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Business Value of IT Investment: The Case of a Low Cost Airline's Website

Márta Aranyossy

Corvinus University of Budapest, Hungary
marta_aranyossy@yahoo.com

Abstract

Using the case of a low cost airline company's website we analyze some special research questions of information technology valuation. The distinctive characteristics of this research are the ex post valuation perspective; the parallel and comparative use of accounting and business valuation approaches; and the integrated application of discounted cash flow and real option valuation. As the examined international company is a strategic user of e-technology and wants to manage and account intangible IT-assets explicitly, these specific valuation perspectives are gaining practical significance.

Keywords: IT value, travel services industry, accounting, discounted cash-flow, real option

1 Introduction

According to a literature review of Melwille et al. (2004, p. 298.) there are five core questions of information technology (IT) business value research - this paper focuses on the first main stream: "Is the IT resource associated with improved operational efficiencies or competitive advantage?"

The early work on this field concentrated mainly on large sample research concerning the impact of IT on economic growth and firm productivity (see e.g.: Barua-Kriebel-Mukhopadhyay, 1995; Oliner-Sichel, 1994), and found significant positive relationship between IT capital invested and firm productivity (Brynjolfsson-Hitt, 2000). After having the IT productivity paradox – mostly – cleared, the next stream of research focused on the measurement issues of IT enabled business value. Researchers analyzed the IT applicability of traditional financial valuation methods, like rate of return calculation, discounted cash-flow (DCF, e.g.: Anandarajan-Wen, 1999) or real option approach (ROA; e.g.: Dos Santos, 1991) (see the row of Methodologies in Figure 1). These last papers were usually written from an ex ante perspective, looking at the IT business value problem from an investment decision support point-of-view.

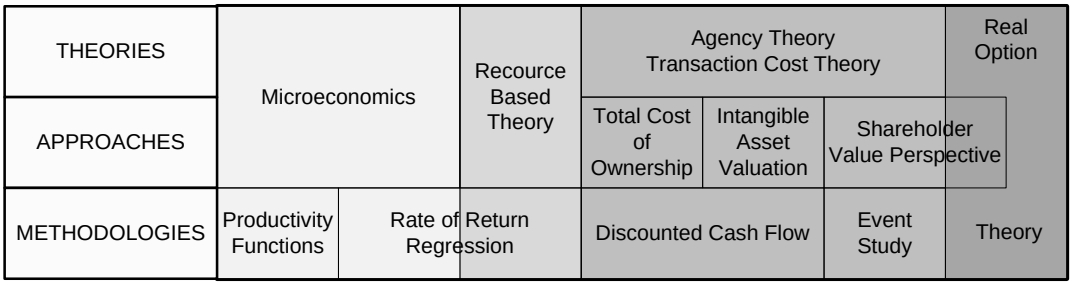

Figure 1: Theories, approaches and methodologies investigating the business value generating potential of IT (enhanced version of an earlier work)

But after the investment decision, the value measurement question remains at least as strong as before, because of the following two reasons: (1) „If you can't measure it you can't manage it!" Effective asset management requires the executives to identify and measure the asset's value ex post, even in the case of the most intangible information technology assets. (Howey, 2004, p. 45.) (2) The international accounting standards now prescribe the capitalization of costs concerning IT-based intangible assets, and proper accounting should be based on proper asset valuation.

Therefore this paper concentrates on ex post IT valuation issues - for demonstrational purposes in a case based manner. The case of a low cost airline's website has been chosen, because this company (and industry) seems to be perfect for illustrating the need for ex post IT valuation. First of all the low cost airline industry has a special business model, where e-commerce is a strategic must, but is also an important competitive tool. Under these circumstances the role of ex post valuation becomes more important. Furthermore our company is a Europe-based limited company with a possible stock exchange entry in the near future. That would mean that the company has to prepare for the IFRS (International Financial Reporting Standards) compliance, which is compulsory for companies present on European stock exchanges from 2005. As part of the IFRS regulation, the "International Accounting Standard (IAS, 2004) 38: Intangible Assets", and one of its interpretation "SIC-32 Intangible Assets" (IFRS, 2002) declare internally built websites as intangible asset. So the correct valuation of this special asset is going to be an accounting must as well.

In Section 2 the theoretical background of financial and accounting valuation will be presented from an IT perspective; and based on this, we will introduce a practical IT business value analysis toolbox in Section 3. Section 4 summarizes the case setting and research methodology. This will be followed by the detailed discussion of the valuation process, followed by the presentation and assessment of results in Section 5. The paper closes with lessons learned in Section 6.

2 Theoretical Background

In this section we compare the discounted cash-flow and real option approaches of IT valuation – but first of all we present the related IT accounting standards as a practical real-life reference point.

