

Reality Vs Hype

Does Cloud Computing Meet the Expectations of SMEs?

Katie Wood and Kevan Buckley

*Department of Computer Science, Faculty of Science and Engineering, Wolverhampton University, Woverhampton, U.K.
{k.wood, k.buckley}@wlv.ac.uk*

Keywords: Cloud Computing (CC), Security, Risk Management, Small and Medium Enterprises (SMEs), Cloud Service Providers (CSP).

Abstract: Small and Medium Enterprises (SMEs) have become a primary target audience for Cloud Service Providers (CSP), such as Amazon and Microsoft to promote their cloud offering. CSP strong marketing campaigns of 'promised' benefits from using their clouds is an attractive offer for SMEs especially where resources are limited and they wish to become more agile and reduce IT costing to be competitive with larger rivals. This paper argues that once SMEs remove the hype surrounding the concept of cloud computing (CC), the reality of significant benefits do not materialize for SMEs. This paper demonstrates, through working with SMEs considering the options of CC that the challenges and risks associated with cloud might actually hinder the business, rather than providing any real long term value.

1 INTRODUCTION

Cloud computing (CC) has gained increased attention and momentum within a short period of time, even those the technology is still very much in its infancy. The increase interest into this form of distributed system has been fuelled by the strong marketing campaigns from Cloud Service Providers (CSP) that have promoted the promised of benefits. It is frequently reported that CC offers a variety of benefits including cost-saving, agility, efficiency, resource consolidation, business opportunities and Green IT (Chang et al., 2010) Even so, cloud is still a young and evolving paradigm that incorporates the evolutionary development of many existing computing technologies. This paper defines hyper surrounding CC as being the extravagant or intensive positive promotion of CC technologies by CSP and through the media. Such extravagant promotions, has lead to SMEs within this study to consider using CC as significant benefits, especially in term of cost saving and improved performance were expected. However the observations and findings of this study, suggest that in reality such expectations have not be achieved.

This study identified there a lack of understanding surrounding the terminology of CC and the changing variable within CC makes it challenging to alignment with SMEs needs.

Concerns surrounding security are noted as being a majority issue for SMEs in terms of establishing their role and the CSPs in protecting the systems.

The remainder of this paper is organized as follows: Section 2 provides a brief outline of the background and rational for undertaking a research project. Section 3, presents an overview of unique features of cloud where benefits are clamed. The section continues through a detailed discussion of the issues and how these limit the chance of any business value of using cloud technology for SMEs, if not understood or assessed during the decision making process. Section 4 outlines the need for risk assessment to be conducted and awareness of risks associated of CC. Section 5 presents considerations as part of a risk assessment that could be part of assessing CC suitable. Section 6 concludes the paper. Finally, section 7 outlines further work that the authors have planned to continue on this project.

2 PRIMARY OBSERVATIONS

The findings outlined in this paper are from research undertaken with SMEs in the West Midlands, UK. SMEs from different industries where selected to take part in a study to access SMEs understanding of CC and what cloud technologies were currently being used or considered. Initially a questionnaire

survey was used to collect data. 50 SMEs in the West Midlands took part in this stage. Businesses were selected based on the fact they heavily used forms of technology in their operations, but were not deemed as a business in the IT sector. The rationale behind this selection was to access people who have an average level of IT usage and experience of IT, who would understand and interact successfully with cloud technology without the need to be an IT expert. The questionnaire survey allowed the authors to gather valuable information and gauge SMEs general understanding of the concept of CC and establish the level of interest and use from the SME community. From the results of stage 1, several SMEs were then invited to take part in a deeper analysis. During this stage semi-structured, in depth interviews were used and acted as the primary data collection method for the project. The SMEs selected were based on the responses from stage one. SMEs selected for this stage were based on the following criteria:

Table 1: Criteria for SME involved in stage 2 of study.

| |
|--|
| The business was involved in the initial questionnaire stage of the project. |
| Staff had a fairly good level of IT skills |
| There was an interest in understanding more about cloud and some evidence of some form of cloud computing has been used. |
| The business wanted to consider using PaaS in the future. |
| The business uses websites, email and database applications, which would be suitable applications to use and store within a form of cloud environment. |

Each interview was individually conducted between the author and participant and took around 45 minutes. A combination of closed and open questions were selected relating to the business use of IT, the business rationale for considering CC and the participants understanding of use of CC. Results and transcripts from the interviews have not been shared or compromised at any point during the project or discussed in this paper order to ensure confidentiality and participant's anonymity.

