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Evaluating Tangible Asset Investments: The Value of Cross Functional Teams

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In recent years, there has been increasing criticism of the short term orientation of corporate decision makers. Much of the criticism is directed at the types of measures used to evaluate management performance.

Traditionally, functional units within the organisation have been evaluated using criteria directly influenced by their function. For example, advertising effectiveness is frequently evaluated on the basis of accomplishing communication or sales objectives, marketing on the basis of sales or market share objectives, production on the basis of units produced or per unit cost of production, and finance evaluated on the basis of cost of capital objectives.

A problem with many of these evaluative measures is that they tend to be short term, tactical outcomes that are easily manipulated and not necessarily complimentary of one another. For example, production may lower per unit production costs by using inferior quality materials, however, marketing and sales may not be able to sell the product because it is perceived as an inferior product by the marketplace. Marketing measures of success may not be compatible with finance and/or accounting measures of success and vice versa. Furthermore, functional area success measures may not relate to performance objectives for the organisation. If functional unit objectives are not complementary to one another, the organisation by definition, achieves less than optimal performance as one functional unit attempts to optimise its outcomes potentially at the expense of another functional area's outcomes. Outcome conflict between functional areas exists because of management's decision to evaluate functional units on the basis of outcomes from activities they control, not outcomes from activities beyond their control. This managerial approach may be defensible at a functional level in some instances, however, it may lead to achieving less than optimal organisation performance.

Since asset investment decisions have accounting, financial and marketing implications, accounting, finance and marketing managers should consider the interdependence of their decisions. While the accounting model of the firm focuses on how an asset is expensed, the marketing model of the firm is primarily concerned with sales and market share, and the finance model focuses on increasing shareholder value (Stewart, 1991). These investment evaluation views may be inconsistent, leading managers to make decisions that optimise outcomes from a functional point of view, but achieving less than optimal outcomes for the organisation. This article illustrates the importance of cross functional teams for making better asset investment decisions.

Much of the difficulty in evaluating the contribution of asset investments revolves around the somewhat unique attributes of some asset investments, particularly intangible assets. Examples of intangible assets include: copyrights, patents,

brand names and goodwill. Current accounting practice recognises the long term benefits of these intangible assets, as they are capitalised and amortised over their useful life. Advertising and R&D also have long-term benefits, however, they are not recognised as intangible assets according to current accounting practice because it is difficult to measure their long-term benefits. This article looks at the true nature of the investment decision and ignores the measurement issue. Using this assumption we investigate how firms might evaluate investments in two intangible assets, advertising and R&D, using functional and cross functional teams.

Because the long term benefit of advertising expenditures cannot be measured with adequate precision, advertising expenditures are treated as single period expenses (Tanenbaum, 1993). At the same time, numerous studies have indicated that advertising expenditures have a long term influence (Dhalla, 1976; Hirschey and Weygandt, 1985; Jones, 1995; and White and Miles, 1996) on marketing outcomes ranging from brand equity (Keller, 1993; Laforet and Saunders, 1994; and Cobb-Walgren, Ruble and Donthu, 1995) to sales (Asmus, Farley and Lehmann, 1984; Broadbent, 1993). Since advertising does appear to have a multiple period benefit to the organisation, White and Miles (1996) correctly state that "the treatment of advertising as an expense is not congruent with financial theory."

Unfortunately, the multiple period benefit measurement problem is frequently compounded by the way in which advertising effectiveness is evaluated by the organisation. Two of the most common advertising effectiveness measures, market share and sales are single period measure and are only indirectly linked to profit and firm value. Single period measures fail to capture advertising's multiple period benefits and may actually provide misinformation to the marketing manager.

Evaluating the contribution of R&D expenditures is no less difficult than and somewhat parallel to advertising's contribution to the organisation. Long term benefits from R&D expenditures are not easily measured, therefore R&D expenditures are treated as single period expenses (Hirschey and Weygandt, 1985; Stewart, 1991; Chauvin and Hirschey, 1993). Development of more efficient production processes and improved products obviously have long term and multiple period benefits to an organisation. Two common measures of R&D effectiveness, number of innovations and cost per innovation are not particularly helpful (Acts and Audretsch, 1988; Ayadi, Dufrene and Obi, 1996). Number of innovations as a success factor does not account for issues like the cost of, demand for and future cash flows from the innovation. Cost per innovation as a success measure does not address the demand for and future cash flows from the innovation. If per unit cost is greater than the projected price at a given level of demand, then future cash flows are negative which is clearly an undesirable situation for a firm. Using either R&D success measure does not ensure optimal investment decisions by the organisation.

