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## CONCERNS OF POLISH SME SECTOR IN REGARDS TO USING CLOUD-BASED SERVICES

**S u m m a r y :** The article presents results of research conducted in Polish SME Sector. The main aim of the research was to identify reasons behind reluctance in using cloud-based services as well as to underline main concerns postulated by chief executive officers of Polish SMEs. Furthermore, the article is showcasing that theories of consumer behavior are well based in the outcomes of data analysis of the subject. To do this the lady-author of the article is using data collected from primary sources by questionnaire conducted on group of 100 units.

**K e y w o r d s :** SME sector, cloud computing, electronic services, consumer behavior, prospect theory, new institutional economics.

**K l a s y f i k a c j a J E L :** L 21

### INTRODUCTION

To the creation of electronic services (e-services) contributed mostly such factors as: development of Information and Communications Technology (ICT), rapid upgrades in consumer electronics with access to the Internet and abandoning from single client licenses of software in favor of subscription business model. E-services are distributed via electronic devices such as laptop, tablets, smartphones, and they are part of physical infrastructure of existing network, and accessible from any internet browser in any place on the Earth.

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Moreover, rapid evolution of millennial generation as well as increase in demand for computing power both laid foundations for the peak in interest in the cloud computing technology. Thus, were born cloud-based services which also are part of physical infrastructure and are available from any internet browsers same as any other e-services. Therefore in a sense, cloud-based services are evolution of e-services.

## THEORETIC FOUNDATIONS AND CONCEPTUAL BASES OF CLOUD COMPUTING

According to the National Institute of Standards and Technology, cloud computing is defined as a ‘model for enabling ubiquitous, 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’ [Mell, Grance, 2011, pp. 2]. The beginning of cloud computing dates back to the 60’s of twentieth century, however, the development of wireless technology in the 90’s mark a real high of the interest in mobile devices with the connection to the Internet which in turn caused influx of interest in cloud computing [Cichorzewska, Haleniuk, 2013, pp. 43].

Cloud-based services can be offered in four basic types of deployment models as follows: private cloud, community cloud, public cloud and hybrid cloud [Becker M. B., 2012, pp. 5]. All of the aforementioned cloud deployment models differ from the receiver to whom the created cloud infrastructure, which consists of hardware and software, is provisioned. In case of the private cloud deployment model the infrastructure is created and provided to the single client on his demand, whereas, in the community cloud deployment model the cloud infrastructure is provided to a specific community of clients. In the public cloud deployment model, by contrast, cloud infrastructure is provided by cloud provider to the group of various clients. Meanwhile, a combination of at least two distinct deployment models of cloud infrastructure is called a hybrid cloud.

The cloud infrastructure can be also understand as a combination of both physical layer and abstraction layer [Becker M. B., 2012, pp. 4]. The physical layer is a composition of server, storage and network components, and which together make hardware resources. Whereas, the abstraction layer should be viewed as software deployed across hardware resources, that is, the physical layer. Connected together, the layers provide the most popular cloud computing service models, that are: Software as a Service (SaaS), Platform as a Service (PaaS), Infrastructure as a Service (IaaS) [Becker M. B., 2012, pp. 4-5]. SaaS, PaaS and IaaS are also shortly named with an acronym SPI.

SaaS provides consumer with access to the given application from the Internet. In this service model server and operating system is ensured by the cloud service provider which is responsible for managing everything [Becker M. B., 2012, pp. 4]. PaaS can be compared to the service of hiring server, storage, network and environment. The consumer has got control only over the application which is deployed by him. Besides that, he can be empowered to configure settings for the application-hosting environment [Becker M. B., 2012, pp. 4-5]. In case of IaaS the consumer is working on the lowest level of cloud infrastructure and receives the least amount of prepared functionalities. In contrast to the other cloud computing service models, consumer has got more power of control given to him ranging from operating systems, storage and deployed application to selected network components [Becker M. B., 2012, pp. 5].

There are five essential characteristics which allow to distinguish cloud-based services from others: on-demand self-service, broad network access, resource pooling, rapid elasticity, measured service [Becker M. B., 2012, pp. 3-4]. Thanks to that, cloud computing allows not only to process enormous amounts of data by the companies, but also to increase flexibility in taken actions. It allows to cut expenses as well as generate new and/or innovative value proposition. To use it the users need only internet connection and appropriate telecommunication tools. In effect, such services can be offered and used at any time and any place all over the world.

