can offer various services within the framework of one cloud model. The Amazon service is a good example, which - except for the compute cloud services mentioned above – offers data storage services (*Amazon Simple Storage Service – S3*¹³).

¹⁰ M. Kedziora, *Co to jest chmura (cloud computing)?*, blogs.technet.com. (Accessed: 20.10.2014).

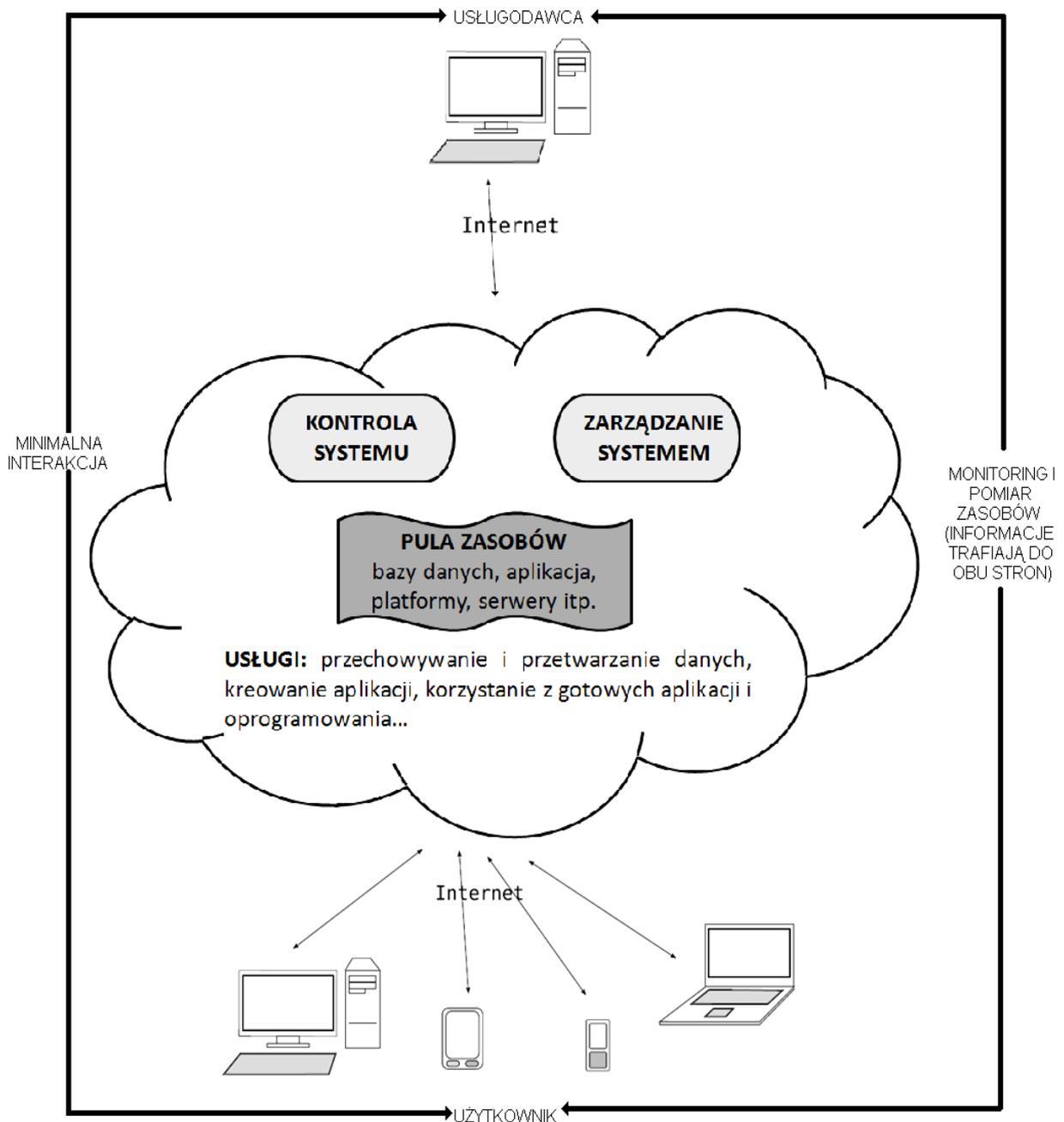
¹¹ G. Gruman, E. Knorr, *What cloud computing really means*, www.infoworld.com (Accessed: 30.09.2014).