The International Accounting Standards Board has a clear view about website-value. The Interpretation, SIC-32: "Intangible Assets – Web Site Costs" (SIC, 2002) refines the original IAS 38 standard (see IFRS, 2004) and clarifies the accounting treatment of internally developed and operating websites. Kevin Stevenson, Chairman of the interpretation committee states that "if an enterprise

applies the Interpretation and the outcome is to recognize the web site as an intangible asset, then unless the web site has an active market and its carrying amount is revalued regularly, the enterprise will need to amortize the expenditure over a short period". (SIC, 2002, p. 1.) The conditions of this treatment are that the intangible asset should be identifiable and controlled by the entity; and the company should demonstrate how its website will generate probable future economic benefits. Promoting and advertising its own products is not a sufficient proof of that, while using website as sales channel would be enough. Even in this case only the application and infrastructure development, and some (not advertising or promotional) part of the graphical design and content development expenses can be recognized in the book value. The IFRS standards allow only historical cost based asset valuation, but there is an opportunity to determine fair market value at the regular revaluation check-points.

In the same time there is a strong worldwide tendency to give more space to future value creation centric methods. The accounting standard mostly used by US companies, FASB (Financial Accounting Standards Board; 2001) Statement No. 142, for example prescribes the intangible asset valuation at fair market value (instead of historical cost), and permits discounted cash-flow method for revaluation purpose. The FASB New Economy Special Report (Upton, 2001, p. 91.) steps even one step further – at least theoretically, – and describes the real option approach as the most promising area of the intangible asset valuation literature. But IFRS accounting standards used by European companies are more cautious and conservative, and still not moving far from the cost approach. (Figure 2 summarizes the different perspectives of accounting and business valuation approaches.)

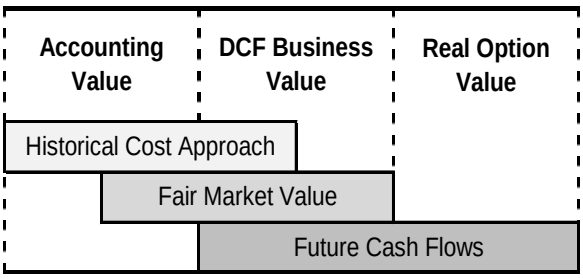

Figure 2: Accounting and Business Valuation Approaches

From a business valuation perspective the discounted cash-flow (DCF) method has significant advantages in comparison to the traditional accounting approach: it considers the investment's (1) whole lifetime, (2) the total spectrum of cash-flows and (3) the cost of capital. While the accounting view is more past-centric, the DCF looks into the future and estimates all the derived future cash-flows, for the whole lifetime of the investment – and in the same time accounts for the time value of money by discounting back to present value. DCF valuation defines cash-flows broader than the accounting view: beyond accounting costs and benefits it also counts with alternative, conditional and intangible costs and benefits. The discount rate used in DCF also represents the alternative cost of capital invested, and also reflects the risk characteristics of the investment as well. (See e.g. Damodaran, 2006)

CF_n: the net cash-flow in period n
r: the (risk-adjusted) cost of capital

$$Present\ value = \sum_{i=1}^{n} \frac{CF_i}{(1+r)^i}$$

Equation 1: Basic Principles of Discounted Cash-Flow Valuation

Usage of DCF-based metrics is a common practice in business life: to measure their IT investments return 47% of companies use internal rate of return and 33% use net present value (Alter, 2006). Still there are some practical and conceptual problems with DCF valuation of IT (Clemons-Weber, 1990; Anandarajan-Wen, 1999, de Jong-Ribbers-van der Zee, 1999):

- The estimation of cash-flows and cost of capital is problematic: the intangible effects of IT are often neglected and the cost of capital is often set unrealistically high because of the presumed extra risks of IT investments.
- The benchmark of the valuation is often the status quo – valuations do not count with change in the strategic position without the technology development.
- DCF is conceptually unable to calculate with the managerial flexibility, the value derived from future decision opportunities.

The last conceptual problem urges IT value researchers to step towards the real option theory. Investment in information technology often opens options to change the scale of the project or carry out follow-up investments, or the management has the option to defer, abandon or stage the investment. (Kumar, 2002; Benaroch et al., 2006, p. 831.) To capture the effect of future uncertainty (which is the main value-driver of these options), researchers propose the application of financial option valuation formulas. Black-Scholes (1973) formula has been used by Benaroch and Kauffman (1999) to value electronic banking investment, or by Taudes et al. (2000) for an SAP version change; while the Cox-Ross-Rubinstein (1979) binomial formula helped Ekström and Björnsson (2003) to calculate a follow-up IT investment's added value.