According to the representatives of New Institutional Economics, innovations – especially in the information technics and new technologies sector – and globalization of international markets should be treated in the context of factors which have impact on economy growth [Steen M., 1999, 63]. Furthermore, the same representatives claim that the ability of enterprise to survive is dependent on its ability to maintain complex and balance in the environment of constant change [Steen M., 1999, 30-32]. Which means that innovation in the field of new technologies and the ability to utilize them are part of the factors which have direct impact on survivability of the enterprise. It also builds competitive advantage of the said enterprise, which in return strengthen the whole economy by making it more competitive. It is also a good idea to keep in mind that SMEs, defined as ‘businesses which employ less than 250 staff and have an annual turnover of less than an annual turnover of less than EUR 50 million, and/or their balance sheet EUR 50 million, and/or their balance sheet total is less than EUR 43 million’, play a substantial role in each economy [Muller P., Caliandro C., Peycheva V., Gagliardi D., Marzocchi C., Ramlogan R., Cox D., 2015, pp. 7]. Besides that, it is important to underline that cloud-based services are a global solution, which allows the enterprises to react quickly to any changes in their nearest environment, but also on the global market, and help them create products of the highest quality.

As a result of this, each year cloud-based services are becoming more and more popular among Polish SMEs. However, the largest cloud-based providers are still pointing out to the lower than anticipated interest in using their services by Polish SMEs. This indicates that along with increased interest in cloud computing technology, arose concerns about usage of such services.

Examples of such concerns are as follows:

- restrictions of autonomy and control over the data for example: there is no way of knowing for sure that data have been deleted when requested,
- access to the materials protected by the copyright is loosened, it hard to tell who have access to such data,
- loopholes in the privacy security,
- less independence in the decision making process regarding the choice of the informational infrastructure, as well as implementation of owned original solutions,
- lack of clear law situation, for example in regards to data transfers,
- in case of conflict with the cloud service provider regarding the contract, dispute is settled in accordance with law of the country in which said provider resides, and not the country of the service user.

While all of this concerns are valid in a way, there are plenty of counterarguments in favor of cloud-based services. Among them: availability, visualization, scalability, flexibility, option to mix and match informational assets available to many users, payments tailored to the users' needs – just to name a few. Outline of all the pros and cons of using cloud solutions are presented in the Table 1.

Table 1. Selected positive and negative aspects for the use of cloud computing technology by the enterprises

Advantage	Disadvantage
<ul style="list-style-type: none"> <li>- duty of the technical infrastructure lies with the service provider (system updates and adding of new functionalities)</li> <li>- service provider is responsible for the protection of the data. To do so usually they keep two data centers - one with the backup data -, and are responsible for the virus and hacker attacks countermeasures</li> <li>- since the infrastructure and staff is managed by the service provider it helps to cut costs and expenses</li> </ul>	<ul style="list-style-type: none"> <li>- less independence in the decision making process regarding the choice of the informational infrastructure, as well as implementation of owned original solutions</li> <li>- user is forced to update software regularly</li> <li>- risk of the lack of compatibility with older software used by the user</li> </ul>
<ul style="list-style-type: none"> <li>- ability to process the data anywhere, anytime</li> </ul>	<ul style="list-style-type: none"> <li>- requirement for constant internet connection and up-to-date internet browser</li> </ul>

- pooling IT resources gives access to multiple users at the same time which allows to co-work on one document	
- easy to use programming environment once code is written and uploaded to the cloud can be re-used  - smooth transition of data between platforms  - regular backups	- code is written on external servers
- enormous computing power and virtual space for data which allows to uploading, storing, processing, accessing and sharing of large data resources without the need to change configuration of applications when the need for upgrade comes  - if needed computing power can be increased at any time	
- user pays per usage	
	- restrictions of autonomy and control over the data  - access to the materials protected by the copyright is loosened
	- lack of clear law situation
	- in case of European Union countries there is restriction does not allow to transfer data out of UE with exception of countries pointed out by European Commission as countries which hold up appropriate level of data security
	- lack of transparency in many cases regarding the guarantee of quality of service and security supervision of cloud service providers
	- in case of conflict with the cloud service provider regarding the contract, dispute is settled in accordance with law of the country in which said provider resides, and not the country of the service user
- lower costs of maintaining and managing IT infrastructure	
- more eco-friendly IT infrastructure	

Source: own materials based on A. Mateos, J. Rosenberg, (2011), Chmura obliczeniowa rozwiązania dla biznesu, Helion, Gliwice, pp. 31-33, 101-130.

This motivated the lady-author of this article to conduct survey research, aimed at identifying both reasons behind reluctance in using cloud-based

services and main concerns postulated by chief executive officers (CEOs) of Polish SMEs.

## METHOD

Focusing on the aim of this paper the following research population was considered: SMEs of tertiary sector of the Polish economy. For the basic unit of the research were chosen subjects which at the time when it was conducted had a status of SME and offered service for at least two years. A simple random sampling was used to select a 100 units of subgroup of the population to answer the survey questions. Data about a population of interest was collected by online survey research (one of indirect questioning techniques). A questionnaire was chosen as an research instrument. To maintain main goal of this study the lady-author of this article assumed a rule that respondents be owners or co-owners of the enterprises. To assure that filtering questions were used in the questionnaire.