¹² M. Małyszko, *SAAS jako metoda świadczenia e-usług*, Wyd. Polska Agencja Rozwoju Przedsiębiorczości, Warszawa 2008, p. 16.

¹³ A. Serafinowicz, *Nie błdzić w chmurach*, www.pclab.pl (Accessed: 27.09.2014).

After the presentation of the characteristics and types of cloud computing services, it can be concluded that the notion of cloud computing is broad and has numerous meanings. However, due to the specific structure of its functioning, cloud computing can really resemble a sort of cloud that contains resources and applications and where operations related to data processing take place (figure 1).

Fig.1. Cloud computing infrastructure



Source: Author's research based on: A. Matoga, N. Waluś, *Cloud computing*, www.student.agh.edu.pl (Accessed: 01.10.2014).

3. Models of cloud computing

At present there are several cloud computing models: 3 service provision models and 5 deployment models. The provision models include SaaS (*Software as a Service*), PaaS (*Platform as a Service*) and IaaS (*Infrastructure as a Service*).

The characteristics of provision models is presented in the table below:

Table 1. Provision models offered by cloud computing

NAME	DESCRIPTION	EXAMPLE
<p>SaaS</p> <p>Software as a service</p>	<p>The consumer uses the provider's applications running on a cloud infrastructure. SaaS offers the widest range of services; it requires the least effort on the part of consumer as regards the creation of applications and a substantial activity on the part of the provider. The customer does not manage or control the infrastructure.</p>	<p>Adobe</p> <p>Google Apps.</p> <p>Facebook</p> <p>You Tube</p> <p>My Space</p> <p>Gmail</p> <p>Hotmail Windows Live</p>
<p>PaaS</p> <p>Platform as a service</p>	<p>The customer is provided with the capability to create applications (resources) and to store them. Paas offers the platform and the infrastructure. The customer does not manage or control the infrastructure.</p>	<p>Windows Azure</p>
<p>IaaS</p> <p>Infrastructure as a service</p>	<p>The customer is provided with the least service range: the infrastructure (server) where the consumer can process the resources and applications. The customer does not manage or control the infrastructure. However, the consumer controls and manages the applications and the operating system. The service provider does not take part in the creation of customer's applications.</p>	<p>Amazon EC2</p>

Source : Author's research based on P. Mell , T. Grance, *The NIST definition of cloud computing (draft)*, Gathersburg 2011.

The services listed in provision models were distinguished with regard to - among other factors – the range of services offered by service providers. In the SaaS model, the customer is provided with the widest service package (capabilities from IaaS and PaaS models plus the software), while in the case of the IaaS model the service range is minimal as the customer is

offered only the infrastructure and must create the applications on his/her own. The PaaS model provides the IaaS capabilities and the platform. That model is used mainly by programmers as it is their job to create applications and they can use particular languages of programming. Other models can be applied by any typical consumers, including the specialists in healthcare.

In order to visualize the idea of particular cloud computing models one could compare the services they offer to the sales of building bricks. The SaaS model is a salesman that provides the customer with everything: the building site, bricks and ready-made structures. The PaaS model can be compared to a salesman who offers the site and the bricks but the structures must be built by the customer; the IaaS model is a salesman that sells only the building site and the bricks must be arranged by the customer who must also built the structure himself.

The presented above models, apart from the service range, differ as regards the degree of customer control and the involvement of customers in the creation of the applications and resources used. In the SaaS model the customer does not create any resources and uses the ready-made applications offered by the service provider. The PaaS customers are involved to a greater extent in the creation of resources, while in the case of the IaaS model, the applications and resources are solely created by its customers. The degree of customer control is reverse to the degree of customer involvement in particular models. The biggest control takes place in the IaaS model, while in the SaaS model there is practically no opportunity to control and manage the infrastructure.

There are 5 types of cloud computing deployment models: public, private, community, hybrid and personal. The types are distinguished by the groups of customers that have access to the resources of a particular cloud. More information on the deployment models is given in table 2.