The real option approach (ROA) complements DCF when the estimation of future cash-flows is difficult thanks to the high level of uncertainty, because that is when the value of an option – of deferring the decision – is the highest. ROA also reverses the risk-aversive approach of DCF (which often causes under-valuation of IT investments): higher uncertainty results in higher option value according to ROA formulas. Still, companies find it hard to deal with the complex mathematic formulas, with the estimation of their input parameters or with the communication of their results, so ROA seems to remain only a qualitative tool for IT management (Alter, 2006). But we strongly believe that real option perspective can compensate DCF's problems (the ignorance of future decision opportunities) effectively in a quantitative manner as well, when the company has to deal with high level uncertainty stemming form one identifiable external source (see also Ekström-Björnsson, 2003). Dai et al. (2000, p. 2.) also argue that ROA is especially suitable for the valuation of IT infrastructure or novel e-commerce solutions. Based on these research experiences, our valuation "toolbox" contains both the DCF and the ROA approach – as complements of each other, just like in the model of Van Putten and MacMillan (2004).

3 IT Business Value Analysis Toolbox

In practice, the analysis of business value generated by a complex IS investment should be carried out using versatile methodology. An IT Business Value Analysis methodology frame should contain the traditional DCF methodology, but extended by the flexibility of real option approach, the techniques assessing the value of intangibles; while market value approach, benchmarking and sensitivity analysis techniques should be used for analytical purposes (See Figure 3):

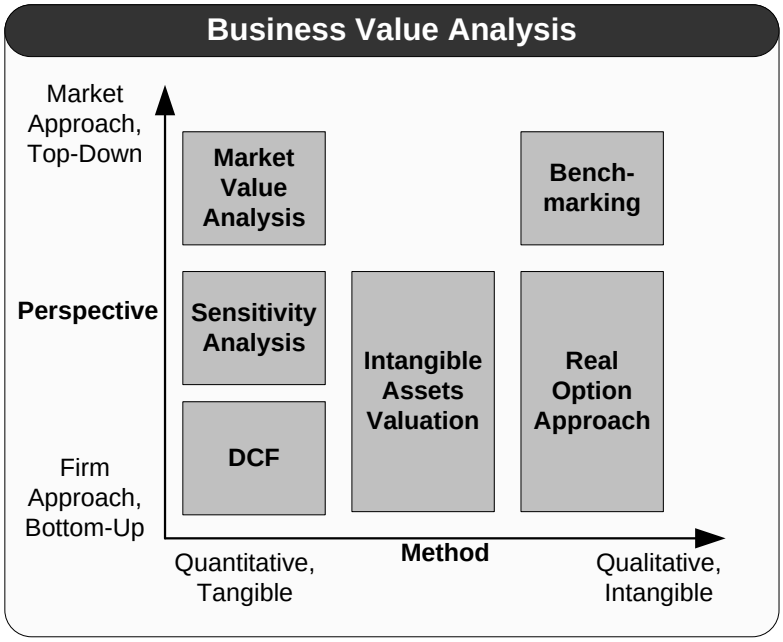

Figure 3: Business Value Analysis Model (partly based on the idea of Thomas, 2001)

- *Benchmarking*. A quantitative and qualitative industry benchmarking should be carried out, concentrating on the identified key value drivers.
- *Market Value Analysis*. Comparing the market value and the book value of the firm we can determine the total value of intangible assets – including the intangible value created by IT as well. (e.g.: Damodaran, 2006)
- *Traditional Discounted Cash-Flow Valuation*. DCF method is used to quantify the key value drivers. (e.g.: Anandarajan – Wen, 1999)
- *Intangible Asset Valuation*. The identification of the indirect cash-flows of an intangible asset assumes the application of special valuation techniques. (See later in details.)
- *Sensitivity Analysis*. Elasticity analysis should be carried out for testing the effect of changes in the main valuation assumptions.
- *Real Option Approach*. Real Option Approach (ROA) can be used to identify and rethink some future opportunities embedded in the IT project. (e.g.: Schwartz – Zozaya-Gorostiza, 2000)

Many strategic investments have benefits that may be difficult to quantify in absolute monetary terms. These intangible benefits represent strategic benefits that are difficult, – sometimes even impossible, – to accurately predict and measure in financial terms. The Financial Accounting Standards Board (FASB, 2001) categorization of intangible assets contains: (1) Marketing-related intangible assets, (2) Customer-related intangible assets, (3) Artistic-related intangible assets, (4) Contract-based intangible assets, and (5) Technology-based

intangible assets. Categories (1), (2) and (5) are important in our case as well. A critical step of the Business Value Analysis is to choose the adequate approach to value these intangible effects. The following list presents a synthesized overview of the techniques available; based on financial theory (Damodaran, 2006), accounting research (Upton, 2001) and audit practice (Deloitte, 2006):

1. Market Methods value intangible assets based on similar market transactions or benchmarks of comparable assets. These methodologies provide the approximation of fair market value, because they rely on evidence from actual market transactions.

