

CIO – Corporate innovation online Innovation management best practices

R&D spending cuts may portend a decline in financial performance?

Research and development spending may be under attack. Boards and senior management need to rethink what R&D means to their organization and its stakeholders.



Cuts create collateral damage!

April 7 2017

Overview

It is fashionable these days to think that innovation is more than simply spending on research and development. The notion is that innovation is more than spending on R&D which, of course, it is. But the consequences of taking the focus off the importance of R&D spending can have serious implications for medium and long-term financial performance.

Fifty years ago, the word innovation, as used in the corporate sense, was immediately associated with an organization's deep investment in laboratory-based, white-coat, spending on new products/services or enhancing current products; back-room stuff that would at some time see the light of day and eventually lead to growth and profit.

Over the last decades, management has made a point of extending the use of the word *innovation* to include all manner of new ideas whether science/technology-based or not. This is a fair new definition of the word innovation but its use has led to a great deal of confusion when one discusses 'innovation'. The word is so pervasive in its use that it has lost its real relevance.

Innovation has become, to some extent, a proxy for research and development and it may be that organizations have left behind the real meaning and impact of *real* research and development. The result

CIO summary at a glance

There is a need to rethink both the importance and reporting on R&D spending!

Three companies seem to be at risk as R&D spending has declined or is below competitive levels; P&G, IBM, and Tim Hortons (now part of Restaurant Brands International Inc.).

Consistency in R&D spending coupled with effective management practices are the keys to sustained innovation.

Information on the spending on R&D appears to be less transparent and informative than in prior years. 3M, John Deere and GE do it right.

R&D means more than R&D, impacting morale, talent hiring, key resource retention and, *wait for it*, new products and services.

Booz&co;

The 2013 Global Innovation Study

'For the 9th year in a row, we have found no correlation between how much companies spend on R&D and their financial performance.

How companies spend their innovation dollars is much more important. Our studies have consistently shown that innovation investments in select capabilities, tools, talent and culture which are tightly aligned with a business's strategy are what drive sustained success.'

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may be a disservice to the impact which R&D has on the growth and success of a corporation.

Witness the decline in financial performance for HP, Valeant, IBM, P&G and others as R&D spending has been reduced. The decline of financial performance is due to many factors that go to make up the perfect storm. R&D spending is one of the factors and important.

For those of us who believe that research and development is key to survival and growth, whether at a micro or macro level, the decline in real R&D has serious consequences in terms of creativity, value-added, and the ultimate generation of exportable products which, if well done, links directly to corporate wellbeing and a country's standard of living.

Booz&co make it clear¹ that they cannot correlate spending on R&D with being a successful and innovative company. Fair enough, but CIO's research suggests that there is a fathomable correlation between spending on R&D and commercial success, not necessarily obvious but significant and not to be treated as incidental. The irony is that Booz&co believed, in the first place, that R&D was closely linked to success, thus their statement.

If not the most important portend of the success of innovation, R&D spending must rank in the top few indicators of eventual success! To some extent, the findings of Booz&co.com can convey the wrong impression. Because one cannot correlate it, this does not mean that it is not important! Such spending, in CIO's view, is the bed rock of the culture of highly-innovative, idea-intensive companies.

In this report, CIO examines the experience of several companies which have sustained innovation through R&D spending and several which have not.

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¹ see their '2013 Global Innovation Study'-

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Trends in R&D spending – for a select few companies

R&D spending from 2% to 12% of revenues

Bloomberg's report² on the woes of IBM brings some light to the R&D spending issues. The article goes on to point out that 'for the second year in a row, the 103-year-old company technology giant' was the worst performer in the Dow Jones Industrial average. Share value has declined. Revenue continues to fall and it is spending more on dividend payouts than on capital expenditures. A sad tale for a company which was so dominant for so long.

Juxta positioned next to the article is a list of the current big spenders on R&D;

- SAP at 13.6% of revenue',
- Microsoft at 13.4%,
- Google at 13.3%,
- Oracle at 13%,
- Cisco at 12.2%,
- Amazon.com at 8.8%,
- IBM at 6.2% and finally
- HP at 2.8%.

The authors correctly state that IBM is spending a fraction on R&D when compared to its rivals.

CIO does not follow all of these companies but does have a perspective on the trends in innovation management for five highly-innovative companies; Deere & Co., Starbucks, GE, P&G and 3M. Is there something learned from this research that relates to R&D spending within these organizations?

Research and development spending seems on the decline in three key corporations based in the U.S.; HP (now HPQ and HPE), P&G. and IBM, where, in the case of IBM, the data may be impacted by their change in asset mix but none-the-less a concern.

There is no more egregious example of cutting R&D than the still evolving story of Valeant. Valeant's business model, under Pearson, was explicit³; 'acquire companies that had sure-fire products, chop R&D and then jack up the prices of existing drugs before the emergence of cheaper generics'. Pearson had previously been employed for 23 years by McKinsey, a consultancy firm. From 2008 to 2014 sales had moved up ten times and the R&D budget, as per plan, had declined to as 'little as 3% of sales. While not the whole answer to the eventual decline of the firms' sales and stock value, the cuts in R&D spending gutted the source of organic growth; particularly since the company was engaged in the pharmaceutical industry.

² Bloomberg, Hardware IBM's Funk Goes On and On, January 12 – 18, 2015

³ Globe and Mail Report on Business, April 2017.

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The HP story is well known – see Appendix A. Marc Hurd took the brunt of criticism for arbitrarily reducing R&D expenditures leading to a lowering of morale, departures of key personnel, at this distinguished organization. HP is still recovering but has now split itself into HPE and HPQ. HPE's R&D spending has been at 4.5% for the past two years while HPQ is at about 2.5%. Ten years ago, expenditures at Hp were closer to 5%.

P&G, Appendix B, used to, in the early 2000s spend about 4.8% of its revenue on R&D and its rate is now close to half of that at 2.4%. Lafley's 'Connect and Develop' initiative, meant to open the corporation to new ideas no matter their source, no doubt mitigated the decline in spending to some degree but the jury is still out on the effectiveness of outsourcing investment in research and development.

Reckitt Benckiser, one of P&G's competitors, had an interesting take on the role of research at the time of an earlier report⁴; RB's comments (Bart Becht's really) suggested that there is a certain attitude towards R&D which is very different from the attitude of most innovative companies. While he indicates that 'Innovation is crucial to high performance in the household care industry' he also states that 'a company's ability to innovate is about much more than R&D' and further that, 'innovation is generated by new ideas, not by messing around in the lab'⁵.

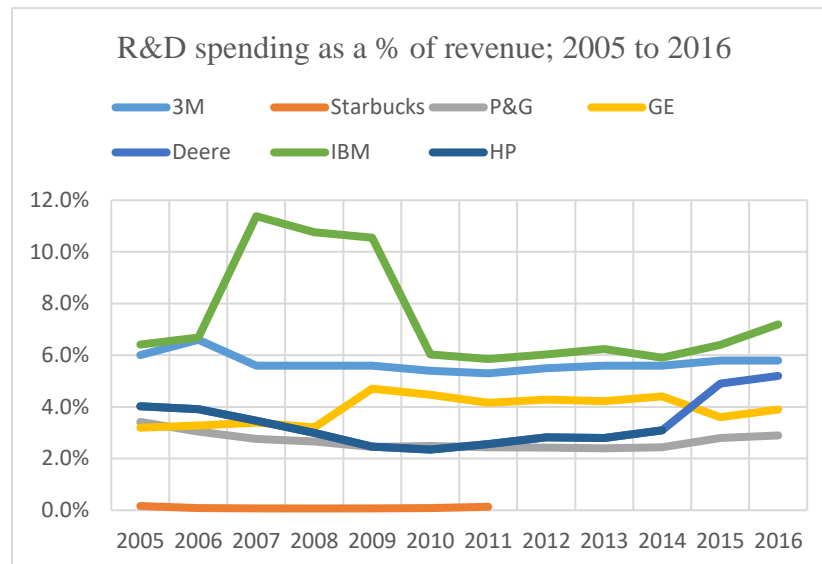
IBM, once a bastion of R&D, in both fundamental and applied science, no longer has the uniqueness of its earlier reputation. Competition intensity has increased.

In contrast to those companies which have seen a decline in spending on R&D, three companies researched by CIO, have maintained their spending levels through thick and thin.

Deere & Co., Appendix D, spends about 4% of revenue on R&D and has done so consistently over many years, certainly since 2002.

3M, Appendix E, in our view the best performer, has consistently spent approximately 5.5%, most recently even 5.6%, since 2002.

Both Deere and 3M have been around for well over a century and have, without exception, made research and development and innovation a significant part of their core values. Every year!



