

# Decision Making Criteria for Cloud Computing Deployment

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**Abstract.** Cloud computing represents a potentially very effective solution to current problems linked to the need to decrease business expenditures. The solution is based on sharing the same solution by multiple users as well as on an opportunity of choosing a custom-made solution that would suit any office's particular needs. Use and deployment of this technology in Europe (compared to the USA) is low. The main reasons include lack of knowledge of the technology benefits and decision making criteria, which can help to recommend cloud computing deployment. The aim of this paper is to describe to proposed decision making model of cloud computing. This model is based on a quantitative survey among SMEs in Europe. Its use has also been verified in enterprises.

**Keywords:** cloud computing, decision making criteria, deployment, business.

## 1 Introduction

The importance of cloud computing is acknowledged at national and international levels, both in public and private sectors. However, its implementation in European countries is considerably lower contrary to assumptions [1], [2]. Among the frequently mentioned cloud computing benefits for companies belong lower costs of ICT departments, an ability to flexibly change requirements for provided services and access to data from anywhere. There are, however, a lot more benefits. According to many studies the further benefits are:

- utilization of network services and the Internet, the speed of implementation,
- faster access to the market,
- innovative approach,
- elasticity and scalability,
- safety and energy savings.

On the other hand, apart from benefits, cloud computing can pose certain risks, too. A lot of authors divide risks linked to cloud computing into a lot of categories, e.g. Azarnik [3] lists technology development risks, functionality risks, political risks, project risks and financial risks. Last but not least, Shayan [5] divides risks into two

categories, tangible risks and intangible risks. Tangible risks can easily be understood and the user can decide whether or not to run the risk. Tangible risks include access, availability, long-term viability, infrastructure, integrity, vendor lock-in and investigative support. On the other hand, intangible risks are not transparent to the user and only the provider knows them. Intangible risks include access, service continuity, confidentiality, protect data, physical network infrastructure, storage mechanism, government investigation and location of data [6].

The lack of knowledge of the technology characteristics is main reason, why some companies refuse cloud computing deployment [7]. These companies attach great importance to the above mentioned risks. The aim of this paper is to describe to proposed decision making model of cloud computing. This model helps clarify the possibility to use cloud computing in relation to business data nad risk factors.

## 2 Method

A method of retrospective analysis of documents is used to characterize the basic concepts and model of cloud computing. For the analysis of assumptions deployment of cloud computing in European countries the research among small and medium companies was carried out. Then decision making criteria for cloud computing deployment were proposed and verified.

## 3 Cloud Computing – Theoretical Background

The basic characteristic of cloud computing infrastructure is accessibility to individual users or companies. The service provider must be an external entity. The same applies to the data centre from which the service is accessible [8]. In relation to this model the so-called Virtual Private Cloud is sometimes mentioned. It is a solution that enables any organization to create a group of separate ICT tools in public space. According to Mell and Grance [8]. Private Cloud is every model which makes services accessible to the only entity. The whole infrastructure can be administered by a third party or the given organization. On the other hand, Armbrust [9] can see the essence of the private solution in internal data centres, which make their services accessible exclusively to their own organization, not to the public or to other entities. are distinguished different service models of cloud computing.

Infrastructure as a Service (IaaS) uses virtualization technology to allow several virtual systems (referred to as virtual machines) to operate on top of a single physical hardware infrastructure in an isolated manner. The key software module in virtualization is the hypervisor that manages and organizes the virtual resources on the physical hardware (memory, processors, storage). In this category, cloud providers can deliver on-demand virtual machines with configurable resources.

Platform as a Service (PaaS) includes all the features provided by IaaS, but in this case the user is able to use the provider's system platform. PaaS allows clients to

develop their own system using the platform tools, without having to install and maintain these tools themselves. In this category, users obtain access to a specific OS (e.g., a version of Windows or Linux) and associated tools (e.g., SQL Server, MySQL, Apache web server, etc.) [9]. Software as a Service (SaaS) - this type of computer cloud eliminates the need to install and run software applications on the client's local computers. With SaaS, cloud providers install, manage, and operate the software application, and the user has neither knowledge nor control of the underlying infrastructure. With this type of cloud service, the end-user has the least flexibility but the cost is dramatically lower [10].

Proposed decision making criteria for cloud computing deployment described below are focused on Infrastructure as a Service (IaaS).