2. Income Methods value intangible assets on the basis of the future economic benefits derived from ownership of the asset. The income based valuation of intangible assets has two phases: (1) identification, separation and quantification of cash-flows derived from the intangible asset; and (2) capitalization of these cash-flows using DCF techniques.

3. Cost Methods value intangible assets by assessing either the development or replacement cost of the asset. We can estimate the book value of an asset by looking at what a firm has invested in that asset over time (Capital Invested Method). This is the least subjective method and is based on actual economic events – but it may not be close to the market value of the asset. Another kind of cost method – which is more focused on the value creation potential – is the Alternative Cost Approach. This estimates the value of the asset by calculating the cost of substituting the asset with a different solution.

4 Case Setting

The Low Cost Airline Limited (LCA Co.) is a Europe based company with a less than five years past on this market. As its principal activity the company operates scheduled commercial flights between major European cities. LCA Co. follows the "low cost / low fare" industry model and is aiming to maintain its current position as the leading service provider in its market segment. The company plans to achieve significant organic growth in the coming years to achieve the economy of size required to operate this business model effectively and profitably. As part of the competitive strategy the company works with a flat and narrow organizations structure, uses outsourcing heavily and focuses mainly on core competencies. LCA Co. won several industry awards, and built a strong brand during the past couple of years. The web-based sales model is an industry standard, and it is a strategic must for LCA to use its website as the main communication and distribution channel.

The question of website business value already arose in the organization at the middle management level, so the problem and our research gained executive support soon. As a zero step in the (e)valuation process a website industry benchmarking has been carried out, analyzing the main functions and possible value sources of low cost airline websites. (See the summary in Table 1.) LCA Co. seems to have a well operating, upper-middle quality - but not innovative - website in comparison to other industry players.

Website Value Analysis - Benchmarking						
	LCA Co.	Competitor 1.	Competitor 2.	Competitor 3.	Benchmark Company 1.	Benchmark Company 2.
Brand	strong, slightly over-highlighted	sophisticated, strong	strong, slightly over-highlighted	-	sophisticated, strong	sophisticated
Additional Services	+ insurance and airport transfer	+ insurance, airport transfer, parking and lounge	+ insurance and lounge	basic	+ web-shop	+ gift voucher
Advertisements	bundled services	bundled services, regions	bundled services	bundled services	bundled services	bundled services
Community Building Initiatives	- (extra services with registration, newsletter)	- (extra services with registration, newsletter)	- (newsletter)	-	community site	- (newsletter with registration)

Table 1: Results of Market Analysis – Website Benchmarking

Then, the on-site research went as follows: (1) First, cross-functional workshops were organized to identify the website value drivers. (2) Then the key value drivers were matched with the appropriate valuation techniques from the toolbox. (3) The next step was the data collection for the valuation parameters, based on internal company data and market information research. (4) After completing the calculations (5) the results were analyzed and checked by industry benchmarking.

5 Discussion

First, the cross functional workshop members (financial, accounting, IT, sales, marketing managers and the research team members) identified six key value drivers[1], as listed below:

- The website as a *sales channel*. E-sales is one of the major drivers of the website's current business value thanks to the cost-advantage of this sales channel.
- *Ancillary revenue*. This component is defined as the added value of distribution of related services available through the website, mostly sold by contractual partners.
- The website as an *advertising area*. A currently almost unused but very promising component of the website's value is the realization of free advertising areas.
- *Brand building*. The website plays a significant role in strengthening the company brand.

1 This step is not going to be discussed in a detailed way in this research - not because of the lack of its importance but because of the narrower focus of this paper.

- *Customer database* behind the website. If used for marketing research purposes the database of registered users can represent a significant value.
- Embedded, *technology-based future sales options*. The currently used web-technology of the company would enable LCA Co. to profit from new sales opportunities, like webshop or seat choice system.

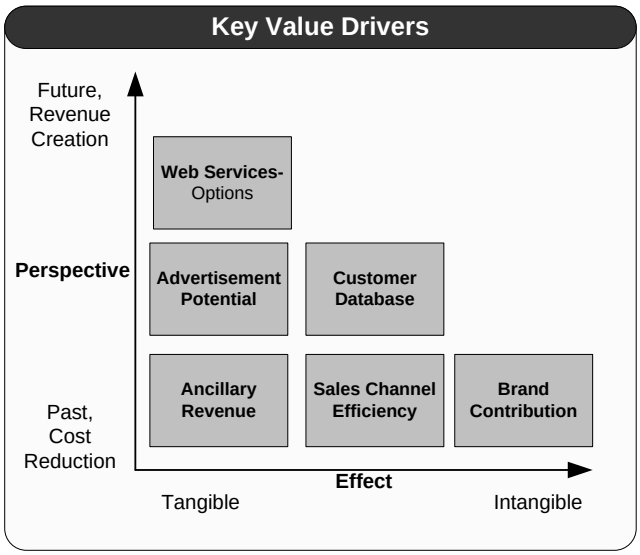

Figure 4: Key Value Drivers of LCA Co.'s website

Some of these value sources have already been exploited in the past, but some of the value drivers are more future-centric, more like value-creation options for the future. Another distinctive feature of the value drivers is their tangibility. Some of the drivers have direct effect on the firm profitability, like ancillary revenue, – some others are more indirect and difficult to capture in financial terms, like brand contribution. (See illustration on Figure 4.)