⁴ Report by CIO dated December 2009 and updated in 2010; currently archived.

⁵ Accenture; Outlook Journal, October, 2005.

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GE, Appendix F, was explicit in its reporting of R&D spending over the period from 2008 to 2012, but has been less communicative as of 2013. GE has progressed through significant restructurings with its sale of the appliance division, its rationalization of its finance business and making significant acquisitions. Reporting on R&D during such a tumultuous change may not make any sense. In any case aviation accounts for the largest share of GE's research and development expenditures with funding from GE and customer contributions. Power and Water and Healthcare were also significant expenditure areas. GE spends, as best one can tell, just over 4% of its revenues on R&D and is, obviously, viewed as a very innovative company.

Starbucks, one of CIO's higher-performing companies⁶, stopped reporting its spending on R&D as of their 2011 annual report. Admittedly, the amount as a % of sales - .13% - was not large and may now be considered trivial for financial reporting, but at the time of CIO's first profile of Starbucks, spending on R&D was a differentiating factor from its competitors. Starbucks' spending messaged that this was a different type of coffee supplier; one which placed an unusual, within its industry, emphasis on roasting curves and experimentation, science if you like, in the coffee market place. It had – and may still have - a R&D department!

As an aside to Starbucks, which built their business with a constant eye on the technology of coffee making, Tim Hortons, under new management from Restaurant Brands International Inc., is currently undergoing a massive restructuring with the focus on cost reduction and a deemphasis on product research. How this reduction in R&D will affect their product image has yet to be realized!

G&M Report on Business, March 2017. Other sources.

Signals of a looming 'Innovation Cliff' and decline in shareholder returns?

Does tinkering – cuts – in R&D portend negative consequences?

CIO's research into the management practices which encourage innovation suggests that there are recognizable indicators of the unwinding of corporate innovativeness. These early indicators which, once recognized, can and should, lead to remedial action on the part of management and/or the Board.

The challenge for large companies has always been to maintain an entrepreneurial spirit within the organization and not become complacent with success. How does spending on R&D relate to this sense of entrepreneurship?

The study of how companies come to be successful provides evidence of a huge variety of happenstances; so many that the real reasons for success are blurred by serendipity and seemingly endless variety of reasons for success.

⁶ See IM (Innovation management) company reports on the web site.

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By contrast, the reasons for company failures turn out to be much more obvious. Dysfunction at the most senior levels, hubris⁷, and – wait for it – tinkering with research and development, when this characteristic has been so much a part of the core value of a corporation, can be disastrous. Such perfect storms can lead to a quick decline and, as we have seen, are difficult to turnaround.

Examples of the combination of cutting R&D spending along with management dysfunction are set out as follows.

Company	3M	Deere & Co.	GE	Starbucks	P&G	HP	RIM/Blackberry	IBM	Nortel
R&D spending trend	Level	Level	Level	Level	Down since 2000	Down	Down	Down	Out of business
Dysfunction incidence	None since 2005	None	None	None since 2008	Yes, CEO shift in 2012	Yes, up to 2010	Yes, at top level	??	Yes
References	CIO reports; available on the web site.					Research and ex-employee data			U of O - Telus study

The first obvious indication of a problem within any corporation is when those who have this ‘entrepreneurial spirit’ leave or when the organization is unable to attract the preferred candidates. The first indicator is relatively easy to detect, if tracked, the second much less so. Entrepreneurs are seldom interested in a company which does not have a reputation for creating ideas and making things happen. CIO posits that a decline in spending in the ‘juice’ that drives innovation, i.e. research and development spending, is an early turn off for those people most organizations would want to attract and retain.

Would-be entrepreneurs either join companies which are exciting or start their own business. Often, they start by joining exciting companies and then branch out on their own.

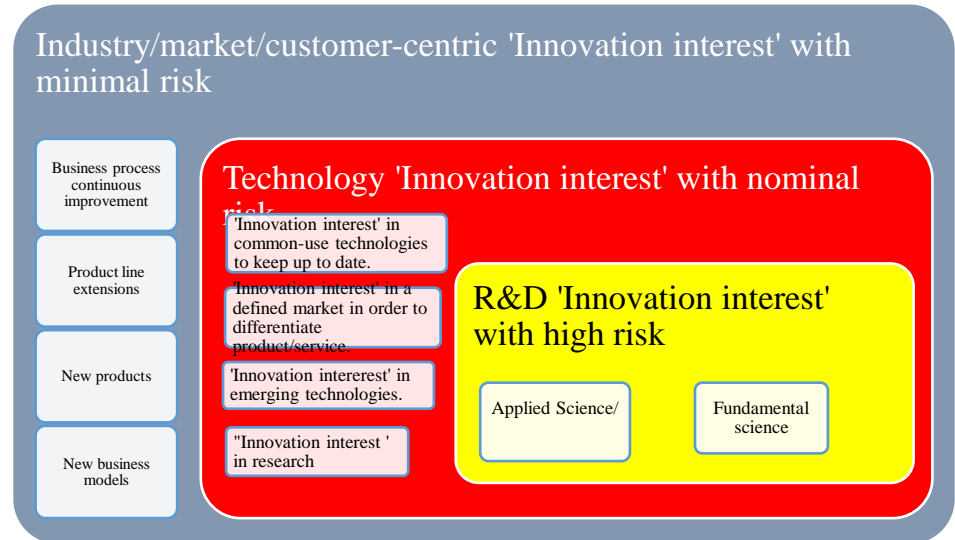
⁷ Telus study of the demise of Nortel – University of Ottawa.

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The focus of entrepreneurship is embodied in a range of innovative initiatives called the 'spectrum of innovation'.

The term used is 'innovation interest' since emotional investment, while not involving money, can be both positive as well as a distraction from the goals of the corporation. While this interest – emotion – cannot easily be measured, it is a factor to be dealt with.



CIO uses the word innovation for covering the waterfront – the spectrum - of new ideas! The point is that the existence of entrepreneurship is manifested in any of the parts of the 'spectrum' but science/technology interests form a large part of the innovativeness. R&D is thus a major component of innovativeness and can, in many corporations be the determiner of its ability to attract and hold entrepreneurs let alone develop new products and services.

Shifting the emphasis on R&D spending to up profits has implications

R&D spending shifts are far from isolated in their impact. Collateral damage occurs and a proper response is called for.

R&D investment is often the bed rock of a company's culture for innovation but not always, as some companies deliberately choose to be a follower. CIO's experience suggests that most companies, deep down, want to lead and have an exciting environment for its staff. The rationalization of being a follower, or just one of the 'top three', is more of an acceptance of the reality of a competitive position than it is the desire.

CIO examined three companies, HP, Massey-Ferguson, and RIM, now reincarnated as 'Blackberry', with regard to the importance of not just the level of spending on R&D but also its effectiveness. Lessons learned.

- When the need arises to focus on profits, earnings per share, and more particularly 'creating shareholder value', communication within the organization and to stakeholders at large becomes even more important than in 'normal' times. The opposite seems to happen.
- The most important Factors – management practices – on which to focus in order to have advance knowledge of a looming innovation cliff were found to be the following.

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- A shift by management and the Board in their tolerance for failure.
- Less importance placed on the need for innovation by the Board and management.
- A shift towards looking for cost reductions rather new opportunities.
- R&D spending reductions.
- A detachment by management and the Board from in-house advice along with evident centralization of important decisions.
- Not paying attention to the management of people and their interactions.

A high ‘score’⁸ can indicate a looming cliff. At their lowest point in the decline, the ‘score’, for MF was ‘134’, for RIM ‘72’ and for HP ‘97’. CIO’s benchmark threshold has always been ‘60’ at which point, (on completion of the on-line survey) it becomes clearer that there is problem with the corporation’s management practices which impact innovativeness. The ‘score’ recognizes the impact of all Factors taken together.

Decreasing investment in R&D is often seen as a major indicator of a looming ‘cliff’ but CIO’s research suggests that while this is the case, it is only one of several which signal a looming cliff, but it is the most measurable and discernable by prospective and current employees, analysts, and shareholders.

In summary, there is no one answer or quick indicator of a looming innovative ‘cliff’ but there are several key indicators which can help predict the nearness of the ‘cliff’. Predicting a looming cliff can lead to important anticipatory action on the part of management with prevention as the objective.

One way to look at the impact of decisions is to identify primary impacts versus collateral damage. Illustrated below is the likely impact of a shift, by management, from a position of balance to an over-emphasis – at least as viewed by stakeholders and staff (not always shareholders) – on having to meet short-term profit objectives, which is often done by curtailing R&D investment?