Table 2. Deployment models offered by cloud computing

NAME	DESCRIPTION	EXAMPLE
Public cloud	The cloud infrastructure is provisioned for open use by the general public and is owned by the organization that sell services within the cloud. Infrastruktura chmury jest dostępna dla ogółu społeczeństwa oraz jest własnością organizacji sprzedającej usługi w ramach tej chmury. As a rule, the service provider is responsible	Gmail, Amazon, Google Apps.

	for the security of data processes in the cloud..	
Private cloud	The cloud infrastructure is provisioned for exclusive use by a single organization. It may be managed by the organization or third party and may operate on or off the premises. That model is recommended for processing confidential data that require special security.	Individual solutions of particular organizations
Community cloud	The cloud infrastructure is shared by several organizations that have common objectives. It can be managed by them or by a third party, and function either on or off the premises. That model is the combination of the public and private clouds.	Automotive Composites Consortium (A joint project of the General Motors, Chrysler and Ford companies).
Hybrid cloud	The cloud infrastructure is a composition of two or more cloud models ¹⁴ (private, public or community) that remain their unique properties but are bound together by standardized or proprietary technology that enable data and application portability (e.g. cloudbursting ¹⁵ for load balancing between clouds)	Some capabilities of the Amazon service
Personal cloud	A small home server or commercial network that can be accessed through the Internet. The cloud is designed to store and exchange private information. It enables browsing and transferring data from any personal computer connected to the Internet.	E.g. personal cloud created the purposes of medical practice

Source : Author's research based on: P. Mell , T. Grance, *The NIST definition of cloud computing (draft)*, Gathersburg 2011 and Committee on the Internal Market and Consumer Protection of EP „Chmura obliczeniowa – Ekspertyza” (Cloud computing – expertise)

It is worth mentioning that any provision model may operate in every deployment model. Different types of clouds may function in organizations. The decision on the choice of a particular model depends mainly on the type of data that is to be processed in the cloud.

¹⁴ The organization may store most of the information in the public cloud, while sensitive data in the private one.

¹⁵ In the case of overloading the public cloud with data , the transfer of data to the private cloud is possible, and vice versa .

Most frequently, private clouds are preferred in the case of confidential data, while public clouds are used for all other information.

4. Advantages of cloud computing

Due to its significant universality and innovativeness, cloud computing can be successfully applied in many fields of life. Cloud computing systems offer a wide range of services which testifies to their significant potentials. Thanks to their numerous advantages, they gain new supporters. It is obvious that benefits resulting from cloud computing outnumber the discomforts and limitations. The main advantages of cloud computing include:

- the access to almost unlimited computing power at any time,
- no need of substantial capital investments to use it,
- the availability of the end user's data and resources from any location with the access to the Internet,
- the reduction of costs on IT and CT on the part of users,
- the opportunity of businesses to expand and develop their offer and services,
- an easier entrance of small and remote businesses to bigger markets,
- an increased attractiveness and efficiency of the services offered,
- an increased competitiveness of business applying cloud computing services,
- the support of digital business and, consequently, the contribution to the increase of efficiency and economic growth.

Thus, the benefits of cloud computing include not only particular companies but also whole business sectors. The potential of cloud computing is so vast that even global markets could successfully take advantage of it and gain significant profits. The application of particular solutions offered by cloud computing in business and other organizations and public institutions would result – with respect both to demand and supply – in an accelerated increase in efficiency and competitiveness of the economy. Moreover, the whole IT and CT sectors could profit from manufacturing and implementing new solutions. The production would cause an increase in income and the implementation of new solutions would assist the work on new products. What is more, big and small units that develop applications would benefit from the increasing demand.

One of the obvious advantages of cloud computing is its vast application. The customers can use its services for the purpose of information storage (e.g. photographs, films, texts or e-

mails) and they can use the software and ready-made applications including so popular social networks or games. Organizations – including medical institutions – can use cloud computing services with the aim to replace gradually their in-company centers of data processing and IT departments, while business companies can use cloud computing models to expand their offer without substantial investments as the exploitation of such services is possible without the necessity to buy expensive computer hardware¹⁶.

Additionally, it should be pointed out that the greater number of units use the cloud computing services the bigger possible benefits. An increased demand for such services would result in the decrease in fees for using the cloud computing models and consequently in a further drop of exploitation costs. However, the benefits from cloud computing are significant even in the case of single companies. They include greater opportunities for remote work, new favorable circumstances for doing business as well as a better access to market, not speaking of the standardization of work organization. Standardization processes improve the work in an organization to a great extent, reduce the risk of errors in routine procedures which results in a substantial drop of operational costs.