After systematizing the main characteristics of the different value drivers and using the IT BVA toolbox presented in Section 3 it is already easier to find the appropriate valuation approach for them. In the next paragraphs we will summarize the valuation methods chosen for each value driver, by describing the core approach and the details in parametric manner.

1. Sales Channel Efficiency. Using the website as the base of the online ticket booking system is the common way of sales in the industry. Since the market can be characterized by price competition and the sales price level is quite depressed, the cost level must be kept low. While the online sales channel seems to be an important condition of staying alive in the competition, it should not be forgotten, that the underlying reason for its existence is its cost reduction potential. As an *alternative cost based valuation* method, we compared the cost of web-based sales to the cost of call center sales (in the percentage of sales revenue) and assumed that the difference is what the company could save. The core elasticity driver here is the long term comparative savings percentage.

R_n: Annual ticket sales revenue in year n
P_W: Revenue percentage of web-based sales (base year data)
C_{WV}: (Contract-based) variable costs of web-based booking system (base year data)
C_{WH}: Help desk variable costs of web-based booking system (base year data)
C_{WI}: Internal human resource variable costs of web-based booking system (base year data)
P_C: Revenue percentage of call center based sales (base year data)
C_{CV}: (Contract-based) variable costs of the outsourced call center booking system (base year)
C_{CH}: Help desk variable costs of the outsourced call center booking system (base year data)

Annual alternative cost savings in year n:

$$[(C_{CV} + C_{CH})/(P_C * R_0) - (C_{WV} + C_{WH} + C_{WI})/(P_W * R_0)] * R_n$$

Equation 2: Valuing Sales Channel Efficiency

2. *Ancillary Revenue*. The normal operation of the sales website creates opportunity to sell other travel services to LCA customers. These complementary services (like accommodation, transfer, car rental etc.) are currently offered by contractual partners, LCA only sells them the access to its traveling customers through the website. For this "click-through" opportunity the service providers pay fix amount or percentage fee from the generated revenue – but they do not pay for the advertisement space used on the website. Based on past revenue data and assumptions about the future growth rate it is easy to estimate cash-flows using the direct *income method*. The valuation will be very sensitive to changes in expected growth rate.

AR_0:	Ancillary revenue in base year
G_n:	Expected ancillary revenue annual growth rate (pessimistic assumption: equal to the ticket sales growth rate)
C_L:	Alternative cost of selling banner/placing link on the website ((in percentage of AR; based on banner size and ad market price)
C_A:	Other administrative and development expenses connected (in percentage of AR)

Annual earnings in year n: $AR_0 \prod_{i=1}^{n} G_i * (1 - C_L - C_A)$

Equation 3: Valuing Ancillary Revenue

3. *Advertisement Potential*. While selling ad spaces on the websites is not a common industry practice yet, we still see a significant revenue generating potential in this area. With such a high number of visitors the website's ad spaces have notable market value. LCA Co. could provide online access to a selected and concentrated target group for other travel service providers (as they already made the first steps toward this goal). The front page and the last page of the booking process are the most precious ones from this point of view. As this is also a direct revenue generating value driver, so after carrying out a large market price analysis, it is easy again to estimate cash-flows using the direct *income method*. The results will be sensitive to the assumed number of ad spaced sold.

NF_n:	Number of ad spaces on the front page sold continuously in year n (assumed growing slightly by time)
PF_n:	Market price of front page ad space (corresponding to the number of visitors and page impressions, assumed decreasing slightly by time)
NB_n:	Number of ad spaces on the last booking page sold continuously in year n
PB_n:	Market price of front page ad space (corresponding to the number of visitors and page impressions, assumed decreasing slightly by time)

Annual earnings in year n: $NF_n * PF_n + NB_n * PB_n$

Equation 4: Valuing Advertisement Potential

4. *Brand Contribution*. As LCA Co. is already preparing its books for international accounting standards, so the brand, as an important intangible asset, is already present in the company's balance sheet. The current brand value has been calculated using capitalized discounted future benefits, and so already contains the added effect of the website. Having only some qualitative information about the website's contribution to the brand image we based the calculation on a past-centric *capital invested approach*. As a first step we estimated the alternative costs of the website spaces used for LCA Co.'s self-advertisements and brand items. Then we compared these capitalized costs with

the capitalized (non-electronic) brand building marketing cost of the past years. This – investment based – website contribution ratio was used to calculate the (minimum) share of the website from the given total brand value. The basic assumption of this kind of valuation is that the capitalized marketing expenses are in linear relationship with the brand value.

