Optimizing Cloud Computing Costs of Services for Consumers

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INTRODUCTION

Cloud Computing (CC) typically deals with organizations using computing services, communication and web applications. The National Institute of Standards and Technology (NIST) defines CC as a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (for example networks, servers, storage, applications and services) that can be rapidly provisioned and released, with minimal management effort or service-provider interaction. Cloud computing targets four main groups of organizational customers: private, public, community and hybrid. Customers choose their CC provider which gives them maximum value in minimal costs. This paper examines users' motivations in choosing their pricing model; certain customers are looking for best value, others looking for least cost while others look for a combination of both reasons.

This research reviews the main motivations and obstacles to adopting the cloud technology by companies, and develops a cost model for optimizing the consumer costs. Providers currently offer software services as bundles consisting of services which include the software, platform and infrastructure services. Providers also offer platform services bundled with infrastructure services. This bundling policy is likely to change in the long run since it contradicts economic free market rules and competition conditions, causing an unfair pricing model and locking-in consumers to specific service providers. A famous example is the Israel telecom revolution where the introduction of competition in 1995 led to an extremely high subscriber growth rate, one of the highest in the world. As of 2014, penetration stands at approximately 125% (The Israel Ministry of Communication, 2016). Vendor lock-in is a major barrier to the adoption of cloud computing, due to the lack of standardization (Opara-Martins, Sahandi, & Tian, 2016). This research assumes that in the future market forces will push providers to act in a free competitive market, in which consumers are free to switch their services among providers. The proposed model is aimed at the potential customer who wishes to find the optimal combination of service providers which minimizes his costs. The objective of this paper is proposing possible strategies for implementation of the model in organizations, optimizing consumers' costs.

BACKGROUND

Comparing CC pricing models is a complicated task due to variance among providers' services and structure of tariff tables. Researchers found that cost saving is the strongest incentive for organizations considering CC adoption (Yung-Ming & Chia-Ling, 2012). CC services are usually sorted to three groups: SaaS (Software as a service), PaaS (Platform as a Service) and IaaS (Infrastructure as a Service), each service belongs to a specified group, and is offered for specific prices.

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There exist two main pricing models. Pay-per-use is the most used model, in which the consumer is charged a fee for a used unit in a specified duration. The unit used may be a certain computing unit of hardware, software or application. Fixed-price model, in which the user is charged for using a service unit for a fixed price, usually in periods of month or year. In the fix-price model consumers may consume an unlimited amount of unit resources, although in some contracts consumption is limited to a maximal amount which consumers do not intend to reach. In the fixed-price model consumers might be charged for resources they have not actually consumed. Al-Roomi, Al-Ebrahim, Buqrais, & Ahmad, (2013) surveyed pricing models, and classified them to three groups: fixed – in which the customer is charged the same amount all the time, dynamic – in which prices changes dynamically according to purchased volumes and market-dependent in which prices change according to market conditions. Lai (2005) claims that market competition powers using pay per use pricing model could bring efficient allocations of computing facilities. Weinhardt et al., (2009) illustrate that current trends in CC show an ambition to base pricing models on dynamic pay-per-use pricing models. In certain cases consumers prefer to pay a fixed price, ignoring pay-per-use model advantages which fit their exact consumption and might minimize their costs (Anandasivam & Premm, 2009; Pueschel, Anandasivam, Buschek, & Neumann, 2009). Wu & Banker, (2010) found that some providers offer pay-per-use pricing and leave some consumer surplus to the customers in order to be more attractive. Researchers explored cloud provider pricing models using cluster analysis and found common business models; first cluster includes niche providers who use fixed pricing, second cluster includes mass players using pay-per-use pricing models (Labes, Erek, & Zarnekow, 2013). A possible explanation of using fixed prices is lock-in situations prevalent among niche players' products. Lilienthal (2013) who compared costing schemes offers a decision model which calculates financial trade-off with respect to the workloads.

Several researchers studied anomalies in consumer decisions. Lambrecht & Skiera (2006) identified fixed-prices biases in which consumers prefer a fixed price model although they would pay less on a pay-per-use tariff for reasons of budget confidence, and cases of consumers prefer a pay-per-use model paying more for operational flexibility. Koehler, Anandasivam, Dan, & Weinhardt (2010) also found that the insurance effect has significant influence on the fixed-price bias while the pay-per-use bias is influenced by the flexibility effects.

Several researchers state that providers use to offer free of charge services using lock-in strategies (Koehler et al., 2010). Researchers found differences between private and organizational consumers (Weinhardt et al., 2009). Most cloud services which are focused on private consumers are free of charge while organizational consumers are usually charged, and only some add-on services are free of charge. PaaS providers often offer their development tools for free. Walterbusch, Martens, & Teuteberg (2013) raise the awareness of indirect and hidden costs in cloud computing pricing models. They found that some providers try to attract customers by a low price per storage while charging hidden costs for data transfer. Chen, Han, Cao, Jiang, & Chen (2013) state that customers face difficulties in evaluating prices of cloud services, those difficulties are one of the main reasons preventing customers from adopting cloud services.

This paper proposes a pricing model which optimize customers' costs in a future cloud computing free-competition market, thus eliminating the above discussed market in-efficiencies.

MAIN FOCUS OF THE ARTICLE

Research literature in the CC pricing models domain names three competition barriers' features: