# New Perspectives on Impact of R&D on Corporate Profitability

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**ABSTRACT**

*There is a significant ever-growing controversy about the role of R&D in the corporate decision-making structure for the US markets. R&D results have been found to be lack-luster creating erosion of trust in the value of R&D in American corporate world. This study sheds light on the relationship between R&D expenses and corporate profitability. It investigates the direct impact of R&D expenses across industries and found that the results were statistically significant. However, they were not consistent in the direction. The study suggest remedies in the current US accounting standards to properly account for measuring the impact of R&D expenses on corporate profitability. Capitalization of R&D expenses was suggested as an alternative method.*

***Keywords:*** *R&D, Marketing, Technology/Research Management, Innovations, Current and Future corporate profitability*

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## INTRODUCTION

The role of R&D and Marketing is generally recognized as primary catalyst fueling the competitive growth, economic stability and future profitability of the corporate world (Porter, 1990; Smith and Barfield, 1996). Similarly it is generally acknowledged that the organized R&D especially when it is done with proper interface with the Marketing professionals to ensure customer centric focus is an integral component of continued competitive advantage for both the technology based and other industrial based companies (Porter 1985). Since the 1980s, the traditional model of non-revenue generating R&D has been giving way to a fully integrated R&D function that focusses on customer-centric and revenue generating function and is a central part of the corporate and business strategy (Iansiti, 1997).

From a broader economic and life-style point of view, many authors such as Greg Ip (2017) concur that even though there are more scientists and engineers in the US than ever before and the R&D as a share of the gross domestic product (GDP) is near an all-time high, this has unfortunately not translated into meaningful advances in American standard of living. Ip (2017) exemplifies this trend by stating that houses, appliances and cars look much like they did a generation ago and airplanes fly no faster than they did in 1960s. Even in the field of pharmaceuticals, none of the 20 most prescribed drugs in the US came to the market in the recent past decade. Hence, American standard of living and economic growth has stagnated since 2000. Coupled with economic downturns, increasing regulations and government laws have further raised the bar for commercializing new ideas. Apart from information technology, the hurdles to innovations and technology are getting higher and it is especially much more evident in medicine.

Ip (2017) suggests that the time has probably come when the US may have to copy ideas from China and India where R&D is thriving and the results are much more pronounced especially with lower costs. However, Ip (2017) cautions regulators to be more tolerant of risks that may come with copying R&D results from other countries.

This study addresses the question about innovation and its impact on the welfare of the American society by using R&D and profitability of the companies as proxy variables. The results of this study are significant in that they highlight the relationship between innovation or lack thereof with overall growth of the companies and their consequent effect on the society.

## ITERATURE REVIEW

Even though R&D function receives a lot of attention in the corporate structure and corporate strategy, many companies and senior executives are frequently frustrated by their failure to convert creative innovation into shareholder returns (Chantal de Moerloose, 2000). As a result, many companies feel compelled to launch strings of new products in the hope that by the law of averages, a certain percentage will someday become winners. However, Moerloose (2000) suggests a number of steps that companies could take to improve the process of R&D and innovation rather than relying on the "hit or miss" perspective held by some companies. Moerloose classified success factors for R&D into five categories: (1) Macro factors consisting of market attractiveness and competitive environment; (2) Synergy factors consisting of technological know-how and commercial synergy; (3) Organizational factors such as top management support, Champion support and open organizational culture; (4) Development process factors such as understanding and fulfilling customer needs, technical and market tests and launching capability of marketing, and (5) Results containing successful superior value creation and financial success.

The bottom line factor in majority of research recently has been on the financial success of the R&D. In the past, R&D has sometimes been protected from the close scrutiny that other functional areas such as manufacturing have endured largely because of the fuzziness about what constitutes "good R&D results" and also because opaque work processes complicate measuring R&D productivity (Singarayar, 2009). This fuzziness about "return on R&D investment" or "return on equity improvement due to R&D" is raising concerns in many industries. Ringel, Tollman, Hersch and Schulze (2013) report a large variety of industries across various parts of the world where the results of R&D have had been inconsistent such pharmaceutical companies and technology based companies where the success of the companies are heavily dependent on R&D. Ringel et al (2013) wondered if the size of the R&D matters or there might other factors that could potentially lead to more consistent results in addition to R&D expenditures.

