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INVESTMENT APPRAISAL PROCESS:
A CASE OF CHEMICAL COMPANIES

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Abstract	This case study examines the capital budgeting practices of two chemical companies. It is found that the companies apply the value management tools to supplement the DCF measures. In addition, the R&D projects are assessed using qualitative methods. Moreover, the study revealed the symptom of a trend shift in the choice of investment appraisal techniques from traditional DCF to the newly crafted value management models.	
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Investment Appraisal Process:
A Case of
Chemical Companies

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Abstract

This case study examines the capital budgeting practices of two chemical companies. It is found that the companies apply the value management tools to supplement the DCF measures. In addition, the R&D projects are assessed using qualitative methods. Moreover, the study revealed the symptom of a trend shift in the choice of investment appraisal techniques from traditional DCF to the newly crafted value management models.

Key words: Investment appraisal, DCF methods, Project, Value Management Techniques, Shareholder Value Analysis

1. Introduction

1.1 Background

The search for a reliable method of project appraisal dates back decades. The issue not only continues to be a matter of concern for academics or managers, but is also becoming more and more important to investors and shareholders of a company. A number of tools are available to determine the extent of profitability of a project (Akalu, 2001; Remer and Nieto, 1995a, 1995b). However, some of these methods are unable to accommodate the current changes in business environment, especially, where increasing shareholder value is of importance. Furthermore, their continuous application reveals significant limitations in their capacity to address the basic problems of investment appraisal (Akalu, 2001, P.379; Dramodaran, 1994; Laitinen, 1997). In addition, some of these methods involve complex decision making processes. Thus, the choice for an appropriate appraisal method is becoming a difficult task for managers, which requires critical analysis of various tools.

Scholars propose various options to solve this basic problem of investment management. The traditional discounted cash flow methods are the most commonly mentioned technique (Arnold and Hatzopoulos, 2000; Graham and Harvey, 2001). In addition, some researchers propose the real option model (Dixit and Pindyck, 1995; Boer, 2000), while others prescribe the value management tools (Rappaport, 1986; Stewart, 1991). However, most of these proposals have got their own demerits. The DCF method is condemned for its inadequacy to appropriately appraise soft projects, such as R&D, which leads the management to select such projects on intuition, experience and rule of thumb (Tam, 1992; Tyrrall, 1998). On the other hand, the Real Option method is found complex, demands enormous computational work and requires additional data for those companies not listed in stock markets (Cheung, 1991). Furthermore, the value management tools, such as the economic value added, are criticized for its inability to measure the shareholder value creation (Fernandez, 2001).

1.2 The Research

The authors are undertaking a series of case studies that describes the practice of project management from appraisal to commissioning. Our goal is to perform an in-depth analysis on the current practice of capital budgeting in selected companies. In particular, we are interested as to how these companies perform investment appraisal, subsequent follow-up and measurement of project success or failure. And to look into the extent of use of the new generation value management models. Finally, it is our hope that the research may reveal the gap, if any, between theory and practice, which may trigger for further research.

The case study focuses on ten companies, which are selected from six industries: Banking & Finance, Chemicals, Oil & Gas, Printing & Publishing, Retails and Utilities; and from two counties, the Netherlands and the United Kingdom. This grouping will enable us to analyze the practice both within and across industry and to review country experiences. For the purpose of investigation, the case analysis is done on firm-by-firm basis, however, reports are produced by industry groupings. In this paper, we present the findings of two companies operating in the Chemical industry.

Since much of the collected information is proprietary, companies prefer to be anonymous. For discussion simplicity, however, we give codes as CH-01 and CH-02 for the two respective Chemical companies.

1.3 The Chemical Industry

Historically chemical companies tended to have a late-cycle nature to their operating momentum caused by volume growth, stronger pricing and low input costs. However, the recent economic cycle don't permit them to continue reaping these late-cycle benefits. Various factors are changed, which makes the old way of doing business unprofitable. For instance, the introduction of supply chain management has weakened the pricing power of companies, which has less impact on smaller purchases.

