Analysis of the Macedonian enterprises’ migration towards cloud computing

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Abstract. Cloud computing is one of the world’s latest business and IT concepts. The main objective of this paper is to elaborate on the adoption of cloud computing by the Macedonian enterprises, perceived from different perspectives determined by the existing conditions on the Macedonian market. For that purpose, a survey and an analysis of the largest enterprises and key stakeholders from this market are conducted in the paper. The analysis is mainly based on the results of an online survey conducted in February 2011 among the enterprises from four knowledge and technology intensive¹ industries in the country: IT, telecommunications, banking and education. Finally, some conclusions about the existing and required conditions for adoption and application of cloud computing by the enterprises in Macedonia are drawn.

Keywords: Cloud computing, survey, enterprises, Service Oriented Architecture, virtualization, Macedonian market, added business value, migration, services, Software-as-a-Service, Infrastructure-as-a-Service

1 Introduction

According to the renowned experts from the cloud computing industry², cloud computing is the third big wave in the IT industry, following the personal computers (PCs) and the Internet. According to the Gartner’s³ definition, cloud computing is a style of computing in which scalable and elastic IT-enabled capabilities are delivered as a service to external customers using Internet technologies⁴. This definition refers to the most known ownership model of cloud computing, called public⁵ cloud computing, where the cloud⁶ is owned by a specialized supplier of cloud services who delivers them to the end-users under certain SLA conditions and usually charges for

¹ ‘Intensive’ from IT and business point of view.
³ Gartner is one of the world’s leading IT research and advisory companies.
⁴ http://www.gartner.com/it/page.jsp?id=1035013
⁵ Besides public, there are also private, shared and hybrid ownership models of cloud computing.
⁶ Cloud is a term used for abstracting the huge IT centers composed of hardware and software that deliver the specialized services through Internet or other networks to the end-users.
the service. Since cloud computing is a new commercial concept\footnote{As a generic concept independent from concrete technologies and architectures, cloud computing is much older.}, even its definitions are not completely cleared out and in full compliance with each other. However this fact does not change the potential of cloud computing for great improvements in the everyday life, in the scientific work as well as in the business models.

The Macedonian market is usually a bit late considering the adoption of the latest technological trends in the world, which is also the case with cloud computing. However, this fact is least valid for the large enterprises in the country, especially from the IT and telecommunications industries, which are very often the first that bring the world’s cutting edge technologies on the market. That is the reason why these large Macedonian enterprises are in the focus of analysis in this paper. Through this approach, the author hopes that he will create a clearer picture about the future of this new concept that is still not yet fully arrived on the Macedonian market.

It should be stressed that all of the herein numbered motives for the enterprises to use cloud computing are \textit{commercial} and as such, analyzed from a commercial point of view. Besides them, there are also other ways of delivering and using cloud computing - free services from public clouds\footnote{Such as the Microsoft Office 365 Live package of cloud-delivered office tools, the Gmail emails service from Google etc.}, developing services from public clouds which may or may not be free of charge\footnote{Such as the Microsoft’s development platform Azure, or the Google’s platform GoogleApps}, educational services from public clouds which are usually free of charge and intended for the educational institutions\footnote{Such as the Microsoft’s Live@Edu services.}.

\section{Analysis of the results from the research conducted on the Macedonian enterprises}

The results exposed herein are based on the online survey conducted by the author in February 2011. The survey is segment-based and anonymous and includes twelve business organizations in Macedonia from four different industries: IT industry represented by the enterprises Seavus, Netcetera, LifeWatch, Asseco (former Pexim); Telecom industry represented by the telecommunication enterprises of T-Home, T-Mobile, One, VIP; Banking industry represented by the following banks - Komercijalna Banka, NLB Tutunska Banka, Prokredit Banka; and Education industry represented by the University of FON, Skopje. They are among the largest organizations in their industries, and are very often the ones that introduce the world’s cutting edge technologies into the Macedonian market.