Market value based measures may be more appropriate for evaluating the benefit of intangible asset investment decisions to the firm than functional area measures. Market value based measures, as opposed to accounting, R&D, and marketing based measures, account for the long term influences of intangible asset investments, consistent with the belief in the carryover effects of advertising and R&D expenditures from one period to another period.

The purpose of this article is to illustrate the conflicting nature of investments in intangible assets when investment decisions are made by strictly functional versus cross functional teams. Specifically, this article will examine the influence of advertising and R&D expenditures on accounting, financial and marketing indicators of firm performance. The article continues with a discussion of the accounting, economic and marketing models of the firm followed by a description of the data and research method. The article finishes with a presentation of the conclusions and recommendations, and directions for future research.

The Accounting and Economic Models of the Firm

Labelled as "today's hottest financial idea" by *Fortune* magazine (Tully, 1993), economic value-added (EVA™) calls into question the fundamental differences between the accounting and economic models of the firm. The accounting model of the firm (Stewart, 1991) suggests that investors capitalise earnings at an appropriate price/earnings multiple. Therefore, according to the accounting model of the firm, the income statement and the balance sheet both play an important role in the valuation process. Whether an item is expensed on the income statement or capitalised on the balance sheet is critically important to determining value with the accounting model of the firm. For example, an item capitalised on the balance sheet will avoid a decrease in earnings, even though this expenditure is associated with a cash outflow.

Stewart (1991) criticises the accounting model of the firm and suggests that earnings should be abandoned as the basis for making decisions. Stewart points to the accounting treatment of research and development as an example of the problems associated with the accounting model of the firm. Accountants expense this item on the income statement, implying that the value received from R&D is received during the period incurred. But as Stewart and others have pointed out, the value of a firm's investment in research and development is realised beyond the year of expenditure and is capitalised by the equity markets (Chauvin and Hirschey, 1993). Others also criticise accounting income on the grounds that it may offer a distorted view of the firm (Watts, 1986; Wernerfelt and Montgomery, 1988). As Watts (1986) suggests,

The rise of modern finance has caused some accountants to revise their thinking about the accounting profession: its achievements, its limitations, and more pointedly, its fundamental purpose.

On the other hand, the economic model of the firm (Stewart, 1991) suggests that value is determined by sources and uses of cash. With the economic model of the firm, capitalising an item on the balance sheet or expensing the item on the income statement is not critically important to the economic value of the firm. The focus is on cash generated by the entity and the riskiness of the cash flow stream.

The marketing model of the firm, an alternate model to the accounting and economic models, typically focuses on increasing sales or market share. Therefore the effectiveness of marketing expenditures such as advertising or promotions may be evaluated by examining the impact of the marketing activity on sales or market share. Like the economic model, the capitalisation of an item on the balance sheet or income statement is not critically important to marketing decisions.

Advertising and R&D expenditures provide researchers with a unique opportunity to examine managerial implications of the accounting, economic and marketing models of the firm. This issue is of interest to both marketers and financial economists. For marketers, the traditional question is whether advertising positively impacts sales. Financial economists are more concerned with how to best measure the impact of managerial decisions, such as R&D expenditures, and whether these expenditures deliver value to shareholders. The next section describes the data used in the research study.

Data Description

Financial data were accessed from the Compustat PC Plus database. The database was screened for firms that consistently reported advertising and R&D expenditures from 1986 to 1995. This screening procedure resulted in 126 firms. Dependent and independent variables are constructed from accounting and market data collected for each year over the ten year period.

This study uses Tobin's q as the market value-based measure of firm performance, return on investment (ROI) as the accounting-based measure of performance, and sales as the marketing-based measure of performance. We use the approximation to Tobin's q recently proposed by Chung and Pruitt (1994). The approximation to q is defined as follows:

$$q = (MVE + PS + (CA - CL) + LT DEBT) / TA$$

where,

MVE	= market value of equity at fiscal year end.
PS	= market value of outstanding preferred stock at fiscal year end.
CA	= short-term assets.
CL	= short-term liabilities.
LT DEBT	= long term debt.
TA	= book value of total assets of the firm.

