Cloud solutions in DMS, the application and the reality

Zuzana Papulova[a*], Faculty of Management, Comenius University in Bratislava, Odbojarov 10, 820 05 Bratislava, Slovakia

Harald Steffen[b], Faculty of Management, Comenius University in Bratislava, Odbojarov 10, 820 05 Bratislava, Slovakia

Maros Slenker[c], Faculty of Management, Comenius University in Bratislava, Odbojarov 10, 820 05 Bratislava, Slovakia

Abstract

This paper discusses the technical application of cloud computing based on the example of document management system (DMS). DMS is based on system to track, manage and store data. The cloud application is a logical continuation of the of development in DMS. However, cloud computing is still missing the wide recognition and satisfied implementation as a result of concerns in the area of data protection as an important issue. Especially in the area of documents management, companies could benefit a lot from the positive properties of using the backup and archival content storage. The paper contains the results of our research based on two studies. The first study was carried out on a sample of students with cloud solutions experiences. The second study contains views and opinions from companies. Based on the results, we sumarise the major problems and concerns of cloud technology application.

Keywords: Document mangement system, cloud computing, cloud solutions.

* ADDRESS FOR CORRESPONDENCE: **Zuzana, Papulova,** Faculty of Management, Comenius University in Bratislava, Odbojarov 10, 820 05 Bratislava, Slovakia.
E-mail address: zuzana.papulova@fm.uniba.sk / Tel.: +421-2-50-117-629

1. Introduction

Nowadays, companies have to compete within a complex of challenging factors, from the globalisation, technological development and the rapid dissemination of new technologies, to the development and exploitation of knowledge (Papula & Volna, 2013). New and more developed technologies can help managers in many aspects of running a company, from marketing perspective to operation processes (Mokrisova, 2013).

Over the past few years, cloud computing is often referred to as a new phenomenon not just in the IT world but also in business practice. Cloud computing brings many benefits and is attractive to managers and business owners as it eliminates the requirement for users to plan ahead. It allows starting from the small and increasing resources only when there is a rise in service demand (Zhang, Cheng & Boutaba, 2010). Cloud computing typically involves over-a-network, on-demand, self-service access and has the potential to improve the way business and IT operate (Carroll, Merwe & Kotze, 2011). There is a noticeable shift from traditional computing to cloud computing due to its benefits, mostly in area of cost saving, scalability, mobile storage, availability of access, energy saving or environment benefits (Hvizdova, Mokrisova & Polacko, 2016; Sether, 2016). However, cloud computing is still missing the wide recognition and the satisfied implementation as a result of concerns in the area of data protection as an important issue for many companies. In the area of document management, a company could benefit from the positive properties, especially using the backup and the archival (long time depot) storage of the content. The first aim of this paper is to summarise the technical application of cloud computing and to exemplary establish the connection to any worthwhile application in practice of organisations based on example of document management system (DMS). The second aim is to bring current opinions, experiences and views on cloud computing based on two independent studies. The results of these studies will be used for comparison and summary of the key issues and current opinions about cloud computing application.

This paper is organised as follows. In the literature review, we discuss the main characteristics of DMS and the possible usage of cloud computing. We also look at the benefits and risks connected with the application of cloud computing. In the next section, we describe the methodology of our research. The results and discussions are presented in the section 'Results'. The last section summarises and concludes our main findings and recommendations.

2. Literature review

2.1. DMS

The term 'document' is usually defined as an information carrier containing written or drawn information for a particular purpose, so information can be easily stored, transferred and handled as a unit (Bjork, 2002). Organisations need to carefully manage their information to ensure its properly handling and at the same time make it available for daily usage. The increasing amount and variety of documents make management and efficient usage of information more challenging and the achievement of efficient document management becomes an emerging issue (Kao & Liu, 2013).

A DMS was created out of archive systems in the 1960s and has been continuously developing since the end of the 1990s. DMS stands in relation to knowledge management and content management systems (CMS) (Schutz, aus Kuhlen, Seeger & Strauch, 2004). CMS and DMS are often considered as components of enterprise CMS (Smits & O´Callaghan, 2014). DMS should provide a system to work with documents efficiently; practically it involves any system, device, means and methods used for the treatment and disposal of documents across an organisation. An integral part of DMS is to create a system for managing the document workflow that includes storage, retrieval, processing, printing, routing and distribution of business documents (Ahmad, Bazlamit & Ayoush, 2017). Early DMSs were systems to manage paper-based documents. Nowadays, DMS is often based on computer programs to

track, manage and store data and documents, mostly in electronic version to reduce paper. According to Hernad and Gaya (2013), the term 'system' in DMS should be understood in a more complex way, not tied exclusively to IT applications but also considering people, processes, tools and technology. DMS is also connected to knowledge management, which is a concern of many disciplines (Kuhlen, Seeger & Strauch, 2004). It is management decision, some companies automate knowledge management and others rely on their employees to share knowledge through more traditional use (Hansen, Nohria & Thierney, 2000). To create a modern document or knowledge-based system, Ohly (2010) suggest the following aspects: software and computer programs; sustainability; longevity of the data carriers (cloud computing); formats (encoding images, symbols, language, meta-language); processing storage and systematic organising and guidelines and classification systems (norms, rules, standards).

