CLOUD COMPUTING - A WAY TO INCREASE THE COMPETITIVENESS OF SMALL AND MEDIUM ENTERPRISES

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Abstract: Cloud computing is an information technology, which in the last few years attracts more and more the attention of the business. It helped in developing new innovative business models, increasing the economic potential and the benefits and effectiveness of the business. Cloud computing offers greater possibilities for computing, lower prices and higher speed communications. The author's aim is to show what are the benefits of cloud computing and their positive impact on the competitiveness of small and medium enterprises. Also, to answer questions related to the expansion of infrastructure, access to best business applications and as a result, improve the productivity of an enterprise. This article argues that cloud computing can become an essential tool for the business growth by utilizing its potential and by providing information resources at affordable prices ensure comfort, reliability and security.

Keywords: cloud computing, small and medium-sized enterprises, competitiveness

1. Introduction

Small and medium-sized enterprises (SMSE) constantly change their sphere of activities based on market influences. These business activities have been influenced by the high dynamics of the economy over the last years. The constant changes in the business environment call for flexibility of used business strategies that are consistent with recent advances in the sciences, business and technologies which in turn can influence to a great extent the effectiveness and competitiveness of the businesses. In addition to many advantages, working a dynamic environment entails a number of challenges for the company itself with respect to its internal organization. (**Belinskaja et al.** 2010).

Many researchers (**Alama**, et.al, 2011; **Avni**, et.al, 2010; **Bressler** et.al, 2006; **Burinskiene** et.al. 2010; **Gatautis**, et.al, 2008, **Etro**, 2009) support the idea that information technologies will have a serious impact on the market structure of many sectors. Technologies will also influence the costs structure and production capabilities of

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all companies, especially the small and medium-size enterprises. Businesses should get their technological capabilities ready in order to obtain competitive advantages.

2. Opportunities Provided by Cloud Computing and the SME's

At times when the global economy is still recovering from the consequences of the subsiding economic crisis, many companies need highly productive solutions that will guarantee a growth that has already started but at the same time look for affordable options because still work with limited budgets. These solutions must be oriented towards the small and medium-sized enterprises and have a number of functionalities that allow for optimization of effectiveness and profitability of the business. Information technologies are used by businesses to facilitate their decision-making processes (**Gatautis 2009**) but in order to be more competitive the small and medium-sized enterprises should follow the latest advancements in the IT development.

Small and medium-sized enterprises could react faster to changes in the economy. Therefore they could faster and easier adopt cloud services. Unlike big company, these businesses usually do not need big IT resources that require complex support. The small and medium-sized enterprises often outsource the supply and exploitation of IT and thus concentrate on their particular business activities (**Bose** et.al, 2006; **Taylor**, 2010; **Vijeikis**, et al., 2009.).

One of the latest trends in the development of IT are the cloud-based technologies. Transferring the systems on a cloud is a new and innovative solution, which can help the SMSEs to economize considerable financial resources. In this way, they pay specialized companies for the services provided and used for a certain period. Enterprises can place everything on the cloud, for example e-mail, company web pages, online stress, etc.

Cloud computing is one of the most widely discussed technologies now. Despite this, there is still no unified, commonly used definition of cloud computing. Various definitions exist and new ones continue to appear. There are places where more than 20 definitions by leading experts are gathered. They outline the nature and contents of this technology and express their opinions (**Geelan** 2009).

The experts from Gartner are one of the most respected specialists in the IT field. They define cloud computing as „a computational style where scalable and elastic IT resources are offered as 'services" to clients with the use of Internet technologies" (**Gartner** 2009).

Figure 1 shows how we can access the different processing resources in the "cloud", namely software applications, infrastructure, platform) from different devices via the Internet. It visualizes better the model of cloud computing.

Another authoritative definition by **Mell**, which is accepted and approved by the National Institute of standards and technology in the USA, states: „Cloud computing is 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. This cloud model is composed of five essential characteristics, three service models, and four deployment models"

According to the above mentioned definition, cloud computing has **five main characteristics**. They are as follows:

- **„On-demand self-service**. A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider.

