Engineers and the Cash Flow Puzzle

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Abstract

Most engineering curricula devote little time to the development of financial literacy among engineering students. Many civil and industrial engineers obtain some exposure in an undergraduate engineering economics course but these courses generally focus primarily on the time value of money and the comparison of alternatives based upon discounted cash flow. Even the ubiquitous topic of cash flows due to taxes is deferred until late in the course. Often projects are compared on the basis of pre-tax cash flows and students gain no appreciation for the fact that virtually all real world comparisons must be performed on an after-tax basis. They also encounter financial statements that they have difficulty interpreting, as they have not learned the accounting concepts that underlie their development. In the past decade, accounting standards have required that Cash Flow Statements accompany SEC filings and annual reports. Encouraged by their familiarity with the term "cash flow", students who attempt to interpret these are in for a rude awakening. The construction of the cash flow statement bears little resemblance to what they have learned. The problem lies with the fact that cash flow statements develop historical annual cash flows from operations, financial and investment activity during the year and they, in effect; reverse the results of accrual accounting for operations. Understanding accrual accounting concepts that are seldom taught to engineers is key to comprehending the cash flow statement. This is no affront; even budding accountants struggle to grasp the subject.

Resolving this dilemma, short of enrolling in Accounting 101, appears to be difficult at best. The first obstacle is developing competency in accrual accounting. Fortunately, there are expedient ways to do this. Kulonda[1] presents a rationale and an approach to developing a conceptual understanding in a few class sessions that could be added as a module to many classes. Adding specific coverage of cash flow statements enlarges that by only one session for mature and motivated students. This paper presents the case materials and supporting reference materials to achieve that end. The presentation will focus on using those materials to obtain the desired level of literacy.

Introduction

Teaching financial accounting to engineering managers is a contentious proposition. Those who argue for this content view the material as important and essential in providing a business perspective for engineering students. Those who argue against including accounting courses in the curriculum usually are reluctant to sacrifice the space in the curriculum because of the rapid expansion of technical material in the engineering disciplines. Both arguments have merit, and some compromise is needed. Certainly it is difficult to justify the usual two-course sequence of

financial and managerial accounting usually required in the business school curricula. Even the single combined course offered in some business schools seems too a large price to pay according to many engineering faculty. Since the students usually find the accounting material uninteresting, and in their view, unimportant, they tend to side with the latter faculty group. This creates even more impetus for the technology driven argument to avoid the topic altogether.

The Rationale for Cash Flow Statements

The value of cash flow statements has become increasingly apparent in recent years. Although newer and less comfortable than traditional balance sheets and income statements, awareness has become widespread as more professionals recognize that they shed much light on the financial condition of the enterprise. They help management understand whether their company is generating enough cash to support the capital investment plan. They show whether the cash flow engine (operations) is providing cash to support business expansion. They may suggest the need for additional outside financing. They show whether the company is creditworthy. They are relied on to provide a more secure picture of earnings strength than income statements.

Their connection with a company's ability to fund capital projects is ostensibly the major reason for engineers' interest; however, the connection with cash flow and DCF are reason enough to at least be aware of their existence and use in operating ventures. In entrepreneurial start-ups, the distinction between cash flow statements and cash burn rate analyses is also important. The former is a formal accounting document tied to the accounting system and mandated for all publicly held companies. The latter is a management projection of the future that is based on information developed from the cash flow statement.

Critical Pre-Requisites

In order for students to be able to understand cash flow statements, they must understand the concepts of accrual accounting as distinct from cash accounting. Before they can understand even the most basic cash flow statements, they must obviously understand the following concepts: revenue recognition, matching, depreciation, accruals, receivables, and payables. This is because cash flow statements are usually derived from the income statement by reversing the impact of accrual accounting. The need for matching involves the concept of capitalization of assets. There is no escape. Accounting Fundamentals are fundamental to the operation of a business.

Attaining the Accounting Understanding

One benchmark for the attainment of financial literacy is the popular monograph produced by Merrill Lynch, How to Read A Financial Report [2]. It is available free of charge from Merrill Lynch. Its intent, of course, is to educate potential customers of the investment service and it assumes no prior background in accounting. Its glossary of terms provides a useful guide for the breadth of education required for financial literacy. However, the depth of the required understanding must go beyond glossary definitions. If engineers are to communicate with managers in their company, it is essential that they understand the logic and structure of the accrual accounting process that generates the reported numbers. This brochure takes the

viewpoint of the potential investor and does not cover accounting concepts or the assumptions and accounting principles behind the numbers reported in financial statements.

An alternative learning aid is the note, Primary Financial Statements[3], available from Harvard Business School Publishing. It explains the basic income and Financial Statements and includes a six-page appendix that carefully explains accounting transactions, closing the books, and statement construction. The first 20 pages explain the accounting concepts and the rationale for the various categories of accounts. Although well written, it requires patience for engineers as it is predictably dry and matter of fact in its exposition.

An alternative to these materials is a financial accounting tutorial developed for engineering students at Stevens Institute in New Jersey[4]. It includes seven sessions that cover the gamut of accounting basics and logic through financial statement analysis and comparative ratios. It should generate learning interest as it is interactive, but it focuses more upon "how to do it," with less emphasis on "why we do it."