In their analysis, Danielson and Press (2005) report significant distortion by R&D expenses in the profitability estimates in a variety of companies from different industries. They suggested a new way to adjust accounting based performance measures for R&D costs and introduced a modified model for Internal Rate of Return (IRR) estimation to remove distortion in the data.

One of the major controversies that is around in accounting and finance literatures stems from the period of impact that R&D expenses ought to be visible. Majority of studies (Danielson and Press, 2005; Ball and Kothari, 1991; Chan, Lakonishok and Sougiannis, 2001) analyzed the impact of current R&D expenses on the return on investment for the same financial year and speculated about future earnings and/or earning announcements.

Ali, Ciftci and Cready (2012) report significant market underestimation of the implications of the R&D expenses for future earnings and provided strong evidence toward capitalization rather than using the current system used under GAAP. Ali, Ciftci and Cready (2012) conclude that their results contribute to the longstanding debate over the current requirement in the US GAAP to expense all R&D expenses in the period they are occurred. They suggest that market participants struggle with appropriately assessing the future profitability and return implications of the R&D expenditures

under the current US standard. These authors, however, did not actually looked into the delayed effects of R&D expenses and did not report using a capitalization method and left it up to future researchers to resolve this controversy.

A few other authors such as Chan, Faff, Gharghori and Ho (2007) looked into the impact of expensing the R&D costs in a financial year based on the accounting standards versus capitalization method where expenses and earnings could be better matched. As per their research under the Australian model where Accounting regulations for R&D allow for the co-existence of two different accounting methods such as the expense method and the capitalization method, Chan. Faff, Chargori and Ho (2007) concluded that the capitalization method based on their so-called "resource based view" gave them significant advantage in estimating future returns of the R&D expenditures.

In order to further investigate the "expense method" and its potential limitations, this research tend to use R&D expense data for the last 16 years of 30 Dow Jones (listed in results section) companies and looks into the impact on profitability as measured by Return on Equity, Return on Assets and stock returns. The purpose of this research is to see if indeed there is underestimation of profitability results for R&D expenses and whattypes of industries suffer the most from such under-estimation. This research further investigates if the expense method used in the US GAAP system can sufficiently address the issue of the gap between current and future profitability estimates.

**Data and Research Method**

The data was obtained from Bloomberg database. It covers data on Dow Jones Industrial (DJ) companies from September 1999 to September 2016. Following model was employed to test the hypotheses on a relationship between R&D and profitability measures.

Return = function of R&D expenditure

ROE = function of R&D expense

ROA = function of R&D expense

The hypothesis is to test if there is significant relationship between R&D and profitability of the companies and if it is, what the nature of the relationship is.

**ESULTS AND DISCUSSION**

In Table 1, results are reported for Dow Jones Industrial Average (DJ) cumulatively for thirty companies that comprise DJ Index. From figure 1, it can be seen that R&D expenditure of DJ companies went up until second quarter of 2008. However, R&D expenditure declined and then did not recover in the subsequent time period after the financial crisis. Still, from Table 1, it can be clearly seen that there is a significant relationship between R&D expenditure and the profitability for DJ companies. For the time period under consideration, however, we find an inverse and significant relationship between R&D expenditure and stock returns. Furthermore, R&D coefficients are very significant when we consider relationship between R&D versus ROE and ROA respectively. It implies that when R&D expenditure goes up, the profitability of the firm declines. One explanation for this inverse relationship between R&D and profitability was provided by Danielson and Press (2005) who pointed out that primary purpose of R&D is to provide higher future cash flows but Financial Accounting Standards require firms to expense this expenditure in the year it is incurred. This implies that the effect of R&D would be felt in the future time periods when the benefit of the expenditure becomes more evident. Hence, the relationship between R&D and profitability is quite complex. We also get some additional insight when we examine the effect of R&D on profitability at the individual firm level. One way this distortion in the current profitability can be corrected is by adjusting ROE and ROA by incorporating useful life of this expenditure. Essentially, this would (to some extent) correct the mismatch between recognition of R&D expenditure and realization of future benefits. A similar result was obtained by Chan et. al, (2007) who found that intensity of R&D expenditure enable firms to improve their future risk-adjusted returns. Since, Chan et. al, used Australian firms data, they could compare different accounting treatment for R&D expenditure where either firms expensed this expenditure immediately or capitalized this expense. This treatment of R&D is allowed in Australia but not permitted under US GAAP.

From Tables 2 and 3 we find that in general, R&D expenditure

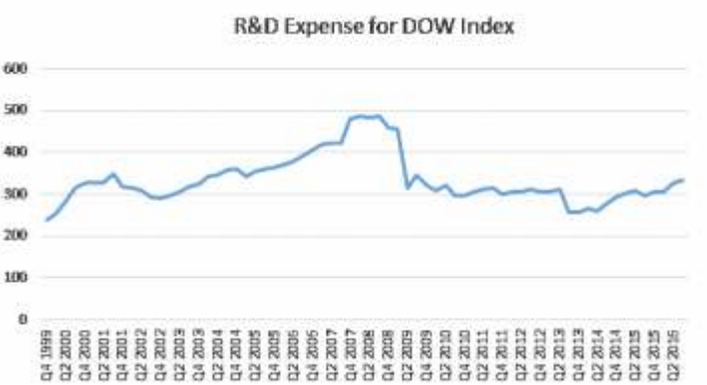


**FIGURE - 1**

**TABLE 1: DJ AND R&D EXPENDITURE – CUMULATIVE DATA FOR THE TIME PERIOD 12/1999 TO 9/2016**

| Dependent Variable | R-Square | F-Value | R&D Coefficient | 't' Value |
|---|---|---|---|---|
| Stock Returns | 10% | 7.06 | -0.00041*** | -2.64 |
| ROE | 36% | 37.01 | -0.04702*** | -6.09 |
| ROA | 35% | 36.94 | -0.01141*** | -6.08 |

**,**,*** denotes significance at 10%, 5%, and 1% level respectively.*

TABLE 2 - DJ COMPANIES AND R&D EXPENDITURE WITH ROE AS THE DEPENDENT VARIABLE

| Name of Company | R-Square | F-Stats | R&D Coefficient | 't' Value |
|---|---|---|---|---|
| Apple Computers | 39% | 41.14 | 0.012871** | 6.42 |
| Boeing | 24% | 20.61 | 0.033059** | 4.54 |
| Caterpillar | 12% | 8.60 | 0.024369** | 2.92 |
| CSCO Systems | 4.4% | 3.01 | 0.004944* | 1.73 |
| DuPont | 15% | 11.42 | 0.056329*** | 3.38 |
| IBM | 6% | 4.32 | 0.045688** | 2.08 |
| Intel Corpn. | 8% | 5.60 | 0.002472** | 2.37 |
| Johnson & Johnson | 27% | 24.36 | -0.00444** | -4.94 |
| MMM | 1% | 0.96 | 0.008738 | 0.98 |
| Merck | 62% | 107.15 | -0.0167*** | -10.35 |
| Microsoft | 2.5% | 1.70 | 0.00296 | 1.30 |
| Pfizer | 43% | 49.14 | -0.01736*** | -7.01 |
| United Tech. | 4% | 2.65 | -0.00385 | -1.63 |

*,**,*** denotes significance at 10%, 5%, and 1% level respectively.