⁸ The ‘score’ is based on the opinion of employees or analysts as expressed in our on-line survey. Registrants are asked for their opinion on the ‘Ideal’ for each of 25 Factors and their ‘Reality’. The difference between the two and agglomerated represents their ‘score’. This survey measures the shift in the registrants’ opinion on each Factor. In the case of these three companies, their rating of the ‘Ideal’ was coincident with their peak performance. Their ‘Reality’ came to be during the decline. For more information visit the web site;
<http://www.corporateinnovationonline.com>

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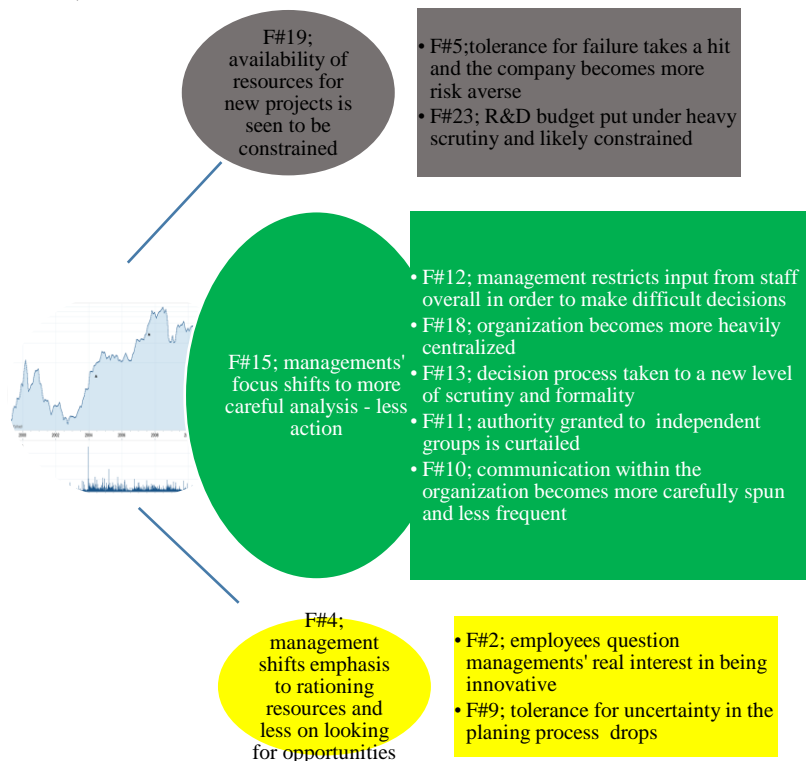
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The impacts of a shift to the goal of realizing short-term profits are set out under three themes.

- leadership (in grey),
- idea generation and realization (in yellow), and the
- organization and management of day-to-day affairs (in green).

Collateral damage is the issue.

Managements' response to the shift is to act to mitigate the damage. Those Factors impacted at the outset of a shift are soon to follow unless the situation improves and leadership can switch its practices or provide reasons for the shift.



Companies currently at risk?

Based on recent shifts in priorities for R&D spending, P&G and IBM seem vulnerable.

Cuts in R&D spending do not bring immediate results. People costs are, of course, constrained but the severance costs impact the year in which they are incurred and direct reduction in compensation occurs in the following years and beyond. The real impact, however, is on the impact on the pipeline of ideas, ideas which do not proceed as quickly as had been anticipated at the outset. This impact can take several years to manifest itself. The introduction of new products, services etc. to not keep pace.

3M measures this through its NPVI tool; noting the number of new products introduced in a year compared to a five-year horizon. 3M's latest target is in the range of 30% but earlier 3M had stated that their target was to be 40%. The primary pump for keeping the NPVI at an acceptable level is the success of its R&D programs.

Leaving aside the efficiency of research and development spending – a different discussion – there is obviously a correlation between the R&D spending level and the ability to maintain a pipeline or products.

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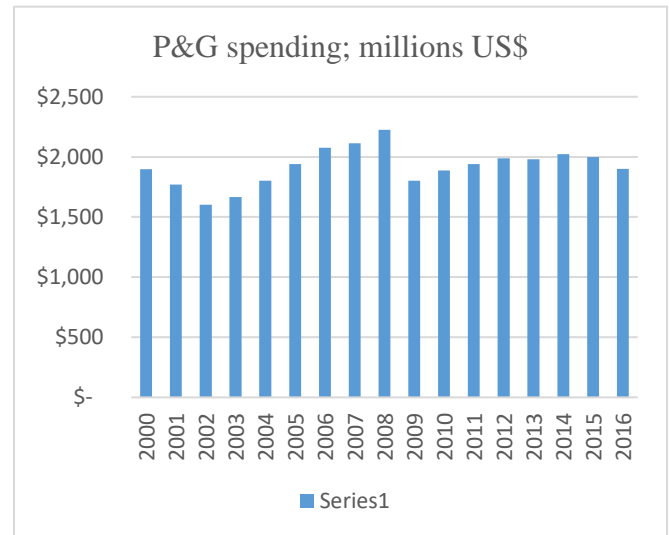
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Of the companies noted in this paper, CIO believes that two are at some risk due primarily due to their significant reduction of R&D spending over the last decade. P&G dropped its level of expenditure from just under five percent to just over two percent over a ten-year period. IBM's spend went from over six percent in the early 2000s, climbed to near eleven percent in the mid 2000s, then dropped to six to seven percent range most recently. In both these cases, spending has stabilized at the lower levels as a percent of sales, somewhat exacerbated due to declining sales revenue.

Over the last five years, revenues have dropped significantly. In the case of P&G, management changes at the CEO level probably contributed to the lack of progress. IBM's most recent spend has increased somewhat; signs that the company may be reenergizing spending.

P&G's research and development spending has been tracking close just under three percent of sales for the last three years, up from the period around 20009/2010, but in absolute terms – see chart – remains flat over the last five years.



P&G's competitors spend less on R&D with most recent results for Clorox at 2.4 percent of sales and Colgate-Palmolive at 1.9 percent. Reckitt Benckiser do not report on their level of spending and only note that '*Research and Development Research expenditure is expensed in the year in which it is incurred. Development expenditure is expensed in the year in which it is incurred, unless it meets the requirements of IAS 38 to be capitalised and then amortised over the useful life of the developed product*'. Unilever information on R&D spending is no longer reported upon in quantifiable terms.

P&G's level of spending is above their competitors and augers well for eventual results once the current restructuring is completed. However overall sales continue to drop.

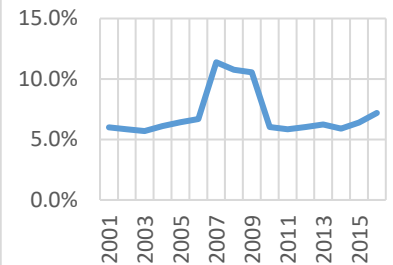
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IBM, which has seen a significant drop in revenues since 2011, has returned its spend to that in the early 2000s; even boosting its spending to 7.2 percent in 2016.

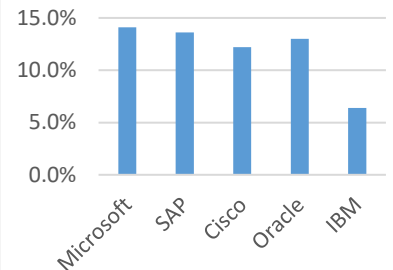
IBM has many competitors and while direct comparisons are difficult to identify, a comparison with at least four of IBM's somewhat indirect competitors shows a large gap in R&D spending.

IBM; R&D spend as a percent of Revenues



Amazon, which competes in the provision of a share of cloud services, has increased their spend over the period 2013 to 2015 from mid 8% to close to 12%, although their use of the proxy for research and development, 'technology & content' and the inclusion of stock provisions make direct comparisons difficult. None the less, and considering other competitors in the 'IT' sector, the comparison with IBM's spend raises questions.

R&D spend as a percent of sales; 2015



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Appendices

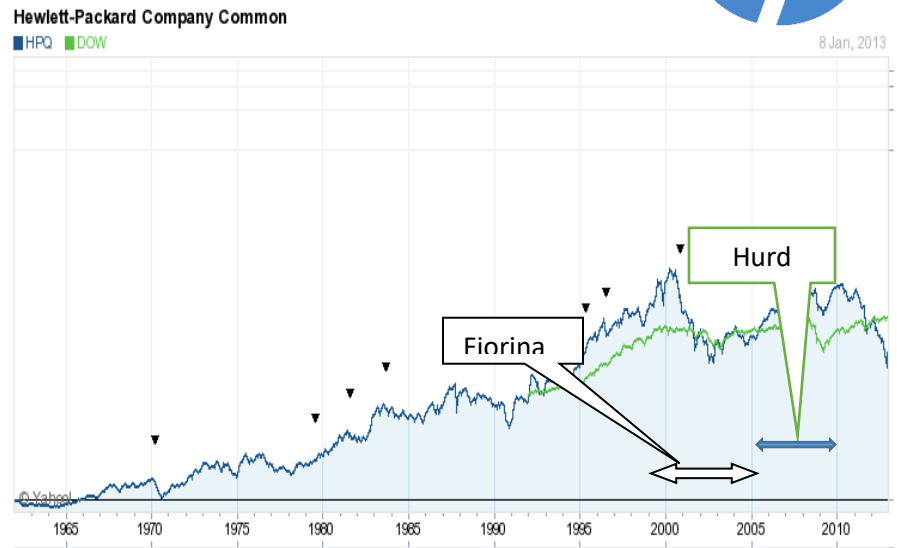
Appendix A; HP – the R&D story

HP is an example of the negative effect of shifting the emphasis on R&D and not proactively following through to mitigate the damage.