Figure 1: Scheme of the cloud computing model
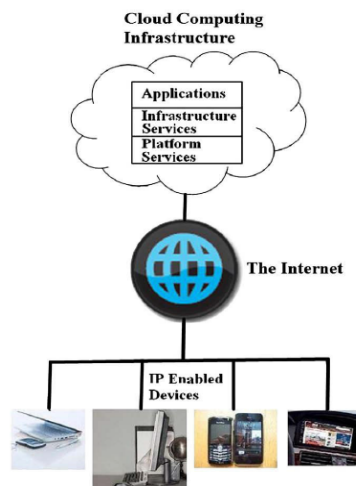
Source: Marston (2011)

- **Broad network access**. Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, tablets, laptops, and workstations).
- **Resource pooling**. The provider's computing resources are pooled to serve multiple consumers sing a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g., country, state, or datacenter). Examples of resources include storage, processing, memory, and network bandwidth.
- **Rapid elasticity**. Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be appropriated in any quantity at any time.
- **Measured service**. Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth, and active user accounts). Resource usage can be monitored, controlled, and reported, providing transparency for both the provider and consumer of the utilized service." (Mell et. al. 2009)

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In addition, **three models of offering Cloud computing services are defined**, namely:

- "**Software as a Service (SaaS)**. The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure. The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g., web-based email), or a program interface. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user – specific application configuration settings.
- **Platform as a Service (PaaS)**. The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages, libraries, services, and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment.
- **Infrastructure as a Service (IaaS)**. The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications; and possibly limited control of select networking components (e.g., host firewalls)" (Mell et al., 2009)

With reference to the definition, there are **four models of implementing** Cloud Computing:

- "**Private cloud**. The cloud infrastructure is provisioned for exclusive use by a single organization comprising multiple consumers (e.g., business units). It may be owned, managed, and operated by the organization, a third party, or some combination of them, and it may exist on or off premises.
- **Community cloud**. The cloud infrastructure is provisioned for exclusive use by a specific community of consumers from organizations that have shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It may be owned, managed, and operated by one or more of the organizations in the community, a third party, or some combination of them, and it may exist on or off premises.
- **Public cloud**. The cloud infrastructure is provisioned for open use by the general public. It may be owned, managed, and operated by a business, academic, or government organization, or some combination of them. It exists on the premises of the cloud provider.
- **Hybrid cloud**. The cloud infrastructure is a composition of two or more distinct cloud infrastructures (private, community, or public) that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability (e.g., cloud bursting for load balancing between clouds)." (Mell. et. al., 2009)

**Cloud Computing - a Way to Increase the Competitiveness
of Small and Medium Enterprise**

Small and medium-sized enterprises can benefit from using cloud computing. These benefits are outlined in many publications (**Beckham**, 2010; **Hoffman**, 2011, **Taylor**, 2010; **Varbanov**, 2011; **White**, 2010;) but we will summarize only the main ones here:

1. **Economizing financial resources** for purchasing hardware, software and other IT. Companies pay a monthly subscription fee for the exact number of users who need the particular application. Reducing IT costs allows organizations to focus their funds on other tasks or spheres of operation.

2. **Security** is one of the key advantages of cloud computing. Not many SMSEs have IT departments. Where there are such departments, security checks are seldom, even never made. If such checks are however made, they reflect the current state. SMSEs rarely can afford to hire specialists in IT security that will monitor it constantly. Most of the cloud services providers secure the highest level of security because they have the financial capacity to hire teams of specialist in the sphere of IT security who can ensure constant monitoring. Another very important element of security are the web based systems. In most cases their level of security is higher and the quality of their internal checks is equal or even better.

3. **Meeting the needs of the customers and scalability.** Users of cloud services can easily express their desire to add new software to their packet of already used services. Unlike standard methods of acquiring new software which require a lot of time for its implementation, with the help of cloud services this period can be shortened considerably and users can start working with the new software sooner. Another important aspect with reference to software applications is the fact that providers update their software much more often compared to the SMSEs that cannot afford to that very often. Companies can quickly get access to more resources if they need that to expand their business or work on a particular project.

