

Cloud Computing Adoption: A comparative study

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Abstract: - It is becoming increasingly evident that enterprise computing is in the process of transformation from the traditional on-premise model to a model characterized by the delivery of infrastructure and software services by external providers on a pay-per-use basis. Most of the evidence about cloud computing adoption originates from studies conducted in North America and Western Europe and may not fully apply in countries with less developed enterprise computing infrastructure and lower overall preparedness for cloud computing. In this paper we describe the design of a comparative study of cloud computing adoption in Australian and Czech companies, and discuss the differences in cloud computing adoption patterns. Australian data shows higher use SaaS services in production environments as well as a higher prevalence of cloud-based mission critical applications.

Key-Words: - cloud computing adoption, comparative study, Australia, Czech Republic

1 Introduction

There can be little doubt that enterprise computing is in the midst of a dramatic transformation driven by the need to eliminate the inefficiencies associated with the traditional on-premise enterprise computing model. IDC estimates that spending on public cloud IT (Information Technology) services in 2011 was \$28 billion. Although this is a relatively small amount when compared to more than \$1.7 trillion of total expenditure on IT products and services, many experts believe that cloud computing has the potential to completely transform the way IT services are delivered in organizations [1]. According to a recent Ovum report cloud computing is becoming a strategic priority for most executives [2]. IDG CIO Global Cloud Computing Adoption Survey (based on responses of 234 U.S., 202 EMEA, and 200 APAC organizations) reports that 26% of IT budget is allocated to cloud, and 88% of executives rate cloud computing as priority over the next 18 months [3]. At the same time, there are indications that the use of complex cloud-based enterprise applications is still very limited and that most organizations use relatively simple cloud services that do not require integration with core enterprise applications [4]. Many organizations are

experimenting with various types of cloud services, often in the context of pilot projects and various non-critical applications; it is important to differentiate between such pilot projects and the use of cloud services in mission-critical applications. According to KPMG research large proportion of organizations (39%) are using application hosting services, followed by data storage (32%) and e-mail and messaging services (29%) [5].

The emerging cloud computing model is associated with a number of well-documented benefits that include cost reduction and predictability, rapid deployment, and elasticity (up and down scalability). But cloud computing also presents numerous challenges in areas such as data security, service continuity, and IT governance. There is increasing evidence that the benefits of cloud computing do not apply equally to all companies and that new (start-up) companies are the prime candidates for cloud computing as these companies can best take advantage of rapid deployment and elasticity of cloud infrastructure. Similarly, it is becoming clear that not all types of enterprise applications can benefit from cloud deployment, and that new innovative applications are likely to drive

cloud adoption. Furthermore, there is evidence that successful deployment of cloud services requires technical and management maturity and an on-going user-vendor relationship [6]. It follows that cloud computing adoption decisions should involve detailed cost-benefit analysis based on considerations of utilization patterns, data sensitivity, and the importance of the service [7, 8].

Another complicating factor is confusion about the definition of cloud computing and the range of services it encompasses. While most definitions agree about the three basic cloud models: SaaS (Software as a Service), IaaS (Infrastructure as a Service), and PaaS (Platform as a Service) opinions diverge regarding more specific details. In general, cloud computing covers a spectrum of various types of services, ranging from simple data storage services to highly sophisticated multitenant SaaS applications. Some cloud computing definitions include the concept of private (and hybrid) clouds that are typically associated with different benefits and tend to have different adoption characteristics. Many researchers use the NIST definition [9], but it is not universally accepted and this makes it difficult to compare the results of different surveys. The levels of cloud computing adoption vary according to type of organization, industry sector, and territory [10, 11]. Most cloud computing surveys have been conducted in North America or Western Europe, and report adoption levels consistent with advanced economies and mature IT market that may not apply in countries with less developed IT infrastructure and different attitudes to sourcing IT services from external providers. Recent BSA (Business Software Alliance) report ranked Australia second out of 24 countries that account for 80 percent of the global ICT market based on seven policy categories (Data privacy, Security, Cybercrime, Intellectual Property Rights, Promoting Free Trade, ICT readiness and Support for industry-led standards) that measure the countries' preparedness to support the growth of cloud computing [12]. The BSA study examined major laws and regulations relevant to cloud computing in seven policy categories as well as ICT-related infrastructure and broadband deployment.