There were two cliffs for HP shareholders, one shortly after its acquisition of Compaq and more recently around the beginning of 2010.

Fiorina presided over the period from 2000 to 2005 and Mark Hurd over the subsequent period until his ouster in 2010. Under Hurd, shareholder value increased but, as most would now believe, this was done at the cost of its research and development efforts, reputation for innovation and the loss of morale throughout the organization. Innovators left the corporation.



The chart at the right, shareholder value compared to the *DOW*, is used here as a proxy for the success or failure of the products/services/changes, typically associated with innovation's impact. Perhaps this is a bit of an unfair comparison considering that the end of the dot.com era was in 1999, but still it is an indicator of HP's financial as well as innovation performance.

From a shareholder perspective, value deterioration occurred over a 10 to 12-year period and under the watch of CEOs new to HP. One presumes, however, that the Board foresaw the impending decline and this led to its action to hire outsiders to turn the company around. Perhaps the seeds of the decline were planted prior to the decline in shareholder value.

The company, was set back 15 years in terms of its shareholder value; share value did not increase over the same period as it should have if it was innovating successfully.

Shifts occur more rapidly and more frequently than any time in history. Since HP's inception in 1947 David Packard had the longest 'period of influence'⁹ over HP affairs at 46 years, until leaving in 1993. William Hewlett had the next longest tenure with 40 years ending in 1987. After these two leaders, the 'periods of influence' become ever shorter. John Young's period was for

⁹ Period of influence is a recognition that the individual continues in a position of influence as a CEO, COO or as a member of the Board of Directors.

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14 years, Lewis Platt for 7 years, beginning in 1993 and ending in 1999. Fiorina's and Hurd's tenure were even shorter.

The shareholder 'cliff' evidenced itself around 2000, coincident with the appointment of Carly Fiorina, but she departed in 2005. There followed a brief interim arrangement and then the appointment of Mark Hurd occurred. Shareholder value increase returned briefly only to fall quickly after his departure in 2010. The 'innovation cliff', one can say, was not arrested during either of their terms in office.

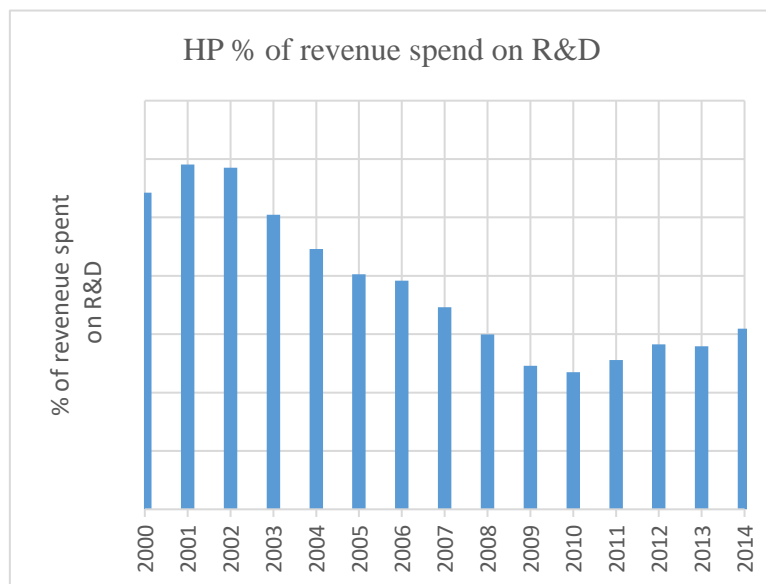
It is difficult to say whether the decline in innovativeness was evident to the Board of HP early on but the Board, in its wisdom, did decide to hire outside the organization, usually a drastic step signaling the need for fresh ideas, action and innovation and the implication that there was no one in house to take over.

At its best, and since its inception, HP had an outstanding reputation for innovation.

Innovators stayed with the company (Factor #21) and, based on CIO's research, there was, up until the late 1990s, a sense that innovation was increasing. Shareholder value was on the rise. HP's management practices during the period leading up to the 'cliff', are for most of the Factors, rated as close to our 'BofB'¹⁰; CIO's benchmark of excellence, for all three themes; *leadership, idea generation and realization* and the *organization and management of day-to-day affairs*¹¹. HP deserved its well-earned reputation.

Based on CIO research, there are several actions on the part of management and the Board which contributed the most to the decline in HP's innovativeness.

Of the three themes examined, leadership (or lack of same) is represented by 5 Factors. Of the 5 Factors three had a larger impact than the other two; i.e. management and the Board shifted emphasis to achieving short term profit – F#1, senior leadership looked less explicitly for innovation – F#2, and shifted from



HP was a superb performer up to the emergence of the 'cliffs' but ran out of steam, made some disastrous strategic decisions – including choosing not to act – brought in outside hires to restructure to no avail, and is currently struggling to regain its previous well-deserved reputation.

¹⁰ 'BofB' refers to our Best of Breed and has been developed by CIO as a result of researching several highly-innovative companies.

¹¹ For more on these three themes and the use of the term 'Factors' please visit the web site; <http://www.corporateinnovationonline.com>

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looking for opportunities to seeking cost reductions – F#4. Overall, ‘leadership’ scores as a negative contributor.

Lack of leadership at the Board and management levels is clearly evident but, more specifically, the following reasons, by Factor, have been identified as equally significant contributors to HP’s decline in innovativeness.

- A drop-in management’s tolerance for failure (Factor #5). Highly-innovative companies have a relatively high tolerance for failure. HP had it but lost it!
- A reduction of R&D spending (Factor #23), mainly under Hurd. This move struck to the core of HP’s culture.
- HP’s approach to planning went from an organization which carefully analyzed and thought through its strategy and then acted to one that became more ‘shooting from the hip’ (Factor #15); action oriented, yes, but seen to be taking the wrong kind of action.
- Decision making, which had been broadly based (Factor #12), but shifted to the point that decisions did not recognize input from its broad base of in-house staff and executives. Over the period of the decline, decision making became much more centralized.
- The management of people and their interactions (Factor #6) was receiving less attention than before as the decline became more evident.

Under whose watch was the pending ‘cliff’ recognized? Suffice to say that the ‘cliff’ was in evidence in and around 2000, was further entrenched during Fiorina’s term, doubled down into during Hurd’s mandate and continued at least until late 2011, the period where CIO’s research stops. Some research suggests that the start of the decline was during Platt’s term in office. It may be significant that Platt was both the CEO and Chairman during this period; 1993 to 1999. Ideas of organizing for appropriate governance have changed since Platt’s time but many companies still do not separate the roles of Chairman and CEO.

Based on researching only HP one might have recognized the looming cliff if information on eight of the 25 Factors had been made available and listened to by HP leadership – both management and the Board. A different strategic course might have been set had the importance of management actions and their impact been recognized. Was the management style known as the ‘HP Way’, as articulated by ‘Bill and Dave’ getting in the way of the creation of shareholder value? Has the ‘HP Way’ⁱ survived? These questions remain.

- Factor #6: it is unlikely that management will immediately change its approach to managing people.
- Factor #3; tolerance for mavericks will continue to be an important legacy value in the company
- Career ladders – Factor #7 - and rewards for innovators – Factor #14 – are unlikely to be impacted in the short term.
- Devotion to the firm versus personnel development, Factor #17 is unlikely to be affected but could be over the long term.

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While not immediately affected, the medium-term consequences of a shift in emphasis could lead to impacting another set of Factors which are extremely important and are seen to be the consequences of decision making respecting innovation.

- Factor #21; noting the departure of innovators
- Factor #22; a growing belief that the organization does not have a tradition of innovation
- Factor #24; the perception that innovation is declining – which has its own collateral damage to the image of the corporation and more significantly to the morale of its employees and stakeholders at large.

Thus, there are short-term as well as potentially long-term impacts of a shift in management's emphasis on profits where there is not an appropriate set of actions taken to mitigate the negative consequences.