This paper outlines some of the responses from the participants from both stage 1 and stage 2 to highlight growing concerns of issues relating to cloud computing and evidence of limited benefits emerging. The findings overall conclude a growing interest in the topic, however when it came to practically using cloud, SMEs either had experienced problems and disappointment through using the technology, or the complexity led to the decision to migrate to cloud being terminated. This

paper outlines several areas where SMEs stated complexity and where potential benefits promoted by the CSP have not materialized to produce overall benefits.

3 CHALLENGES OF CLOUD

3.1 What Actually Is Cloud Computing?

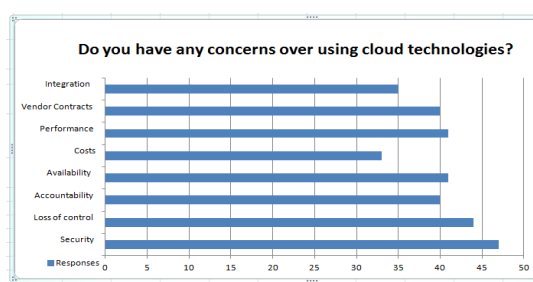
To establish the participants understanding of CC, the first sets of questions asked to participants during the interviews were to assess their understanding of the concept of CC and user experience. All participants involved in this study had heard of the concept CC, so you might wonder why the question "*Do you know what cloud computing is?*" was even asked? According to results from a survey conducted in 2012 (Chang et al., 2010). Participants in that study were asked to explain the concept "the cloud" The majority responded with the view it either referred to an actual cloud (specifically a "fluffy white thing") in the sky or something related to the weather (29 percent). Only 16 percent of participants thought it was related to computer networking to aid storage, access and share data from Internet-connected devices.

It this particular research project with SMEs participants the results from this question concluded that only 30% of the participants could actually provide some clearly definition on what the term means in the context of computing. Surprisingly over half the participants believed they have actual use a form of cloud technology, even those they were not sure what was meant by the term CC. From a security point of view, this statement is concerning as participants are not aware of what technology, services or systems they are actually using and the risk associated.

Given the relatively immature nature of CC and that it is still evolving. It is not surprising that end users and businesses are finding it difficult to understand what is exactly meant by the term cloud computing. There has been work in recent years to establish a benchmark and suitable definition for cloud. Currently however there is still no precise definition (Interworkscloud, 2013) for cloud, which makes it a challenge for businesses to understand the different elements that are required for a successful uptake of CC. This has led to arguments by researchers that the term "cloud computing" is far too broad making it difficult to develop a single and

clear definition. (Wood Katie, 2012) Currently, there are over 20 different definitions. The most regularly used definition is by the National Institute of Standards and Technology (National Institute of Standards and Technologies, 2009) Basically, 'CC' as an umbrella term being applied to different situations and their solutions. It is the next stage in the distributed and shared computing. This form of computing provides a range of computation facilities, storage and scalable functions and services that are accessible anywhere via a connection to the Internet.

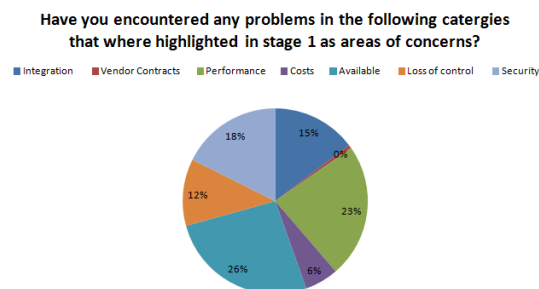
3.2 SMEs Concerns



Graph 1: Results from stage 1 – Questionnaires Shows the range of concerns SMEs have with cloud technologies.