As noted earlier, to carry out the online survey research the lady-author used Google's Software as a Service (SaaS) which is known as Google Forms.

Between the beginning of January and the end of April 2016 conductor of the research using electronic mail sent to the selected group request for them to fill the attached questionnaire. Within the sent message was added hyperlink for the web page where the questionnaire was available.

## RESULTS

In the study participated one hundred Polish enterprises which provide services of many diverse kinds, in the local, national and international markets, and also possess the status of micro, small or medium-sized enterprise. Noteworthy is a fact that 55,2% of enterprises, which participated in the study, is wholly or partly conducting business over the Internet.

According to the results approximately 60% of the respondents claimed that their enterprises use cloud-based services to run the business or part of it. Remaining 40% of the respondents claim that their enterprises do not use cloud-based services, and only in one case participant indicated that they consider to use it in the future.

In this 40% each respondent had the possibility to choose multiple answers as for the reasons behind their decisions to not use cloud-based services. Among the respondents 66% pointed out that the concern for not using cloud-based services was the complete lack of the need for such services. 25% of the respondents pointed to concerns about unauthorized access to materials protected by the copyright. Regarding concerns where: there was restricted autonomy of

the enterprise, lack of control over companies' data, concerns about the loss of data, risk of the lack of compatibility with older software, dependence on cloud service providers, lack of required solutions on the market – in each of these cases there was 17% rate choice for it being a concern for not using cloud-based services. Meanwhile, concerns such as the insufficient knowledge for the proper use of cloud-based services, the lack of cooperation from the employees, and the lack of control over costs of using cloud-based services were indicated by the 8% of the respondents.

Answers proposed in the questionnaire:

- creation of the source code on the external servers,
  - necessity for constant Internet connection,
  - necessity for the regular updates of the software,
  - diversity in the legal bases for the protection of data in the cloud,
  - the lack of possibility to transfer data to the data centers located outside the European Union countries or countries that do not provide EU-standard data protection,
  - lack of international standards and norms ensuring safety of the highest level,
  - lack of transparency of cloud services providers regarding guarantees of service quality and data security,
- were not chosen by any of the respondents.

That shows that among the concerns which influence whether the enterprise use cloud-based services or not dominant part play the ones revolving around safety of the data which said enterprises uploaded to the cloud. Among them the most notable are: the lack of control over data, unauthorized access, the loss of the data.

Respondents which admitted that their enterprise do use cloud-based services were asked about the advantages of using cloud solutions. Again respondents could choose from multiple suggested answers. 30% of the respondents pointed out that one of the main advantages is an increase of data security as well as the knowledge and experience of cloud service provider.

Interestingly enough, more than 80% of respondents, which claim that their enterprise do not use cloud-based services, chose at least one service based on cloud technology which was named in the questionnaire, and in fact is used by the enterprise. It is worth to point out that all of respondents mentioned above claimed that their enterprises do not use cloud-based services which means the same respondents who chose the answers regarding reasons not to use cloud solutions, and pointed out the complete lack of the need for such services and/or the lack of proper required solutions on the market, when in fact they use them unknowingly. Which further leads to the conclusion that lack of interest in cloud-based services is mainly caused by the lack of knowledge of cloud computing

technology, and not out of real, tangible concerns.

Even among the respondents, who admitted that their enterprises use cloud-based services, the level of knowledge about them is surprisingly low. Almost half of them (47,1%) were not able to identify service or deployments models of the cloud in which the service is provided to their enterprise.

Lastly, the analysis did not proven any correlation between the lack of the knowledge about cloud computing technology and sex, age or education of the respondents. Furthermore, the analysis did not show any influence of customer segments for which the enterprise provides service or the use of telecommunication devices by the company over whether or not the business use cloud-based service.

## DISCUSSION

Data gathered through the study allowed to identify reasons behind reluctance of the main decision makers of the enterprises to use cloud-based services. Through the careful analysis, the lady-author selected the most noteworthy ones. According to the data, most common reasons not to use cloud-based services is lack of the control over data, and in effect, lack of information about unauthorized access, theft, leak, use or even lack of assurance that data was deleted.

Base on this, it might be reasonable to assume that even small probability of third-party access to the data is reason enough not to use cloud-based services. It brings to mind prospect theory by D. Kahneman & A. Tversky.

According to the prospect theory, people have tendency to overestimate small probabilities, and in consequence blow them out of proportion [Kahneman, A. Tversky, 1979, pp. 7-8]. Because of this, small probabilities may become more significant than the real big one. Moreover, in case of small probabilities, when people face loss, they tend to exhibit aversion to risk [Kahneman, A. Tversky, 1979, pp. 7-8].