In this paper we discuss the outcomes of a comparative study based on cloud computing surveys conducted in Australia and Czech Republic at the end of 2011. The aim of this study was to identify differences between adoption patterns in countries with different level of readiness for cloud computing. Czech Republic is located in CEE

(Central and Eastern Europe), a region with less developed ICT infrastructure and different attitudes towards outsourcing. The paper is structured as follows. In section 2 we describe the design of the study and discuss the rationale for the structure and content of questionnaire. Section 3 includes the main results of the Australian and Czech surveys and a discussion of Cloud computing adoption patterns in the two countries. Section 4 is a summary of the main conclusions.

2 Survey Design

We have conducted two separate surveys towards the end of 2011 using an identical online questionnaire. In Australia, the survey was conducted with the assistance from Computer World (<http://www.computerworld.com.au/>) and CIO Magazine (<http://www.cio.com.au/>), and in Czech Republic with the assistance of Computer World (<http://computerworld.cz/>), CSSI (Czech Society of Systems Integrators), (<http://www.cssi.cz/cssi/>), and CACIO (Czech Association of IT Managers) (<http://www.cacio.cz/>). Involvement of these organizations was vital for gaining access to top IT management, improving reliability of the responses. The questionnaire consisted of two main parts:

- 1) questions related to the profile of respondent organization, including the size of the organizations (number of employees), industry sector, duration of operation, IT expenditure, etc.
- 2) questions related to cloud computing adoption, including level of expenditure on cloud services, perceived benefits of cloud computing, concerns about adopting cloud services, types of cloud services used by the organization, types of processes supported by these services, level of satisfaction with adopted cloud services, etc.

Based on our experience with previous surveys we have designed the questionnaire to focus entirely on public clouds and to ask direct questions about specific cloud models (i.e. SaaS, IaaS and PaaS), rather than about cloud computing in general [11]. This reduces the impact of different interpretations of the meaning of the cloud computing. Importantly, the questionnaire differentiates between pilot projects designed to test the suitability of cloud services and production systems, with additional questions designed to establish if cloud services are used to support mission-critical business processes. In order to establish adoption trends we have

included questions about past use of cloud services (over the last 12 months), current, and intended future use (over the next 12 months). The questionnaire is available on: <http://cloud-computing.vse.cz/questionnaire/public/>.

3 Survey results

Both surveys produced comparable number of responses with resulting sample size of 96 for the Australian survey and 105 for the survey in Czech Republic. Most participating organization were large enterprises with more than 250 employees (60% in the Australian survey, and 52% in the Czech survey), operating for more than 5 years. The main difference between the two samples was that a relatively large proportion of the Czech companies were in the IT (Information Technology) sector (45%) as compared to Australian companies (17%).

3.1 Level of Cloud Computing Adoption

The overall cloud computing adoption rate was higher in Australia (73%) than in Czech Republic (58%), with the following adoption rates for the

individual cloud computing models: in Australia: SaaS 53%, IaaS 30%, and PaaS 27%, and in Czech Republic: SaaS 25%, IaaS 13%, and PaaS 11%. SaaS is the most popular cloud model in both countries. While the size and duration of operation of organizations did not appear to influence adoption rate, there is some evidence that IT companies are more likely to adopt cloud services (45% of IT companies in the Czech Republic use cloud services). There is also some indication that cloud adopters tend to spend less on IT, with 59% of Australian and 51% of companies in Czech Republic having IT expenditure of less than 5% of their revenues. In addition to overall adoption rates our studies include data about the type of use of cloud services, more specifically if cloud services are used in pilot or production systems (Figure 1). Australian data shows much higher use of cloud services in production, in particular for SaaS applications (44%) with other types of cloud services around 20% in production systems.

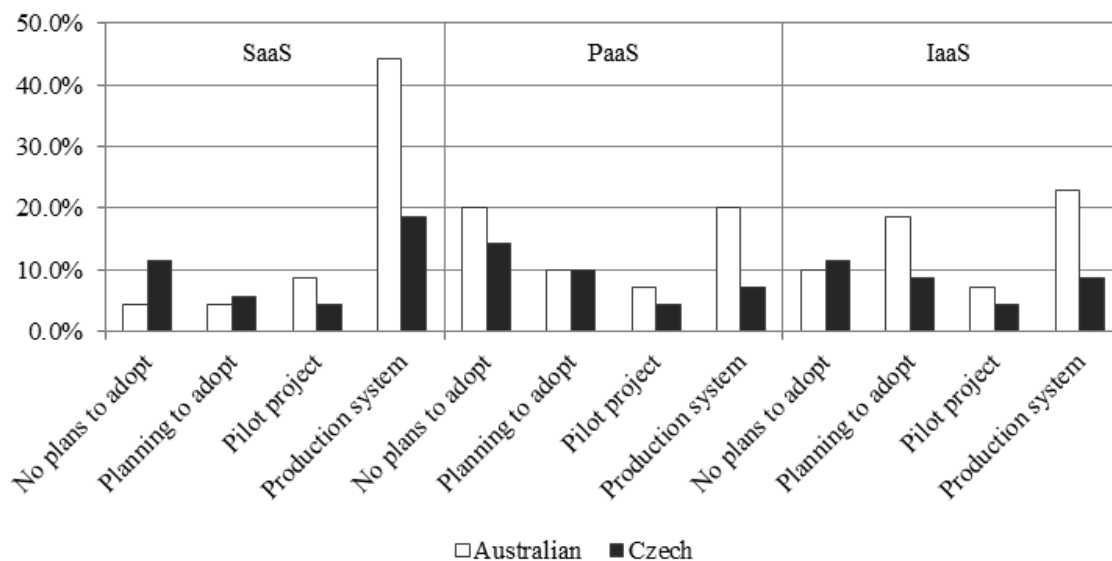


Fig. 1. – Pilot vs. production use of Cloud computing services

Furthermore, 31% of Australian companies are using SaaS in mission critical applications as compared to 23% in Czech Republic. The use IaaS in mission critical applications is lower, 23% and 10% in Australia and Czech Republic, respectively. These results indicate that cloud computing has reached a high level of acceptance in Australian companies and is becoming a viable alternative to on-premise solutions, whereas most companies in Czech Republic are still in the process of evaluating cloud services.

3.2 Motivations for Cloud Computing Adoption

In line with international studies the most cited benefits of cloud computing adoption include cost reduction, elasticity, flexibility, and rapid deployment (Figure 2). Australian companies put more emphasis on improved support for business processes in SaaS applications (26%) as compared to Czech companies (about 6%) and appear to be less concerned about cost reduction.

3.3 Barriers to Cloud Computing Adoption

Concerns about adoption of cloud services in Australia include data security and privacy issues (34% for SaaS, 17% for PaaS, 27% for IaaS), IT governance (27% for SaaS, 19% for PaaS, 23% for IaaS), service availability (21% for SaaS, 12% for PaaS, 22% for IaaS) and dependence on service provider (21% for SaaS, 13% for PaaS, 16% for

IaaS). In Czech Republic most respondents considered dependence on service provider as of highest importance (28% for SaaS, 28% for PaaS, 11% for IaaS), followed by data security and privacy (23% for SaaS, 23% for PaaS, 13% for IaaS), service availability (16% for SaaS, PaaS and IaaS), IT governance (13% for SaaS, PaaS, and IaaS) and high cost (13% for SaaS and PaaS, 8% for IaaS). These results are similar to those obtained by other studies, for example the 2010 IDC study [13].