Hence, there becomes a necessity to device a strategy and technique, for chemical companies, to maintains investor confidence and increases shareholders wealth as the operating environment changes. There are a number of approaches to achieve greater shareholder value, which are often used in chemical industries, such as, the specialty approach, acquisition, restructuring and sale to a strategic buyer (Cohn & Marshbank, 2001). These methods help them to direct their business to change-oriented strategies and, enables companies to increase shareholder value.

A number of companies are moving ahead with this new strategy. For instance, Hercules, Lilly, Dexter, McWhorter, Sybron, Betz Dearborn, Morton International, Lawter, Nalco and Furon have redirected their strategy into value creation (Cohn & Marshbank, 2001, P. 28).

The continuous growth in Chemical industries is partly attributed by chemical research and development (R&D). R&D play a critical role and generate a higher return on investment for such companies. The study by the Council for Chemical Research reports that on average, every dollar invested in chemical R&D today produces $2 in corporate operating income (Hess, 2001). However, some chemical companies regard the R&D cost as an expense rather than part of an investment, which tends to cover the true picture of company's performance (Land, 2001).

In order to measure the profitability of their projects, chemical companies do use various tools. Similar to non-chemical firms, the methods range from traditional techniques to the newly designed value management tools. Since recently, free cash flow (FCF) related measures are also found the most common tools used by many chemical companies. Free cash flow is a method that accounts for capital expenditures and working capital as uses of cash; and adds back the non-cash expenses to net income to get a clear picture of how much actual cash the business has generated from a project.

Measuring FCF gives investors an idea of how companies can fund their project from the cash it generates (Chang, 2001). It is argued that companies lacking positive free cash flows are likely to under perform both their peers and the broader market, in which they are operating (Begleiter, 2001a). The FCF analysis is applied to make decisions on acquisitions, buy back stock, investment in new projects and expansions of the existing infrastructures. This is the beginning of a trend shift in the capital budgeting techniques.

The remaining part of the paper is structured as follows. Section two deals with the method of acquiring data. Section three analyzes the companies investment appraisal process. Section four concludes the case study.

2. Methodology

Data is collected from two sources: face-to-face interview and archives. From the structured outline, interview questionnaires are developed on the following four main themes: company history, investment appraisal process in the company, problems of the standard investment appraisal methods, and on the prospects of other methods, such as, SVA, EVA, etc., as investment appraisal tool.

The above four topics are sent to participant companies, one-week in advance, in order to give enough time for the discussion. The interview took from 90 to 150 minutes with a possible extension of the discussion (via telephone line or e-mail) during case analysis. The whole discussion is tape recorded for further analysis and documentation. In addition, relevant company documents are also collected where available.

The financial data is fetched from the Henley Management College (UK), databases, and RIBES[1] archives, which comprises the published annual accounts and reports. Furthermore, the Datastream is also used for market related information.

In addition, the draft report is sent to the participant companies for comments and further improvements. All suggested comments and improvements are incorporated in this paper.

3. Investment Appraisal

3.1 Introduction

Although not under their current name, the two companies have been in the chemical product manufacturing for more than a Century. As they were in the same business, these companies have been facing very similar category risk of doing business. Furthermore, they have been operating in a similar (European) economic environment.

These companies are the results of long process of restructuring, mergers, acquisitions and takeovers. Hence, their growth and development may trace back to their history. According their historical profile, CH-01 had under gone about 13 mergers and divestment transactions. And CH-02 had passed through more than 50 mergers and divestments.

The companies produce variety of products. Their sales value by product type, for the year ended December 1999, is presented below. As it can be seen from Table 1, both companies have heavy emphasis on specialty products than other product groups.

Table 1
Sales by Product Type (%)

Description	CH-01	CH-02
Speciality Products	35.4	47.4
Paints/Coatings	38.1	29.9
Industrial Chemicals	26.5	22.7

On the other hand, 67.6% and 47.4% respectively for the CH-01 and CH-02 sales are from European countries. Particularly, CH-02 has got more domestic market presence than CH-01, which is only 17.9% (Table 2).