Evidence by Chung and Pruitt shows that the approximation to Tobin's q can explain more than 96% of the total variability of the traditional q suggested by Lindenberg and Ross (1981).

Although research has shown that accounting measures of performance are flawed (Watts, 1986; Weston and Brigham, 1993; Wernerfelt and Montgomery, 1988), surveys and financial studies indicate that these measures are the most frequently employed performance measures (Mechlin and Berg, 1980; Watts, 1986; Obi, 1994). We use ROI reported by Compustat PC Plus. We select return on investment over return on equity due to the capital structure biases inherent in return on equity. For example, a firm's ROE may be inflated by the firm's reliance on debt financing. Although additional debt increases the financial risk of stockholders, a higher ROE may be falsely attributed to advertising or R&D expenditures, when in fact the higher ROE is due to financial leverage.

Since the focus of the analysis is to measure the impact of advertising and R&D expenditures on firm performance, it is necessary to control for other predictors of firm performance: cash flow, growth, risk, and market share. Finance theory proposes that the value of an asset is a function of the magnitude of cash flows, the growth of cash flows, and the riskiness of the cash flow stream. Chauvin and Hirschey (1993) use current cash flow as a predictor of the firm's ability to generate future cash flows. We measure cash flow as operating income before depreciation, depletion and amortisation minus interest expense, taxes, preferred dividends and common dividends (Lehn and Poulsen, 1989). Growth is measured as the least-squares estimate of the 10 year growth rate in sales for each firm. Risk is measured as the logarithm of the ratio of the 52-week high and low stock price for each firm (Chauvin and Hirschey, 1993). Finally, market share is included as an additional determinant of firm performance. Thomadakis (1977) suggests that market share impacts value because of the market-dominating firm's ability to earn economic rents. We define market share as total revenue of the firm expressed as a percentage of the firm's primary four-digit SIC industry sales.

Analysis

Regression analysis is used to examine the impact of advertising, R&D and other explanatory variables on market value, accounting profitability, and sales. The following models are estimated using ordinary least squares regression. In the four models the independent variables are assumed to have a linear relationship with the dependent variable. Significance of the beta coefficients identified the significance of the independent variables in the specified model. Adjusted R-squared values assess the ability of the independent variables to explain the variance of the dependent variable.

$$\text{Tobin's } q = f(\text{Advertising, Cash flow, Market share, R\&D, Risk, Growth}) \quad (1)$$

$$\text{ROI} = f(\text{Advertising, Cash flow, Market share, R\&D, Risk, Growth}) \quad (2)$$

$$\text{Sales} = f(\text{Advertising expenditures, R\&D expenditures}) \quad (3)$$

$$\text{Tobin's } q = f(\text{Sales}) \quad (4)$$

Where:

Advertising = Current year advertising expenditures as a percent of current year sales.

Cash flow = Cash flow as a percent of current year sales.

Market share = Current year firm sales as a percent of current year industry sales.

R&D = Current year R&D expenditures as a percent of current year sales.

Risk = Logarithm of the ratio of the 52 week high and low stock price.

Growth = Ten year least squares growth rate of sales.

Sales = Current year sales.



Discussion

Results of this study indicate that the effects of R&D expenditures are captured primarily through the market value-based measure of Tobin's q (Table 2). Effects of advertising expenditures are captured through ROI, an accounting based measure of performance (Table 3) not the market value-based measure of performance (Table 2). Cross functional teams should measure the success of asset investments with market value-based measures such as Tobin's q because these investments directly impact a firm's market value. On the other hand, functional area (e.g. ROI or Sales) performance measures fail to capture the value-added effects of all intangible asset investments (Table 3). As a result, firms or functional teams that use accounting-based measures such as ROI to evaluate asset investment decisions may fail to measure the positive effects of some intangible asset investments. Cross functional teams may be more likely to recognise the positive effect of intangible asset investments on firm value.

Results of the influence of advertising and R&D expenditures on sales at the firm level (Table 4) are consistent with the marketing and new product development literature that show a positive effect of advertising and R&D expenditures on sales (among others, anonymous 1978, Clarke, 1976). However, the positive and direct impact of sales on financial firm performance measures is not sustained (Table 5). This result supports the notion that increasing firm revenues does not automatically translate into increased firm value. Marketing managers and R&D directors should be particularly aware of the relationship between return on capital expenditures and the cost of capital. Advertising and R&D expenditures should be used by managers and asset investment decision teams to increase stockholder value.