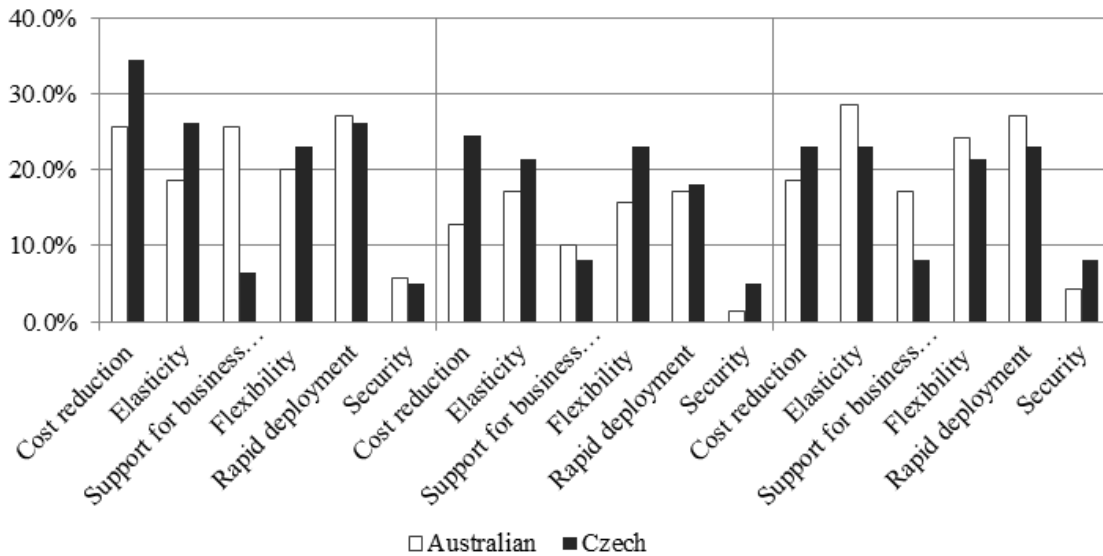


Fig. 2. Motivators for cloud computing adoption

An interesting feature of our study is the comparison of concerns before and after adoption of cloud services. Figures 3 and 4 show average values for the three cloud models (i.e. SaaS, IaaS, and PaaS) for companies that have adopted cloud services and indicate that following adoption, some of the

original concerns organizations had are significantly reduced. For example, concerns about data security, IT governance, service availability and dependence on service provider are held by much lower number of respondents in both Australian and Czech surveys once adoption took place.

