

THREAT AND RISK FACTORS IN ADOPTION OF CLOUD COMPUTING: AN EMPIRICAL STUDY

Theophilus B. A. Addo, College of Business Administration, San Diego State University, 5500 Campanile Drive, San Diego, CA 92182-8234, 619-594-5316, taddo@mail.sdsu.edu

Takahiko Kajiyama, 1025 Island Avenue, Ste. 202, San Diego, CA 92101, 503-781-3601, taka.kajiyama@gmail.com

Murray E. Jennex, College of Business Administration, San Diego State University, 5500 Campanile Drive, San Diego, CA 92182-8234, 619-594-5316, mjennex@mail.sdsu.edu

Christopher Paolini, College of Engineering, San Diego State University, 5500 Campanile Drive, San Diego, CA 92182, 619-594-7159, paolini@engineering.sdsu.edu

ABSTRACT

Cloud computing is fast becoming a serious alternative to proprietary information technology infrastructure. Its growth is projected to remain strong for the next several years. However, along with the many financial and efficiency-related benefits of cloud computing also come many significant concerns and risks which serve to impede its adoption. Using information from the literature, as well as a survey instrument, this study aims to identify the key risk factors in cloud computing and how they affect cloud adoption decisions. Immediate results indicate that the inherent risks in cloud computing are not a sufficient enough deterrent to the majority of cloud decision makers.

INTRODUCTION

Cloud computing has been generally welcomed by organizations as a cost-effective and flexible alternative to procuring and maintaining hardware and software in-house. This appeal has been spurred further by the introduction of Amazon's S3 (Simple Storage Service) and EC2 (Elastic Compute Cloud) in 2006. Various studies have indicated that the cloud services market is expected to maintain strong growth through 2014 (Gartner, 2010; Pettey & Tudor, 2009, para. 1). The Gartner study also states that by that time, worldwide cloud service revenue is expected to reach \$148.8 billion, easily surpassing the 2011 revenues of two software giants, Microsoft and Oracle, combined (\$69.94 billion and \$35.6 billion, respectively) (Microsoft: Statistics and Facts, 2012, para. 3) (Bond & Hellinger, 2011).

CLOUD COMPUTING BENEFITS AND RISKS

For corporate management and decision makers, cloud computing brings many financial and functional benefits. According to a report by CFO Research Services (2009), many mid-size companies spend more than \$1 million annually to update and maintain their ERP systems—an activity that does not necessarily provide any new functionality to the users. Clearly, outsourcing this function (or even the entire IT infrastructure) to a cloud service provider is very attractive, especially for small- to mid-size enterprises (SMEs) that cannot afford to allocate large shares of their budgets to projects that do not generate revenues. The cloud computing model also makes economic sense for many organizations because it allows for the rapid development and deployment of applications using tools and platforms that are already in place, tested, and proven to be efficacious for the purpose. Other benefits of cloud computing, cited in a GAO (2011) report, include the ability to access corporate resources through the Internet from any location, thus eliminating the need to carry data in removal media such as USB drives, and the relatively low-cost disaster recovery and data storage capability that cloud computing accords.

However, in addition to the benefits cited above, cloud computing also comes with many serious concerns, including security, governance, and compliance issues, which could threaten business continuity and harm corporate reputation. These issues are considered to be potentially major barriers to broader adoption of cloud computing. In a survey conducted by the 1105 Government Information Group (2012), more than 50 percent of respondents indicated that current cloud solutions are not secure enough due to potential data loss and leakage, lack of strong identity authentication and credential management, ambiguous data ownership, and physical location of data possibly being outside U.S. borders. Sixty percent of respondents said they believed that cloud computing security risks are greater than on-premises security risks (this is an increase from 54 percent in 2011) (Brocade, 2012). Issues pertaining to being fully dependent on a cloud service provider were among the most prominent raised.

STUDY GOALS AND METHODOLOGY

The purpose of this study is to identify the key risk factors in cloud computing and to assess how these risks and threats are affecting current and prospective cloud users' decisions on adoption of the cloud. Both practitioner and academic literature was reviewed in order to incorporate views from both sides on cloud computing, with especial attention to security. Technology white papers, government reports, and recent market and security articles were also used for this purpose. Finally, an online survey, targeting current and prospective cloud users, was conducted and real-life driving as well as resisting forces of cloud adoption were assessed. The survey also ascertained how those companies that are already involved in the cloud are guarding their assets in the cloud as compared to adopting the best practices recommended by security experts for safeguarding in-house resources.

The survey consisted of a set of 48 questions, divided into four parts as follows: *Part 1—Current cloud computing usage; Part 2—Security concerns; Part 3—Defensive measures (for current cloud users only); and Part 4—Respondent's organization and general comments.* The survey was conducted electronically and anonymously. It was advertised on four major networking web sites that IT professionals from various industries use to gather and discuss cloud computing and security related topics. A Likert scale was used to record participants' responses to the core risk factor questions. Descriptive statistics as well as t-tests were used in the data analysis to test for differences in the means of various measures such as size and type of industry.

RESULTS

The results indicate that the survey participants were very well aware of the inherent risks of cloud computing, identifying security, loss of data governance, and vendor (cloud provider) lock-in among their top concerns. (Among the top drivers of cloud adoption were reduced spending on technology infrastructure and better scalability and elasticity.) In spite of their awareness of the cloud's risks, the majority of respondents did not consider these risks significant enough to cause them to rethink their decision to go to the cloud. Indeed, roughly 50 percent reported confidence in their cloud providers' security capabilities while only 2 percent reported dissatisfaction with same. This generally positive outlook could be due to the fact that the vast majority of the participants expressed confidence that cloud computing is going to be more secure in the future as the service models become more mature and better technologies become available.

References available