CM_n: (Non-electronic) brand building marketing costs in year n (calculated for all elapsed years)
CW_n: Website brand building alternative costs in year n (estimated for all elapsed years)
r: nominal cost of capital for LCA Co.
x: years of operation till now
w: website's brand contribution ratio:

$$\sum_{n=1}^{x} CW_n * (1+r)^{x-n} / \sum_{n=1}^{x} (CM_n + CW_n) * (1+r)^{x-n}$$

B: Book value of brand

Website's contribution to brand value: w*B

Equation 5: Valuing Brand Contribution

5. *Customer Database*. Thanks to the website and the online communication with LCA customers the company accumulated a large customer database, which contains e-mail addresses and phone numbers as well as some information about customers' traveling habits. As a lower estimation of the customer database's business value we determined the *cost of an alternative* way to access this number of potential customers: via buying selected e-mail addresses for the same target group from outside partner. (The results will be very sensitive to changes in market value of e-mail addresses.) Here we have to add that the customer database value – just like the brand value – should be detached from the website in the balance sheet, as it is a separate intangible asset.

CU_0: Number of customers receiving newsletters in base year
v: share of valid email addresses
G_n: Expected yearly growth rate of customer database (assumption: equal to the ticket sales number growth rate)
C_e: Alternative cost of "buying" e-mail addresses for a selected target group for one campaign per e-mail
NN: Number of newsletters/campaigns per year

Annual earnings (savings) in year n:

$$CU_0 * v * C_a * NN * \prod_{i=1}^{n} G_i$$

Equation 6: Valuing Customer Database

6. *Technology-based future sales options – Example of Seat Choice System.* The real option theory is not widely used in the corporate life in a quantitative manner – LCA Co. is not an exception itself. The management has been interested in the potential future website-enabled business development options, but they expected this analysis to be fully qualitative. Still, we carried out some experimental valuations for specific options with outside uncertainty factors.

Rf:	riskless discount factor (using the return rate of n month treasury bill)
n:	number of month till expiration of the option (e.g.: 1 year – n=12)
u:	potential monthly upside movement multiplier for customer number (e.g.: if the positive market experience for these kind of new services is monthly +10% than 1.1)
d:	potential monthly downside movement multiplier for customer number (e.g.: if the negative market experience for these kind of new services is monthly -2% than 0.98)
NC:	monthly number of customers in month 0
S:	net profit per customer (revenue per transaction minus variable costs)
AF:	annuity factor for the lifetime of the service
X:	initial investment needed for the service (minimal development costs)

Than the value of the seat reservation system option (based on Cox-Ross formula):

$$C = \frac{1}{Rf^n} \sum_{j=0}^{n} \frac{n!}{j!(n-j)!} * p^j * (1-p)^{n-j} * \max(0, u^j d^{n-j} NC * S * AF - X)$$

Where

$$p = \frac{Rf - d}{u - d}$$

Equation 7: Valuing Seat Reservation System Option

The example of the seat reservation system will be explained in Equation 7. The update of the current website version would offer LCA an option – among others – to introduce a seat reservation system, which would enable the passengers to book the preferred seat on the plane (during the standard electronic ticket reservation process) for an extra fee. Currently this development could be characterized with a negative net present value because of the low adoption rate of the potential customers. But with time this service could be more common in the industry, and the higher number of customers would make this service profitable. If the value of this option (and others, enabled by the new software version) exceeds the cost of the website update, then the investment would be justified. A Cox-Ross binomial formula (Cox et al., 1979) has been used for this option, modeling the monthly revision of the customer adoption rate of the service, which is the key uncertainty factor here.

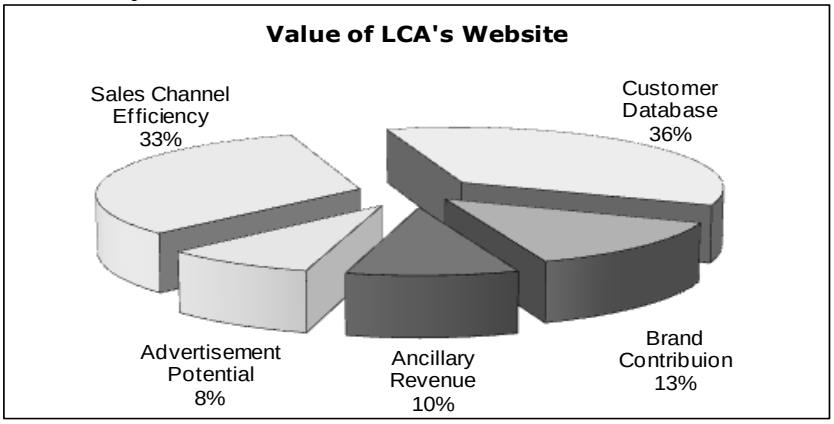

Figure 5: Effects of Different Value Drivers on the Website Value

Figure 5 shows the partial effect of the five different value drivers in the LCA case. This summary does not contain the option value, but shows the effect of the customer database and brand value share, which are separate intangible assets created through the website. Even if we gave a lower estimation for the customer database value it still makes the tierce of the website enabled business value. Another tierce of the total value is created by the sales channel efficiency, which corresponds to the website's role in the business model. The website has also significant direct contribution to the company's (advertisement and ancillary) revenues, but 82% of the total value is created through website enabled, indirect cost savings.

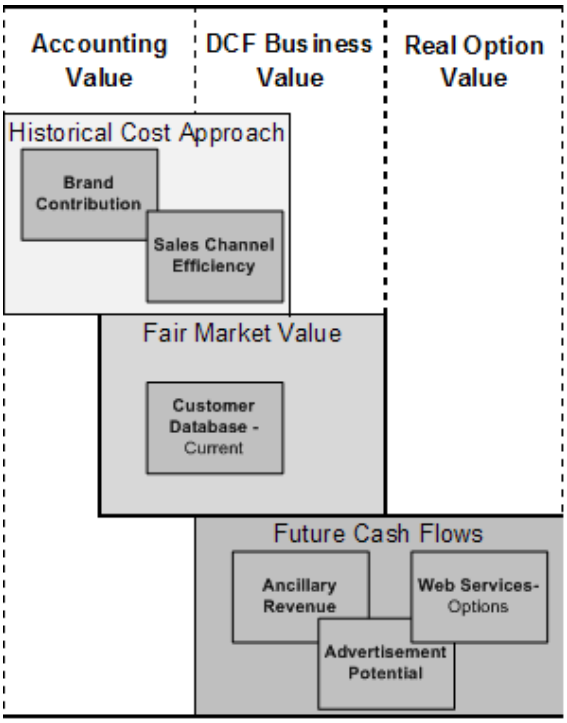

Figure 6: Key Value Drivers and Valuation Approaches

In Figure 6 we also summarized our case from a more theoretic perspective. While we used a cost based approach both in the case of Brand Contribution and Sales Channel Efficiency, the European accounting standards accept only the first one, the invested capital based valuation of brand contribution (and it is already listed in LSA Co's books). The Sales Channel efficiency is the core function of the website in this industry and a basic requirement in the business model – and because of this the balance sheet will have to capture the website value somehow. But IFRS would only accept the capital invested method for valuation. The Customer Database have also been valued by an alternative cost approach, but from accounting perspective the firm should value the customer database first using historical cost approach, but by a revaluation a market value approach similar to our logic could be applied. The direct ancillary and advertisement revenue generating potential of the website satisfies the IFRS criteria of intangible asset, but the DCF calculations can not be used for accounting valuation purposes yet. The web service real options are important pillars of the website business value, but they are not recognized by any accounting approach.

6 Lessons Learned

This paper – and the presented case study – has three important contributions to the IT business value literature. The first is the ex post valuation focus and the demonstration of its importance and relevance under specific circumstances. In the case of LCA Co. the ex ante valuation of information technology investments is important but without a strategic relevance because of the strongly IT based business model. This is also the reason why the ex post valuation gets more important: to manage this important strategic asset it is highly advisable to be able to measure its value-creation.

Another practical contribution of this research is the developed IT Business Value Analysis (BVA) toolbox, which helps company level IT management by summarizing the possible solutions for the measurement issue. This BVA toolbox contains the traditional financial valuation methods and the less widespread intangible specific valuation approaches as well. The toolbox and our case also show that the real option approach can be integrated into the valuation practice and solves the valuation issue of future managerial flexibility.

And the last – but not least – significant contribution of this paper is the introduction of the accounting perspective into the IT value research field. Seeing the current accounting trends, valuation of IT assets is going to be increasingly important issue for the companies. One step toward the solution of this accounting issue is the recognition of differences between accounting and business valuation of IT. While business valuation of intangible IT assets is a strategic management issue, the accounting valuation is becoming a legal compliance issue – two important challenges, with overlapping solutions, just like in the presented case of the Low Cost Airline Company.

References

Alter, A. E., (2006): July 2006 survey: What's the value of IT? At many companies, it's just guesswork, CIOInsight, July 25, 2006, http://www.cioinsight.com/article2/0,1540,1987873,00.asp (10.09.2006)

Anandarajan, A., Wen, H. J. (1999): Evaluation of information technology investment, Management Decision, Vol. 37, No. 4, pp. 329-337.