Table 2
Sales by Regions (1999, %)

Description	CH-01	CH-02
Domestic	17.9	28.7
Europe	49.7	18.7
USA & Canada	21.9	27.8
Other Americas	3.9	8.5
Asia /Pacific	4.8	15.5
Other Countries	1.9	0.8

In order to give a bench mark for the discussion, a chemical peer group is formed, with those public listed companies having the same accounting period, operating in Western Europe and with more than $10 billion asset book value. This pool contains twelve companies. The result of the two companies in relation to the performance of their peer group is depicted below.

[1]Rotterdam Institute for Business and Economic Studies.

Table 3
The Median value 1993-1999 ($ billion)

Description	CH-01	CH-02	Peers
Total Assets	11.56	14.71	14.83
Total Liabilities	7.15	8.41	11.66
Net Sales	12.89	14.38	12.93
EAIT[2]	0.71	0.41	0.52

In terms of sales value, CH-02 outperforms CH-01 (Table 3). However, the earning performance of CH-01 is greater than both the CH-02 and the peers. Moreover, CH-02 is having very similar asset size as compared to the peers.

Similarly, if we compare the returns of various accounts against the peers, CH-01 is doing better than the rest of the group and CH-02 (Table 4).

Table 4
Five Year Returns 1995-1999 (%)

Description	CH-01	CH-02	Peers
ROA[3]	7.43	5.37	4.65
ROI[4]	12.28	8.69	8.18
ROE[5]	17.60	90.07	10.99

In addition, growth and the market related performances are computed in relation to the peer (Table 5).

Table 5
Five Year Growth 1995-1999 (%)

Description	CH-01	CH-02	Peers
Growth in Assets	7.61	-5.15	1.15
Growth in Revenue	7.45	-4.79	-1.94
Growth in EAIT	-17.52	6.03	0.07
Growth in MVA[6]	24	46	39.4
Growth in M/B[7]	15	26	13.3
Growth in TSR[8]	62.7	9.6	39.44

Accordingly, CH-01 beats the group and CH-02 with respect to growth in assets and revenue. However, CH-02 is doing better in its EAIT and market performances.

3.2 The Appraisal Process

CH-02 allocates about $373 million annual capital budgets. The maximum project life at CH-02 is about 3 years at an average cost of $14.9 million per project. While CH-01 allocates $800 million, for projects ranging up to 10 years life and each costing an average of $9.42 million.

At the CH-02, the process of project appraisal and approval is decentralised based on the amount of money that a project requires. Hence, the Strategic Business Unit, the Head Quarter, and the Board of Advisers have the authority to approve various types of projects. Similar process of investment appraisal and approval is also performed at CH-01. And it has three ladders of authority. The Business Unit, the Board Committee, and the Board of Management/the Supervisory Board are the authorities to approve projects. The segmentation of authority is also based on the estimated amount of investment outlay required by a project. These companies have formal guidelines of investment appraisal, which includes both safety and health regulations. In each company, projects are checked against respective strategic objectives before an approval.

The prime objective of CH-02 and CH-01 is increasing shareholder value. At CH-02, multiple measures such as profit target, return on net asset (RONA), net contribution to value (NCV) and cash contribution are used to check whether the objective is achieved or not. Of all these methods, CH-02 favours NCV method. The net contribution to value is computed using the following relationship:

$$\text{NCV} = (\text{EAIT}) - \begin{pmatrix}\text{Exceptional} \\ \text{amortisations}\end{pmatrix} - (\text{Capital Charges})$$

[2] Earning After Interest and Taxes
[3] Return on Asset.
[4] Return on Investment.
[5] Return on Equity.
[6] Market Value Added.
[7] Market to Book ratio.
[8] Total Shareholders Return.

On the other hand, CH-01 measures the attainment of its prime objective using the economic value added (EVA).