Graph 1 shows the different categories that SMEs had concerns over using cloud technologies. 47/50 participants identified security has their major concern. This was followed by a high proportion of participants stating concerns over loss or control 43/50 and performance 41/50. Concerns highlighted above led to a follow up question directly linked to this during the interview stage in order to see if any of the concerns raised by SMEs have also materialize into real problems for SMEs that had used cloud technologies. Unsurprisingly SMEs had encountered problems in most of the categories previously outline which showed that there is evidence to back up the concerns from SMEs that might still be weighting up the options of cloud. 26% of SME in stage 2 identified that they have encountered security problems and 23% as having experience performance problems. As semi structured questions were used during this stage, some SMEs further explained that the problems they had occurred several times over a short period of time. In once case led to a SME to reconsider using cloud services to store data as the performance of the system led to performance and available problems which was seriously hindering the operational side of the business. Cost of using cloud technologies did not appear to be a concern by SME participants in

this study. There was a consensus from participants that there is a wide option of price plans offered by different CSPs which allowed for flexibly.



Graph 2: Results from stage 2 – Interviews Shows the range of concerns SMEs have with cloud technologies.

3.3 Migration and Section

One of the first challenges for any potential cloud user is dealing with selecting the correct cloud. CC can be classified into three categories: Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS). To further complex the situation, CC can also be offered in different deployment formation - public, private, community and hybrid clouds. Each form of cloud and deployment bring a whole set of different potential benefits and associated risk. Therefore the first challenge is assessing which form of cloud is suitable for that business. In order to benefit from cloud systems and services a business needs to have an understanding of the difference between the forms or clouds as well as looking at several CSPs.

Do you feel there is enough advice, support or training available to SMEs in selecting cloud technologies?



Graph 3: Results from stage 1 – Questionnaires. Shows the percentage of participants that feel there is not enough advice, support or training available for SMEs.

As shown in graph 3. Participants for this study felt strongly that training, education and support on the subject of CC is currently lacking. Participants in this study felt there is not enough advice, support or training in dealing with the starting process over selection and migration of systems and applications and also the legal aspects to ensure their data and rights are protected.

3.4 Compatibility

Linking to the migration to clouds, all businesses in this study highlighted the need for cloud services that are compatible with existing services and application. Participants felt that there is not enough guidelines or support in terms of how suitable clouds are to meet their needs and also their compatibility with exist systems and applications the business might still require. As businesses has already invest in systems prior to considering the option of cloud it is important those systems and applications are not ignored if these are still fit for purpose. There is limited documentation and advice on the matter to aid businesses in finding suitable and available tools and techniques to support this objective. 80% of the participants during stage 1 stated if cloud systems where used, they would still feel current systems and application would have to remain for certain tasks. Therefore this would be increase outgoing costs of maintaining both an existing systems and cloud system, therefore not providing the businesses with any cost saving.

3.5 Security

CSP often claiming that security in the cloud is tighter than in most enterprises (David Binning, 2009) however the following questions need clear and defined answers for CSPs. Will SMEs data be safe in the cloud? What about data protection? What will happen if security threats or breeches occur on the cloud even those the technology has been around for several years now, Gartner warned in 2013 that there are still six major security issues that businesses should tackle when considering cloud adoption. (Warwick Ashford, 2013) Each cloud is unique, offering different benefits and ways to reduce costing. However there are also significant drawbacks of cloud systems, particularly in security. The variation of security threats and possible breaches that the system could encounter, further complicates cloud. [7 Distributed denial of service attacks are on the raise on cloud systems, as clouds host services for different customers on their servers, so it's no surprise these systems are a hot target for cybercrimes. The fact that different businesses and users sharing the cloud space also increases the risk of access errors and leading to data been vulnerable and at risk of being accessed by others. How data is moved across and between CSP and the end user also places greater risk and vulnerabilities.

One major downside of clouds is that the provider has control of the user's data. Users have to

relay and trust their provider will protect their data and privacy. Privacy is an important issue for cloud computing, both in terms of legal compliance and user trust and this need to be considered at every phase of design. (S. Srinivasamurthy and D. Q. Liu, 2010) Privacy has yet to be fully acknowledged as a serious problem by policy makers and CSP. The limited regulations and legislation being enforced on privacy and user protection rights reflect this. According to a recent Cloud Security Alliance Report, insider attacks are the third biggest threat in cloud computing. (Top Threats to Cloud Computing v1.0, 2014) The reasons for this may vary, from users not understanding the system and the configuration processors, through to users who are motivated to create damage and misuse. Administrators and development need to deal with this situation in a more consistent manner across different cloud platforms. Therefore it is essential to access the dynamics of a range of configuration techniques and tools to evaluate and distinguish the impact these issues have on a cloud.

