Case Studies and Organisational Sustainability Modelling Presented by Cloud Computing Business Framework

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ABSTRACT

In this paper, Cloud Computing Business Framework (CCBF) is proposed to help organisations achieve good Cloud design, deployment, migration, and services. Although organisations adopt Cloud Computing for Web Services, technical and business challenges emerge, including the measurement of Cloud business performance. Organisational Sustainability Modelling (OSM) is a way to measure Cloud business performance quantitatively and accurately. It combines statistical computation and 3D Visualisation to present the Return on Investment arising from the adoption of Cloud Computing by organisations. 3D visualisation simplifies the review process and is a method for Return of Investment (ROI) valuation. Two detailed case studies with SAP and Vodafone are presented, where OSM has analysed the business performance and explained how CCBF offers insights, which are helpful for WS and Grid businesses. Comparisons and discussions between CCBF and other approaches related to WS are presented, where lessons learned are useful for Web Services, Cloud and Grid communities.

Keywords: *3D Visualisation, Business Challenges for Clouds, Cloud Business Model Comparison and Analysis, Cloud Computing, Cloud Computing Business Framework (CCBF), Grid Business, Organisational Sustainability Modelling (OSM), Return of Investment (ROI)*

1. INTRODUCTION

Cloud Computing provides added value for organisations; saving costs in operations, resources and staff − as well as new business opportunities for service-oriented models (Vouk, 2008; Briscoe & Marinos, 2009; Hayne, 2009; Schubert, Jeffery, & Neidecker-Lutz, 2010; Chang et al., 2010a; Chang, Wills, & De Roure, 2010b). In addition, it is likely that

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cloud computing focusing on operational savings and green technology will be the focus of attention. To avoid repeats of Internet bubbles and to maintain business operations, achieving long-term sustainability is an important success factor for organisations (Chang, Mills, & Newhouse, 2007). Before deploying any type of cloud computing development, it is essential to design and implement good-quality Business Models and a Business Framework (Hosono et al., 2009; Weinhardt et al., 2009). Hosono et al. (2009) demonstrate Service System Modelling (SSM) and explain how SSM helps Business Models to be developed with Cloud Frameworks. Anstett et al. (2009) explain how Business Process Execution Language (BPEL) assists in developing a Cloud Framework to create a SOA-driven Business Model. Weinhardt et al. (2009) explain how their definitions and importance of Cloud Business Models (CBM), and show how CBM can influence research directions for the academic communities. Buyya et al. (2008, 2009) and Patterson and Armbrust et al. (2009) define CBM and explain their rationales in terms of (i) pay-as-you go systems; (ii) cost saving calculations; and (iii) SOA and SLA theories.

However, the feedback from industrialists (Chang et al., 2010d, 2011a) is that the CBMs proposed by Buyya et al. (2008, 2009) and Patterson, Armbrust et al. (2009) are getting too complicated to understand, and as a result, these models are unable to be used and applied effectively in the real-time cloud computing businesses. In addition, there are few Cloud Business Frameworks that can accommodate different types of technical solutions in relations to their businesses (Klems, Nimis, & Tsai, 2009). Despite IaaS, PaaS and SaaS are generally classified as three business models, there is no definite guideline for how to succeed and sustain in the cloud businesses. Therefore, businesses models proposed in this research are categorised, easy to follow and structured into Cloud Computing Business Frameworks (CCBF), where Organisational Sustainability is a major area in the CCBF.

Organisational Sustainability Modelling (OSM) is designed to measure cloud business performance, so that that it gives the following two advantages: (i) allows performance reviews at any time; and (ii) provides strategic directions and added-values for adopting right types of cloud business for organisational sustainability. The structure for this paper is as follows. Section 1 described Web Services overview and its technical and business challenges. Section 2 presents the literature review. Section 3 describes the CCBF and OSM. Section 4 present two in-depth organisational case studies with OSM and 3D visualisation demonstrated, which belong to part of OSM to measure cloud business performance. Section 5 presents several similar approaches and compares them with our CCBF, and also discusses their respective strengths and weaknesses. Section 6 describes conclusion and future work.

2. LITERATURE REVIEW

2.1. Software as a Service (SaaS)

The term "Software as a Service" (SaaS) was first used by Saleforce.com in 1999 when they saw the vision of merging Web Services (WS) and Service Oriented Architecture (SOA). SaaS is a popular type of cloud service and provides added values on top of WS and SOA (Foster et al., 2008; Briscoe & Marinos, 2009; Buyya et al., 2009). In addition, there are Infrastructure as a Service and Platform as a Service for Cloud Computing (CC) and Web Services. They can be defined as follows.

- *Infrastructure as a Service* (IaaS) is divided into Compute Clouds and Resource Clouds. Compute Clouds provide users access to computational resources such as CPUs, hypervisors and utilities. Resource Clouds contain managed and scalable resources as services to users – in other words, they provide enhanced virtualisation capabilities.
- *Platform as a Service* (PaaS): provides computational resources via a platform