| Name of Company | R-Square | F-Stats | R&D Coefficient | 't' Value |
|---|---|---|---|---|
| Apple Computers | 22.9% | 18.14 | 0.005908*** | 4.26 |
| Boeing | 1% | 0.72 | -0.00046 | -0.84 |
| Caterpillar | 15% | 11.55 | 0.004342*** | 3.40 |
| CSCO Systems | 2% | 0.17 | -0.0008 | -0.42 |
| DuPont | 5% | 3.30 | 0.009466* | 1.81 |
| IBM | 24% | 21.25 | 0.010081*** | 4.61 |
| Intel Corpn. | 1% | 0.07 | 0.000221 | 0.28 |
| Johnson & Johnson | 32% | 30.45 | -0.00323*** | -5.52 |
| MMM | 10% | 8.03 | 0.01069*** | 2.83 |
| Merck | 55% | 80.39 | -0.00544*** | -8.96 |
| Microsoft | 2.6% | 1.74 | -0.00143 | -1.32 |
| Pfizer | 39% | 42.17 | -0.00791*** | -6.49 |
| United Tech. | 2% | 1.26 | -0.00078 | -1.12 |

*,**,*** denotes significance at 10%, 5%, and 1% level respectively

tends to have a significant effect on firms profitability but the results are inconsistent if we compare DJ firms across industry categories. For instance, Apple Computers displays a positive coefficient for both ROE and ROA with R&D as an independent variable. It implies that the effect of R&D for the current period and the past periods cumulatively tends to have a positive effect on the profitability of this company. With R-square equal to 39% for ROE and 23% for ROA we can clearly see substantial effect on profitability when the company increases its R&D expenditure. In many studies in finance, R-square of 39% is considered very high because the relationship between profitability and R&D expenditure is quite complex. Also, there are many other factors that affect the profitability of the firm such as size, liquidity, capital adequacy, effectiveness, efficiency of management, and risk. We can draw a similar conclusion when the results of Boeing are examined. These results are more conclusive for R&D and ROE but ROA for Boeing is unrelated to R&D. That is expected because R&D expenditure tends to have long cycles for an aircraft manufacturer when compared against a computer company such as Apple.

Other manufacturing companies such as Caterpillar, MMM, United Technologies, the effect of R&D expenditure on profitability is insignificant. In a recent article in Wall Street Journal, the effect of innovation in the past decade has been dismal 0.5% per year when compared against stellar growth rate of total factor productivity of about 3.4% per year in 1950's. As a consequence of this lack of innovation American standard of living has stagnated since 2000. Hence, this lack of relationship between R&D and profitability for the manufacturing firms is not surprising.

On the other hand, pharmaceutical firms have a significant but negative or inverse relationship between R&D and profitability with R-squares ranging from 62% for Merck to 27% for Johnson and Johnson. One reason for this inverse relationship between R&D and profitability could be because of conservative accounting treatment of this expenditure in the income statement. Since, FDA approval and very expensive clinical trial of drugs that have a very long cycle from innovation to approval, it is not surprising that expenditure for R&D is likely to make a serious dent on the profitability. Also, none of the most prescribed twenty drugs came to market in the past decade. That is, no new major drug approval has occurred since 2000. Many other firms in our sample do not have R&D expenditure in their balance sheet as these firms are not involved in manufacturing.

## ONCLUSION

Overall, as it can be seen from the results, the relationship between R&D and profitability is significant. However, the nature of the relationship for different industries is different. For manufacturing companies, the relationship is positive. But, for pharmaceutical companies, the relationship between R&D and profitability is negative or inverse.

These results tend to provide support to what others authors also speculated. This study however provides sufficient evidence confirming the role of R&D in corporate profitability consideration.

The fuzziness about the "benefits of R&D" and its impact on corporate decision based on return on investment as stated by Singarayar (2009) appears to be a complex matter. The complexity however is a result of how R&D expenditure is treated in US accounting standards. The delayed impact of R&D is largely unknown and unaccounted for in the financial statements.

This study also provides clear indication that US GAAP standards need to be modified for accounting R&D expenditures and a clear move toward capitalization of these expenses is needed. However, there is clear evidence to support that the capitalization method which is allowed in Australia as found by Ali, Ciftci and Cready (2012) works and has significant impact on profitability. No such evidence exists in the US as it is not permitted under GAAP rules which are followed in the United States. The evidence about Efficient Market Hypotheses may not be relevant because the analysts are not constrained by accounting rules and are allowed to adjust the profits by using capitalization method.

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