The transition to the solutions offered by cloud computing may result in a more effective use of the hardware, which is important to units willing to manage their resources economically. Effective management of the infrastructure leads to its slower wear and, consequently, to the decrease of breakdowns. Moreover, even if there is a hardware failure, the organization still has the access to the resources being processed in the compute cloud as it can be done from any facility that is connected to the Internet. Such a solution is particularly useful in big companies where significant amount of resources is processed; otherwise the lack of access to the data would result in the danger of a partial stoppage of operations.

As it was mentioned before, the implementation of cloud computing enables organizations to enter new markets. At present, the opportunity to offer the services on increasingly remote markets is highly valuable and, as a result, every attempt that leads to the presentation of the offer to new customers is appreciated. Together with the access to the Internet, cloud computing makes it possible to overcome the problems of big distances in the case of any company, be it a high-tech organization, a small trading company or a craft

¹⁶ D. Kuropas, *Uroki bujania w obłokach*, Rynek Zdrowia, 28.06.2012 r., www.rynekzdrowia.pl (Accessed: 10.09.2014).

business. The concept of cloud computing opens new opportunities for economic development to any unit that has new ideas, a suitable plan and a network infrastructure.

Another advantage resulting from the use of cloud computing is the possibility to create job places for IT specialists. Additionally, new work places can be created in the dwelling places of such employees without the need of relocation. Thanks to that, new job places may appear in underdeveloped regions, whose income could increase in a short period of time. Several local products that are unknown to a wide group of customers may achieve a global recognition and increase their presence in the Internet – the main window onto the contemporary world of computerized society.

Not only private business but also public institutions from different sectors can benefit significantly from cloud computing. The benefits could result in the improvement of the effectiveness and elasticity of their products that would meet the growing needs of people and organizations. Cloud computing could also result in substantial savings due to lower costs of IT thanks to the reduction of expenditure on hardware and a more effective use of the existing equipment¹⁷. Further financial advantages and other benefits could be caused by an increased scope of joint infrastructure use by various offices.

Cloud computing solutions can also assist in and accelerate the transition to the application of modern public services, i.e. the ones that are interoperational and adapted to the needs of mobile clients and companies that wish to take advantage of the digital market. It is evident that a significant improvement of services would occur after a large scale implementation of cloud computing models. Possibly, there would be an improvement in security, transparency for the customers and the pace of launching new services on the market. It is predicted that in the nearest dozen or so years the availability of the Internet will increase several times and, consequently, the use of cloud computing would help people to take a full advantage of public e-services. That would be an attractive alternative for the existing and still growing bureaucracy. Moreover, as the concept of cloud computing assumes the lack of geographical boundaries, it can contribute to the beginning of a new stage of digital market development.

Many of the discussed above aspects seem to have nothing in common with health care. However, it is not so, as every health unit is not a medical institution detached from reality but a business entity that – like all other big or small companies – experiences problems with

¹⁷ D. Kuropaś, *Uroki bujania w obłokach*, Rynek Zdrowia, 28.06.2012 r., www.rynekzdrowia.pl (Accessed: 22.10.2014).

effective resource management and finding new customers and one that has to deal with other economic issues. Medical units must be managed just like other organizations and, preferably, with the application of innovative technologies. Of course, their mission is different but that does not change the fact that they are still profit-oriented and must be sufficiently competitive to survive on the market. The sooner that fact is understood by hospital managers and heads of medical centers, the better it is for the future of these institutions.

5. Limitations of cloud computing

Without any doubt cloud computing has several advantages. However, apart from numerous positive properties, it has several drawbacks and limitations that affect its application. The most significant are:

- the lack of uniform and clear legal regulations as regards the application of cloud computing;
- local geographic limitations in the access to the Internet, which makes the implementation of cloud computing services impossible;
- the possibility of cyber attacks and the danger of losing the resources that are stored in the cloud;
- the reluctance and lack of confidence to cloud computing on the part of potential users;
- the inability to use cloud computing by a part of society;
- the possibility of longer blackouts resulting in the unavailability of the resources stored in the cloud.