Despite the investments, DMS produces quick savings due to optimised and shorter processing times, more fluid workflow and significantly more comfortable handling. These processes can run even faster if a company is certified according to ISO 900x. DMS can cope with exorbitant amounts of electronic documents in enterprises and public administrations (Gulbins, Seyfried & Strack-Zimmermann, 1999). As Klingelholler (2001) indicated, the amount of information increases inexorably and equally to its targeted availability decrease.

In the literature, there are already many models and examples documented with calculation how many savings with DMS are possible. Especially with quality electronic DMS, organisations should be able to reduce the overall document-related costs, and to improve the efficiency of processes and procedures in order to address the specific business needs (Ahmad et al., 2017). To implement quality DMS, there is requirement for a joint target agreement between company and manufacturer of DMS as they can have different views. To consider what will be achieved with DMS and how to set targets, it is recommended to apply the specific measurable, accepted, realistic, timely principle. These targets usually include requirements for the software, specifically on the suitability of software usage. Here are some standard targets (EN ISO 9241-11:2017-019. 2017): effectiveness of the solution; efficiency of the system handling; satisfaction of software users.

A key point of a transition to an electronic DMS is to save the operation data, documents and the managing data, metadata and to be able to manage them. Among other benefits, this contributes to easy and fast backup and archiving. Here, it is possible to use a new technology, cloud computing, which is so far not widely spread. Certainly, it will not be possible to have a company without paper, but paper can be reduced in consistent implementation of the available opportunities. Especially in the area of document management that deals with the integration and documentation functions with a regard on large and steadily growing volume of content (documents), security (tamper-proof) and reliability (clearly recoverable originality), it is very important to manage the technology of cloud computing (Schutz et al., 2004).

2.2. Usage of cloud computing

DMS and cloud computing are two supporting technologies that can work together, reduce costs and make the daily processes in companies faster and more reliable. Cloud computing is considered as one of the most promising technologies in computing today (Zissis & Lekkas, 2012). There are many benefits possible with cloud computing (Rittinghouse & Ransome, 2009; Steffen, 2014), the most important being virtually unlimited, dynamically scalable storage volume; virtual computer environment, decoupled from existing hardware; flexible-to-use access to the content; automated data synchronised between devices (data replication); high reliability, redundant storage at the vendors/service providers (hosting); automation of backup and archiving strategies and its reliable application; worldwide unlimited access, 24/365; backup and archives at one point; reliability of storage; inseparable connection of content (documents, etc.) and associated metadata; and economic advantages (no high initial investment). These benefits are predestined for many applications, for example, it can be used for marketing oriented content; external data; for personal service or home-

office; SaaS (Software as a Service); applications that need to be mobile accessible; production data acquisition of machines and plants.

From the historical view of cloud document solutions, Salesforce.com pioneered the concept of delivering enterprise applications via a simple web site in 1999. Then Amazon came with Amazon Web Services, which provided a suite of cloud-based services including storage, computation and even human intelligence. Later Google with Google docs really popularised the idea of cloud document storage (Quddusi, 2014). Currently popular cloud solutions are offered by worldwide providers like Dropbox, Microsoft and Google. The major features of cloud storage service are to provide an online storage space for users and simple access methods to use the space (Kao & Liu, 2013).

However, after the initial hype of cloud usage, security concerns emerged. From a security perspective, a number of unchartered risks and challenges have been introduced. There are aspects like data security, industrial espionage and cyber threats. Non-authorised persons can get data access when data are transferred to parties of interest. This means that the data reliability is reduced, data are lost and cybercrime increases (Rittinghouse & Ransome, 2009; Zissis & Lekkas, 2012). Business customers can be reluctant to use the cloud and security is one of the major issues that reduce the growth of cloud computing due to complications with data privacy and data protection (Subashini & Javitha, 2011).