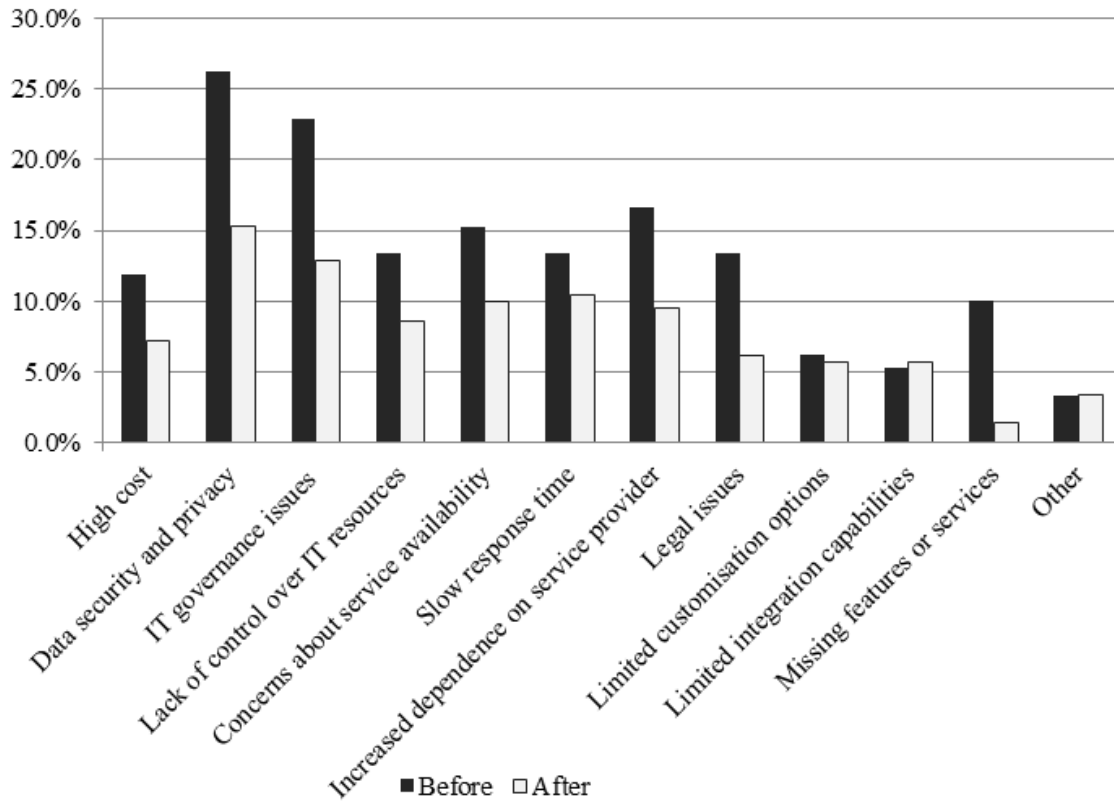


Fig. 3. – Barriers to cloud computing adoption in Australia (average for all models)

Companies that have not adopted any cloud services have identified data security and privacy (68%), dependence on service provider (52%), service availability (29%) and high cost (29%) as

the main inhibitors of cloud computing adoption in Czech Republic. In Australia, the main adoption barriers were concerns about data security and privacy, and concerns about IT governance.

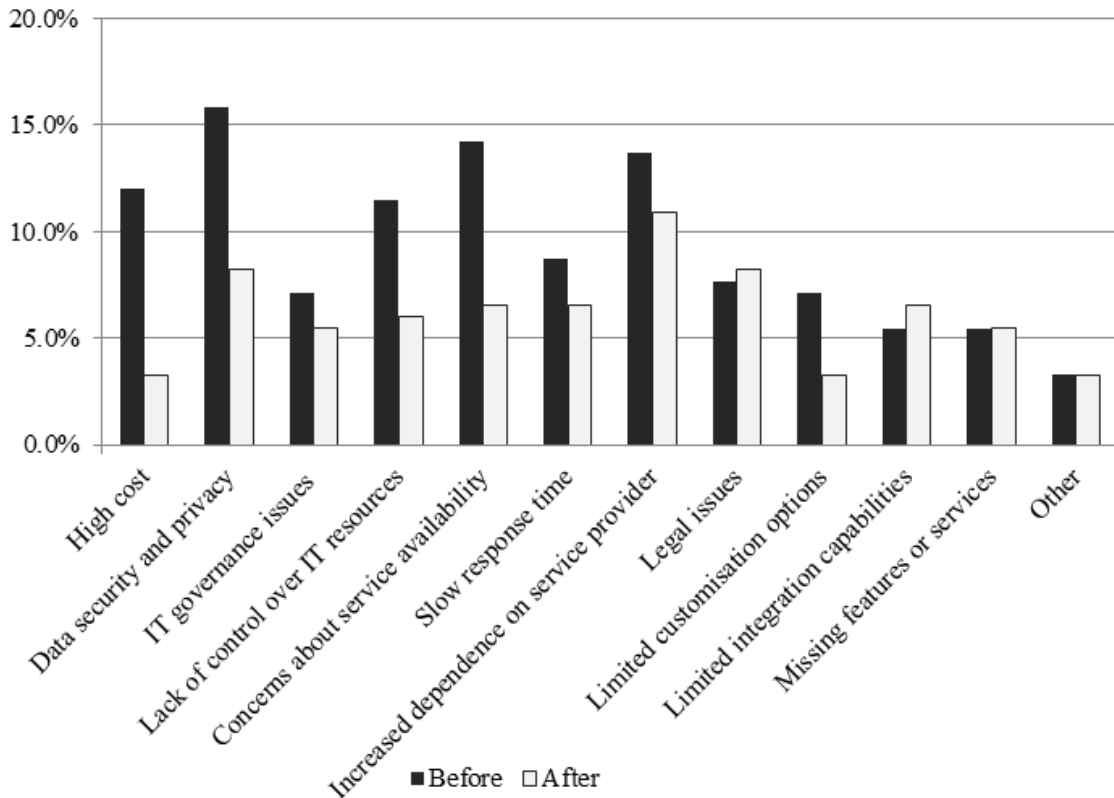


Fig. 4. Barriers to cloud computing adoption in Czech Republic (average for all models)