From among the above listed factors, the lack of adequate legal regulations that would control cloud computing services restricts their application. Although there are some legal acts referring to cloud computing, they are not precise enough, which results in the problems with their interpretation¹⁸.

The reluctance to cloud computing and the lack of skills to use it should also be considered an equally important barrier. Such a problem is particularly visible in the healthcare sector where there was no need to apply IT until that time. Quite the contrary, there was a requirement to keep the records in a paper version. Thus, one should expect that the departure from traditional data processing and convincing the staff to apply cloud computing

¹⁸ S. Cieśla, T. Helbing, *Raport: prawne aspekty cloud computing*, www.prawnik.pl (Accessed: 21.10.2014).

would require a lot of time. It is evident, that apart from time, some financial expenditure on training the staff would be necessary, too.

The application of such services by some units may be questioned in the face of numerous fears and barriers concerning cloud computing. It often happens that despite the obvious benefits of such services and the readiness of potential customers to use them, they do not make the decision to apply them. And that is usually justified by the lack of clear rules as regards the use of cloud computing.

Conclusion

The analysis of the issue of data security in the context of its processing in computational clouds leads to the following conclusions. In spite of the fact that both in the EU and Polish law systems there are provisions relating to the protection of personal and medical data, at present there are no legal acts that would directly concern data storage in cloud computing. Unfortunately, such a state of affairs impedes the application of cloud computing in processing the data that require special protection measures. There are significant reservations concerning mainly the use of cloud computing to store sensitive data.

Considering the development of high-tech and the expansion of digitization in nearly any area of life, it should be expected that functioning in an informative society without any interference into the privacy of individuals will be almost impossible. That refers not only to the access to personal data in offices and other institutions but also to the access to sensitive data in healthcare units. That is why the problem of the security of sensitive data, medical data included, is gaining in significance.

Particularly electronic medical data require special security. Processing medical data with the use of information and communication technologies calls for special security measures. Data processing, despite numerous legal provisions that support data digitization, raises reservations in many, especially medical, institutions. Particularly cloud computing does not enjoy the trust of medical units. That is not completely justified as some models of cloud computing ensure sufficiently high degree of security of their resources.

Private cloud platforms are the safest model of cloud computing since they apply servers with a precisely determined location and provide the access to only one organization, which almost completely reduces the risk of the loss or the damage to the data. When using private cloud computing, it is possible to exploit servers located out of a medical unit as it is a secure solution due to the possibility of protecting the unauthorized access by adequate coding

of the data being processed. Much more significant problems occur when a public cloud model is used as its resources are available to a wider range of customers and a precise location of the servers with the data is not so obvious. Because of that the use of public computing in healthcare sector is at present possible only in the cases of processing data that do not require special protection.

The use of hybrid cloud computing is a good option in the case of medical services because it combines the properties of the public and private cloud models. In such a model, personal and medical data can be processed as all the safety measures are maintained here and the remaining information is stored under the terms and conditions typical for public cloud computing.

At present all the solutions that have been developed within the framework of the cloud computing models are at the implementation stage as regards the healthcare sector. However, it can be expected that in time the technology of cloud computing will gain in popularity and will be introduced to many medical units. Moreover, when considering the changes in the Polish and international law systems, it can be expected that some more precise and extensive legal provisions concerning security of data processed in cloud computing models will be developed in the future. When analyzing the factors that pose danger to data security, legislators should pay special attention to the hazards regarding data processing in information systems that are connected to external networks. The reason of that is that the risk of interception and misuse of the data by unauthorized people is high. Another question that requires further and more detailed regulations is the issue of legal relationships that are created when signing cloud computing service agreements.

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Abstract

The use of traditional models that provide IT services is gradually coming to an end and that process makes it possible to take advantage of the innovative models of community service provision. Thus, it is crucial to look closer at the new models of information services provision. Cloud computing, which has been developed fairly recently and provides numerous application opportunities, is one of such models.

The article is an attempt to explain the idea of cloud computing and – which is the main objective – to present potential applications of that technology in the healthcare sector as there are several types of cloud computing that may be used in various ways. It should be emphasized that the article presents the technical aspects of cloud computing only to the extent that is necessary to help understand this technology.