In a study of the BITKOM research commissioned by KPMG from 14 March 2017, 47% of the companies rated cloud computing as open-minded and as interested in usage of cloud computing. And 65% of them already used (at the moment) cloud solutions. As the most popular public cloud application, they identified MS Office applications (46%), security as a service (44%) and e-mail and calendar (35%). VoIP was ranked at the lower end (23%). The majority (60%) of the respondents fear unauthorised access to sensitive corporate data and 51% of respondents fear data loss (Bitcom, 2017). According to them, not everything in DMS is suitable for cloud. Applications with limited openness of the documentation, e.g., in the areas of development and research content, calculation and planning or security-related and internal corporate documents are not suitable to leave the company due to insufficient data protection. Therefore cloud computing is not fully recommended for all applications.

3. Methodology

The main goal of our research is to assess current views, opinions and experiences with cloud computing, especially focusing on document management. To understand and evaluate the approach to cloud computing, we collected data from two independent studies:

1) The first study was based on a survey among students of the Bachelor's degree programmes from universities in Baden-Wurttemberg in cooperation with the state university, DHBW. Our sample consisted of 90 students. We chose students from different faculties and with study programmes that combined own and corporate practice experience with a theoretical background (students spent alternating semester at the college or as interns in the selected company):
- 26% (23 students) from computer science
- 56% (50 students) from electrical engineering
- 19% (17 students) from business administration

Data were collected from various surveys during 2015 and 2016. Due to the actuality of the topic, a response rate was 80%. This study focused on the following areas: popularity and awareness of cloud computing; cloud computing solutions and application; areas of problems and risk with cloud computing.

2) The second study involved a survey of selected companies. Our sample consists of medium-sized manufacturing companies in the field of mechanical and electrical engineering with less than 50 employees operating in Germany. Respondents were employees with cloud computing experiences. We sent 1,050 personalised e-mails with a questionnaire consisting of 48 questions. The study is a

part of the dissertation research on the topic of document management. Data were collected in fall 2016 and the response rate was 21%. For the purpose of the paper, we chose the following areas: problems in operation of DMS with application of cloud computing; DMS as complementary to the Enterprise resource planning (ERP) or CMS; usability and limits of cloud computing.

4. Results

4.1. Results from student survey

These results are connected to our first study based on a student survey:

4.1.1. Popularity and awareness of cloud computing
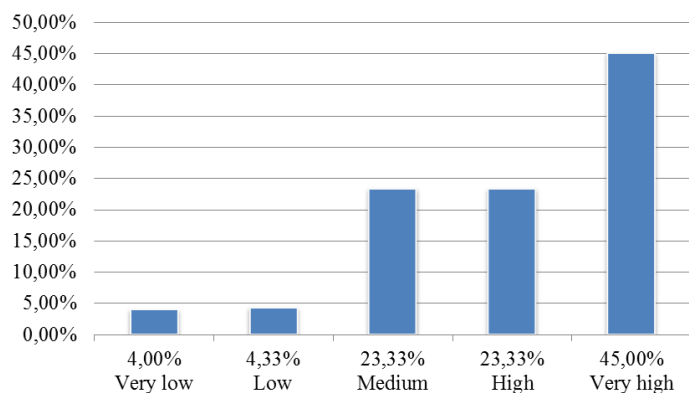The results are shown in Figure 1.

Figure 1. Popularity and awareness of cloud computing

The students of all disciplines highly valued the popularity of cloud computing. In the majority (68%), the level of awareness of cloud computing among all students is high or very high. They recognised and understood the application of cloud computing. With computer science students, we received the best results (60% of very high popularity and awareness of cloud computing) and we could not find a computer science student that had not heard anything about cloud computing. Computer science students were mostly interested in the technical application and development of cloud computing. Electrical engineering students see the future development potential of cloud computing for simulations of assemblies (schematics of electronic) and students of business administration see the long-term costs to be more relevant in cloud computing.

4.1.2. Cloud computing solutions and application
All of the students had some experiences with cloud solutions based on their study or practical experiences. We were searching for what is the most used and worth cloud computing solution connected to data storage or document management. The results from all the students are shown in Table 1.

Table 1. The most used and worth cloud computing solutions for students

Solutions	Number	%
MS outlook	72	80%
Dropbox	63	70%
Moodle	45	50%
Doodle	27	30%
Document management	18	20%
Other software concept	18	20%

MS Outlook (as a tool for e-mail, meeting, planning or scheduling) is the most popular cloud solution among students and also the most wroth solution they daily use. Dropbox is also popular among many students for data storage of documents and sharing of documents (70%). Moodle as eLearning system is frequently used by students especially for course materials and for study purpose, but it was less valued (50%) as the previous ones.