The objective of the survey was to examine the existing preconditions and conditions in the Macedonian market regarding the business migration\footnote{Under migration, a systematic and professional approach is presupposed in this paper.} towards cloud computing, including the technical requirements and the necessary knowledge and experience of the large enterprises in the process of adoption of the new concept. Since Macedonian market is behind the world’s leading markets regarding the usage of cloud computing, it was not possible to examine in details the added business
values of this new commercial concept. The thesis of the survey was that the Macedonian market needs preparations not only about the necessary conditions but about the preconditions as well, in order to be able to successfully adopt the new concept of cloud computing. Eleven out of twelve respondents answered the questionnaire specially designed for this purposes. The examination of the surveyed data included basic statistical analysis and frequencies.

From the research results 82% of the enterprises consider cloud computing as an enabling technology that already contributes to business transformations and innovations. For the rest of 18% it is a new developing concept that will need years to mature\textsuperscript{12}. By itself, this result indicates the progressive understanding that the Macedonian enterprises have about this new concept.

Considering the readiness of the enterprises for migration to cloud computing, 73% of them responded positively. The reasons for such a migration they found in: huge processing power and maximum utilization of systems parallelism; interoperability between independent systems; better services for email, intranet and files (so-called commodity services); lowering of the Total Costs of Ownership (TCO); flexibility for growth and choice of different solution-developing platforms; e-commerce; process optimization; inner services and applications contributing to a bigger portfolio of available cloud services etc.

The detailed results of the question about the most suitable ownership model of cloud computing are represented by the following chart (Fig.1):

![Fig.1. Most suitable ownership models of cloud computing for the Macedonian enterprises](image-url)

\textsuperscript{12} It is interesting to mention that all of the telecom and banking organizations look at cloud computing as an enabling technology.
It is almost half of the enterprises (i.e. 45.5%) that have already been using some services of some kind of ownership and provision cloud models. Exactly the same percentage of the enterprises is planning to use such services in the following two to three years. All of the enterprises that are already using some services from cloud sorted out the private ownership model and 80% of them claimed IaaS as the provision model of cloud computing unlike the rest 20% that claimed the Software-as-a-Service (SaaS) provision model of cloud computing.

Considering the purposes of using / planning to use cloud services, 40% of the enterprises chose the commercial ones, while 30% voted for own (inner) purposes. The detailed chart results of this question can be found in the following chart (Fig.2.)

![Chart of purposes of using / planning to use cloud services by the Macedonian enterprises](image)

**Fig. 2.** Purposes of using / planning to use cloud services by the Macedonian enterprises

83% of these enterprises that use / plan to use cloud services, responded that these services from cloud (will) replace the existing traditional ones, while the rest of 17% responded that the cloud services will be/are additional channels of servicing and sales.

A separate part in the survey consisted of two matrix questions about the main advantages and disadvantages / risks of cloud computing. From the positive viewpoint (advantages) the private ownership model of cloud is mostly preferred by the

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13 SaaS is a software provision model in which software and its associated data are hosted centrally (typically in the (Internet) cloud) and are typically accessed by users using a thin client, normally using a web browser over the Internet. Source: [http://en.wikipedia.org/wiki/SaaS](http://en.wikipedia.org/wiki/SaaS)

14 Half of these 83% of enterprises also responded that these services will complement the existing traditional services.

15 Matrix questions are two-dimensional: the horizontal dimension is consisted of predefined responses while the vertical dimension contained the different ownership models of cloud computing. In this survey, multiple responses were allowed per rows as well as per columns.
Macedonian enterprises, while from the negative viewpoint (disadvantages) it is the public cloud computing that most enterprises referred to. The advantages of cloud computing for the enterprises were grouped in two groups of predefined question choices – business and IT. From the business group, the most preferred were business agility and improvement of time competitiveness (so-called time-to-market factor) followed by better cost control, replacement of the capital expenses with operational ones and lowered TCO. From the IT group, the first place was divided between fast adaptability to sudden changes in the system load and better accessibility (and lowered downtime) of the systems followed by improved system performances and utilization of modern technology.

The predefined disadvantages of cloud computing for the enterprises were also grouped in business and IT groups. From the business ones, the first place was divided between the privacy of the data, insufficient / incomplete Service Level Agreements offered by the cloud service providers as well as insufficient / non-existing law regulations. From the IT disadvantages mostly recognized was the limited actual offer of cloud services followed by the latency of access to the services / slow real-time response and the reliability and experience of the cloud provider.

Important to point out is also the survey result according to which 18% of the enterprises in Macedonia are provisioning cloud services while 27% are not provisioning but plan to.

