IDEA GROUP PUBLISHING
701 E. Chocolate Avenue, Suite 200, Hershey PA 17033-1240, USA
Tel: 717/533-8845; Fax 717/533-8661; URL-http://www.idea-group.com
ITB12760

This paper appears in the book, *Emerging Trends and Challenges in Information Technology Management, Volume 1 and Volume 2* edited by Mehdi Khosrow-Pour © 2006, Idea Group Inc.

The Evaluation of IT Investments through Real Options

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INTRODUCTION

As Information Technology (IT) evolves, it becomes increasingly complex investment decisions upon it. The technological uncertainties make it difficult to estimate the value that IT solutions can bring. Therefore, Chief Information Officers (CIO) face prejudice from top management, which is skeptical about the real benefit that IT can bring up to business. Hence, this conservatism can lead companies to a lack of investments in IT projects that establish the foundation for future opportunities in products and services innovation.

This article intends to, through a bibliographic review, apply into IT a relatively new methodology, called real options, used into corporate strategy for evaluating and deciding about new investments. Particularly, this methodology is highly recommended when either there is a considerable level of uncertainty about the benefits to be achieved, or when the investment does not create value directly to the business but enables a platform for future impacts.

"REAL OPTIONS": UNCERTAINTY CREATING OPPORTUNITY

Basic Concepts

According to Amram and Kulatilaka (1999), option is a right, not an obligation, of taking an action in the future. Options have value when there are uncertainties (uncertainty is the random nature of external events that managers don't have influence). A "real option" is the extension of the concept of financial option for real assets. The difference is that a financial option is a contract, while a "real option" needs to be identified and specified, so that the managerial decisions are made in a way to create future opportunities of investment or disinvestment, according to external events (uncertainties).

The value of an option depends basically on 3 factors: the expected value of a variable (result of a project phase) for a future decision, the time until the decision has to be made and the related uncertainty (volatility). The larger is the uncertainty, the greater is the value of an option; because an option leverages the benefits from a satisfactory result and limits the losses.

On one hand the advantages of real options, applied to the differential equation of Black and Scholes (1973), are the small amount of information and the limited opportunity for biased evaluations, if compared to discounted cash flow approach. On the other hand, the disadvantages of this model are the abstraction required to identify the options in real assets and the translation of the investment into a financial portfolio. It is important to highlight that the traditional models based on cash flow estimates work well for projects which uncertainty is small or changes are predictable.

Types of Real Options and IT investments

There are five categories of real options that influence the way of evaluating and managing investments.

- **Waiting to Invest Options:** The value of waiting for deciding about an investment is superior to immediately invest.
- **Growth Options:** Investments in projects that allow future opportunities of new projects that will affect the growth or revenues of a company.
- **Flexibility Options:** Investments in projects that allow flexibility in the use of existent assets, due to external uncertainties.
- **Exit Options:** Investments in projects with high uncertainty which the total result of a project become attractive, if the value of abandoning the project is considered.
- **Learning Options:** Phased investments, in which the approval of continuing the project depends on a previous phase

"REAL OPTIONS" IN THE EVALUATION OF IT

The productivity paradox, widely discussed in the literature, argues about the impact of IT investments in companies´ productivity. On one side some authors, like Landauer (1995), claim that benefits of IT investments were minimal; on the other side other authors, like Brynjolfsson (1993) and Willcoks (1994) highlight that the lack of evidence of benefits from IT investments is related to deficiencies in the evaluation methodologies and metrics of these impacts.

Brynjolfsson (1993) indicates four elements that led to a misunderstanding of the benefits generated by IT to business: poor evaluation methods and metrics, time lag due to learning and adjustment, relocation of profits and finally poor IT management practices.

Within this context, real options can be a method of investment evaluation and projects management that can contribute to a better identification of the results of IT investments.

As Smithson and Hirschheim (1998) state, the evaluation of IT became very complex and difficult to accomplish, basically due to the wide and fundamental role of IT in business:

- IT is embedded in companies services/products, becoming difficult to evaluate the benefits of IT separated of the business (growth option)
- IT is faced as an element of competitive advantage, which embeds uncertainty about the final result, hindering any estimate (exit option)
- IT is a component of a business whole transformation process that involves products/services, processes and structure, which turned the evaluation process complex and phased (learning option)
- Nowadays, IT investments lead to evolving/replacing existent IT platform that requires analysis beyond the system life cycle. (waiting to invest option, flexibility option)

Real options allows the appropriate approach for this problem, Specifically, it should be applied for projects selection and management that it is difficult to directly quantify the benefits of IT investments.

APPLYING REAL OPTIONS IN THE RULING PROCESS OF IT

Real options method can be very useful in IT management, not for all types of companies and projects of investments, but for those investments in which a real future option is created.