Our results are consistent with the finance literature on firm performance measures (Ayadi, Dufrene, and Obi, 1996; Landsman and Shapiro, 1995; Chung and Pruitt, 1994). Since a firm's investment in advertising or R&D can be viewed as an intangible asset with payoff implications beyond the year of expenditure, traditional accounting-based measures fail to capture the contribution to firm value of a company's R&D expenditures. Our results lend additional support to the use of market value-based measures such as Tobin's q to correctly assess the impact of asset investments, such as advertising and R&D, with multiple period benefits. The evidence shows that accounting-based measures, which are based on ex post financial data, fail to capture the ex ante economic value of certain marketing investments.

Furthermore, we provide evidence consistent with the marketing literature that shows a positive relationship between sales, and advertising and R&D. However, using the same data set, we demonstrate that sales has a negative impact on market value as measured by Tobin's q . Hence, the use of sales as a performance measure by functional teams, such as marketers evaluating advertising effectiveness, may not be warranted. Advertising and R&D expenditures may increase sales, just as capital allocations often increase earnings. However, the more fundamental question is whether any capital allocation, advertising and R&D in this case, increases value. Our results suggest that R&D expenditures make a positive contribution to firm value.

Results of this study support the use of cross functional teams in evaluating intangible asset investments. A cross functional team may be more likely to make a firm optimising decision about advertising and R&D investments. A functional team using only an accounting based performance measure may have failed to make a firm optimising decision. Functional teams using marketing-based performance measures may also be less likely to make an investment decision that would increase shareholder value than a cross functional team.

Advertising

The empirical results support the use of market value-based measures to evaluate the effectiveness of a firm's advertising strategy. The advertising variable is insignificant and positive in the market value-based model and significant and positive in the accounting-based and marketing-based models. This suggests that advertising investment decisions made by marketers or a team of marketers and accountants may make decisions that do not significantly increase shareholder value. Therefore, the addition of an individual from finance on a cross functional team may lead to more optimal investment decisions.

In addition, we offer results that are consistent with much of the marketing literature on the relationship between advertising and sales. The results indicate that advertising positively impacts sales, the marketing-based measure of performance.

However, the advertising objective of increasing sales may fail to capture the true costs or benefits associated with an increasing advertising expenditure strategy. A separate regression (Table 5) shows that sales has a negative impact on market value. This indicates that increasing sales alone does not create value. Value is created when the return on invested capital exceeds the cost of capital employed. This further emphasises the need to evaluate marketing decisions with cross functional teams.

R&D Expenditures

Results support the use of market value-based measures to evaluate investments in R&D. R&D expenditures are significant and positive predictors in the market value-based and marketing-based model and insignificant and negative in the accounting-based model. This suggests that accounting-based performance measures fail to capture the multiple period benefits from investments in R&D. Additionally, results show a positive relation between R&D expenditures and sales, consistent with the marketing and new product development literature.

However, if R&D investment decisions were left to a functional team using ROI or sales as the single indicator of investment performance, sub-optimal firm decisions may occur. An investment analysis team with individuals from marketing, accounting, and finance may be more likely to make a decision that would increase shareholder value than a team comprised only of accountants or marketers.

Market Share

The market share variable is negative and statistically significant in the market value-based model. While this result may be counter intuitive, the explanation is consistent with finance theory and is an important contribution to finance and marketing research. The goal of financial management is to maximise shareholder value; while marketers are typically concerned with the impact of decisions on market share or sales. While the premise of shareholder wealth maximisation can be consistent with increasing market share, the two are not mutually exclusive. Companies may increase market share by simply investing capital. However, as finance theory predicts, value is destroyed if the return on invested capital does not exceed the cost of capital. Although the firm may not earn the cost of capital on capital expenditures, it is quite likely that an investment of capital often results in increased sales and subsequent market share gains. While increasing sales or market share is frequently mentioned as a performance measure of marketers, achieving this objective can also destroy shareholder value. The results from the ROI model show that market share is not a significant predictor of return on investment.

Risk, Growth, and Cash Flow

In the market value-based model, the effect of risk is negative and statistically significant. This finding is consistent with *a priori* expectations. Finance theory predicts a negative relationship between risk and value. As risk of cash flows increases, the value of the underlying asset decreases. Investors discount the value of high risk firms in order to realise the higher required rates of return. Growth is significant in the market value-based model. As previous research indicates, the value of the firm is largely derived more from growth in future investment opportunities (Woolridge, 1993). Hence, this may explain the lack of significance for the cash flow variable.