## **4 Decision Making Criteria for Cloud Computing Deployment – Case Study**

In August 2013, a questionnaire survey was carried out in the Czech Republic (the chosen European country). Its topic was „Utilization of ICT in Czech companies“. This survey's aim was to determine current attitudes of companies to using technologies in order to support financial management, customer relation management (CRM) and cloud computing. The total of 200 questionnaires was collected. The respondents were managers and managing directors of companies, or heads of ICT departments. Respondents indicated as the most significant criteria for successful utilization of cloud computing, scalability, elasticity and customization. Problem of data security is dismissed as less significant in cloud computing. It becomes a problem only when the respondents are asked about risks of linked to the implementation of cloud computing. Some managers perceive following obstacles:

- data security,
- dependence of operation on internet access,
- insufficient knowledge of cloud computing and its possibilities,
- low priority of perceiving cloud computing as necessary and the related lack of time for analysing strengths and weaknesses,
- financial burden.

The main reason for low utilization of cloud computing is the fact that companies do not perceive the need to implement this technology 68.5% and do not have sufficient knowledge of its possibilities (14.5%). The proposed model helps clarify the possibility to use cloud computing in relation to business data and risk factors.

### **4.1 Criterion Questions for the Decision of Cloud Computing**

Criterion are divided into three groups: entry information, Company's strategic management and Technical area (table no. 1).

**Table 1.** Criterion questions for the decision of cloud computing

<b>Entry information</b>	<b>Value</b>
Field of business	CZ NACE
Size of organization	small/medium/large
Geographical location of subsidiaries	CR, Europe, USA, ASIA, in one place
A number of full-time employees	in % out of the whole company's employment rate
A number of part-time employees	in % out of the whole company's employment rate
Field work	in % out of all activities
Online business	yes/no
Type of business relationship	B2B, B2C, B2G, B2A
Fluctuation of orders during the year	in % out of all activities
What data volume with respect to the whole cannot be transferred on a third party (consider possible barriers: customer's requirements, internal regulations)	in % out of the whole data volume
<b>Company's strategic management</b>	
Is your present IT capable of beating its competition or bring such savings you need? (Do you consider criteria such as speed of service supply, price or quality?)	scale 1-4
Can your IT adjust to the company's expansion, particularly with respect to its needs to store ever growing data volumes and growing computer demands? (Do you consider criteria such as data storage costs, renewal after the breakdown and provision for the continuity of business?)	scale 1-4
Do the investments into IT help you to differ from your competition, i.e. do you use quite specific solutions to your business or do you, on the contrary, use highly standard solutions? (Do you consider criteria such as an investment share into the standard IT solutions?)	scale 1-4
<b>Technical area</b>	
Is the whole day's loading of a server constant from the company's point of view?	scale 1-4
Is there a situation when I need to react to the current need of loading immediately?	scale 1-4
How often do you renew HW?	less than once in three years/ 3-5 years/ in five years and more
How much data do I need to backup during the year? (GB)	TB
Do you request monitoring?	Yes /no
Which distribution channel are you thinking about to use?	PaaS/ SaaS/IaaS
When was your last investment into your IT?	less than two years ago/ 2-4 years ago/ five and more years ago
At what price?	Czech Crown

Source: own processing according to:[5]

With respect to the first set of questions, it can be said that if there is a company which has more subsidiaries in different locations, its employees do their work outside the company or at home, no investment into the IT system have been recently made, cloud computing can be definitely used. Furthermore, it is important to know how the internal regulations are set with respect to the handling of data, whether companies work with sensitive data of their clients and whether it is necessary to solve the question of legislative regulations connected with personal data protection in different countries. This is important for a choice of the model implementation. The questions connected with the company's strategic management aim at a good description of flexibility of company's IT equipment in relation to its strategic targets and their changes. The last set of questions focuses on the technical requirements such as server performance, requirements of loading changes or data storage. At this stage these requirements are only indicative and they are fully discussed in the next step.

## 5 Conclusion

Since 2009, cloud computing technology has been getting to the foreground. A rapid growth in its utilisation is expected from 2014 onwards. The European Union supports this technology by means of a strategy aiming to encourage the use of cloud computing and create unified rules for its utilisation by European companies. Cloud computing utilisation may help create a competitive advantage. However, its implementation in European countries is considerably low.

The aim of this article therefore was to characterize the criterion model of cloud computing with respect to its use in entrepreneurial practice. The model is based on the conditions of the European business environment. After overcoming the initial barriers and concerns about data safety, Internet connection failures, and data migration, the new technology brings about a lot of benefits.

**Acknowledgement.** This paper is published thanks to the support of the internal projects of University of Hradec Kralove: Economic and Managerial Aspects of Processes in Biomedicine.

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