- All of the enterprises that are already provisioning cloud services stressed the flexibility, elasticity and efficacy as the main changes that they already had / expect to have in their business strategy and tactics. The services that they provision are mostly from the IaaS and SaaS cloud computing provision models.

![Fig. 3. Provisioning of cloud computing services to third-parties by the Macedonian enterprises](image_url)
Only 27% of the Macedonian enterprises responded that they are familiar with some existing obstacles on the market about adopting the cloud computing. These were the located obstacles:

1. Insufficient / non-existing law regulations about criteria that should be fulfilled by the cloud computing providers, from the viewpoint of availability, integrity and reliability of the services and the data in the cloud. The further author’s research showed that the problem is not in the law regulations (which exist and are sufficient even for the latest concepts like the cloud computing) but in the fact that some of them are still not implemented. It should be also noticed that Macedonia is currently under numerous IT standardization changes.

2. Insufficient experience from the potential cloud computing providers on the Macedonian market (like Microsoft, IBM, Oracle) which is correct and was confirmed by the local offices of the three mentioned providers – namely, their local tech-teams are (mainly) not experienced enough for developing complete cloud solutions for interested third parties in the country. That is why these local providers are currently obliged to consult and collaborate with the more experienced teams from their offices on the developed world’s markets when complete cloud solutions are to be developed for a local customer.

3. Non-existing communication standards as well as assessments of Service Level Agreements (SLAs) between the customers and the cloud providers. According to the additionally gathered information by the author, this is a non-existing obstacle on the Macedonian market. Namely, the ISO 27000 (including its updates beginning from the 270001 up to the latest 270005) standard regulates these problem-domains, besides other approaches, also through the rules of the third-party service provisioning management that are incorporating recommendations about composing an SLA, what the agreement should consist of etc.

4. Electronic / digital signatures - additional information collected by the author cleared out that this is also a non-existing obstacle on the Macedonian market since there are authorized worldwide authorities for such signatures that are legally obliged for verification and guarantee of these signatures. It should be noticed however, that even in the case of owning worldwide recognized KIBS Certificate by the cloud computing provider, the provider should register it in the appropriate governmental institution, in order to be able to legally work with digitally signed services. According to the latest data of the State Statistical Office, 27.2% of the enterprises with 50-249 employees and 44.9% of the enterprises with 250 or more employees in the country were using digital signatures in some exchanged messages during the year of 2010.

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16 Considering the obstacles, besides the other methods of checking them, the author additionally consulted an expert of security of IT systems and ethical hacking.
17 So-called KIBS Certificate Authorities.
18 These signatures are officially valid in the country as well.
19 Press release No: 8.1.10.18, 24. September 2010
As a general conclusion of the four previously numbered obstacles for adopting cloud computing, it can be said that the responsible employees for technological innovations of the Macedonian enterprises are not always fully informed about the existing conditions on the market considering the development of this new commercial concept known as cloud computing.

Finally, as some of the most interesting results, are the responses of the question about the expected changes in the business strategy and tactics as a result of the introduction of cloud computing by the enterprises. Due to a better and more detailed contextual interpretation, they will be represented grouped by the industrial segments:

- Two responses were collected from the banking segment, cited herein: ability for a faster development of new solutions because of the fast and simple creation of the needed virtualized environment; changes in the operational working as well as a better tracking of the customers’ satisfaction in order to more appropriately evaluate the cloud services.

- The IT segment gave the following cited responses about the expected changes in the business strategy and tactics: flexibility, elasticity and efficacy; lowering of the TCO; increased flexibility for growth; different developing platforms; more optimal utilization of the IT resources while the front-end systems and the business processes remain unchanged; much better processing; as well as a response referring to the disadvantages of the cloud computing and reads “the biggest efforts are in the training of the software developing teams.”

- The Telecom segment gave these two cited responses: new products, better offerings and more flexible business access; online accessibility of the clients’ services.

In the next pages are the most indicative survey results that were not covered in such details, from the two largest surveyed segments – IT and Telecom:

**IT segment**

100% from the IT enterprises that stated both SOA and virtualization as applied technologies in theirs solutions, confirmed that they were ready for a migration towards cloud computing. This undoubtedly affirms the thesis that SOA and virtualization are both required for a successful cloud-based solution.