4.1.3. Areas of problems and risk of cloud computing

We found interesting and different points of view regarding problems and risks of cloud computing. According to the results from all students, the most important problems were identified in these areas:

1. The biggest problem is the protection of personal data; there is (at the moment) no trust in the provider.
2. A control over the large amount of data is difficult because the lack of a uniform standard.
3. The costs are not exactly specified for the long time period.

The following areas of problems demonstrate individual entries of each group of students:

1) Problems and concerns identified by computer science students: Uniform standards are still missing or they are not defined; Quantity problem of content; Access problems (if many users at the same time attempting to gain access); Responsibility; Opportunities and risks on the part of the company administrators to access the data or to change data; Concerns if there is a (planned and documented) worst-case scenario; Concerns where to access to proper information.
2) Problems and concerns identified by electrical engineering students: Running costs per month are low, however, longer maturities will increase these costs, which could eventually exceed the initial investment; Concerns if the database where files are stored is reliably protected and multilingual worldwide accessible; Concerns how the data are protected from third-party access.
3) Problems and concerns identified by business administration students*:* Concerns about locations of stored data; Solution is bad for development and costing data; Concerns about how up-to-date are application systems; Concerns about clarifying past occurred privacy problems and security risks; Concerns about existence of special solutions for high-risk documents. These results show that students are interested in cloud computing, they responded openly and specifically to could computing document management solutions. Despite the openness and passion for the new technology, the major and the most often identified problem by students was 'the privacy issue'. This problem was evident in all study programmes with a high number of mentions. Other problems were influenced by the focus and perspective of different study programmes. In the area of computer science, the problems were connected specifically to formats, uniform standards, and load-balancing problems at high user load. In the area of business administration, the focus was clearly on the monetary evaluation and investment security. In the field of electrical engineering, specialisation development and construction planning, the responses focused on the privacy of internal company documents. In many answers, we could find concerns that this technology is not clearly explained and they are missing a lot of information and do not know where to get the proper information. These aspects can also reduce confidence in usage of cloud computing.

4.2. Results from company survey

These results are showing current opinions and experiences of companies:

4.2.1. Problems in operation of DMS with application of cloud computing

The most common problems identified by companies are:

- Privacy issue are not clearly established, cloud computing should be more safe.

- Problems with Data Hosting, data storage is not clearly established.
- Access shares on the data not clearly established or not clearly defined.

The privacy issue and safety was also identified in a previous study (34% of all students identified the same problems) and also seen as major problem for companies. According to companies, cloud computing should be safer to handle the private data and documents as they need to be properly handled and carefully managed.

There were also other concerns connected to costs (negative evaluation of costs for cloud services in the longer period of usage) and more transparent information and important facts openly explained (information is mere marketing oriented and often charges, missing transparency of important facts and comparisons).

4.2.2. DMS as complementary to the ERP or CMS

The results are shown in Figure 2. The majority of the respondents from companies agree (70%) that DMS can support the existing systems, for example ERP or CMS and can be (in the long run) a part of it. DMS can be part of an ERP system. These systems are ISO basic, e.g., certification for the standard ISO 900x. In the ideal case, ERP system accesses the content of the DMS and can import the content from it.
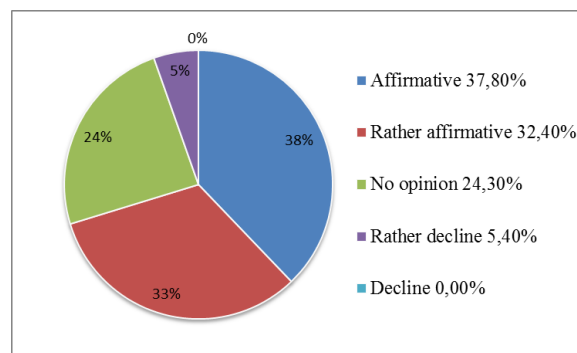