How Does One Include Real Options in IT Management?

Willcoks and Lester (1997) suggested that the deficiencies in IT evaluation derived not just from deficiencies in the metrics used, but also from the absence of an integrated evaluation process.

Considering an IS life cycle, real options can be incorporated in several ways. When deciding about a new investment, real options can be used when there are high uncertainties about business benefits. Initially, it should be identified benefits and future options, calculated the value of them and investments should be prioritized.

Alongside the implementation phase, the approach of real options can be applied through phasing a project, specifically for learning during the implementation and minimizing the uncertainties. Therefore, the decision about continuing a project is related to performance metrics expected in each phase.

Finally, after the conclusion of a project it is relevant to re-evaluate the IT portfolio. At this moment, real options is appropriate to evaluate new investments that will support future growth or innovative developments.

In this context, the application of real options methodology in IT strategic management can contribute for IT effectiveness, because it support to take the right decisions and manage them.

Under which Conditions Does One Apply Real Options in IT?

Real Options should not always be applied to support the IT investment decisions. Considering the levels of IT evaluation proposed by Laurindo and Shimizu (2000), it is possible to analyze the conditions in which the use of Real Options is well suited.

Relevance of IT to the strategic competitiveness. Considering McFarlan´s strategic grid (1984), the proposition is that Real Options is quite appropriate to companies classified as "strategic" and 'turnaround".

In the "strategic" category, IT has great influence on the present and future business results. IT investments tend to generate opportunities for future revenues (growth option) and many projects are related to up-to-date technologies or innovative solutions, that naturally bring up uncertainties about a company ability to implement them properly (learning option).

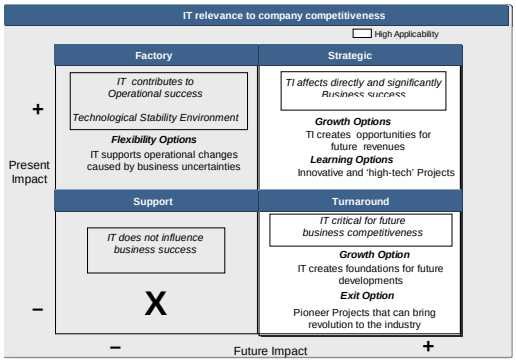
In the "turnaround" category, IT can create a foundation for future competitive transformations of the company. Real options can be applied in projects that represent a platform for future development, or that support the future company competitiveness.

In companies positioned as "factory", IT investments do not represent a future option of innovation or even future improvement of business efficiency. Therefore, IT investments should be evaluated through traditional techniques (NPV, payback, etc.). Finally, in "Support" category, IT impact in the business neither involves uncertainties nor future opportunities; thus real options should not be applied (Figure 1).

Positioning of IT in a Company. From the point of view of the strategic alignment model proposed by Henderson and Venkatraman (1993), there should be an alignment between business and IT strategy/structure. The proposition is that Real Options can be applied when IT performance is evaluated based on technological or business leadership. In both cases there is uncertainty; in the first case, as a result of business innovation lead by IT application; in the second, as a result of visionary top management decisions to apply new technologies. Hence, in both cases, decision process and project management require an approach to deal with uncertainty, i.e., leveraging possible opportunities.

IT Organizational Structure. Taking into account the IT stages proposed by Nolan (1979), and the contribution of real options in identifying key evaluation elements, real options is an appropriate methodology when IT planning and control is formalized (stage 3, control). It would be even more useful when businesses and IT areas jointly accept the responsibilities and consider IT as part of the strategic planning (stage 6. maturity). In the previous stages (initiation and contagion), real options is less relevant phases because budget practices do not reflect IT results.

Figure 1. Application of Real Options according to IT strategic relevance (adapted from McFarlan, 1984)



CONCLUSION

The real options methodology can contribute significantly to IT strategic management, by introducing a new perspective into investment decision and project management, particularly in IT infrastructure, in new technologies or in innovative solutions.

Considering business effectiveness, real options application collaborates by avoiding the rejection of projects with high uncertainty. Additionally, this methodology can change IT managerial mindset, forcing it to conceive projects which minimize losses and leverage positive results when facing uncertainty. Regarding the "productivity paradox", real options introduces new metrics in the evaluation of IT impact; in addition, the methodology is perfectly suited to evaluate project benefits that constitute an infrastructure platform for future growth or innovation.

However, this work requires further development, i.e., it should apply the methodology in some IT cases, testing the application of real options and indicating differences of the decision outcomes, *vis-a-vis* traditional methods. Other issues that could be addressed are the applicability of the proposed methodology, according to IT maturity level. Despite of all, this paper introduces an alternative to achieve IT effectiveness by incorporating real options methodology to the investment decision process.

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