4. **Easier management.** The web browser is all users need to cave access to the system. All users will work with the same version of the software because of the fact that they use one and the same system. Another advantage is the possibility to archive data in real time which prevents the big losses of data.

5. **Ensuring accessibility.** Staff of SMSEs is not numerous and this may cause problems to the organizations. Due to cloud computing staff, business partners or customers can have access and upload information regardless of their location at the moment. They can work from distance without returning to the office or from home which saves time.

6. **Possibility to try a particular application before purchasing it**. There are applications that companies would like to buy. Of course this entails risks because companies cannot be sure whether this application will be useful for them. This situation can lead to big financial losses for the SMSEs. Therefore it is recommended to test the applications first. Many business applications are available on the cloud and providers can allow free access to them on trial basis or detailed demonstrations. This allows companies to decide whether the particular application is suitable for them.

Together with the advantages cloud computing hide risks for the companies that it. These risks are summarized in Table 1.

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Table 1. Risks of cloud computing for the business

Risks	Explanation and description
Concerns related with security	There are considerable risks in the spheres of protecting personal information and confidential or sensitive information.
Lack of Internet	The lack of access to the Internet for a given period means companies do not have access to their information.
Loss of control over data	Companies do not physically possess their data.
Dependence	Companies lose control over their data, software applications and are dependable on their service suppliers.

Source: created by the authors using the references (Beckham, 2010; Hoffman, 2011; Taylor, 2010; Varbanov, 2011; White, 2010;)

It is evident that cloud computing has both advantages and disadvantages. We think that the small and medium-sized enterprises can overcome the risks of implementing cloud computing. What is more, the faster they understand that this technology is beneficial for them, the sooner their will improve their competitiveness.

There are various methods for increasing competitiveness. One of them is by reducing the cost of goods and services offered by keeping their quality or even increasing it, if possible. This can be achieved by reducing production costs for manufacturing the goods or offering the service and since cloud computing can save money, as it has already been mentioned, companies can increase their competitiveness by implementing it.

With reference to this, **Höfer** advocates the idea that "Having analyzed the important features of cloud computing services, the different levels have to be defined and the taxonomy can be generated. Then a brief explanation of the choice of levels is given.

The taxonomy has a tree-based structure. At the root of the tree are all cloud services. The first level is made up of the three main service categories. The next levels correspond to the common characteristics, followed by the service specific characteristics.

The taxonomy tree is shown in Fig. 2. Due to space constraints, for each of the three cloud service categories, only one path is drawn until the bottom of the tree. The other branches that have not been continued are identical to the drawn branch for the respective category. The illustration is meant to give an idea of the amount of combinations that can form different cloud computing services.

The taxonomy levels are:

1. Main service category
2. License type
3. Intended user group
4. Payment system
5. Formal agreements
6. Security measures
7. Standardization efforts
8. Openness of clouds

The IaaS levels are:

a) Supported operating systems
b) Supported applications and frameworks

c) Available development tools
d) Virtualization technology

The PaaS levels are:

a) Supported languages and environments
b) Supported operating systems
c) Supported applications and frameworks

The SaaS levels are:

a) Customer/application domain

Fig. 2 The cloud computing services tree

Source: Höfer (2011)

According to a survey, conducted by **Ipsos Mori,** about one fourth of the participants answered (see figure 3) that solving IT problems takes them tree or more than three hours per week. In this way companies waste more than 156 hours per year to cope with IT problems. This in turn leads to considerable break downs in the work process and considerable losses. These problems can be overcome with the help of cloud computing because it is the supplier who deals with arising problems or any other related issues. In this way companies can focus on their main activities, for example improving the quality of offered products and services.