Figure 2. The DMS is complementary to the ERP or CMS

4.2.3. Usability and limits of cloud computing

In the third area of our study, we were focusing on the importance, usability and potential of improvement of cloud computing. Importance of cloud computing is shown in Figure 3 (a) and (b) shows the opinion about cloud computing and saving data in the cloud.
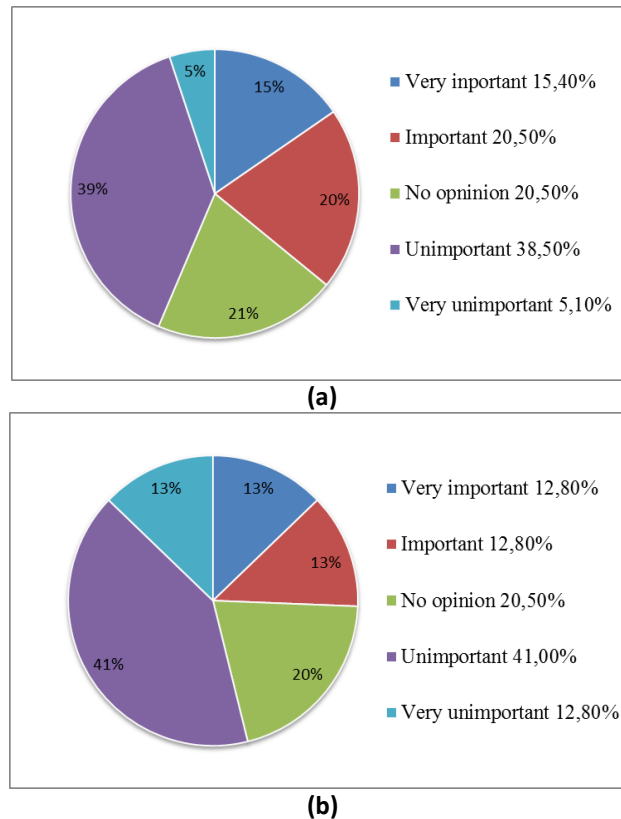
(a)

(b)

Figure 3. (a) Importance of cloud computing. (b) Saving data in the cloud.

According to the most common statements, respondents identified these areas with potential for improvement of cloud computing: Data protection should be improved; take security concerns, educate about problems; data protection and validation of processes; data hosting should be done in the country of origin.

In the company study, there were similar doubts about data protection. Data protection means, for example, protection of personal data against abuse, focus: people, can be reached through encryption, access control and use control. In contrast, data security focuses on the availability of data that are backed up through redundancy and backup. Data in the cloud must be stored redundantly and repeatedly backed up. There were no concerns about memory security or backup. In addition to this advantage, data security has a high rank. All concerns were about data protection and data handling during the life cycle. This is interesting, because many providers of application software with reliable data repositories in the cloud advertise it. Additional a data encryption is offered by many supporters. According to the results, cloud computing solutions apparently lack trust in data protection. Data security was never the problem.

More than 38% for all companies respondents came to the conclusion that cloud technology for enterprise storage applications, especially for documents is (at the moment) not important (Figure 3). More than 12% of respondents even assessed it as 'very unimportant' (Figure 3). These results also show a low awareness of cloud computing solutions and benefits of this technology in DMS.

5. Conclusion

Following the statement 'basically is to determine, that for the safety first the user and not the cloud provider is responsible and therefore liable' (Arend, 2017), the problem of data protection is really the problem of the user and the provider. This statement is very difficult, because the user has

little/no direct influence on the dropped data. Often, the location of the database server is not known; it is not clear where the data are stored.

Are German cloud customers and others on the safe side, if they abandon American provider? Apart from practical considerations, this would mean exit for countless users from the widely used system by Apple with Mac, iPhone and iCloud: any company that maintains a business relationship with the United States in any form, must submit to the Patriot Act. This means: companies such as Deutsche Telekom, which called their own side of the Atlantic including the mobile radio subsidiary T-Mobile USA, would grant the US authorities in case of doubt data access. This is applied to user in Germany but accordingly to users in other countries as well. So data hosting will be a problem all over the world.

Based on our research, the major problems with cloud computing are in the area of personal data. These problems were identified by students and companies as well. But this isn't at all about data security, while many of respondents agreed. According to the current state, storage in the cloud is a very reliable solution for data security. Data are often redundant and repeatedly held out in more different places. There are dependability rates of 99.999999999% and 99.99% availability of data over a period of years (Steffen, 2014). So data loss will be the smallest problem of cloud computing. The reliability of the storage systems is extremely high. This was also regarded by the students and the companies and not considered in doubt.

Therefore, the current problem of cloud computing is the data protection of stored data. We also identified many concerns in this area because of the lack of information. Information about data protection is not available, not clear and not transparent. People using cloud also do not know, where the data flows and where they are stored. Results from companies also show a low awareness of cloud computing solutions and their benefits. Our recommendations and suggestions lead to better communication and education about cloud computing and to improvement of cloud solutions, especially in areas students and companies suggested.

The benefits of the cloud technology are obvious and we believe there will be a growth of this technology in the medium and long term. But not all companies and all users will be convinced to apply the technology. According to results of Bitcom (2017), this monitor already indicated a growth increase of 9% from the previous year.

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