The survey used in stage 1 showed that (75%) of the SMEs stated concerns over employees IT knowledge and felt that employees would have to receive additional education and support in order to use the technology effectively. (50%) of these businesses further stated they are currently not in a position to invest in providing such support for employees at the moment. This further outlines drawback to using cloud technologies that businesses are assuming that high investment in education and training would be required to use these systems, when in fact the role of using clouds could be to simplify certain IT tasks, for example updates security countermeasures.

3.6 Costing

One of most hyped aspect of cloud computing is surrounding cost savings. Yet has stated in early sections of this paper, If SMEs have to continue using existing systems and applications along a cloud system there are no financial benefits. Businesses and individuals considering using cloud, expect appropriately reliable and timely service delivery, easy-to-use interfaces, collaborative support, information about their services, etc.(M. A. Vouk, 2008) Such high exceptions are understandable as the CSP have promoted their cloud service as being able to achieve such goals. All CSP will be affect at some point by downtime, for example during upgrades. There was been recent cases of security breaches in Amazon, Gmail and

Hotmail. The user is often unaware of such problems unless their CSP informs them or they are affected by the security breach. There is currently no legislation in place which states the CSP must inform users of all security breaches on their systems.

3.7 Performance

Clouds promote the benefits of scalability and flexibility for customers as cloud computing shifts everything from local, individual devices to distributed, virtual, and scalable resources, thereby enabling end-users to utilize the systems, storage, and other application resources (which forms the “cloud”) on-demand (Hayes, 2008). The term multi-tenancy refers to the ability to run multiple customers on a single software instance installed on multiple servers. These systems have recently become popular due to the multi-tenancy features within which allows businesses to benefit from reduced costs yet continue to gain access to data and applications. (Wood and Anderson, 2011) Reliance on cloud infrastructure provides issues for the end user in terms of the reliability and availability of the CSP and cloud services. It is crucial that CSPs ensure they meet the privacy requirements of users and legislative requirements. Reports on privacy failure and loss of user data have had serious impact on the creditability of Cloud technology and the overall expansion of cloud services, as well as on the end user. This clearly demonstrates the risk associated with reducing control of own data

4 RISK ASSESSMENT

Given the nature of CC and its key characteristics several risks can be determined. Some of these risks are traditional risk and concerns that are common with any form of networking technology. However, there are also specific risks relating to cloud. Businesses need to understand, analyse, and evaluate important economics and elasticity capabilities of different forms of cloud systems and technologies and providers before making any commitment to CC. Any selection should be based on the suitability for meeting the business requirements and alignment, rather than being motivated with marketing and the desire for the latest technologies. For any business it is important to consider all the options available. In the case of SMEs, it is more critical given their limited budget to get outsider exit advice – i.e. consultancy services to aid the decision

making process, due to financial constraints.

5 CONSIDERATIONS IN TACKLING CLOUD CHALLENGES

5.1 Testing and Evaluating

The development and integration of different system hardware, storage, networks, interfaces, administration and so on, should be carefully planned out. However businesses are not always sure what IT they require in the short and long term. Before committing to any cloud technologies, it is critical that businesses assess and evaluate their business needs as well as exploring the different cloud options available. This might appear time-consuming and costly; however the right decision must be made. There are too many different CSPs available and packages; therefore it is useful to research against the business requirements a few different CSPs to see what is being offered. Several CSPs offer limited access to service as a free trial approach in an attempt to entice users to commit to a contract. These free trials can provide an opportunity for businesses to compare and evaluate different services and functionalities between providers.

5.2 Assurance Measures

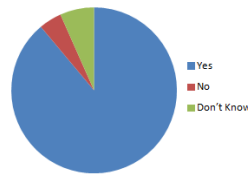
Businesses that wish to explore cloud must seek assurance from the CSP over how potential risks will be prevented. It is important to check CSP reliability reports to determine how often breaches have occurred and the impacts to see if that CSP has a good track record and provide the required level of protection and support. Checking through blogs and internet sites over any reports of major security breaches or problems that other users have experienced can provide valuable insight into the cloud culture.