Obviously one of the remaining questions is a determination of which of these Factors is the best indicator or indicators of a looming innovation cliff. Testing for those Factors which are not impacted makes little sense. Testing for Factors which could suggest an upcoming cliff is desirable. As has been pointed out, a simple decision to shift emphasis to shorter term thinking has its direct and indirect affects, some of which are measurable.

The most important Factors – management practices – on which to focus to have advance knowledge of a looming innovation cliff were found to be the following.

- A shift by management and the Board in their tolerance for failure.
- Less importance placed on the need for innovation by the Board and management.
- A shift towards looking for cost reductions rather new opportunities.
- R&D spending reductions.
- A detachment by management and the Board from in-house advice along with evident centralization of important decisions.

Appendix B; P&G – over Lafley's term

P&G has made innovation one of its core values. Innovation has been and is emphasized in its annual reports and presentations. It is clear that the company wants to be outstanding in the generation of new products/services and to outdo its competitors.



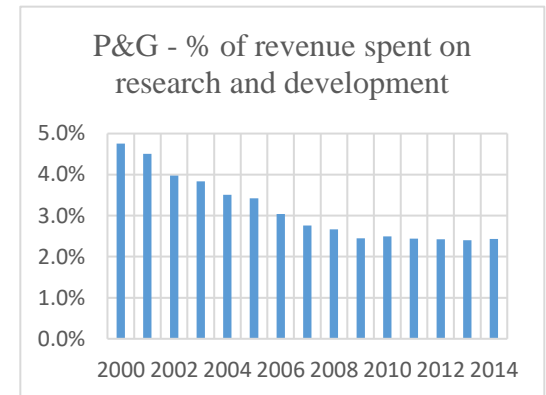
P&G's spending on research and development has progressively declined since the early 2000s. In 2000, Lafley's view was that company overheads and R&D spending were too high for a

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corporation with only \$40 billion in sales; the ‘level of spending was more suited to a company with \$50 billion’¹².

‘In the fiscal year, July 2004-June 2005, P&G invested \$ 1.8 billion in leading-edge research and development activities. There were over 9,000 scientists and researchers, including 1000 PhD scientists, working in 28 research centers in 12 countries across 4 continents - conducting R&D across a broad range of areas.’. For example, in the UK and Ireland P&G had 3 Research & Development Centers employing around 520 scientists/researchers. In 2008 P&G had 8,500 researchers.



P&G presents a rationale¹³ for the decline in R&D expenditures.

We have doubled the productivity of our R&D organization since 2000 even as we’ve become more innovative. This means that P&G can now support an additional \$44 billion in sales with virtually the same number of R&D employees we had nearly a decade ago. We’ve become so much more productive because we continually innovate how we innovate and because we are working with such a large and diverse global network of external innovation partners. This productivity discipline ensures that P&G has the flexibility and the resources to invest in growth even in the most challenging environments.

Lafley chose, on assuming the office of the CEO (the first time), to focus on those goals where he could have the biggest impact, ‘goals and strategies, leadership and culture’. He states that ‘P&G are getting it right more often’. ‘P&G’s strategy and structures empower innovation’.

The clear implication is that these areas were not, prior to Lafley’s appointment, performing up to expectations and that considerable improvement would come about by placing the emphasis on these four areas; goals, strategies, leadership and culture. Management believed that innovation was increasing at least during Lafley’s first term but recent performance may raise questions about the current rate of innovation. The hiring of the consultant firm Innosight is a recognition that the process of innovation was not up to Lafley’s expectations and it needed improvement.

The pace of innovation has doubled in the past decade¹⁴. At P&G, ‘there is a broader, stronger, more consistent innovation culture today than at any time in our history’ – states Lafley. There is an inference that innovation, as practiced prior to 2000, was seen to be the domain of the technologists in P&G; an innovative tradition none the less, but one with a narrow focus.

¹² Page 74, The Game-Changer

¹³ P&G Annual Report 2009

¹⁴ Page 79, The Game-Changer

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P&G makes it clear that they believe that the company has exceptional talent and knowledge of the science behind all, or most of their products. Science is given a prominent position in the literature. ‘Our Research & Development efforts cover 150 areas of science. The ‘essential part of P&G’s R&D – world-class technologists who are masters of core technologies critical to P&G’s household and personal-care’ has not changed over the last several years. ‘While many people think of P&G as just a marketing company they are surprised by the enormous depth and breadth of the in-house science capability’.

The company’s ‘Connect + Develop’ initiative is a way to tap into more R&D. ‘Outside the organization there are another 1.5 million similar researchers with pertinent areas of expertise’ according to Lafley. To tap this outside knowledge, Technical entrepreneurs (TEs) are charged with making the connections with ‘academic institutions, government labs, suppliers’ etc. TE’s use advanced search methods for finding answers to questions and sourcing ideas and, further, ensure that the business units know about these connections. The focus is on establishing intellectual relationships.

Quick Comparison of Competitors –
Source yahoo.ca. Most recent data

	P&G	Unilver	Colgate-Palmolive	RB	Clorox	Measures What?
Stock symbol	PG	UL	CL	RB	CLX	
Revenue - billions	\$ 83.72	\$ 66.45	\$ 17.20	\$ 9.57	\$ 5.62	Sales and advertising effectiveness
Operating margin -%	19.99	13.60	23.43	26.86	17.09	Operations effectiveness
Return on assets (ttm) %	7.17	9.19	19.95	10.04	14.36	Overall management effectiveness
Return on equity (ttm) %	15.73	40.14	121.8	30.68	454.40	Overall management effectiveness
Employees	126000	173000	37700	35900	8400	
Sector	Consumer Goods	Consumer Goods	Consumer Goods	Consumer Goods	Consumer Goods	
Industry	Personal Products	Food - Major Diversified	Personal Products	Personal Products	House wares and Accessories	
Revenue per employee	\$664,444	\$384,104	\$ 456,233	\$266,574	\$669,048	

While R&D spending per se, as a percent of sales, has declined, it seems obvious that when you consider ‘Connect + Develop’ as part of the process of finding and evaluating new products or new ideas, overall investment in research may have increased. Also, spending on ‘immersive in-store and in-home research is up five-fold since the beginning of the decade’. Perhaps improving these two linkages is one of the reasons that R&D productivity is up 85% over the year 2000 even though R&D spending is only ‘modestly up’.

By comparison, Colgate’s spend on R&D in 2013 was \$267 million or about 1.5% of revenue, fairly consistent by year from 2011. Unilever’s spend was about 2%. P&G seems to be ‘catching up’ to the competition – but perhaps in going in the wrong direction if it wishes to be outstanding.

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So, while P&G's spending on R&D has declined it has only decreased to the equivalent amount spent by two of its competitors, Colgate and Unilever. None-the-less, the decline is evident and the impact of a shift can be as significant as the absolute percentages or dollar amounts.

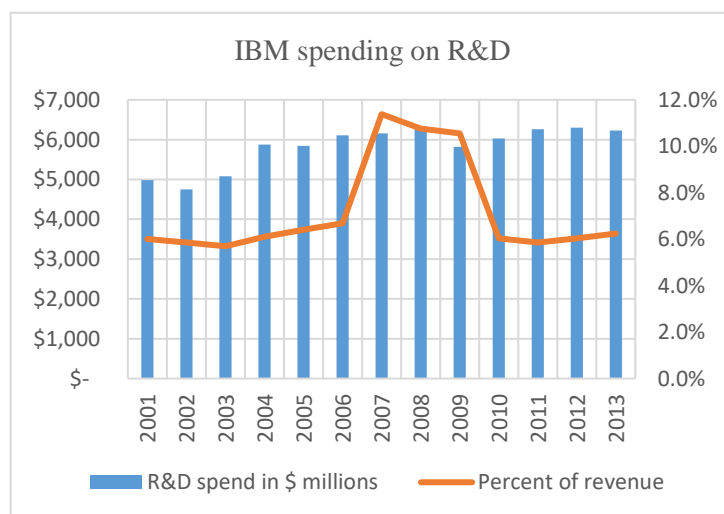
Appendix C; IBM



IBM, as has already been noted in the Bloomberg article, is simply not spending in the range as its competitors and equally significant, this is a decline in spending from the period from 2007 to 2009. Absolute amounts are as important as the change in level of spending.

Recent information which appears to suggest that IBM is about to lay off hundreds if not thousands of its employees mark a threat to the organization not only in terms of a reduction in research and development spending but also to the spirit of the company as an innovative organization.

CIO has not researched IBM and therefore cannot make further comment but it is the shift in R&D spending which might portend negative consequences for this titan of the IT industry.



Appendix D; Deere & Co.