Project initiation both at CH-02 and CH-01 is continuous. At the CH-02, project appraisal tools vary depending on the size (investment cost) of a project. Larger projects are appraised using IRR and NCV while payback period is used to evaluate smaller ones. Among these methods, CH-02 gives importance to IRR and NCV methods. In case of CH-01, new projects are evaluated using the EVA and the discounted cash flow, particularly the net present value (NPV) method.

In addition to the formal methods, projects of the two companies are thoroughly assessed against "soft constraints" such as, health & safety rules and environment. It is learned that, in some cases, the soft constraints determine the type of project to be chosen irrespective of the value of quantitative methods and profitability figures.

At the CH-02, on going projects are assessed on quarterly basis, by a principle called "review by exception". During this evaluation, data such as cost, time, and schedule, are gathered in addition to technical and environmental reports. However, at CH-01 there is no custom of project progress evaluation, but only periodic reporting. The periodic report contains such data as cost, schedule, budget variances, and technical performances. Furthermore, cost, time or schedule variation is kept between -10% and +10%. If the deviation goes out of this range, it may trigger for reassessment of the project. Such information is not available at CH-02.

The case companies have got R&D projects focusing on commercial applications and new product development respectively for CH-02 and CH-01. During the last ten years (1990-1999), the total R&D investment was $5559 and $6150 million respectively for CH-02 and CH-01.

The two companies apply qualitative tools to analyse the worthiness of their respective R&D projects. According to the discussion, in most situations, even appraising may not be needed, as such projects should be done in order to keep up to the current market situation or government regulations.

CH-02 uses external consultants to assess the degree and size of risk for a project. In addition, the market research and sensitivity analysis, is also done to substantiate the decision making process. The experience at CH-01, however, is to handle risk through a separate department that analyses using both qualitative and quantitative methods. However, no particular risk analysis model is mentioned during the discussion.

At the CH-02, the final risk estimate is added to the cost of capital. The company uses constant discount factor over time and across all projects. CH-01 uses 9% after tax cost of capital for all class of projects and across time.

Project success or failure, at CH-02, is gauged based on the results of various metrics. The result of post implementation review (one year and two years after commissioning for small and large projects respectively) combined with commercial, technical and financial results determine the success or failure of a project. The issue of whether or not a project did add additional values to shareholders is also evaluated during such process. Similarly, at CH-01, project success or failure is also determined at the post implementation review, which is carried out after two years of completion. In most situations the financial measures are dominating the assessment process.

CH-02 believes that the current investment appraisal tools don't provide sufficient assurance on its assumptions, on which the methods are based. Hence, there is still information realisation problem with these methods. In addition, the human dimension (cultural set-ups, employees, etc.), which is not picked up by these methods, will affect the success of a project. CH-01 also forwards similar reasons. Hence, by applying the NCV and EVA methods (CH-02 and CH-01 respectively), these companies expect to bridge the gap created by the traditional investment appraisal methods.

Creating value to shareholders is the vision of CH-02. As a result, it has implemented the measurement of performance using value-based measures such as total shareholders return. Recently, CH-01 has also shifted its strategic measurement methods to one of the value management tools, the EVA.

According to the interview, the respective companies have found that the application of value management tools has got a paramount effect on their business performance. The methods are not only simple to understand and apply, but also give priority to cash flow information.

At the final note of the discussion, the companies have expressed qualities of good investment appraisal based on the problems they faced on the traditional investment appraisal methods. They believes that good investment appraisal tool should provide:

- more option to investment portfolios. That is, more flexibility and dynamism as oppose to the DCF methods, which are static and inflexible.
- a method that will be applied up to post implementation review.
- a room to contain risk and its mitigation methods.
- both necessary and sufficient condition to accept or reject a project.
- transparency; showing the effect of over or under performance including rewards and punishments,
- simple and easy procedure,
- a means to measure the prime objectives at any moment in time.

The summary of the investment appraisal process of the case companies is depicted in Table 6.