5.3 Training, Education and Cloud Awareness

Graph 3 shows that SMEs would consider using clouds if more advice, support and training were made available.

There needs to be an inquiry about what the system/services are being offered and the privacy policies that the CSP has. This must be conducted before users commit and hand over their data. A

If there was better advice, support and training available would you consider using this form of technology?



Graph 3: Shows the percentage of SMEs that would consider using clouds if more advice, support and training were made available.

contract which includes the Terms of Service (TOS) and also s Privacy Policies and Service Level Agreement (SLA) will insure a level of assurance for users. This also provides grounds for legal action against the CSP if the provider does not maintain their side of the contract. For example, passing user details on to a 3rd party. It is also essential that users are aware of the data protection laws as their data could be transferred across into regions which are not as strict on data protection. This could result in invasion of privacy. Like all forms of technology, clouds are changing, aspects are being improved and other forms of risks are emerging therefore users need to be aware of changes to their cloud systems. What applications are being updates or removed for example, and how these might impact?

6 CONCLUSIONS

This paper has highlighted that CC often does not meet the expectations of SMEs. Finding suggested this is because SMEs have unrealistic expectations from using CC and the fact that CSP promote a range of benefits which can't be achieved for all. CC is not a one size fit all technology and as every business differ in size, resources and IT experience it is difficult to compare and contracts how CC benefits can be achieved for the masses. Therefore SMEs need to conduct an in depth risk assessment and evaluation of existing systems and CC options in order to access if CC is more suitable to that particular business.

7 FUTURE WORK

Further work and support is required for SMEs to actually deploy a cloud system that can be integration with existing applications and systems. Therefore the author's further work will include explores risks relating to the more technical aspects

of cloud and SMEs role in these, for example configuration management and access rights in a cloud system. Alongside this, a book will be produced which will provide a framework to act as a set of risk and support guidelines for SMEs during the change cycle of migrating to a cloud.

REFERENCES

- Chang, V., Bacigalupo, D., Wills, G. and De Roure, D. (2010) A Categorisation of Cloud Computing Business Models. In: CCGrid 2010, The 10th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing, May 17-20, Melbourne, Australia. pp. 509-512.
- Interworksccloud. (2013) How much do people know about the cloud really? [Online] Available from: <http://blog.interworksccloud.com/how-much-do-people-know-about-the-cloud-really/> [Accessed: 19th June 2012]
- Korri, T (2009) "Cloud computing: utility computing over the Internet" *Seminar on Internetworking 2009*.
- Wood Katie, "Exploring security issues in cloud computing" (2012). *UK Academy for Information Systems Conference Proceedings 2012*. Paper 30. <http://aisel.aisnet.org/ukais2012/30>.
- National Institute of Standards and Technologies; Draft NIST Working Definition of Cloud Computing, May 14, 2009.
- David Binning 24 April 2009 'Top five cloud computing securityissues' <http://www.computerweekly.com/news/2240089111/Top-five-cloud-computing-security-issues#2>.
- Warwick Ashford [Friday 22 March 2013] 'Six security issues to tackle before encrypting cloud data' <http://www.computerweekly.com/news/2240180087/Six-security-issues-to-tackle-before-encrypting-cloud-data>.
- Wood, K (2012) 'Understanding Configuration Management with Cloud Computing' International Conference on Computational Informatics and Technology Enhanced Education (ICCITEE> 2012) Amsterdam, Netherlands.
- S. Srinivasamurthy and D. Q. Liu, "Survey on Cloud Computing Security", *Proc. Conf. on Cloud Computing, CloudCom'10*.
- Top Threats to Cloud Computing v1.0". Cloud Security Alliance. Retrieved 24/10/2014.
- M. A. Vouk Cloud computing — issues, research and implementations *Journal of Computing and Information Technology - CIT* 16, 2008, 4, 235–246 doi:10.2498/cit.1001391.
- Hayes, B. "Cloud Computing," *Communications of the ACM*, 51(7):9–11 (2008).
- Wood, K and Anderson, M (2011) 'Understanding the complexity surrounding multi-tenancy in cloud computing' 8th IEEE International Conference on e-Business Engineering, Tsinghua University, (ICEBE 2011).