R&D expenditures are consistent

R&D has consistently run in the range of 4 to 5 percent of new sales, generally high for our industry... a spend rate of nearly \$2 million a day' according to Robert W. Lane, immediate past CEO of Deere. Allen, who has been the CEO/Chairman since February 2010, has maintained this level throughout his regime.



The company's commitment to investment in R&D is confirmed by John Lawson¹⁵, an employee of 44 years, who says that he 'never remembers a time anyone suggested cutting back on research and development spending, even in the toughest times. Cutting costs have been required in difficult times 'but engineering was always supported'.

¹⁵ ibid

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According to Magee¹⁶, spending on R&D is a reason the company has maintained an innovation edge throughout its history.

Robert W. Lane refers to the beginning of innovation at Deere and that the founder ‘infused in us an appreciation that continuing innovation, often breakthrough innovation, is necessary to sustain long-term growth... and that this tradition is as old as the company.

But Deere has gone further than R&D spending to enhance its reputation for innovation Lane states further that;

- *‘The need for a significant level of innovation and hence, differentiation has led us to develop a complementary process to BGP [a multi-phased framework called the Business Growth Process, or BGP, which is designed to help the entire enterprise achieve sustained, profitable growth from a mix of new innovative offerings, as well as enhancements to our existing products and services] which focuses on both speeding up and improving the quality of our innovation. The Accelerated Innovation Process, or AIP, is being implemented to help us conceive, evaluate, and propose ideas much more quickly. Then, as appropriate, we advance the ideas with higher potential, sideline merely good ideas for later consideration, and discard the ones that show less promise.’*

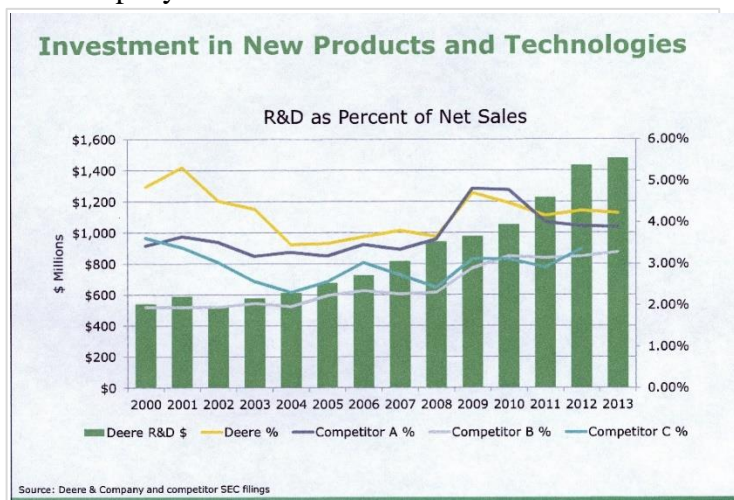
The introduction of the Accelerated Innovation Process is a direct effort to speed up the generation and management of the innovation process within Deere. This initiative may have been in response to a perception that Deere was falling behind its competitors or it may have been a means of staying well ahead. Anecdotal evidence is not clear on the starting point for this initiative.

Appendix E; 3M – Best management practices and consistent support for R&D



3M’s expenditure on R&D has been consistent over the last decade and their approach to the management of innovation has not waived except for a relatively short period while under McNerney.

Under McNerney, from 2000 to 2005, 3M went through a significant change in its approach to its investment in research and development. R&D was no longer as serendipity as it had been¹⁷ and there was a much greater focus on linking R&D spending to shorter-term commercial goals. Spending, as a % of sales declined. We provide further perspective on this period by reviewing a



¹⁶ The John Deere Way

¹⁷ You can’t order change, by Peter S. Cohan.

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most recent book – Appendix A - which, while focussed on McNerney's leadership at Boeing, provides insight into his workings at 3M. Suffice to say that this period was different for 3M'ers and not always welcomed.

The chart clearly indicates the decline during the McNerney period. What is important is to note that the spending on R&D during the 1990s was between 6.7% and 7.4% of revenue.

George Buckely, McNerney's successor states in 3M's Annual Report¹⁸, that "So innovation is unquestionably back at 3M, reflected in our results for 2011, but also in the excitement of our innovation everywhere". Clearly the company had gone through and had by this time recovered from the early 2000s.

Further, and equally important to the issue of innovativeness, is that 3M has had a set of management practices which are aimed at maintaining an entrepreneurial spirit within the organization and most of these have been around for decades. Some of these practices, impacted during McNerney's time, are so deeply ingrained in the organization that a mere 5 years is not significant compared to over a century of tradition and success. Perhaps McNerney's impact was a healthy restructuring of some of these practices. Opinion differ.

Many practices can be directly attributed to early senior management with McKnight¹⁹ deserving much credit. Our research has identified nine management practices which we believe are the most important contributors to this spirit within 3M and it is these practices which have had a significant contribution to 3M's reputation and performance over decades.

Nine Factors cause 3M to stand out from other companies and, in some respects, differentiate their management practices from other highly-innovative companies which we have researched.

In four of the nine Factors, the rating for 3M exceeds our Best of Breed. Best of Breed is drawn from our research into all five companies.

What is difficult to separate out is whether it is the management practices which drive 3M's success or the consistency of their spending on R&D which is the key; i.e. even more important than it might appear. 3M has both attributes at work and it is probably the combination of the two which has this organization continuing to generate ideas, products and services, in great numbers.

¹⁸ Letter to shareholders as of February 16, 2012

¹⁹ For a full discussion of the development of 3M's policies and management practices visit the web site and search for IM reports.

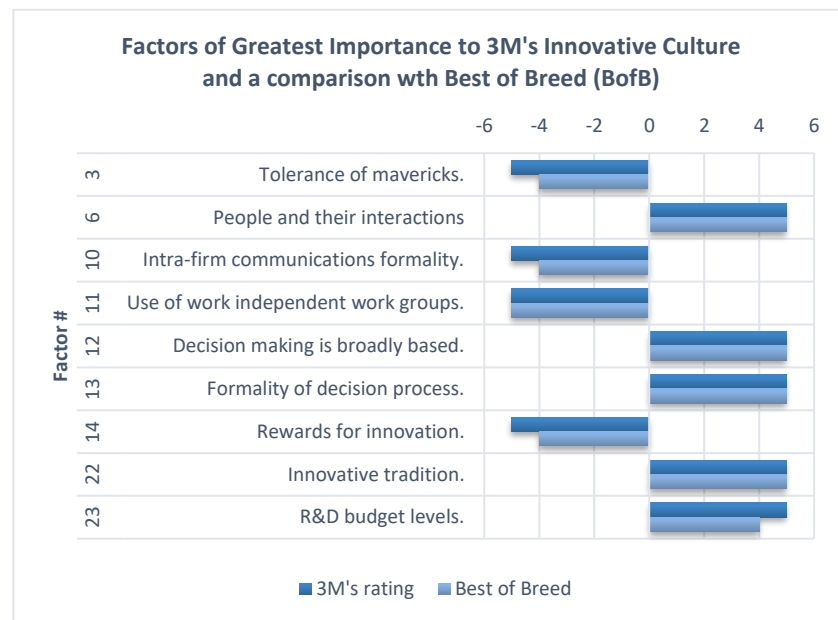
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3M is very transparent about how it is spending its research and development funds and equally candid on how it measured success. Their NPVI is one of the best examples of measuring the effectiveness of R&D investment. 3M's Thulin is so singularly focused on making sure science moves from invention to mass production, that the company has an internal measure called the "NPVI," or New Product Vitality Index. The NPVI is the percentage of revenue the company generates from products that didn't exist five years earlier. In 2008, 25 percent of the company's revenue came from products created in the last five years. Today, that number is 34 percent and their forecast is for even a higher number over the next few years.

George W. Buckley, immediate past Chairman of the Board, President and Chief Executive Officer states in the 2006 3M Annual Report; 'To the outside world, what we do looks a little like magic. Our people have an uncanny ability to see customer needs and then meet them by drawing on 3M's deep pool of technologies – a pool supported by R&D-related investment averaging more than 6 percent of sales. We create entirely new product categories and breathe new life into markets crying for reinvention'. Sometimes that growth comes through product extensions; sometimes through entirely new beginnings. But whatever form growth might take, it is clear to me that there is a direct correlation between the successful acceleration of 3M's growth and the health of innovation and creativity at our company. At its core, 3M remains an idea company that prospers best when we commit ourselves to invest in ideas, technology development and new products. Without innovation, we will not grow'. You could not have a stronger commitment to innovation as a whole and to R&D in particular.

"I believe that what is driving this company in terms of return for us is the investment in research and development, and every time we do it we know that we have a competitive advantage," says CEO Inge Thulin, who took over as CEO in early 2012. The culture continues.