However, the analysis of gathered data supplemented of synthesis method allowed to identify main reason behind reluctance of Polish SMEs to use cloud-based services. That reason is insufficient knowledge of decision making CEOs of SMEs about cloud-based services. The lack of this basic knowledge which allows to ascertain what exactly is the cloud, how it works, and how it is being secured will always breed concern and uncertainty about the use of cloud-based services. Which in turn will lead to abstaining from such solutions.

One of the basic theories, on which micro economy is based, states that consumers on the market will make decisions which will allow them to achieve maximum satisfaction. It is synonymous with utility, happiness, fulfillment, pleasure which each consumer gets while consuming given good or service. To



achieve this goal there are three necessary conditions to be fulfilled: person needs to have choice between multiple alternatives, the person needs to relinquish at least one alternative, the person decisions must be guided by the scale of benefits which means they have to make choices which benefits outweigh taken costs, or at least are equal to them [Brue, S. L., Grant R. R., 2013, pp. 245-251]. The maximizing of satisfaction is an effect of specific consumer behavior on the market, called rational consumer behavior.

In other words, the process of satisfaction maximizing is comprised of specific decisions made by consumers based on priory conducted analysis of benefits and costs. If people act rationally they always choose such solutions which benefits them the most and cost them the least, and only in marginal cases costs and benefits will be equal.

Respondents who participated in the study declared that they are either owners or co-owners of enterprises. In case of micro, small and medium-sized enterprises it is mainly them who make decisions about the course of the companies development. In effect, their reluctance to use cloud-based services caused by the insufficient knowledge may, in fact, stagger their progress. Especially that, 60% of the respondents claim that the reason for them to use cloud-based services is wish to create innovative value proposition offered by their enterprise.

Considering everything mentioned before one might be tempted to state that economy provides theories of consumer behavior which find their confirmation also in behavior of consumers of cloud-based services.

## CONCLUSION

Results of various research papers about cloud computing technology present advantages for enterprises of using cloud-based services, most notable financial ones [Chandrasekaran K., Essentials of Cloud Computing, s. 38]. However, group of Polish SMEs still declare their aversion to the idea of such solutions, pointing out to various concerns, and such situations find their confirmation in economic theories of consumer behavior.

Meanwhile, the analysis of gathered data showed that services provided in cloud computing model are in fact used by the subjects of SME sector in Poland. Even though, in the most cases unconsciously. Moreover, the concerns are not the real deciding factor even when they revolve around safety of the data which said enterprises uploaded to the cloud, but in reality more often than not it is simply narrowmindedness and misinformation or simple lack of the knowledge of the people in charge.

This proves that knowledge of the decisions makers in regard to cloud computing plays major role in perception of risk and opportunities that are

associated with cloud-based services, and in return it affects level of interest about the service. However, the lack of knowledge is a very broad concern in this matter, as it is only one of links in the chain. The classification of circumstances of such state of the matters seems to be important as well as their influence over the result. That requires, of course, further study into the roots of the problem of the lack of knowledge.

This calls for creation of the recommendation for the enterprises, which provide cloud-based services, so that when reaching out the customers they provide at least the basic information about the functionalities and utilization behind the mechanics of data security.

Lastly, the situation where there is no sufficient information from the cloud-based services providers, breeds even more serious problem, where the users of their services act without the full comprehension of the rules and regulations. It is especially risky in regards to the data security which the enterprises handles. Because of differing terms of service and the regulations of the Polish law system, the enterprises might not fulfill the terms of the contract with their customers, or even break the law unknowingly.

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## OBAWY POLSKIEGO SEKTORA MŚP W KWESTII KORZYSTANIA Z USŁUG ŚWIADCZONYCH W MODELU CHMURY OBLICZENIOWEJ

**Zarys treści:** Artykuł przedstawia wyniki badania przeprowadzonego wśród podmiotów sektora MŚP w Polsce, którego celem było zidentyfikowane przyczyn niechęci korzystania przez nich z usług świadczonych w modelu chmury obliczeniowej oraz obaw najczęściej wysuwanych przez głównych decydentów w tym zakresie. Ponadto wykazana zostaje zgodność wyników analizy danych z ekonomicznymi teoriami zachowania się konsumenta. W tym celu autorka odwołuje się do danych zebranych ze źródeł pierwotnych za pomocą kwestionariusza ankietowego na próbie liczącej 100 jednostek.

**Słowa kluczowe:** sektor MŚP, chmura obliczeniowa, usługi elektroniczne, zachowanie konsumenta, teoria prospektu, nowa ekonomia instytucjonalna.

