

## Chapter 81

# Holistic Investment Framework for Cloud Computing: A Management–Philosophical Approach Based on Complex Adaptive Systems

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### ABSTRACT

*Cloud computing is a new technology which puts whole or partial parts of the Information Technology (IT) infrastructure and services in a virtualized environment inside and/or outside the traditional IT center perimeter. It touches every level of the IT architecture and thus has a big influence on the way the internal and external users via their business processes are interacting with this architecture. Security is a big issue in this context and a lot of business and IT people are reluctant to move to the Cloud. Besides the security, business and architectural issues may increase the risks and create more uncertainties for these kinds of projects. For this reason, the chapter presents an investment framework, which takes into account the global, the business, the IT and the operational strategies, so that cloud computing projects have more chance to succeed. The need for flexibility in the investments is addressed by the real option valuation, which is placed in the context of the chapter's holistic investment framework for cloud computing.*

### INTRODUCTION

Cloud computing is a hot topic today amongst business and IT (Information Technology) leaders for its potential to transform IT service delivery (Abrams, 2010) and to galvanize service-oriented architecture (SOA). Some people even state that just like electricity and telephone systems; IT will be transformed into a commodity or the fifth form of utility.

A survey of Industry Week (IW, 2010) showed that there is a lot of fear surrounding Cloud Computing in the business world to step into the Cloud. Research shows that intuitively they want to make the move, but that they need more accurate data to do it (Benaroch, 2007). So the technology of cloud computing forces the top management of organizations to think more carefully about competition and collaboration, be it now in relation to the customers, suppliers, government or “tradi-

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tional” competitors. Brandenburger et al. (1995) are talking about “Co-opetition”; a combination of Cooperation and Competition in the evolution of game theory, which through strategic games can generally be applied in the investment decision process and more specifically in IT.

With Cloud Computing, applications and data can be stored all over the world. Thus trust becomes a very important issue. Trust is already an important issue in SOA but Cloud Computing has brought it to the forefront. There has to be a trade-off between cost and confidentiality, which is culturally influenced.

But more important is the strategic context of the organization. Nowadays the business has moved from a “safe and slow” market toward a complex even chaotic fast moving society (not only the markets have changed). The theory of Complex Adaptive Systems (CAS) which describes the internal and external connections of the organization in such an environment will help leaders and managers in companies, governments and non-profit organizations to evolve in this context. Cloud Computing is part of that system.

Therefore there is a need for a new Business Thinking Model. It may not be solely technology driven (otherwise hype) but also business driven. A combination of both should already be implemented in the development of the Grand Strategy. Only in this way can the new paradigm be proliferated into business strategy and resources strategy (like IT-strategy), resulting in an awareness at the operational level (business processes and projects).

Consequently the investment methodology has to follow this new concept where adequate tools provided by the game theory (strategic interaction), and real options analysis (uncertainty, risk, flexibility) can be used.

The purpose of this chapter is to present a holistic investment framework for IT and in particular Cloud Computing. The term holistic refers to the fact that profit and non-profit organizations should take all aspects of the organization, business

and resources, into consideration to avoid sub-optimization in a domain instead of optimization in the larger whole.

In this way the possible economies of an implementation or an extension of Cloud Computing in the organization, along with the risks, are assessed in the business and technology context of that organization. Concepts like real options and game theory are introduced in this holistic investment framework to tackle issues of strategic interaction, uncertainties, and risks thus grounding investment decisions on proven decision methodologies.

## **CLOUD COMPUTING AND REAL OPTION VALUATION (ROV)**

### **Cloud Computing Defined**

Although terms related to Cloud Computing are being defined (National Institute of Standards and Technology (NIST)), some commercial companies are redefining some terms to suite their sales or marketing model. We will give an overview of the definitions and characteristics of cloud computing as defined by NIST. The quoted parts are extracted from NIST (2011).

### **The Characteristics of Cloud Computing**

*On-demand self-service:* A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service’s provider.

This demands that the service provider’s management processes must be as much as possible automated to deliver quick service. However in reality in the case that important parts of the infrastructure or applications are requested, companies want Service Level Agreements (SLA). Therefore negotiated contracts are more the rule than the exception.

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