Barua, A., Kriebel, C.H., Mukhopadhyay, T., (1995): Information technology and business value: An analytic and empirical investigation, Information System Research, Vol. 6, No. 1, pp. 3-23.

Benaroch, M., Kauffman, R. J., (1999): A case for using real options pricing analysis to evaluate information technology investment, Information System Research, Vol. 10, No. 1, pp.70-86.

Benaroch, M., Lichtenstein, Y., Robinson, K., (2006): Real options in information technology risk management: An empirical validation of risk-option relationship, MIS Quarterly, Vol. 30, No. 4, pp. 827-864.

Black, F., Scholes, M., (1973): The pricing of options and corporate liabilities, Journal of Political Economy, Vol. 81, pp. 637-654.

Brynjolfsson, E., Hitt, L. M., (2000): Beyond computation: Information technology, organizational transformation and business performance, Journal of Economic Perspectives, Vol. 14, No. 4, pp. 23-48.

Clemons, E. K., Weber, B. W., (1990): Strategic information technology investments: Guidelines for decision making, Journal of Management Information Systems, Vol. 7, No. 2, pp. 9-28.

Cox, J. C., Ross, S. A., Rubinstein, M., (1979): Option pricing: A simplified approach, Journal of Financial Economics, No. 7, pp. 229-263.

Damodaran, A., (2006): Dealing with intangibles: Valuing brand names, flexibility and patents, http://pages.stern.nyu.edu/~adamodar/ (05.03.2006)

Dai, Q., Kauffman, R.J., March, S.T. (2000): Analyzing Investments in Object-oriented Middleware: An Options Perspective, Working Paper, Carlson School of Management, University of Minnesota

Deloitte, (2006): Valuing intangible assets, What are they really worth? January 2006, http://www.deloitte.com/dtt/cda/doc/content/dtt_ie_intangibleassetsJan06.pdf (25.04.2006)

Dos Santos, B.L. (1991): Justifying Investment in New Information Technologies, Journal of Management Information Systems, Vol. 7, No. 4, pp. 71-89.

Ekström, M. A., Björnsson, H. C., (2003): Evaluating IT investments in construction, Accounting for strategic flexibility, Stanford University, Center for Integrated Facility Engineering, Technical Report No. 136

FASB (Financial Accounting Standards Board), (2001): Summary of Statement No. 142 Goodwill and Other Intangible Assets, Issued 6/01, http://www.fasb.org/st/summary/stsum142.shtml (28.12.2006)

Howey, R. A., (2004): Valuing Technology, Knowledge, Technology, & Policy, Vol. 17, No. 3-4, pp. 44-64.

IASB (International Accounting Standards Board), (2004): IAS 38: Intangible Assets, http://www.iasb.org/NR/rdonlyres/149D67E2-6769-4E8F-976D-6BABEB783D90/0/ias38sum.pdf (15.12.2005)

de Jong, B., Ribbers, P. M. A., van der Zee, H. T. M., (1999): Option pricing for IT valuation: a dead end, Electronic Journal of Information Systems

Evaluation, Vol. 2, No. 1, http://www.ejise.com/volume-2/volume2-issue1/issue1-art1.htm

Kumar, R. L., (2002): Managing risks in IT projects: An option perspective, Information & Management, No. 40, pp. 63-74.

Melville, N., Kraemer, K., Gurbaxani, V. (2004): Review: Information technology and organizational performance: An integrative model of IT business value, MIS Quarterly, Vol. 28, No. 2, pp. 283-322.

van Putten, A. B., MacMillan, I. C. (2004): Making real options really work, Harvard Business Review, December 2004, pp. 134-141.

Oliner, S. D., Sichel, D. E., (1994): Computers and output growth revisited: How big is the puzzle? Brooking Papers on Economic Activity, No. 2, pp. 273-317.

Schwartz, E. S., Zozaya-Gorostiza, C. (2000): Valuation of information technology investments as real options. UCLA Finance Department. Working Paper 6-00.

SIC (Standing Interpretations Committee), (2002): Interpretation SIC-32 Intangible Assets – Web Site Costs, http://www.iasplus.com/pressrel/sic32.pdf (04.01.2006)

Taudes, A., Feurstein, M., Mild, A., (2000): Options Analysis of Software Platform Decisions: A Case Study, MIS Quarterly, Vol. 24, No. 2, pp. 227-243.

Thomas, R., (2001): Business value analysis: Coping with unruly uncertainty, Strategy & Leadership, MSB University Press, Vol. 29, No. 2, pp. 16-23.

Upton, W. S. Jr., (2001): Business and financial reporting, Challenges from the New Economy, Financial Accounting Series, No. 219-A Financial Accounting Standards Board of the Financial Accounting Foundation