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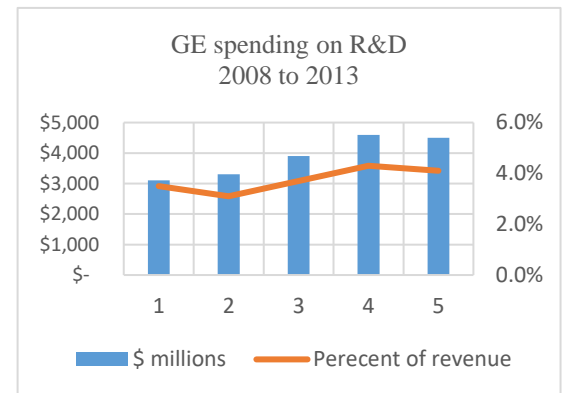
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Appendix F; GE – R&D continues but restructuring is crucial.

GE is known as company which has an innovative tradition going back 130 years²⁰. Begun under Edison, its founder, the tradition has been a core value of GE. In Breakthroughs²¹, which was published in 1986, the research director of EMI Electronics, makes reference to the ‘enormous technical and commercial resources available to’ GE.



Edison established a culture at GE which focused on filing patents as a means of protecting its intellectual property. At age 84²² Edison applied for his 1,093 patent. While there was a period where Edison became disenchanted with the patent system – because of a perception of insufficient protection for the patent holder – this was put aside and patent filing were resumed in the early 1900s²³. The tradition continued for decades establishing GE as one of the top 20 holders of patents globally. That position was lost immediately during the two decades to 2000. Immelt is now focused on restoring GE’s reputation in this regard. GE’s Annual Report 2008 makes the point that ‘patent applications in 2008 were 8% above the level in the prior year’²⁴. By 2012 GE was back in the top 10 patent filers in the U.S.



Not only does GE comprise a significant percent of the Dow Industrial average but it is also viewed as a bell weather stock for the U. S. economy. Its industrial focus and profile was, however, modified in the last 25 years by the initiatives in the finance and media businesses, most of which have divested shed more recently.

GE has been known for its prowess and innovation²⁵ and for over a century has been one of the worlds’ biggest and best. It has transformed itself, long ago, into a multi-division conglomerate, a long way from its start-up single focus on the electric lamp when under its founder, Thomas Edison.

²⁰ *ibid*, p.80.

²¹ Breakthroughs! p. 170.

²² Innovate Like Edison, p. 42.

²³ *ibid*, p.127.

²⁴ 2008 Annual Report.

²⁵ The New GE Way, p.1.

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Whereas Welch pushed for profits through business leadership and tough goal stretching, Immelt is known for placing pressure²⁶ on the organization to deliver ideas – anticipating that this emphasis will provide the growth necessary for success in both patents and profits.

GE's approach to R&D is to make sure that they 'own it' – at least in the priority areas of molecular medicine, nano technology, renewable energy, energy efficiency and environmental technology– and while Immelt states that they are going to own it, they are not there yet²⁷. Immelt's expressed desire to 'own the technology' is reminiscent of Edison's approach to invention. In reference to his vast library at the West Orange Laboratory, he began 'by reading up everything that has been done along that line in the past²⁸'. He 'never began a round of experiments without first reading everything available on the subjects of his studies'.

The GE Global Research Centre has been a leading innovator with thousands of patents²⁹ and was the first company in the U.S. to operate an independent research and development laboratory. It appears that the center was given much less emphasis during Welch's term and mild complacency had crept in mainly because of the emphasis being placed on Crotonville. It was as if 'business leadership' was surpassing 'inventiveness' as the basic culture in GE. Funding the Research Centre from Divisional revenues, along with Welch's push for quarter-on-quarter improvements, was no doubt a contributor to a new focus on short-term thinking. Immelt seems determined to restore the 'innovative, grow-from-within culture'³⁰. The Research center is now to 'foster innovation for the entire company' and has been upgraded and funded with this in mind.

Immelt's approach to fostering innovation is, as the first step, to 'prepare the organization to innovate³¹ or in so many words, creating a 'culture' wherein innovation can take place.

GE has, under Immelt, significantly expanded the R&D function. Not only have more funds been spent in the U.S. but there have been research centers established abroad, in India, China and Germany. Immelt 'upgraded the center...through \$100 million...and adding disciplines which did not previously exist'³² as well as adding infrastructure investment. Funding has increased each year since Immelt took over. Part of the increase in funding derives from contributions from GE's partners.

²⁶ *ibid*, p.88.

²⁷ *ibid*, p. 109.

²⁸ *Innovate Like Edison*, p. 61.

²⁹ *ibid*, p.85.

³⁰ *ibid*, p.87.

³¹ *ibid*, p. 108.

³² *The New GE Way*, p.107.

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Appendix G; Lessons learned from McNerney's experience at 3M.

An extract from on 3M drawn from 'You Can't Order Change', Lessons from Jim McNerney's Turnaround at Boeing, by Peter S. Cohan³³

James McNerney joined 3M as CEO on January 1, 2001 and left on June 30, 2005. He was hired to revitalize the 'tired old industrial giant' according to this most recent book. McNerney evidently sought, by way of creating an environment for creating and exchanging ideas, to revitalize 3M after a 'decade of dormancy'. Evidently, he viewed 3M's culture as a 'problem'. People were set in their ways and these ways were 'sluggish and complacent'. On joining McNerney stated that 3M's 'growth culture had become "stale"'.

McNerney was the first outsider to run 3M. He quickly cut 5000 jobs (6.6% of its work force at the time) and focussed its research spending on health care products and plastics film for display screens.

He also made many other changes and these are the subject of this review. What is in 'quotes' are direct takes from the book and are not to be construed as the opinion of CIO.

McNerney was brought in at a time when his predecessor's overly optimistic forecasts were 'about to be exposed'.

DeSimone³⁴, forecast an 11 percent increase in revenue in the year ahead and a 12 percent rise in operating income, but this was not to be as the dot.com debacle occurred. 3M's stock price was

3M is one of the companies which CIO has researched in depth on its innovation management practices.

This information presented here is focussed on matters which relate to R&D directly and indirectly; another view on the policies and management practices of this highly-innovative company.

These are the findings and opinions of the author, Peter S. Cohan and obviously, those of James McNerney.

³³ Peter S. Cohan is a management consultant, venture capitalist, teacher, author and blogger. Prior to starting his management consulting and venture capital firm in 1994, he worked for Monitor Company, a strategy consulting firm co-founded by HBS Professor, Michael Porter and as an internal consultant in the banking and insurance industries. His firm has completed over 150 consulting projects for companies and governments. He has invested in seven private companies, three of which were sold for a total of \$2 billion. As a Lecturer of Strategy, he teaches business strategy and entrepreneurship to undergraduate and MBA students at Babson College; has authored 12 books; and writes the "Startup Economy" column for Forbes and the "Hungry Start-up" column for Inc.

³⁴ DeSimone had joined 3M at age 21. He was a chemical engineer. In 'A Century of Innovation' published by 3M, it is stated that his leadership will be remembered 'for his empathy for people, his commitment to innovation and his willingness to make hard decisions and weather tough economic times. He became CEO and Chairman of the Board in 1991. His tenure lasted almost a decade, a period longer than all predecessors except for McKnight.

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falling. Revenues were declining in most parts of 3M. The Board made their decision. The abrupt downturn and a sense of crisis provided an opportunity for McNerney to make changes.

His first year was spent working with the organization to define ‘leadership’ in the context of 3M. In most respects, the book is about McNerney’s leadership ideas, his philosophy, and his overall approach to business. The focus of this paper is on how these traits or characteristics relate to research and development.

What McNerney found

What did McNerney find at the beginning of his tenure? CIO has organized the comments into three categories but, as one will note, not all of the ‘findings’ fit neatly into only one category.

On leadership

- The level in the organization determined the allocation of stock options each year.
- The system ‘overvalued experience and undervalued leadership’. 3M ‘suffered from lethargy because of a system that rewarded tenure over performance.
- The company ran on ‘legends and an undisciplined culture of experimentation’.
- 3M was ‘sprawling and lacked strategic focus; 146 plants in sixty countries – 53% of sales were from outside the U.S.
- A confusing organization chart.
- Wall Street did not like the confusion. It was a hard company for Wall Street to understand!
- 3M had a lot of divisions – 45 in number and too many for a \$20 billion company.

On the organization and management of day-to-day affairs

- People made decisions slowly.
- Disciplined performance reviews and accountability were lacking.
- 3M’s pay-for-performance system had deteriorated to a ‘form of entitlement’.
- Older folks were rewarded for tenure; and the ‘young folks’ did not like this discrimination.
- 3M had a ‘bureaucratic environment’ which stood in the way of progress.