In the ROI model, advertising, risk and growth are significant predictors of return on investment. The growth variable is positive and significant, indicating that high growth firms are more profitable and therefore generate higher returns. The significant negative relationship between risk and ROI demonstrates one of the problems with accounting-based measures of performance. Although risk is significant and negative, no logical explanation can be found since these accounting-based measures should not be sensitive to risk.

Conclusion

This study demonstrates more optimal investment decisions may be made by cross functional teams. Cross functional teams may use multiple measures of investment performance, increasing the likelihood of investments that positively increase shareholder value. Results show neither, market value-based, marketing-based or accounting-based measure of performance capture the multi-period benefits from intangible asset investment decisions. Advertising and R&D expenditures may be viewed as an intangible asset with payoff implications beyond the year incurred. Therefore, the market should appropriately capitalise advertising and R&D, and assess its impact on the market value of the firm. To the contrary, accounting-based measures are historical in nature and may fail to capture the future benefits of investments in tangible and intangible assets.

This study also shows the inherent problems of using increased sales or market share as the basis for evaluating advertising effectiveness. Increasing sales or market share may be acceptable to assess the immediate impact of advertising, but a more fundamental question is whether these expenditures deliver value to the shareholders. The results show that market share, an objective often mentioned by marketers, is negatively related to market value. Consistent with this finding, we also find that sales has a significant and negative impact on Tobin's q, highlighting the potential pitfalls in using sales or market share as a performance measure of asset investment decisions.

Future research should be directed at investigating the decision making processes of cross functional teams. Additional effort should be expended to gain insight into the resolution of conflicts between success measures of functional managers in cross function teams. Knowledge of the existence and use of cross functional teams is another fruitful area for research.

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Table 1: Descriptive Statistics

<i>Variable</i>	<i>Median</i>	<i>Mean</i>	<i>Standard Deviation</i>
Advertising as a percent of sales	0.03	0.05	0.08
Cash flow as a percent of sales	0.05	32.57	1340.30
Growth	9.00	12.70	28.45
Market share	0.19	0.30	0.30
Tobin's Q	1.43	1.72	1.11
R&D as a percent of sales	0.02	0.04	0.11
Risk	0.25	0.30	0.19
ROI	7.80	2.60	63.25
Sales (in millions)	304.44	3683.24	12743.99
Total Assets (in millions)	208.76	3713.22	17190.95

Table 2: Regression Results of Tobin's q on Advertising, Cash flow, Growth, Market share and Risk

<i>Variable</i>	<i>Beta Coefficient</i>	<i>Standardised Beta Coefficient</i>	<i>Significance</i>
Advertising as a percent of sales	0.6787	0.0563	0.0778
Cash flow as a percent of sales	-0.0001	-0.0023	0.9348
Growth	0.0140	0.3256	0.0000
Market share	-0.2168	-0.0607	0.0402
R&D as a percent of sales	1.9218	0.1888	0.0000
Risk	-0.5080	-0.0841	0.0045
Adjusted R-Squared	0.1539		

Table 3: Regression Results of ROI on Advertising, Cash flow, Growth, Market share, R&D and Risk

<i>Variable</i>	<i>Beta Coefficient</i>	<i>Standardised Beta Coefficient</i>	<i>Significance</i>
Advertising as a percent of sales	61.7300	0.0781	0.0170
Cash flow as a percent of sales	0.0310	0.0128	0.6615
Growth	0.2537	0.0903	0.0021
Market share	-0.3329	-0.0014	0.9621
R&D as a percent of sales	-42.4758	-0.0639	0.0535
Risk	-97.3760	-0.2474	0.0000
Adjusted R-Squared	0.0676		

<i>Variable</i>	<i>Beta Coefficient</i>	<i>Standardised Beta Coefficient</i>	<i>Significance</i>
Advertising Expenditures	8.2671	0.2282	0.0000
R&D Expenditures	18.1725	0.7926	0.0000
Adjusted R-Squared	0.9265		

<i>Variable</i>	<i>Beta Coefficient</i>	<i>Standardised Beta Coefficient</i>	<i>Significance</i>
Sales	-0.0001	-0.1022	0.0000
Adjusted R-Squared	0.0099		