3.4 Types of Cloud Services in Use

We have investigated which types of SaaS services are in use in Australia and Czech Republic (Figure 5). CRM (Customer Relationship Management) is the most popular SaaS service used by 21% of companies in Australia and 15% in Czech Republic, followed by email (20% in Australia and 13% in Czech Republic), collaboration software (16% both

in Australia and Czech Republic) and HRM (Human Resources Management) applications (14% in Australia and 8% in Czech Republic). In the case of infrastructure services (IaaS) virtual servers are used by 29% of organizations in Australia and 20% in Czech Republic followed by storage (23% in Australia and 13% in Czech Republic). The use of platform services (PaaS) is quite limited in both countries (below 10%) with Force.com, Microsoft Azure, and Google App Engine the most popular platforms.

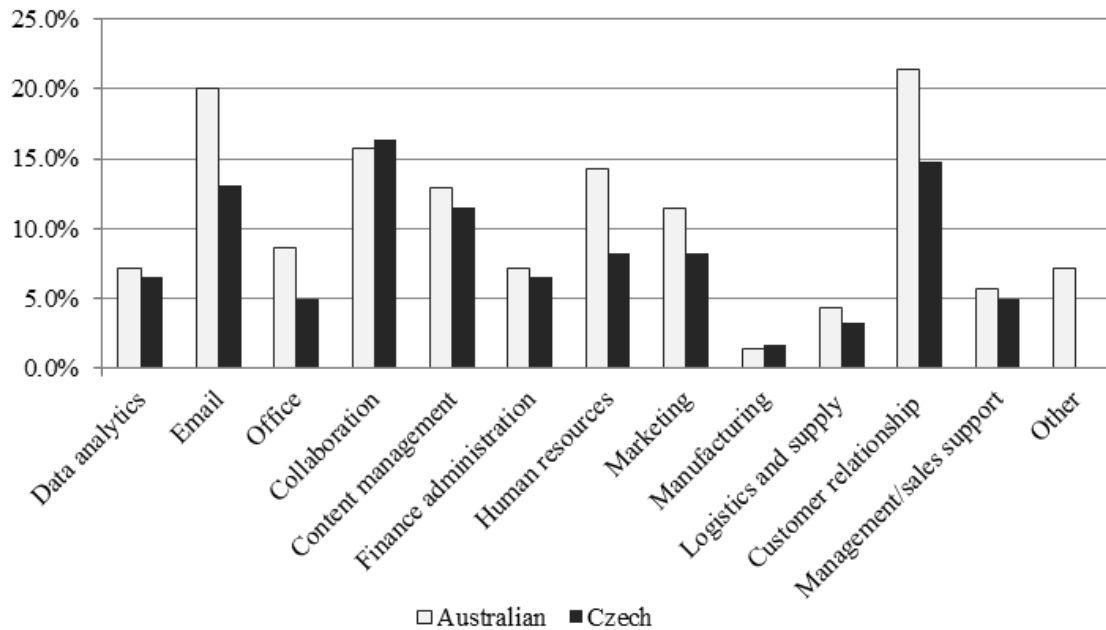


Fig. 5. Types of SaaS services in use

4 Conclusions

Our results indicate several areas of marked difference between cloud computing adoption patterns in Australia and Czech Republic. Firstly, Australian data shows much higher use of cloud services in production environments, in particular for SaaS applications (44%) as compared to less than 20% in Czech Republic. Higher level of acceptance of cloud services in Australia is further evidenced by a larger number of Australian companies (31%) using SaaS in mission critical applications (as compared to 23% in Czech Republic). Another area of difference involves companies that have decided not to adopt cloud services. Czech companies have identified data security and privacy, dependence on service provider, service availability and high cost as the main inhibitors of Cloud computing adoption. Australian companies, on the other hand, view concerns about data security and privacy, and IT governance as the main barriers to adoption and view other concerns as much less important. Another interesting result relates to changes in perception of adoption issues following a decision to adopt cloud services. Our results indicate that concerns about data security, IT governance, service availability and dependence on service provider are held by much lower number of respondents following adoption of cloud services. Finally, the study indicates that SaaS adoption is confined to a small number of relatively simple types of