On idea generation and realization

- 1500 products in development.
- Too much money was being spent on scientists in white coats who were conducting pure research into topics that were of great scientific interest to them, but not necessarily to anyone else. Too much overhead in running 12 technology centres.
- 3M did not analyze R&D projects, it simply refreshed annual budgets based on how much they had spent the previous year.
- Found that many researchers were in ‘ivory towers’.
- Researchers at 3M did not ask three important questions. Is the opportunity real? Can we win at it? Is it worth it?
- 3M scientists had not worked with customers.

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What McNerney did!

He immediately set about setting ‘ambitious goals’ including increasing sales and operating earnings by 10 percent. To do this, according to this latest report, he did not order them – the goals – but tried to win the “hearts and minds of employees”. His goals were ‘much more ambitious than his predecessor’.

McNerney did the following, here organized under the same three heading as above.

To leadership

- His focus was on being a leader and less on being a strategist. Six things had to be done extremely well in his view.
 - chart a course for themselves and for the people who work for them
 - continually raise expectations in a reasonable way, or raise the bar every year
 - motivate and energize people
 - innovate resourcefully
 - live 3M’s ethical and compliance-oriented values
 - deliver results
- He encouraged leadership traits such as ‘bring out and learn from and act on knowledge from the bottom or outside the organization’.
- He believes in leadership development – much the same as GE under Welch and Immelt but switched a R&D training centre into a Leadership Development Institute; consistent with his priorities. The Accelerated Leadership Development Program was implemented at this centre.
- He believes that executives should be compensated for doing things which are within their control. This placed a lower priority on the link between compensation arrangements and stock price than had been the case. He tied compensation to what executives can control – and in the company’s long-term interests.
- He set goals in January 2001 for achieving a 5% annual growth rate from internally developed new products – “organic growth”.
- Since 3M had a lot of divisions – 45 in number for a \$20 billion company – he made the smaller divisions share resources.
- He reorganized 3M into a focus on markets such as health care and transportation and away from a focus on products such as tapes, abrasives and adhesives. This permitted a means of holding division managers accountable for growth

To organization and management of day-to-day affairs

- He used established management methodologies to get the job – his job – done. Six Sigma (new ways to approach business problems) to improve operations, Lean Six Sigma to reduce waste in manufacturing operations. He states that he does not impose such techniques? He had seen the technique work well at GE. 3M’s margins were increased from 17 percent to 23 percent with ‘the help of Six Sigma’. Training in these methodologies was key to their success.
- He established rewards those who deliver according to goals.

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- At the beginning, he had 3M's managers rank every employee reporting to them; GE's version of the same was called "rank and yank".
- To revive the "stale" culture, he regrouped engineers into "results-focussed energized teams".

To idea generation and realization

- Shifted scientists into business units so they would become more business focussed.
- Centralized that part of R&D which was 'focused on breakthrough technologies'. He centralized those scientists into one corporate research lab – bringing 3M's 500 researchers under one organization divided into four sections; materials, processes, software/electronics/mechanical systems and analytical. The centralization was intended to keep 3M broadly competitive in international markets.
- Nurtured 3M's entrepreneurship based on the traditional 15% rule.
- Encouraged managers to shut down projects that lacked significant revenue potential within 'a few quarters'.
- He created a new process for allocating R&D resources. The "3M Acceleration" process was the vehicle to do this. The system of choice was a stage-gate system (SGS) – using filters and screening to get ideas moving forward and at the same time looking for early closure on likely-to-fail projects'. The new threshold for projects to move forward was that would lead to revenues of \$100 million or more.
- He encouraged growth that comes from internal sources; called "organic growth", more so than growth by acquisition.
- He assigned the 'ivory-tower' researchers – four hundred in number – to seven "market-focussed businesses".
- He wanted to involve scientists in working with customers.
- He introduced a "Won/lost" process to analyze of past new-product successes and failures.

Five myths. The problem and what to do to overcome the situation

Myth	Description	Consequences and what to do
Innovation is a crusade	The iconic, classic researcher is responsible for most innovation	Companies become too dependent upon individuals who sometimes demand resources, fail to communicate and work poorly with others. Requires teaming including with suppliers and customers. Technical sharing and openness. Hoarding information is not productive.
Innovation is technology alone	And technologists are the only innovators	Denies the benefit from the input of many different functions needed to turn the idea into a profit-making product line. We should expect all functions of a business to improve. Innovation is dependent on a culture of sharing and should be shared in all areas of the business. Innovation can occur in all areas of the business.
All innovation is radical	Innovation has to change everything	Focussing on 'breakthroughs' can take away from smaller technological advances which are most valuable to current customers.
Innovation is lucky	It is a matter of serendipity or accidental luck	The notion that luck plays a major part undervalues the idea of frugal choices and doing experiments and quickly culling failures.
Innovation must be undisciplined	Discipline and creativity are mortal and cannot coexist	This puts too much control in the hands of a lone technologist who may be unwilling to give up and may starve the company of resources for projects with greater profit potential. In a business environment creativity cannot exist without discipline. Companies need the discipline to reallocate capital and people from failing programs to winning ones.

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The author presents McNerney's view of what are referred to as 'myths' of innovation along with a neatly-organized response to these beliefs. It all makes sense.

The Numbers and Summary Comment

As the author states, the book is not about numbers even though there are many references to financial results. The following information is drawn from CIO's own analysis and provides yet another perspective on the period under McNerney's tenure.

Revenue

McNerney achieved 7 consecutive quarters – until the third quarter of 2003 - of record sales during a time when there was 'very tepid growth in the U.S.'

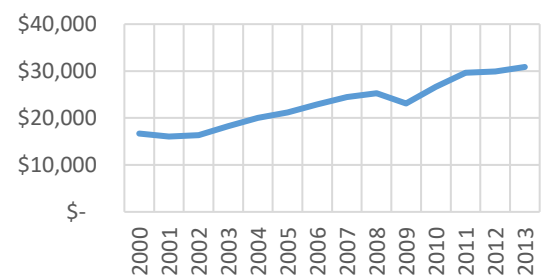
Revenue was in a state of decline over 2000 and 2001 and even flat into 2002. McNerney's impact would not be significant in 2001 given the size and complexity of the company and his newness to this organization but as of 2002, his efforts would begin to be realized.

EPS (earnings per share), while declining for fiscal 2000 and 2001, rose during the balance of 2002 and have kept on the same upward path with the exception of the 2008/2009 period.

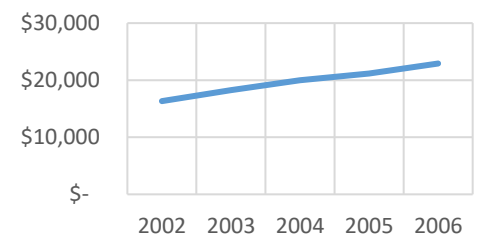
Average annual return on total capital (Value Line report) rose significantly during the last 3 years of McNerney's tenure and, probably due to his broad range of initiatives, continued into 2006.

The P/E ratio rose dramatically from 2000 to 2001, reflecting the market optimism surrounding the appointment of McNerney, but then continued on a downward slope until 2013.

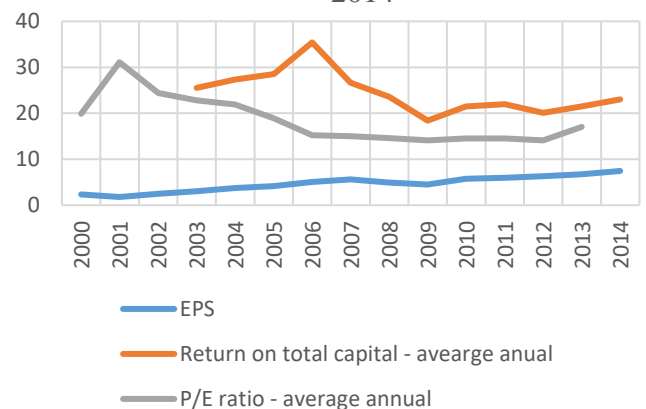
Revenue by year from 2000



Revenue increase reflecting McNerney's initiatives



Financial performance from 2000 through to 2013 (actual) and forecast for 2014



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3M's stock price, when compared to the DOW, while mirroring the DOW's performance for several decades, started to lose ground during the mid-1990s, and had particular lack lustre performance during the early 2000s. By 2003 the two numbers were more closely aligned.

McNerney's tenure at 3M was marked with some controversy and some are quoted as saying that the jury is "still out".

It has been reported that

McNerney's successor, George Buckley, scaled back some of the 3M Acceleration program on the basis that it made for a focus on more incremental predictable development over bigger more important open-ended blue sky approach.