Additionally, for all of the previously mentioned IT enterprises, cloud computing is an enabling technology that already contributes to business transformations and innovations. This result clearly points out the link between the progressive point of view on cloud computing and the readiness for a migration to this new concept.

As indicative can also be found the result according to which 100% of the IT enterprises for which the most appropriate cloud ownership model is the private model, are ready for a migration to cloud computing. This result confirms that this

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20 In absolute numbers, four enterprises in each of the both segments took participation in the survey. Considering that the four Telecoms are covering more than 95% of the telecommunications market in Macedonia, while the four IT enterprises are among the five largest IT organizations in the country, the results from these two segments can be taken with a high degree of segment-based credibility.
kind of migration of the large enterprises in Macedonia starts with private clouds motivated by their own needs. Besides that, all of these enterprises are already using or planning to use some kind of cloud services and are expecting that these services will replace some of the existing ones.

It is also worth mentioning that 75% of the IT enterprises which are ready for a migration to cloud computing, are already using some services from cloud, while the rest of 25% plan to use such services in near future (2-3 years). This can be taken as a good indicator about the link between the utilization of cloud services with the readiness for a migration of own solutions to a cloud.

75% out of those IT enterprises that are already using some cloud computing services stated that the services were for commercial purposes. The same percentage stated that they have already provided cloud services to end-users. This is a noticeable convenient result about the IT segment which emphasizes that the IT enterprise in the country are the most progressive from the viewpoint of commercial utilization and provisioning of cloud services to end-users.

**Telecom segment**

Similarly to the IT segment, 100% of the enterprises from this segment which stated that are using sufficient (for own needs) SOA-based IT architecture, also stated that are using sufficient for the needs virtualization in their solutions and even more, in combination with SOA.

Additionally, all of these enterprises are using information and/or services from a third party for their own needs while 67% of them responded that an average or big part of these information and/or services origin from the foreign markets. These results, in combination with some additional information collected by the author, are a clear indicator that the Telecoms in Macedonia are widely connected and interrelated with their headquarters outside of the country21.

The only result from this segment that digresses from the appropriate one in the IT segment is that here 67% of the telecommunication enterprises stated that they are ready for a migration to cloud computing (unlike the 100% of their IT counterparts).

The telecommunication enterprises which are ready for a migration have either been already using or are planning to use some services from cloud in near future. Some of them expect that these services will firstly complement, and afterwards possibly completely replace the existing services, while the others expect that the cloud services will represent additional channels for customer services and sales.

### 4 Conclusions

The Macedonian enterprises showed progressive view on the cloud computing as an enabling technology that has already been contributing to business transformations and innovations. At the same time, an overwhelming number of them assume that

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21 According to the research of the author, this interrelation is weaker in the IT segment, and same (or maybe even stronger) in the banking segment because of the nature of their industry
they are ready for a migration to cloud computing. The segment-based analysis showed that the telecommunications segment is the most prepared one in Macedonia for a migration, closely followed by the IT segment while the banking segment should put more effort in order to reach them, even though it stands good in this context. The additional information gathered out of the online survey conducted for the purposes of the research showed that the banking segment should work on a more systematic and more integrated whole of the two key technological concepts for enabling the cloud computing – SOA and virtualization. This would create a solid basis for a further systematic migration to the concept of cloud computing.

According to the results from the research, the development of this new concept starts internally within the enterprises (through their private clouds intended for own purposes) from the simplest provision form of cloud computing – IaaS. The conclusions based on these results lead to the assumptions that the next phase for the Macedonian enterprises will be even greater utilization of the SaaS model as well, which would represent an opening step of the private clouds of the large enterprises to a wider commercial and public use. Additionally, there are good chances that one part of the private cloud solutions will emerge into shared / hybrid cloud solutions which will link these enterprises with each other. Encouraging is the fact that the commercial use of cloud computing already exists in a significant part (40%) of the enterprises.

References

7. prof. Dr Bobek Shuklev, prof.Dr. Ljubomir Drakulevski: Strategical Management (2001)

22 This way, these solutions would be of a bigger benefit not only for the enterprises that developed and used them, but also for the business segment globally and, in the bottom line, for the customers.