Table 6
Summary of the investment appraisal process

Variables	CH-01	CH-02
Project initiation	Continuous	Continuous
Investment decision	Decentralised	Decentralised
Appr. Method - Generic	EVA, NPV	IRR, NCV
Appr. Method - R&D, ICT	No specific model	No specific model
Objectives measurement	EVA	RONA, NCV
Project in progress: metrics	TCS[9]	TCS
Risk analysis method	Qualitative & Quantitative	External analysis
Success criteria	Financial performance	Financial & Technical performance

3.3 Analysis

Similar to many companies, project management is a continuous task in chemical industries as well (Akalu and Turner, 2001). Therefore, project management decision greatly affects the value creation process of the chemical companies. And, this process in tern affects the financial picture of companies (Paul, 1998).

This case study confirms that the NPV and IRR continue to be used as major investment appraisal techniques. The result is similar to the findings of recent research works in capital budgeting (Akalu and Turner, 2001, P.6; Graham and Harvey

[9] Time, Cost and Schedule.

2001; Anrold and Hatzopolous, 2000). However, as oppose to previous findings, the DCF measures are playing a complementary role to value management models.

Although various researches indicate the use of mathematical models, the two companies studied don't apply such models in R&D project evaluation (Hodder and Riggs, 1985; Merino, 1989). This may indicate that either the standard investment appraisal methods don't help the companies to evaluate R&D projects; or since these projects are mostly strategic in nature, the appraisal value may not change the decision to execute such projects.

Value-creating strategies based on value management models, particularly shareholder value analysis, has been practiced in chemical companies (Cohen and Marshbank, 2001, P. 30; Begleiter, 2001b; Chang, 2001). This is an indication of the move from traditional and static metrics to the more flexible models. The use of EVA and NCV by the case study companies, further confirm the increasing use of value management tools to supplement the traditional investment appraisal techniques.

The cases under consideration do report their project-in-progress using time, cost and schedule data. However, there is no evaluation of project in progress, which questions the actual value of the project at the time of the assessment. Time/cost reporting is a routine process at the companies, which is also similar to the case study findings in the banking and finance industry (Akalu and Turner, 2001, P. 5). Although such approach is traditionally taken from the field of civil engineering, the validity of those measurements vis-à-vis the attainment of shareholders value is not certain (Sunde and Lichtenberg, 1995; Singletary, 1996; Fleming and Koppelman, 1996; Barr, 1996).

Despite the absence of explicitly stated type of risk analysis model, the case companies use both qualitative and quantitative tools. One of the companies under study, however, applies external analysis and subcontracting. However, similar to the absence of value creation check up, companies do not review the extent of projected risk while projects are in progress.

4. Discussions

As observed in practice, these companies fail to apply uniform methods from the beginning to the end of the project life cycle. If one uses diverse measurement methods on the various stages of a project, it is very difficult to monitor whether that project adds value to shareholder or not at any point in time. Reconciling the outputs of various models into a single metric value is also another drawback of this approach.

Regular appraisal of project in progress is important to understand the health of the project. The case companies under study don't practice such fundamental control process of value creation. Neither the routine reporting of cost and time, nor the review by exception does substitute the measurement of project progress. We believe that there has to be a check at any point in time against stipulated project value. This approach will protect the company from financing cost overrun and value destroying projects.

The application of constant cost of capital across time and project is contrary to the basic premises of risk and return. As all projects are not having the same risk, the use of linear cost of capital may lead to accept a project that reduces the value of shareholders.

Although subcontracting may reduce cost of handling risk, the company may lose the learning opportunity of project risk analysis for its future.

The basic advantage of DCF is its capacity to incorporate the concept of time value of money. This is pillar to any form of investment as the value of money to day is not the same as tomorrow. However, the use of NCV and EVA are far from incorporating this premise. The models seem to take the accounting information as it is. This will bring us to the problems of accounting measures, which as been dealt extensively by many scholars (Arnold, et al., 1985; Mayfield, 1997; Burton, 1996).

Neglecting appraisal models and turning to the rule thumb methods may certainly mislead the decision making process. It may also endanger the value of shareholders by erroneously accepting projects that do not add value (Gifford, 2001).

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