enterprise applications that include CRM, email and other types of collaboration software. This finding is consistent with other internal studies, for example the KPMG survey [4] of 806 senior executives conducted in 15 countries in 2011 [4].

In conclusion, while important differences in cloud computing adoption patterns between Australia and Czech Republic exists at present is it likely that the factors that cause lower level of acceptance of cloud computing in Czech Republic will diminish over time as the ICT infrastructure and overall readiness for cloud computing improves. Further investigation is needed to identify the impact of country-specific factors such as the availability of localized SaaS applications and local cloud providers on cloud computing adoption decisions.

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References:

1. Gantz, J.F., Minton, S., Toncheva, A. *Cloud Computing Role in Job Creation*. 2012; Available from: http://www.microsoft.com/en-us/news/download/features/2012/IDC_Cloud_jobs_White_Paper.pdf.
2. Lachal, L., *2011 Trends to Watch: Cloud Computing Technology*, in *Ovum Trends Brief* 2011, Ovum 2011.
3. IDG. *CIO Global Cloud Computing Adoption Survey*. 2011 [cited 2012 20/09/2012]; Available from: http://download3.vmware.com/interactive_brochure/docs/CIO-Global-Cloud-Computing-Adoption-Survey-Results-PP-EN.pdf.
4. KPMG. *Clarity in the Cloud: Global study of the business adoption in the cloud*. 2011 [cited 2012 19/09/2012]; Available from: <http://www.kpmg.com/AU/en/IssuesAndInsights/ArticlesPublications/cloud-computing/Documents/clarity-in-the-cloud-business-adoption.pdf>.
5. Hermans, J. *From Hype to Future: KPMG's 2010 Cloud Computing Survey*. 2010 [cited 2011 11.5.2011]; Available from: http://www.kpmg.com/NL/nl/IssuesAndInsights/ArticlesPublications/Documents/PDF/IT_Performance/From_Hype_to_Future.pdf.
6. Garrison, G., S. Kim, and R.L. Wakefield, *Success factors for deploying cloud computing*. *Communications of the ACM*, 2012. **55**(9): p. 62-68.
7. Kim, W., Kim, S.D., Lee, E., Lee, S. *Adoption issues for cloud computing*. in *11th International Conference on Information Integration and Web-based Applications & Services*. 2009. ACM.
8. Misra, S.C. and A. Mondal, *Identification of a company's suitability for the adoption of cloud computing and modelling its corresponding Return on Investment*. *Mathematical and Computer Modelling*, 2010.
9. Mell, P. and T. Grance, *The NIST definition of cloud computing (draft)*. NIST Special Publication, 2011. **800**: p. 145.
10. Bitcurrent. *Bitcurrent Cloud Computing Survey 2011: Cloud Adoption, concerns, and motivations*. 2011; Available from: <http://www.bitcurrent.com/download/cloud-computing-survey-2011>.
11. Feuerlicht, G., L. Burkon, and M. ŠEBESTA, *Cloud Computing Adoption: What are the Issues*. *Systemova integrace*, 2011: p. 187-192.
12. Alliance, B.S. *BSA Cloud Computing Score Card: A Blueprint for Economic Opportunity*. 2012 [cited 2012 18/09/2012]; Available from: http://portal.bsa.org/cloudscorecard2012/assets/PDFs/BSA_GlobalCloudScorecard.pdf.
13. IDC. *Cloud Computing 2010 An IDC Update*. 2010 [cited 2011 5.5.2011]; Available from: <http://www.slideshare.net/JorFigOr/cloud-computing-2010-an-idc-update>.