Evaluate IT Investment Opportunities Using Real Options Theory

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ABSTRACT

In this paper, we discuss the real options theory and its applications in IT investment evaluation. We provide a framework within which the appropriateness of using real options theory in strategic IT investment evaluation is systematically justified. In our framework, IT investment opportunities are classified into four categories based on two criteria: the technology switching costs and the nature of competition. We point out that different real options models should be adopted for each category. The electronic brokerage’s investment decision in wireless technology is discussed as a real world case within the framework. Our study also provides some insights about the relationship between technology standardization and IT investment decisions.

Keywords: Real options, risk management, capital budgeting, strategic IT investment, electronic brokerage, standardization.

INTRODUCTION

Today’s fiercely competitive environment means that every player in the real business world must be proactive. However, limited financial resources and many uncertainties require business practitioners to maximize their shareholders’ equity while controlling the risks incurred at an acceptable level. As the unprecedented development in information technology (IT) continuously produces great opportunities that are usually associated with significant uncertainties, technology adoption and planning become more and more crucial to companies in the information era. Karahama et al. (1999) point out that the value-adding potential of the new technology in question is a critical factor in IT adoption. Raghunathan and Madey (1999) develop a
firm-level framework for electronic commerce information systems (ECIS) infrastructure planning. In this study, we attempt to evaluate IT investment opportunities from a new perspective, namely, the real options theory. Unlike the standard corporate resource allocation approaches, the real options approach acknowledges the importance of managerial flexibility and strategic adaptability. Its superiority over other capital budgeting methods like discounted cash flow analysis has been widely recognized in analyzing the strategic investment decision under uncertainties (Amram and Kulatilaka, 1999; Luehrman, 1998a, 1998b). In fact, some previous IS researches have recognized the fact that many IT investment projects in the uncertain world possess some option-like characteristics (Clemsons, 1991; Dos Santos, 1991 and Kumar 1996). Recently, Benaroth and Kauffman (1999, 2000) and Taudes, Feurstein and Mild (2000) apply the real options theory to real world business cases and evaluate this approach’s merits as a tool for IT investment planning. For a general discussion of the link between real options theory and IT investment planning, readers are referred to Amram, Kulatilaka and Henderson (1999).

As all real options models inevitably depend on some specific assumptions, their appropriateness should be scrutinized under different scenarios. This study aims to provide a framework that will help IS researchers to better understand the real options models and to apply them more rigorously in IT investment evaluation. As the technology changes, the basic economic principles underlying the real options theory do not change. So we do not need a brand new theory, but we do need to integrate the IT dimension into the real options based investment decision-making process. Using electronic brokerage’s investment decision in wireless technology as a real-world example, we show the importance of adopting appropriate real options models in IT investment planning. By specifically focusing on the uncertainties caused by IT innovation and competition, our study also gives some intriguing results about the dynamics between IT adoption and the technology standard setting process.

**REAL OPTIONS THEORY**

The seminal works of Fischer Black, Robert Merton and Myron Scholes offer us a standard pricing model for financial options. Together with their colleague at MIT, Stewart Myers, they recognized that option-pricing theory could be applied to real assets and non-financial investments. To differentiate the options on real assets from the financial options traded in the market, Myers coined the term “real options” that has been widely accepted in academic and industry world. It is generally believed that the real options approach will play a more important role in the highly uncertain and technology driven digital economy. Before reviewing the real options literature body that is growing very rapidly, we use two examples to give readers an intuitive illustration of the values of real options and their significance in financial capital budgeting.

**Example 1. This Year or Next Year?**

A software company is facing a new investment opportunity. It plans to spend $100,000 to make its best-selling database system compatible with an emerging Operating System (OS) in the market. But as the new OS is still in its infancy, the company is not sure whether it will be widely accepted in the near future. Suppose that the uncertainty about the new OS can be
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