A more comprehensive way to communicate accounting concepts and why they are important can be developed through the Chemalite[5] case. There, students observe the first and second board meetings or an entrepreneurial start-up, Chemalite, Inc. They observe the first period's results and must resolve a dispute among board members regarding the first period's profit (or lack thereof). They are led to understand the need for accrual accounting, and the difference between capitalizing and expensing an outlay of cash.

Armed with this newly found knowledge of accounting based upon common sense and a set of standard conventions and accounting principles, students are required to take on the task of developing the financial scorecard for the second accounting period. In so doing they are shown quite vividly the difference between cash accounting and accrual accounting and are led to the need for statements of cash flow as the third major accounting report.

Developing the Cash Flow Understanding

Understanding the difference between accrual and cash accounting is the first step in understanding the importance and value of cash flow statements. Once this is accomplished, much headway can be made by having students read the outstanding tutorial article, Solving the Puzzle of the Cash Flow Statement[6]. This article provides a short description of the format and construction of cash flow statements on both a direct and indirect basis. It also outlines a four-step process for analyzing the statements:

1. Scanning the Big Picture… What are the trends in profitability, growth and cash flow?
2. Checking the Cash Flow Engine….Does operations provide enough cash to fund growth and expansion? Or is working capital being drained?
3. Pinpointing Good News/ Bad News….Are there suspicious indicators that co-exist with the up Trends?
4. Putting the Puzzle Together….Does the scenario make sense?

To illustrate the process, the paper applies the four steps to a recent cash flow statement for the Colgate Palmolive Company. It then presents and asks the reader to analyze a fictitious statement with suggested answers provided in the footnotes. Again, this paper does a fine job of developing concepts to be learned without undue emphasis on obtaining precise answers to the mechanics.

A less friendly but more exact (from a pure accounting perspective) resource is Understanding the Statement of Cash Flows[7]. It is probably a more useful reference for instructors than for students as the tutorial meets the objectives for conveying the essential ideas and is much more readable.

The actual learning takes place when students or student teams prepare to discuss a case, Statement of Cash Flows: Three Examples [8] and engage in a class debrief. This case provides three example cash flow statements labeled as alpha, beta, and gamma. Their direction is to read and interpret each and decide whether they would invest in that company. That sounds rather demanding for a first-time reader, and it is. To assist the students in their task, the cash flow analysis form shown in Figure 1 is provided. The format roughly follows the content emphasized in the first three steps of the process and provides students with the security of having some structure to rely upon. An important added assist is to advise the students to analyze the companies in order of gamma first, then beta, and then alpha. Each company is reported in a different format and the line item labeling varies from politely instructive to mercilessly cryptic. The Gamma Company is, of course, the most gentle of the three statements. It almost walks the reader through a statement prepared using the indirect method, the most common format. Beta uses a direct method development augmented by a reconciliation to verify its consistency with the income statement. Finally, the alpha statement appears to have been prepared for experienced accountants but is workable once the pattern is discerned from the other statements.

Class discussion begins with a class debrief of each company in the order suggested. After each company's situation is recorded, students are asked whether they would invest in the company and a big picture is developed as the pieces of the puzzle are put together. After the student vote is recorded, the real identity of the company is identified. The students are amazed to see that their observations quite readily square with the real circumstances once they learn the company identity.

Conclusion

As may be obvious from the sequence of events these are highly interactive sessions where students must prepare ahead of class and learn much of the major lessons by discovery. If this seems heartless, consider the alternative of lecturing this deadly, dull material. For example, the Chemalite case should be taught before any coverage of bookkeeping, debits, credit, T-accounts, etc. This allows the class to focus on the importance of the underlying concepts before attempting to cope with an unfamiliar structure. By focusing on the objective of de-mystifying accounting, student confidence can be built quickly.

CASH FLOW ANALYSIS FOR _____

	1991	1990	1989
Sources of cash **Uses of cash**			
CFO vs. NI			
CFO vs. Capex			
CFO vs. Capex and dividends			
How is excess cash invested			
If no excess cash, how are capex and div's funded?			
Working capital accounts sources of cash or users of cash?			
Trend: NI			
Trend: CFO			
Trend: Capex			
Trend: divs			
Trend: net borrowing			
Trend: Working cap			

Figure 1. Cash Flow Analysis Form

BIBLIOGRAPHY

[1] Kulonda, Dennis, "Graduate Engineering Economics for Engineering Managers" Annual Conference and Exposition Proceedings ASEE Montreal, Canada. June 2002
[2] Merrill Lynch, How to Read A Financial Report
[3] Primary Financial Statements, Harvard Business School Publishing, 9-197-178
[4] Evaluating the Effectiveness of Computer Tutorials Versus Traditional Learning, Journal of Engineering Education, Merino, Donald and Abel, Kate, Vol.92, No.2, April 2003
[5] Chemalite, Inc. Harvard Business School Publishing, 9-177-078
[6] Morganstern, Julie H and Sharon M. McKinnon, Solving the Puzzle of the Cash Flow Statement, Business Horizons, January-February 1997
[7] Understanding the Statement of Cash Flows, Harvard Business School Publishing, 9-193-027
[8] Statement of Cash Flows: Three Examples, Harvard Business School Publishing, 9-193-103

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