Fig. 3: In total, how much time do you typically spend on dealing with IT issues each week?
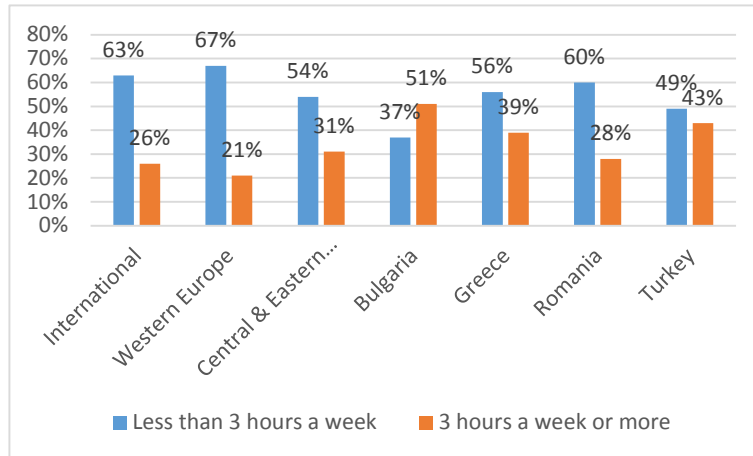
Source: Ipsos MORI

One of the main reasons for the small and medium-sized enterprises for a shift towards cloud computing is security. Security is also one of the main concerns of the business that still do not use cloud computing against it. Despite these concerns, the percentage of companies which have already implemented this technology is rather high as can be seen from the study of Ipsos Mori. Figure 4 shows that worldwide more than half of the companies already use cloud computing. Approximately three quarters of the small and medium-size enterprises, taking part in the survey, think that the IT solutions help them deal effectively with their professional tasks this is 74% compared to only 61% of the companies that do not use cloud services.

Fig. 4: Who are current cloud users
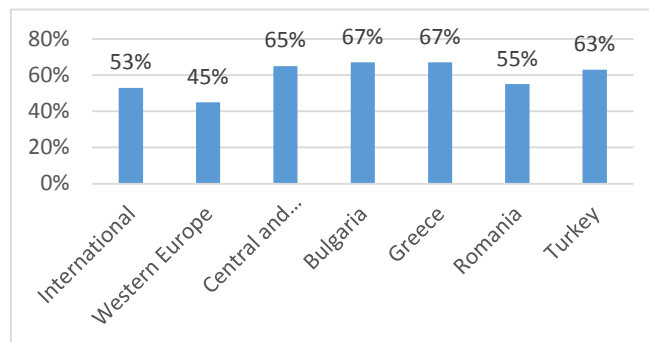
Source: Ipsos MORI

According to the same study, 68% of the companies that use cloud computing agree that it is of key importance for all small companies that have ambitious plans for development compared to only 46% of the companies that do not use cloud services. These

results clearly show that these companies understand the importance of cloud services for the development of their competitiveness.

3. Conclusion

In the end of the all said above we can point out that cloud computing can have positive effect on the competitiveness of the small and medium size enterprises. Thanks to it these companies can expand their infrastructure and at the same time obtain access to the best business' solutions without spending too much. Cloud computing can become one of the key instruments of economic growth for businesses by realizing their potential to provide access to information resources on affordable prices, guaranteeing convenience of use, reliability and safety and ultimately to lead to increase of productivity.

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"CLOUD COMPUTING" – NAČIN ZA UNAPREĐENJE KONKURENTNOSTI MALIH I SREDNJIH PREDUZEĆA

Rezime: "Cloud computing" je informaciona tehnologija, koja je poslednjih godina privukla dosta pažnje u poslovnim krugovima. Pomogla e u razvoju inovativnih poslovnih modela, uvećavajući ekonomski potencijal, efektivnosti i pozitivne efekte poslovne aktivnosti. Ova tehnologija unapređuje mogućnosti računanja, omogućuje sniženje cena i brže komunikacije. Cilj rada e da ukaže na prednosti ove tehnologije i njen pozitivan utica na konkurentnost malih i srednjih preduzeća. Takođe pokušavamo da odgovorimo na pitanja povezana sa ekspanzijom infrastrukture, pristup najboljim poslovnim aplikacijama i kao rezultat, unaprediti produktivnost preduzeća. U ovom radu zauzimamo stav da "cloud computing" može postati osnovni alat za rast poslovne organizacije, preko korišćenja potenciala ove tehnologije u obezbeđenu informacionih resursa po prihvatljivim cenama, pouzdanost i bezbednost.

Ključne reči: cloud computing, mala i srednja preduzeća, konkurentnost.